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Noise and Vibration

Background Report

July 1999

LAKESIDE

Energy from Waste

Environmental Statement

PROJECT NO. GRW/111 ADAMS HENDRY
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Lakeside Energy from Waste Environmental Statement

Environmental Noise Assessment

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For S. Grundon (Waste) Ltd

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Non-Technical Summary

S. Grundon (Waste) Limited is proposing to re-develop its existing Lakeside Clinical waste and recycling plant as an Integrated Waste Management Facility. This facility is situated approximately 0.5 km to the north of the nearest residential properties in Poyle, Borough of Slough. It has been recognised that construction and operation of the development has the potential to impact on the environment and is also subject to statutory requirements with regards to environmental impact assessment.

This report presents the results of a specialist study conducted to establish the likely impact of noise and vibration from redevelopment construction and operation of the plant including traffic movements associated with the development.

For each of the above, criteria are presented for assessment of the significance of any impact. The proposed criteria are based on industry guidance and the results of noise surveys undertaken in the Poyle and Colnbrook areas to establish the prevailing noise environment in the vicinity of the site.

It is concluded that existing noise levels are dominated by traffic movements on the adjacent motorway (M4, M25) and highway (A4) networks, along with flights to and from Heathrow Airport. It is also concluded that the residential properties in the Poyle area will form the critical locations with respect to noise impact, both from construction and operations, and numerical limits are defined based on the proposed significance criteria. It is considered that achievement of a satisfactory impact in this area will result in satisfactory impacts at other locations in the vicinity of the site, eg Colnbrook. It is concluded that perceptible vibration beyond the site boundary will not be of significance.

Calculations have been undertaken to assess the feasibility of achieving the proposed limits, based on available information at this time, and it is concluded that the plant should not compromise the limits proposed and will have no impacts relating to noise and vibration which will be of significance.

A number of mitigation and monitoring measures are proposed which will ensure that the acoustic impact of the development will be engineered within the limits proposed.

1. INTRODUCTION

1.1 S. Grundon (Waste) Limited is proposing to construct and operate a new Integrated Waste Management Facility at its site on the Lakeside Industrial Estate, near Poyle in the Borough of Slough. It has been recognised that construction and operation of the development has the potential to impact on the environment and is also subject to statutory requirements with regards to environmental impact assessment.

1.2 This report presents the results of a specialist study conducted to establish the likely impact of noise and vibration from redevelopment construction and operation of the plant.

1.3 The report seeks to address the following major issues considered as relevant to the development :

- The methodology adopted in undertaking the study,
- The criteria proposed for assessment,
- The results of background monitoring in the vicinity of the site, used to establish baseline conditions against which impacts can be judged,
- The impacts of different phases of the development against the existing environment and other relevant guidelines.
- Required mitigation measures, including proposed limits, methodologies and monitoring, required to ensure impacts are managed.

2. DESCRIPTION OF THE SITE AND SURROUNDINGS

2.1 The site location and its surrounding environs are shown in Figure 1. From Figure 1 it can be seen that the site resides within the existing Lakeside Industrial Estate. It is approximately 2.7 hectares in size and located some 0.5 km to the west of the M25, 1 km to the south of the M4 and immediately north of the main A4 Colnbrook bypass. The site is within 3 km of the main Heathrow Airport and approximately 1 km north of the flight path for air traffic using Heathrow's northern runway.

2.2 The nearest residential properties to the site are to the south in "The Hawthorns", Poyle and are some 450 m from the site (see Figure 1). Other residential properties to the south of the A4 are in the Colnbrook area which is approximately 1 km to the west of the site. There are no residential properties to the east of the site in between the site and the M25 similarly to the north there are no residential properties in between the site and the M4.

2.3 The whole Lakeside, Poyle and Colnbrook area is relatively flat, although the A4 is raised at the southern boundary of the Grundon site as it crosses the railway line. The effect of this is that an earth bund of approximately 6 m in height forms the southern boundary of the site, i.e. in the direction of the residential properties in Poyle.

2.4 The land immediately east of the site is proposed for development as the Heathrow Terminal 5 Construction Logistics Centre, the land immediately east and west of the site is proposed for development as the London International Freight Exchange (L.I.F.E). Neither of these developments has yet received planning approval.

3. OUTLINE OF PROPOSED SITE DEVELOPMENT

3.1 EXISTING SITE ACTIVITIES

The site currently consists of a Materials Recycling Facility (MRF), Clinical Waste Incinerator (CWI) and transport depot. At present, the MRF typically processes 150,000 tonnes of waste per annum and receives waste deliveries from around 7am in the morning with the last deliveries around 5pm and does not operate during the night-time. The facility does not operate on a Sunday and has a reduced operation on Saturdays. The CWI is operated on a 24 hour basis seven days a week and has sufficient site storage to enable this to be achieved with weekday day time only deliveries.

The site is currently licensed to receive 400,000 tonnes of waste at site each year, treat that quantity of waste on site, and then tranship the same quantity of processed waste to other locations. The site is also licensed for the incineration of clinical waste.

3.2 NEW DEVELOPMENT

The proposed development at site will require the redevelopment of the existing CWI and MRF as an integrated waste management facility comprising an Energy from Waste Plant (EfW), a new MRF and a new CWI. It will be necessary to maintain an operational CWI throughout the majority of the site re-development.

The new EfW plant will be capable of handling approximately 440,000 tonnes of waste per annum, consisting of domestic, commercial and industrial waste, plus the un-recyclable outputs from the new MRF. It is intended that the majority of the waste arriving at site will have been pre-treated at local MRF facilities and hence the new Lakeside MRF will only process that waste which has not been pre-treated. Because of the combustion process the amount of materials leaving the site will be much reduced in comparison with that entering. Typically 30% of the incoming waste (by weight) will leave as bottom ash, 3% will leave as fly ash and a small percentage of the total incoming waste will be recycled in the MRF. Therefore the number of traffic movements associated with waste removal will be much lower than associated with delivery.

The EfW process is as follows, see Figure 2.

3.2.1 Waste Path

3.2.1.1 Waste will enter the facility via a weigh-bridge and will be tipped in the tipping hall. MRF bound waste will be placed in the MRF hopper for sorting in the facility beneath the tipping hall. All other waste will be transferred via a number of shoots into the main waste storage bunker. From here two semi-automatic overhead grab cranes will transfer waste into the throat of one of the two steam raising plants (boilers). The waste is then incinerated on a moving grate system within the boilers and the heat produced is used to raise steam. The residual output of the boilers (bottom ash) is then quenched and transferred to a bunker for storage. This ash is then loaded into bulk carriers for transfer offsite.

3.2.2 Gas Path

3.2.2.1 Combustion air is drawn into the two boilers from above the tipping hall. Following combustion, the hot gases leaving the boilers are passed through a number of pollution abatement plants (lime scrubbers, bag filters etc), prior to entering the two main ID fans at the base of the stack. These fans maintain the flow of air through the system and can be significant noise sources. Following the ID fans, the flue gases enter the stack and discharge to atmosphere. The ID fans and stack are located at the north end of the facility, see Figure 2.

3.2.2.2 To prevent over-pressure in the boilers, a number of pressure relief valves will be located at the top of each boiler. Un-attenuated these are high intensity noise sources and will therefore be fitted with custom designed silencers. It is conventional for these valves to be tested as part of the site commissioning procedures. This aspect is discussed further in Section 7 of the report.

3.2.3 Electricity Generation

The hot gases passing through the boiler raise steam within the boiler tubes. This steam is passed to a steam turbine which is used to drive a generator of around 30 MW electrical capacity. The electricity will be exported from site via transformer and overhead wires. The output from the steam turbine will be fed to an air cooled condenser and returned to the system as water for the boiler feed pumps. The steam system is therefore a closed system, apart from a small amount of high purity make-up from the water treatment plant. The steam turbine, generator and air cooled condensers are located at the southern end of the main EfW building, see Figure 2.

4. IMPACT ASSESSMENT METHODOLOGY

The noise impact of the proposals have been assessed using industry standard procedures which were discussed during an initial consultation meeting between the applicant's representatives and Slough Borough Council. Central to the assessments is an understanding of current environmental noise levels in the vicinity of the site against which projected impacts can be judged. In assessing the impact of the site, it is considered appropriate to split the development into distinct phases covering,

- The demolition of the existing facility and construction of the new plant,
- Traffic movements associated with operation of the plant,
- Continuous operation of the EfW plant.

4.1 NOISE MONITORING METHODOLOGY

4.1.1 General

4.1.1.1 The noise monitoring procedure adopted was discussed with Slough Borough Council prior to commencement of the assessment. The objective was to determine the existing ambient noise levels, both day and night, week day and week end at selected control locations. It was envisaged at the outset that noise levels during flying hours (nominally 6am to 11pm) would be significantly influenced by activity at Heathrow Airport, and also that activity on the main M25 and M4 motorways would influence noise levels.

4.1.1.2 Four locations were selected for measurement, with permanent noise monitors installed at two (Pippins School in Poyle and Colnbrook School). The two permanent noise monitors were used to continuously monitor noise levels over a period of 1 week. These locations were also visited during the week and attended measurements were undertaken to augment the results from the permanent monitors. For the attended measurements, weather conditions were in accordance with the guidelines offered by BS4142 for background surveys (see section 5.2.1). Both day and night-time measurements were undertaken.

4.1.1.3 The survey was scheduled to commence during a period of favourable conditions for noise propagation from the site towards the Poyle and Colnbrook areas, i.e. under light winds with a northerly component. This was considered of importance as the calculations used to establish the noise levels from the development also assume favourable conditions for noise propagation. It is by comparison of predicted noise levels (or limits) with existing background levels that the impact of the development is assessed. For the Poyle and Colnbrook situation this was considered particularly relevant as a northerly air stream implies that the areas are also downwind of the M4, A4 and albeit to a lesser extent, the M25. Because of this, it was considered likely that a significant difference between noise levels under northerly and southerly to south-westerly air streams would occur.

4.1.1.4 During the surveys, subjective observations were noted of factors contributing to the ambient noise environment. Weather information was also obtained using a hand held instrument during the survey, and from the meteorological office for hourly weather statistics at Heathrow Airport (wind speed and direction and rainfall) throughout the week long period. The wind speed indication from Heathrow is based on results from an anemometer located at 10 m above ground.

4.1.2 Measuring Equipment

4.1.2.1 For the week's continuous monitoring at Location 1, Pippins School, measurements were made using a Larson Davis sound level meter type LD820, fitted with a weather protected Cirrus microphone, type MK224. This equipment conforms with the requirements of a type 1 sound level meter (as BS EN 60651). For Colnbrook School, results were provided from the permanent noise monitoring station owned and operated by Heathrow Airports noise team. This system also conforms to the requirements of a type 1 sound level meter.

4.1.2.2 All attended noise measurements were recorded using a Bruel and Kjaer Modular Precision Sound Analyser Type 2260 fitted with a Bruel and Kjaer Type 4189 microphone. The analyser was calibrated using a Bruel and Kjaer Type 4231 calibrator.

4.1.3 Measurement Locations

4.1.3.1 The following measurement locations were used for assessment of environmental noise levels, see Figure 1.

Location 1 : Pippins School.

The residential area around Pippins School is considered to be the most critical with respect to environmental noise from the development. The noise monitor was set up in the garden of the caretakers house immediately adjacent to Pippins School. In accordance with the guidelines offered in BS4142, 1997 (reference 1), the microphone was approximately 1.5 m above ground and located and more than 3.5 m from any reflective surface. This location is approximately 500 m from the existing Grundon site, 400 m south of the A4 and 500 m west of the M25. Poyle is almost directly beneath the flight-path from Heathrow for aircraft using the northern runway The intervening land between the Grundon site and the school is relatively flat, apart from the raised section of the A4 across the southern boundary of the site. A direct line of site to the Grundon site was obscured by the school building (single storey), trees in the land between Poyle trading estate and the A4. This location, similar to all other residential properties at the eastern side of the Rodney Way residential area is shielded from noise from the M25 by the buildings on Coln Trading Estate.

Location 2 : Colnbrook School

The noise monitor at this location is part of Heathrow Airport's permanent noise monitoring scheme. The monitor is located within the school grounds, with the microphone at a height of 5 m above ground. Colnbrook School is approximately 1.3 km from the Grundon site and 400 m south of the A4. The site is also approximately 1.2 km south of the M4 and 1.6 km west of the M25. Similarly to Poyle, Colnbrook is almost directly beneath the flight-path from Heathrow for aircraft using the northern run-way

Location 3 : The North End of Mill Street, Colnbrook

This location was selected as typical of the dwellings at the north-east side of Colnbrook. The location is approximately 1 km from the site and 170 m south of the A4. The land in between the site and this location is flat and generally open land.

Location 4 : Opposite The Public House on The A4.

This location is approximately 420 m from the Grundon site and is directly alongside the A4 next to the BP filling station. The land between the site and the location is flat. It is unknown whether or not the establishment is inhabited as a residential dwelling.

For each set of attended measurements, the microphone was set at a height of approximately 1.5 m above the ground.

4.1.4 Measured Parameters

For the permanent noise monitors at Pippins School and Colnbrook School, measurements were recorded using a 1 hour sample period. Attended measurements were recorded using a 10 minute sample period. For each of the attended measurements, and permanent measurements at Pippins School, the following parameters were recorded : L_{A90}, L_{A50}, L_{A10}, L_{A1} and L_{Aeq} in decibels over the sample period. For attended measurements, the octave band composition of the noise levels was also recorded.

The results from the monitor at Colnbrook School have been made available in terms of hourly L_{A90} and L_{Aeq} parameters.

A brief description of the acoustic terminology used in this report is presented as Appendix 1.

5. IMPACT SIGNIFICANCE ASSESSMENT CRITERIA

As discussed in Section 4, it is considered that the different phases of the development have potential to impact on the environment. Also discussed is that new industrial noise sources are conventionally assessed by comparison of existing noise levels with those predicted to ensue during the development and operation of the plant. General guidance with regards to the significance of any predicted increase in noise level, be it associated with the construction or operational phase of the development can be gained by reference to BS4142 : 1997 (reference 1), for plant operations, and BS5228 : 1997 (reference 2) for construction phases. However, in all cases this guidance must be used in collaboration with knowledge of any specific local factors which may influence the significance of impacts.

In making assessments as to the significance of increase in noise levels, it is worth noting that an increase in noise level of 3 dB is just noticeable to an average listener, whereas a increase of 10 dB is perceived as a doubling noise loudness.

5.1 SIGNIFICANCE CRITERIA CONSTRUCTION AND DEMOLITION PHASE

5.1.1 Planning Policy Guidance No 24 (reference 3) advises that detailed advice on assessing noise from construction sites can be found in a Code of Practice published as British Standard BS5228 (reference 2), Parts 1 to 4. Part 1 of this standard is particularly relevant to noise from sites, whereas Part 4 is specific to issues relating to piling activities. This standard is also referred to by Slough Borough Council in its Guidance Notes on Demolition and Building Construction Sites (reference 4).

5.1.2 BS 5228

This Code of Practice makes reference to a number of factors which are likely to affect the significance and acceptability of construction site noise. These are:

i) Site location;
ii) Existing ambient noise levels;
iii) Duration of site operations;
iv) Hours of work;
v) Attitude to the site operator;
vi) Noise characteristics.

With respect to (ii) and (iii) it is generally recognised that for industrial noise the likelihood of complaints is related to the difference between the industrial noise and the existing background noise level (reference 1) although the Code of Practice recognises that this relationship between response and noise level differences may well be different for construction noise activities, and a greater difference may be tolerated when it is known that the operations are of relatively short duration. It would be anticipated that the longer the construction activities are scheduled for, the closer is the perception of a construction site to a permanent industrial facility, particularly if the construction activities continue during the night. It is therefore relevant to consider the duration of the proposed works, plus the hours of construction working in the context of the development area.

With respect to (iv), BS 5228 makes reference to the fact that noise levels generated during the evening (19.00 to 23.00) may need to be less than day-time (07.00 to 19.00) limits (a figure of 10 dB is quoted) and also that for any night-time (23.00 to 07.00) operations levels should be quieter still. The standard does not however offer guidelines with respect to specific limits or a method of determining limits in a given environment. On this, DOE (now DETR) Advisory Leaflet AL 72, 1976 (reference 5) suggests that 70 dB L_{Aeq} level should be applied for noise from construction activities impacting at residential properties. This is equivalent to a free field noise level of 67 dB L_{Aeq}. The advisory leaflet is also referenced by Slough Borough Council in its guidance notes for demolition and construction sites (reference 4).

It is worth noting that a similar limit, 65 dB L_{Aeq} at residential properties is proposed by RPS Group Plc in its explanatory statement for construction of the Heathrow Terminal 5 Construction Logistics Centre (reference 6). The construction phase of this development is likely to have a duration of approximately 6 months, followed by an operational phase of "not longer than 10 years". The document recognises that a lower limit should be applied to the 10 year period and suggests a limit of 55 dB L_{Aeq}. For construction activities at the Centre, the proposed hours of working are 07.00 to 19.00 weekdays and 07.00 to 16.00 on Saturdays.

BS5228 recognises that people's attitudes to noise can be influenced by their attitude to the source itself. Any noise may be more readily accepted by local residents if they consider that the operator is doing all that he can to avoid unnecessary noise. In this regard, good public relations are always important to minimise the impact of any potentially noisy operation.

Taking the above factors into account, it is recommended that a suitable criteria for noise from the construction phase of the development is a free field limit of 67 dB L_{Aeq} at residential properties between the hours of 07.00 and 19.00 weekdays and 07.00 and 14.00 on Saturdays. In the evening, 19.00 to 23.00 and Saturday afternoon, a limit of 10 dB less than this would be appropriate based on the guidance offered in reference 2, along with consideration of existing ambient noise levels.

5.2 SIGNIFICANCE CRITERIA OPERATIONAL PHASE

5.2.1 BS 4142 : 1997 presents a methodology for assessment noise from an industrial noise source impacting on residential properties. This technique relies on quantification of the "*specific noise level*"; the noise contribution from the new source, expressed in terms of the L_{Aeq} parameter, outside the relevant property, along with quantification of the pre-existing "*background level*", expressed in terms of the L_{A90} parameter. If appropriate, the specific noise level is corrected to account for the character of the noise (a + 5 dB correction is applied if the noise is considered to be tonal or have distinctive character). This corrected noise level is termed the "rating level". The difference between the rating and the background noise is the measure set forward in BS4142 for assessment of significance. The standard suggests that *"a difference of around +10 or more indicates that complaints are likely"*, whereas *"a difference of around +5 is of marginal significance"*. The standard also states that *"if the rating level is more than 10 dB below the measured background noise level then this is a positive indication that complaints are unlikely"*. Based on this guidance, and knowledge of local factors, the following criteria are proposed for assessment of the significance of noise levels from the development:

Table 1 : **Criteria For Assessment of Continuous Site Operations**

Significance Criteria	Rating Level (L_{Aeq}) – Background Level L_{A90}
Substantial increase	> 6 dB
Marginal increase	1-5 dB
Minor increase	-5 – 0 dB
None	<-5 dB

5.3 SIGNIFICANCE CRITERIA: TRAFFIC

5.3.1 Road traffic noise is conventionally calculated using the guidelines offered by the Department Of Transport publication "Calculation of Road Traffic Noise" (reference 7). This method presents methodologies for establishing noise levels due to road traffic expressed in terms of the L_{A10} metric (the noise level exceeded for 10% of a given measurement period), which is

the standard parameter against which noise from road traffic is judged. For assessments of noise insulation entitlement under the Noise Insulation Regulations (reference 8), an 18 hour reference period is specified. For other purposes the document also sets forward procedures for calculating hourly values of the L_{A10} parameter. Where hourly traffic flows are available, it is considered more appropriate to utilise the hourly L_{A10} parameters to assess changes in noise level throughout the course of a day.

5.3.2 The methods require primary input data in terms of the volume of traffic. From this a basic hourly noise level L_{A10} is predicted at a position 10m from the road. This is then corrected for speed, percentage HGV, gradient and road surface. Noise levels at relevant properties are then calculated using propagation algorithms based on distance. Using this technique, it is therefore relatively straightforward to assess increases or decreases in noise levels from a given road as the majority of the input parameters remain constant (gradient, surface, average speed and propagation).

5.3.3 For the Grundon's site, all traffic leaving the plant enters the main A4 Colnbrook by-pass and it is therefore considered relevant to assess the increase / decrease in noise from this section of road.

5.3.4 In terms of significance criteria, then it is considered relevant to use the guidelines offered in Volume 11 (Environmental Assessments) of the "Design Manual For Roads and Bridges" (reference 9) : 1993. Here in Section 3, Part 7, Chapter 3 the document considers nuisance from traffic noise and vibration. The document states that *"In the period following a change in traffic flow, people may find appreciable benefits or disbenefits where noise changes are as small as 1dB(A) – equivalent to a change in traffic flow of 25%"*. A 1 dB(A) change in the $L_{A10,18}$ hour parameter is also considered as one of the test conditions for entitlement under the Noise Insulation Regulations, albeit qualified by other conditions on absolute level and contribution from a modified or new scheme.

5.3.5 Based on the above, it is therefore possible to use a 1 dB increase in the hourly L_{A10} parameter as an initial guide measure of significance (using the fact that if the maximum change in the hourly statistic is less than 1 dB, then the change in the 18 hour statistic must also be less than 1 dB). Below this level, the change in noise level can be considered as insignificant.

6. EXISTING BASELINE CONDITIONS

The results of the baseline noise surveys undertaken in the vicinity of the site are presented in Tables 2 and 3 of this report. Table 2 presents the results from the two permanent monitors at Pippins School and Colnbrook School along with corresponding hourly meteorological data obtained from Heathrow Airport. Table 3 present the results of the attended monitoring including information regarding the prevailing meteorological conditions and subjective impressions of the surveyor.

The results from the permanent monitors, in terms of the hourly L_{A90} and L_{Aeq} parameters are also presented in Figures 3 to 10. Figure 3 presents the information for the full duration of the survey period, whereas Figures 5 to 10 show the variation in noise levels for each consecutive 24 hour period, commencing at midday. Figure 4 presents the results of the monitoring from 4pm on Friday the 8th January (the start of the measurements) to 11am on Saturday the 9th.

6.1 PIPPINS SCHOOL : LOCATION 1

6.1.1 Figures 4 to 10 show the daily variation in L_{A90} and L_{Acq} at Pippins School. From these results, it can be seen that large variations in noise level occur throughout each day. Typically day-time L_{A90} levels are between 10 and 15 dB above night-time (23.00 to 07.00) levels, with a larger variation in the L_{Acq} parameter. It can also be seen that the quietest night-time periods are relatively short, from around midnight to 5am and correspond with periods of relatively low activity on the motorway / A4 networks and Heathrow Airport. It is particularly relevant to consider night-time noise levels for assessment of the operational phase of the new EfW plant. This is because the combustion and electricity generation processes will be 24 hour operations. The noise impact of these aspects should therefore be judged against night-time conditions. Table 4 below presents the average night-time minimum background noise levels (midnight to 4am) along with the average wind speed and direction. It is not considered appropriate to use the average levels over a full night-time period of 23.00 to 07.00 as noise levels in Poyle do not fall to a minimum until after midnight and begin to rise quite steeply from around 5am onwards).

Table 4 : **Average Night Time Background Noise Levels at Pippins School, Poyle**

Date	Average Night-time L_{A90} (00.00 to 05.00)	Average Hourly Wind Speed m/s	Wind Direction
8th / 9th	49	2	NNW
9th / 10th Saturday night	42	2	NNW
10th / 11th	47	3	N
11th / 12th	41	1-2	SW
12th / 13th	41	4	W
13th / 14th	32	4	WSW
14th / 15th	35	5+	SW

6.1.2 Of particular note in the above table is the influence of the prevailing wind direction on average noise levels. Because of the location of Poyle with respect to the M25, A4 and M4, see Figure 1, wind directions between SSW and W are the only ones which represent non downwind conditions for noise from major roads to the area. The effect of this is demonstrated in Table 4 where it can be seen that lower average noise levels were recorded on the last two nights of the survey, which corresponded to winds from a WSW and SW direction.

6.1.3 For establishing proposed noise source strength limits for continuous operations at site, it is considered appropriate to compare the noise levels monitored under light northerly air streams as this represents a downwind condition from the site to Poyle. This is because the noise propagation calculations described in Section 7 of this report also assume a light downwind condition from a noise source towards a receiver.

6.1.4 With regards to day time noise levels, it can be seen from Figures 4 to 10 that L_{Aeq} levels are generally in excess of 60 dB between the hours of 7am and 10pm. The exception to this is during the later parts of the 13th and 14th January, where noise levels were lower than 60 dB from around 3pm and the wind was from the southwest (it is understood that the characteristic drop in noise levels at 3pm from Monday onwards is due to the Heathrow run-way management regime which switches from take off to landing on the northern run-way at 3pm). From Figures 3 to 10 it is also evident that day-time hourly L_{Aeq} levels in excess of 70 and occasionally 80 dB are not uncommon during weekdays (it is understood that the single high level peak around late morning corresponds with the Concord flight schedule).

6.2 COLNBROOK SCHOOL : LOCATION 2

6.2.1 Figures 3 to 10 show the results from the permanent monitor at Colnbrook School in terms of the hourly L_{A90} and L_{Aeq} parameter (note the data from Colnbrook has been provided from the afternoon of Saturday the 9th January onwards, whereas the monitor at Pippins School commenced operation 24 hours earlier). It can be seen from these figures that a very similar noise environment exists in Colnbrook to that in the Poyle area and hence the observations set out in Section 6.1 above also apply . An exception to this is observed from around midnight on 12th January (last two days of the survey) when it can be seen that noise levels at Colnbrook are generally higher than those in Poyle. This corresponds to the period of south-westerly and westerly winds, see Table 4 in Section 6.1 above.

Because of this, and the relative location of Colnbrook and Poyle with respect to the Grundons site, it is ambient noise levels in Poyle which will be critical with respect to establishing the impact of the development. For this reason, section 7, "Impact Assessments", make reference to noise levels in Poyle as the basic assessment criteria.

6.3 ATTENDED MEASUREMENTS, LOCATIONS 1 TO 4

6.3.1 The results of attended noise monitoring in the Colnbrook and Poyle area are presented in Table 3. Measurements were recorded from mid-afternoon on the 12th January and finished at approximately 1am on the 13th January. Each measurement was recorded using a 10 minute sample period and the local wind speed and direction, plus comments relating significant noise sources are also presented. The results demonstrate consistency with the levels recorded at the two permanent monitors (Table 1) and also that noise levels in the Colnbrook and Poyle areas are generally comparable.

6.3.2 Subjectively dominant noise sources in the area were traffic, both distant (M4, M25) and nearby (A4), plus aircraft movements to and from Heathrow.

7. IMPACT ASSESSMENTS

7.1 DEMOLITION & CONSTRUCTION

7.1.1 To evaluate the noise and vibration impact of the demolition and construction phase of the project, it is necessary to define specific phases of work to which equipment types and mixes can be ascribed. This has been defined by Grundons and its advisors for the EfW plant based on previous similar development experience. The construction phases, mixes of equipment type and assumed operating regimes are presented in Table 5. As can be seen, Table 5 also presents a typical sound power level for each equipment item (based on the information presented in BS5228), a percentage utilisation factor (% on time) and resultant noise level for each phase at varying distances from the site. The predictions makes no correction for any local screening which may occur and are therefore likely to slightly over-estimate noise levels. This is particularly true for noise propagation towards Poyle due to the elevated section of the A4 which runs across the southern boundary of the Grundon site thus providing an earth barrier of approximately 6 m height in between the site and the receiver location.

7.1.2 A number of the specific phases will overlap during the construction programme, and therefore the combined noise impact during over-lapping phases has also been determined. The resultant noise level due to these over-lapping phases is also calculated and presented in Table 5.

7.1.3 In completing this assessment, it can be seen that the noise levels generated by the construction activities at the control points will generally be less than the pre-existing day time L_{Aeq} values which are dominated by traffic and aircraft movements and consistently in excess of 70 dB, see Figure 3. The levels are also below those set forward in Section 5.1 as proposed upper limits for construction noise at residential properties.

7.1.4 In addition to the identified phases of the construction programme there will also be a commissioning phase prior to normal operations. During this stage a number of activities will be undertaken up-to full power operation of the site processes. This will include the necessity to test the boiler pressure relief systems and vent high pressure steam to atmosphere. Un-attenuated, this activity is one of the loudest sources of noise on industrial plants. Vents should be attenuated by means of a proprietary silencer which will reduce both on-site and environmental noise levels. It will be necessary consult with the boiler / valve manufacturers regarding likely noise levels and the performance requirements for the silencers. It will also

be necessary to consult with Slough Borough Council regarding this activity, times, duration (likely to be approximately 15 minutes per occurrence) and agree a strategy for informing the public of such events. It is worthy of note that high noise levels are experienced in the area on a regular basis during the take off of Concord, see Table 2 which shows that maximum noise levels in excess of 100 dB(A) can be generated, albeit for a short duration.

7.1.5 With regard to traffic generated during the construction phase of the development, it is considered that a positive situation may ensue as the current waste deliveries to site will cease (except for CWI inputs) for the duration of the construction phase.

7.2 VIBRATION

7.2.1 The only activity during the programme considered as having the potential for perceptible vibration beyond the site boundary is the piling phase which will be undertaken soon after the start of the project. On this, Part 4 of BS5228 offers guidance with respect to measured levels of vibration (in terms of peak particle velocities ppv's) at distance from various different piling operations. The standard also suggests acceptable limits for vibration based on building damage criteria for typical residential properties and also for light and flexible structures such as industrial units utilising framework and cladding. The levels suggested are 10 mm/s ppv for residential properties and 20 mm/s ppv for light and flexible structures. The standard recognises that the vibration level generated is related to the type of operation (drop hammer / bored / driven etc), the energy per blow or per cycle (bored) and the type of ground being penetrated. In general driven or impact piling leads to the highest vibration levels and the resultant vibration level is proportional the hardness of the ground and energy per blow. It is worthy of note that even for driven piles, measured vibration levels which exceed the suggested guidelines have generally been recorded at distances close to the piling operations, i.e. less than 10 m. For distances comparable with those to Poyle (approximately 450 m) two quoted levels are presented at 0.025 mm/s at 250 m and 0.015 mm/s at 300 m. These levels approximate to the base curves presented in BS6472 (reference 10), which suggests that at levels below the base curves adverse comments relating to vibration would not be expected.

7.2.2 Based on this and the information presented in BS5228 and BS6472, it is therefore concluded that piling activities at site will not lead to any perceptible vibration levels in residential areas. It would however be prudent to undertake monitoring of vibration levels at the adjacent industrial units (within approximately 30 m of the site northern boundary) during test pile operations, particularly if driven piles are to be employed towards the northern boundary.

7.3 OPERATIONS – ROAD TRAFFIC, PLANT OPERATIONS

The two principal elements of the operation with potential for noise impact are any increases in traffic associated with the plant and the noise generated by the continuous processes, see Section 3. It is appropriate to consider each of these aspects in turn.

7.3.1 Traffic Noise Impact

7.3.1.1 As described in Section 5.3, it is appropriate to calculate the change in traffic noise levels due to the site by use of the CRTN method (reference 7), with the application of a 1 dB(A) increase in the $L_{A10,\ 1\ hour}$ parameter as a screening measure of possible significance. Below this level, the impact can be considered as insignificant.

7.3.1.2 The primary information required for this assessment is a measure of volumes of traffic and percentages of heavy goods vehicles both with and without the proposed EfW plant. This information is required for the hours during which deliveries to and from the plant will take place (nominally 24 hours, 7 days per week, although with much less activity at night and during the weekend). It is also considered that because of the nearby connections to major motorways and main roads, any impact will be confined to the Colnbrook by-pass section of the A4. It is also assumed that the average speed of vehicles, road surface and gradient will remain constant.

7.3.1.3 The existing information regarding traffic flows on the Colnbrook by-pass have been set forward in Chapter 9 of the main Environmental Statement and the specialist traffic report. The data, in terms of hourly flows on the A4, has been derived from surveys undertaken by Quali-Dat between 11th and 21st April 1999. From the raw data, average hourly flows on the A4 have been determined for both weekday and weekends, along with percentages of HGV's (including those associated with the current Grundon operation). Using the CRTN methodology, it necessary to establish similar data for the potential and proposed developments in order to assess the change in the hourly L_{A10} parameter. This information,

along with information relating to the current MRF and CWI operations have been provided in Chapter 9 of the main Environmental Statement, and the specialist traffic report. In undertaking the assessment, it is relevant to note that Grundons current site licence allows for delivery and re-cycling and removal of 400,000 tonnes of waste to the MRF at site, see Section 3.1.

7.3.1.4 From information regarding current A4 flows, the existing Grundon site traffic, the consented Grundon traffic and the traffic associated with the EfW, Table 6 (weekdays) and Table 7 (weekends) have been derived. These tables present the projected increase in traffic noise (in terms of the $L_{A10,\ 1\ hour}$ parameter 10 m from the carriageway) assuming (i) Grundon operates the site to its consented maximum and (ii) the EfW scheme is implemented. The flow of traffic to the EfW has been based on the assumed hourly delivery profile of a similar development. The influence of private cars to and from the site has not been assessed as it is considered insignificant. This is because the numbers of cars arriving at site is unlikely to have a significant effect on traffic flows on the A4. From Table 6 (weekdays), it can be seen that the maximum change in this parameter at a distance of 10 m (predictions are based on a notional point 10 m from the carriageway), is 0.7 dB(A) between the "quietest" situation (current operations) and the "noisiest" situation (consented operations) during the hour of peak deliveries (9am to 10am). For the EfW situation, this difference is less, approximately 0.5 dB(A), again during the peak hour for deliveries between 9am and 10am.

For the weekend (Table 7), a maximum change of 0.8 dB is predicted for the EfW during the peak hour of 9 to 10.

7.3.1.5 It is therefore concluded that traffic associated with the proposed site redevelopment will not lead to a significant noise impact.

7.3.2 Continuous Operations

7.3.2.1 Section 5.2 sets forward proposed parameters for assessment of the significance of continuous noise from the development. It is explained earlier in this document that as the plants electricity generation process will operate 24 hours a day, it is relevant to assess its noise impact against the prevailing night-time noise environment. It is also explained that noise propagation techniques conventionally assume favourable conditions for propagation from sources towards receivers, and that because of this, it is relevant to establish limits based on background levels under similar conditions. It is worth noting that for conditions when the site is downwind of the residential properties, i.e. winds from the south-east to south-west, the

expected noise contribution from the plant at the properties would be approximately 10 dB (A) less that under the reverse condition (see for example, reference 11).

7.3.2.2 For Pippins School, Poyle it is possible to develop the following table which presents the existing night-time background noise levels along with the implied limits for noise from the Grundons site for varying significance criteria.

Table 7: **Proposed Limits For Continuous Operations Based On Achievement of "No Significance" Criteria.**

Date	Night-time (00.00 to 5am) L_{A90} (from Table 4)	Upper Limit for Significance Criteria = No Significance (Table 1)	Wind Direction
8^{th} / 9^{th}	49	44	NNW
9^{th} / 10^{th} Saturday night	42	37	NNW
10^{th} / 11^{th}	47	42	N
* 11^{th} / 12^{th}	41	-	SW
* 12^{th} / 13^{th}	41	-	W
* 13^{th} / 14^{th}	32	-	WSW
* 14^{th} / 15^{th}	35	-	SW

* wind direction not valid for limit derivation.

7.3.2.3 Based on the above assessment, it is therefore proposed that a noise limit of 37 dB L_{Aeq} at The Hawthorns / Pippins School, i.e. at a distance of approximately 450 m to the south of the site, should form one of the plant performance specifications. For this site, achievement of this limit is considered as appropriate, as it will lead to no impact of significance, but can be delivered using available technology. Because of this it is argued that the limit represents the principles of BATNEEC for noise at this site. For the proposed site, it would not however be considered appropriate to apply a general boundary limit for noise from the plant as some items are very close to the boundary, for example, the steam turbine and air cooled condensers at the southern end of the site, and the ID fans at the northern end of the site.

7.4 CUMULATIVE IMPACTS

7.4.1 As described in Section 2, the Lakeside area is subject to a number of potential developments, most notably the London International Freight Exchange, the Heathrow Terminal 5 Construction Logistics Centre and the Grundon EfW plant.

7.4.2 With regards to any cumulative effects, it is only considered appropriate in this document to make reference to how the proposed EfW plant may add to other identified impacts.

7.4.3 The maximum noise level predicted for construction of the EfW facility is 63 dB L_{Aeq} at Poyle. The documentation supporting the Logistics Centre proposals predict a maximum noise level of 52 dB L_{Aeq} at equivalent locations in Poyle during the construction and earthworks phase.

7.4.4 For construction of the LIFE scheme no specific noise predictions are presented but it is stated that 'in general, noise generated by construction work reduces significantly over a distance of 200-300 metres, such that noise from other nearby sources are predominant. However, this depends greatly on the ambient noise environment in the area. In this case, the noise measurements undertaken indicate that daytime noise levels are such that construction noise would not be expected to have an effect beyond some 200 metres from the work area' (para 6.46 LIFE Environmental Statement, RPS Group Plc).

7.4.5 It is therefore concluded that in the unlikely event that maximum construction noise from the Logistics Centre, LIFE and EfW facility occur simultaneously, then there would be a noise level of approximately 64 dB(A) at the residential areas of Poyle, This level is less than typical existing day-time noise levels and 3 dB(A) below the proposed maximum for daytime construction activities.

8. MITIGATION MEASURES AND MONITORING

8.1 From Section 7, it can be seen that noise limits have been proposed for the phases of the development which should result in the plant having an acceptable environmental noise impact. Mitigation measures and procedures will therefore be required to ensure the limits are achieved.

8.2 The construction noise calculations presented in Section 7 have been based on reasonable assumptions as to the most likely methods, phases and equipment items to be employed. In practice, it is possible that the contractor(s) may deviate from this leading to different noise levels from those predicted.

8.3 Grundons, will therefore require selected contractors to submit method statements giving construction plant schedules, working hours and predicted noise levels at defined residential receiver locations (Poyle) judged against the proposed limits. These assessments should be submitted to the local planning authority for approval along with a proposed scheme for monitoring noise generated from the construction activities. The scheme should seek to identify key phases of the development with potential for high noise levels, eg piling, demolition and should provide for sample monitoring of these at agreed locations, along with calculations to demonstrate levels generated at residential properties.

8.4 During commissioning, it has been identified that test operation of the site pressure relief systems may lead to high intensity noise levels. A method statement with regards to the these activities should be developed setting forward the methods of informing local residents of such operations, the likely noise levels generated and methods of reasonably attenuating the events. Again, this should be submitted to the local planning authority for approval.

8.5 For the plant operational phase, it is proposed that the plant should be designed to the limits specified in Section 7 of this document. Grundon will therefore require the selected main plant contractor to submit an acoustic design report detailing significant noise sources within the plant and methods of attenuating these to enable compliance with the limits proposed. This study should address aspects of the design such as the required acoustic performance of the main cladding envelope, the attenuation of individual noise sources, primarily the steam turbine and generator, the air cooled condenser, the ID fans associated with both the EfW plant and the CWI and fuel handling systems. The study will address issues relating to the attenuation of tonal noise sources and will set forward a methodology for checking noise

levels during commissioning of the plant at control locations along with calculation techniques for determination of the contribution in the Poyle area.

8.6 It is considered that attenuation measures are likely to include

- Specification of acoustic enclosure / building for the main steam turbine and electrical generator,
- Specification of adequate noise limits for the external air cooled condenser, including fan selection,
- Specification of noise limits for the ID fans and for stack attenuation downstream of the units,
- Provision of doors to minimise noise breakout from the main building (also desirable with respect to odour control).
- Specification of attenuation properties for the main building structures, based on expected internal noise levels.

9. CONCLUSIONS

9.1 This report considered the noise and vibration impact of the proposed redevelopment of Grundons Lakeside site as an integrated waste management facility. The report addresses each of the phases of the redevelopment considered as having potential to impact on the environment. These phases are :

- The demolition and construction phase, likely to extend for approximately 28 months,
- The operational phase,
- The associated traffic movements.

9.2 For each of the above, criteria are presented for assessment of the significance of any impact. The proposed criteria are based on industry guidance and a knowledge of the prevailing noise environment in the vicinity of the site.

9.3 It is concluded that the residential properties in the Poyle area will form the critical locations with respect to noise impact, both construction and operations, and numerical limits are defined based on the proposed significance criteria. It is also concluded that perceptible vibration beyond the site boundary will not be of significance.

9.4 Calculations have been undertaken to assess the feasibility of achieving the proposed limits, based on available information at this time, and it is concluded that the plant should not compromise the limits. A number of mitigation measures are proposed which will ensure that the acoustic impact of the development will be engineered within the limits proposed.

REFERENCES

1. "Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas", British Standard, BS4142 (1997).

2. "Noise and Vibration Control On Construction and Open Sites", British Standard, BS5228 (1997).

3. "Planning and Noise", Department of the Environment, Planning Policy Guidance, PPG24 (1994).

4. "Guidance Notes on Demolition and Building Sites", Slough Borough Council Environmental Health Department (1992).

5. "Noise Control on Building Sites", Ministry of Public Building & Works Advisory Leaflet Number 72 (1976).

6. "Heathrow Terminal 5 : Construction Colnbrook Logistics Centre Explanatory Statement", RPS Group Plc (1998).

7. "Calculation of Road Traffic Noise", Department of Transport (1988).

8. "Noise Insulation Regulations" (1975).

9. "Design Manual For Roads and Bridges, Volume 11, Environmental Assessment" The Department of Transport (1993).

10. "Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)", British Standard, BS6472 (1992).

11. "The Propagation of Noise From Petroleum and Petrochemical Complexes To Neighbouring Communities" CONCAWE Report No 4/81 (1981).

12. London International Freight Exchange, Environmental Statement, RPS Group Plc, January 1999.

APPENDIX 1: ACOUSTIC TERMINOLOGY

1. When listening to noise which occurs out in the open from road traffic, aircraft, birds, wind in the trees etc., it is common experience that the noise level is not constant in loudness, but is changing in amplitude all of the time. Therefore in order to numerically describe the noise levels it is necessary to use statistical parameters. It has become practice to use indices which describe the noise level which has been exceeded for a certain percentage of the measurement period, and also an index which gives a form of average of the sound energy over a particular time interval. The former are termed percentile noise levels and are notated L_{A90}, L_{A50}, L_{A10} etc. and the latter is termed the equivalent continuous noise level and is notated by L_{Aeq}. It is worth noting that if the noise level does not vary with time, then all the parameters, in theory, normalise to a single value.

2. All the parameters refer to the noise level measured as an 'A' weighted sound pressure level. The term 'A' weighting implies a measurement made using a filter with a standardised frequency response which approximates the frequency response of the human ear at relatively low levels of noise. The resulting level, expressed in 'A' weighted decibels or dB(A), is widely used in noise standards, regulations and criteria throughout the world.

3. With regard to the percentile levels, the L_{A90} is the 'A' weighted sound pressure level which is exceeded for 90% of the measurement time. It is generally used as the measure of background noise in environmental noise standards. The L_{A10} is the 'A' weighted sound pressure level which is exceeded for 10% of the measurement time. Similarly the L_{A50} is the 'A' weighted sound pressure level exceeded for 50% of the time. The L_{A50} and the L_{A10} help to provide a numerical picture of the range of the measured noise levels. The L_{Amax} is the very maximum 'A' weighted sound pressure level which occurred during the measurement period.

4. The L_{Aeq}, the equivalent continuous noise level, is an energy averaged value of the actual time varying 'A' weighted sound pressure level. It is used in the UK as a measure of the noise level of a specific industrial noise source when assessing the level of the specific source against the background noise. Another parameter which is useful is describing the noise level of discrete events is the Sound Exposure Level (SEL). This is the equivalent continuous noise level measured over the period of the event, normalised to a one second time period. This may then be used to calculate the equivalent noise level over any particular period, if the number of events which occur in that period are known.

TABLE 2: **Existing Noise Environment in the Poyle and Colnbrook Areas. Meteorological Data from Heathrow Airport**

Date 1999	Time	Sound Pressure Level dB re 20uPa.							Hourly Averaged Meteorological Data From H'Row		
		Pippins School					Colnbrook School		Wind Speed m/s at 10m	Wind Direction °	Rain Fall mm
		L_{Aeq}	L_{A90}	L_{A10}	L_{A1}	L_{Amax}	L_{Aeq}	L_{A90}			
8th January	16:00	66.5	56.2	70.9	77.9	84	64.6	56.3	3.2	50	trace
	17:00	68.5	56.8	69.7	77.4	96	67.9	56.2	2.7	30	1.6
	18:00	65.5	55.2	70	76.9	83.7	63.8	56	3.6	50	1.4
	19:00	70.5	57.3	72.4	81.5	95.9	67.8	56.6	2.3	20	0.6
	20:00	72.7	56.2	76.2	85	91.2	70	55.3	2.7	360	trace
	21:00	74.2	53	74.5	88.4	95.5	70.9	52.6	1.8	350	nil
	22:00	73.9	52	72.7	88.7	92.5	70.5	51.3	2.3	340	trace
	23:00	60.3	52.1	54.8	74	83.5	62.8	51.2	2.7	330	trace
9th January	0:00	51.1	49.2	52.7	54	58.2	52.9	48.8	2.7	340	trace
	1:00	51	49.2	52.5	54	59	49.6	47.8	2.3	340	0.2
	2:00	50.3	48.2	52.1	53.8	58.7	49.1	47.2	2.3	340	nil
	3:00	49.8	48.1	51.5	53	55.5	48.3	46.4	1.8	310	nil
	4:00	49.7	48.1	51.2	52.7	62.5	49.1	47.3	1.8	320	nil
	5:00	52.1	49.7	53.6	57.5	67.5	50	48.4	1.4	320	nil
	6:00	57.3	52.2	57.3	64.7	82.4	55.8	50.5	1.8	310	nil
	7:00	61.1	56.2	63.7	70.5	79.7	60.8	55.1	1.4	320	nil
	8:00	62.1	57.3	63.8	70.5	83.5	66.2	56.2	0.9	340	nil
	9:00	61.2	50.7	63.2	72.2	84.7	65.8	52.1	0.9	330	nil
	10:00	62.5	52.1	63.2	71.2	88.4	67.7	52	1.8	330	nil
	11:00	60.2	54	62.8	70.9	79.5	62.5	53.4	1.4	320	nil
	12:00	59.8	52.6	63.2	69.2	77.9	62.6	53	3.2	340	nil
	13:00	61.7	54.6	65.2	71.9	79.7	64	54.3	1.8	350	nil
	14:00	65.5	53.2	63.6	77	92.5	62.7	53.2	4.1	340	nil
	15:00	72.7	54	75.9	86.2	93	70.5	53.4	3.2	350	nil
	16:00	73.2	53.7	76.2	86.4	91	69.7	53.3	2.7	330	nil
	17:00	69.5	53.2	71.7	81.9	90.9	68.7	54.2	2.7	360	nil
	18:00	64.2	54.5	68	76.2	83.9	62.8	54.2	1.8	350	nil
	19:00	63.6	53.3	67.5	74.9	82.5	61.8	53.3	2.7	20	nil
	20:00	63	50.3	64	75.7	82.9	61.2	50.8	2.3	10	nil
	21:00	56.8	49.2	54.7	71.2	78	56.3	49.3	2.7	20	nil
	22:00	54.6	48	52.6	65.5	79	51.8	47.5	1.8	10	nil
	23:00	56.3	46.7	50.5	65	84.4	53.9	46.5	1.4	360	nil
10th January	0:00	46.7	42.7	48.7	50.3	53.2	44.7	42.5	1.8	340	nil
	1:00	45.5	43	47.5	49.7	54.8	44.4	42	1.4	340	nil
	2:00	45.3	42.3	47.6	50.6	54.7	43.7	41	1.4	360	nil
	3:00	44.2	41.1	46.2	50.8	57.8	53.5	42.4	2.3	350	nil
	4:00	54.3	42.6	47.7	63.5	81.2	52.6	43.8	2.3	350	nil
	5:00	54.5	42.5	51	57.1	80.5	61.6	46	2.3	20	nil
	6:00	64.2	44.8	60.2	78.4	85	62.5	49.4	0.9	350	nil
	7:00	65.5	48.1	68.7	77.9	88.2	63.5	50.6	1.4	30	nil
	8:00	65.5	50.3	69.9	77.5	84.7	63.2	52	2.3	40	nil
	9:00	64.7	51.5	68.9	76.5	82.5	63.3	52	2.7	10	nil
	10:00	65.5	52.1	69.2	77.7	88.9	62.9	51.3	2.7	20	nil
	11:00	65.2	51	68.9	77.5	86.7	62.4	52.9	2.7	20	nil
	12:00	64	51.7	68.4	75.7	85.7	63.4	53.5	2.3	360	nil
	13:00	65.2	53.7	68.4	77.4	85	63.5	54	2.7	10	trace
	14:00	65.2	54.2	68.4	77.5	85.7	63.4	55.3	2.3	360	nil
	15:00	65.4	55.7	69.2	77.4	81.5	63.9	56.8	3.2	20	nil
	16:00	65.4	57.8	69.7	76	81.4	63.3	57.1	2.7	20	nil
	17:00	65.2	57.5	68.7	76.2	83.5	64.2	56	2.7	20	nil
	18:00	65.2	55.7	69.5	76.5	82.2	63.9	55.2	2.3	10	nil
	19:00	65.7	55.5	70.5	76.7	83.5	63.5	54.1	2.3	10	nil
	20:00	65.4	55.5	69.5	76.9	84	62.1	53.1	2.3	10	nil
	21:00	63.6	54.7	65.2	76	82.7	58	51.5	3.2	10	nil
	22:00	59.5	53.3	57.5	72.7	81.5	51	49.3	4.5	10	nil
	23:00	53.5	51.3	55.1	57.1	65.7	48.5	46.6	4.5	360	nil
11th January	0:00	50.7	48.6	52.3	54	57	47.1	44.4	3.6	360	nil
	1:00	49.3	47.1	51.2	52.8	57.2	46.5	43.9	3.2	360	nil
	2:00	48.3	46	50.2	52.1	60.7	47.2	45.1	3.2	10	nil
	3:00	49.2	47.1	51.1	53.7	60	55.4	47.3	3.2	10	nil
	4:00	57.1	48.8	54.2	68.7	81.9	56.9	51.1	2.7	350	nil
	5:00	59.6	52.8	57.5	72.9	81	62.9	55.3	2.7	10	nil
	6:00	64.4	54.8	64.9	77.2	82.4	63.3	56.4	1.4	360	nil
	7:00	65	56.1	69.5	76.4	81.2	63.6	55.2	1.8	10	nil
	8:00	65.9	55.3	70.2	77.4	82.9	68.4	55.8	1.8	350	nil
	9:00	71.5	56.6	75.2	83.7	88.5	75.8	55.6	1.8	330	nil
	10:00	81.7	56.2	76.2	86.7	109.2	71.1	55.4	2.7	340	nil
	11:00	73.7	56.1	76.2	86.9	93.2	73.2	53.8	3.6	360	nil
	12:00	73.7	55.3	76.5	87	91.9	92	55	1.8	360	nil
	13:00	75.5	53.2	77.5	89	95.2	68.1	66.5	2.7	340	nil
	14:00	73.7	55.2	76.7	86.4	91.7	71	54.7	2.7	340	nil
	15:00	60.2	54.1	63.3	69.9	79	62.4	54.2	2.3	340	nil
	16:00	60.5	55	63.6	69.5	77.9	62.6	54.6	3.2	330	nil
	17:00	61.6	56.2	64	71.7	80.5	63.2	55.5	2.3	320	nil
	18:00	62.2	56.7	64.9	71	78.9	64	56.4	1.4	320	nil
	19:00	65	59.2	66.2	75.5	87.2	67.7	59.5	1.8	330	nil
	20:00	61.7	57.5	64.5	69.5	73.4	62.3	57.6	0.9	320	nil
	21:00	60.1	51.7	63.2	71.2	75.2	62.6	54	0.9	340	nil
	22:00	59.6	46.5	62.3	68.7	84.4	62.3	47.5	0.9	230	nil
	23:00	60.1	42.7	48.6	74.5	84.2	57.9	45.3	0.9	190	nil
12th January	0:00	47.2	38.7	43.2	47.1	76.4	46.3	38.7	0.9	280	nil
	1:00	42	39.5	43.8	45.7	50.7	44	41.8	0.9	270	nil
	2:00	42.2	40.2	44.1	46.2	50	44.1	41.7	0.9	210	nil
	3:00	45.7	42.1	48.1	50.7	58.7	45.6	42.5	2.3	210	nil
	4:00	49.5	46.7	51.2	55.2	62.6	49.3	47.3	1.8	180	nil

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Date 1999	Time	Sound Pressure Level dB re 20uPa.							Hourly Averaged Meteorological Data From HRow		
		Pippins School					Colnbrook School		Wind Speed m/s at 10m	Wind Direction °	Rain Fall mm
		L_{Aeq}	L_{A90}	L_{A10}	L_{A1}	L_{Amax}	L_{Aeq}	L_{A90}			
	5:00	54.2	51.7	55.8	58.3	62.7	52.7	50.7	2.7	190	nil
	6:00	66	56.1	68	78.2	87.2	61.9	54.4	2.3	180	nil
	7:00	71.5	55.1	75.2	83.5	91.2	68.3	54.5	3.2	180	nil
	8:00	69.7	54.7	74.2	80.7	88.7	68.2	53.8	3.6	190	0.2
	9:00	72.2	56.2	75.2	84.2	93.7	69.4	53.8	4.1	180	0.8
	10:00	74.2	56.6	76.7	87	96.7	70.7	54.3	5.0	200	0.8
	11:00	84.9	57.2	77.4	90	117.2	80.2	55.3	4.5	180	1.4
	12:00	73.5	56.3	74.7	87.2	95	71.1	53.7	6.8	190	1.6
	13:00	75.2	56.5	76	88.7	97.9	72.6	55.3	8.6	200	1.2
	14:00	73.4	54	76	85.5	95.4	70.4	53.4	7.3	200	0.8
	15:00	72.4	54.7	75.2	85.2	93.2	70.3	55.4	3.6	220	1.4
	16:00	61.7	54.2	65.5	71.7	80.2	62.5	55.1	4.1	300	trace
	17:00	62.2	53.7	65.5	72.5	83.7	63.6	54.5	3.2	290	nil
	18:00	61.2	53	64.5	71.9	80.9	63.4	54.6	3.6	290	nil
	19:00	62.8	51.7	63.3	71.5	92	66.1	54.2	3.6	270	nil
	20:00	57.7	49.7	61.6	67.7	75.9	61	52.6	3.2	280	nil
	21:00	59.1	47.7	63.3	69.5	82.9	61.4	50.8	3.2	290	nil
	22:00	58.6	46.8	62.7	69.7	80.7	61.2	49.3	3.6	280	nil
	23:00	51.2	46.7	51.5	61.7	71.9	51.6	48.1	2.3	290	nil
13th January	0:00	51.7	43.7	53.6	63.1	72.2	52.2	45.9	1.8	290	nil
	1:00	44.6	41	46.2	52.6	66.9	49.4	44.7	4.5	280	nil
	2:00	48.7	40.3	50.2	60.7	71.7	46.6	43.8	4.1	270	nil
	3:00	43.2	39.3	44	51.3	67.5	47.2	43.7	4.5	280	nil
	4:00	45.7	40.7	44.7	51.2	79.2	48.7	46.3	4.1	290	nil
	5:00	51.1	43	46.7	50.8	88.2	51.1	49.2	3.6	290	nil
	6:00	57.3	46.1	53.5	71.4	85.4	58.6	52.1	2.3	280	nil
	7:00	63.2	47	67.5	73.7	85.7	67	52.9	2.7	260	nil
	8:00	62.1	46.2	66.7	73.2	81	67.5	52.6	2.7	260	nil
	9:00	63.8	46.1	67.7	75.7	82.9	69.4	53.9	3.2	260	nil
	10:00	73.7	44.1	67.7	79.2	102.4	78	52.2	3.6	280	nil
	11:00	66.2	44.6	68	79.5	88.7	70.5	51.5	3.2	260	nil
	12:00	63.7	42.8	66.4	76.2	84	71.6	51.9	3.6	240	trace
	13:00	64.2	42.7	65.5	77.7	85.2	73.2	52.1	3.6	230	0.4
	14:00	62.7	43.2	64.2	76	85.4	72	52.5	5.5	220	trace
	15:00	50.6	43.2	53.7	59.8	79.5	62.4	53.3	5.0	200	0.2
	16:00	52.6	43.3	55.1	63.8	78.2	62.4	53	5.9	210	trace
	17:00	51.7	42.3	53.7	62.7	75.7	62.4	51.7	5.9	220	trace
	18:00	51.8	42.2	55.7	62.1	69.5	62.3	51.2	5.0	220	trace
	19:00	59.2	42.7	56.8	67.9	87.2	67.9	52.3	4.1	240	trace
	20:00	51.8	41.2	55.8	61.7	72.2	62.6	51.2	3.6	260	nil
	21:00	50.6	39.1	53.8	62.5	72	60.7	49.1	4.1	250	nil
	22:00	49.8	38.7	54.2	61.2	68.9	62.7	49.5	5.0	260	trace
	23:00	45.7	35.6	39.3	58	73.4	56.1	46.1	4.1	260	nil
14th January	0:00	35.5	33.5	37	38.8	43.5	48.1	45	4.1	260	nil
	1:00	34.7	31.3	35.8	41.5	54.7	52.8	45.2	4.1	270	nil
	2:00	33	30.8	34.7	38.1	51.7	47.6	42	5.5	260	nil
	3:00	33.8	31.5	35.6	39.2	47.2	48.1	43.2	4.5	250	nil
	4:00	36.5	33.5	38.7	40.8	48.2	46.8	44	5.0	260	nil
	5:00	40.2	38.2	41.7	44.2	48.5	49.7	46.3	3.6	260	nil
	6:00	54.1	41.2	51.6	67.5	76.4	61.1	50.9	3.6	270	nil
	7:00	59	42.5	63.2	70.5	77.5	67.4	52.7	3.6	270	nil
	8:00	60.2	43.5	64.7	70.9	81.7	68	53.1	3.6	260	nil
	9:00	63.6	43	64.9	76.5	86	71.3	52.8	3.2	260	nil
	10:00	62	42.5	64.7	74.2	83.7	69.6	52.4	4.1	260	nil
	11:00	62.7	42.2	65	75.5	83.4	71.1	52.3	5.9	250	nil
	12:00	72	42.3	65.5	78	100.4	78	53.4	5.0	260	nil
	13:00	64.5	41.2	65.5	77.4	88.5	71.4	52.6	6.4	250	nil
	14:00	64	42.1	65.5	77	86.5	72.4	52.6	5.5	240	nil
	15:00	53.1	43.2	56.1	63.7	73.5	64.8	53.3	6.8	230	nil
	16:00	51.1	42.2	54.6	61.3	69.4	62.7	52	6.4	220	nil
	17:00	51.5	42.6	54.7	62.1	71.5	62.9	52.3	6.4	220	nil
	18:00	54.7	44.2	57.5	65.5	79.5	65	54.4	7.3	220	trace
	19:00	58.7	45.2	56.7	67.5	85.5	67.4	54.5	6.8	220	trace
	20:00	53.6	42.8	56.8	64	71.9	64.1	54.4	7.7	230	trace
	21:00	53.7	41.2	56.2	65.5	75.5	62.5	50.3	7.3	240	0.4
	22:00	50.6	40.1	54.7	61.8	70.5	62	49.2	5.9	240	trace
	23:00	46.2	37.5	44.2	59	69.7	57.8	48	5.0	240	0.4
15th January	0:00	37.3	35.2	39.2	41.6	49.2	48.5	43.8	6.4	240	nil
	1:00	36.2	34.2	37.7	40.7	51.7	47.3	42.1	5.5	240	nil
	2:00	36	34.1	37.7	39.7	43.5	44.9	41.2	5.9	230	nil
	3:00	36.7	34.8	38.3	39.8	42.7	45.5	42	4.1	230	nil
	4:00	38.8	36.2	40.7	42.5	47.2	45.3	42.9	4.5	220	nil
	5:00	42.8	40.8	44.6	46.2	54.2	49.7	47	4.5	210	nil
	6:00	56.5	43.2	55	70	80	62.3	49.3	5.0	210	nil
	7:00	61.3	43.7	65.2	72.9	82.9	67.6	51.7	5.5	220	nil
	8:00	60.8	44.7	65	72	81.2	67.9	52.2	5.9	220	nil
	9:00	68	46.7	69.5	80.2	92.2	69	54.4	7.3	220	nil
	10:00	72.7	56.2	74	84.2	96	78.3	56.3	8.6	210	nil

Table 3: **Results of Attended Noise Measurements in the Lakeside Vicinity**

Date	Time		Wind		Sound Pressure Levels, dB(A)						Measurement Location & no ref Figure 1 ()	Surveyor Subjective Observations
Jan-99	Start	Finish	Speed	Direction	L_{A90}	L_{A50}	L_{A10}	L_{A1}	L_{Amax}	L_{Aeq}		
12	17:22:41	17:33:02	0-1	NW	57.6	58.6	61.6	65.6	72.5	59.8	Pippins School aircraft paused (1)	A4, distant aircraft
12	17:33:12	17:43:19	0-1	NW	57.8	59.2	64.6	70.6	75.8	61.9	Pippins School - with Aircraft (1)	A4, overflying aircraft
12	18:08:17	18:18:17	0-2	NW	53.2	56.2	64.2	69.6	72.9	60.4	Colnbrook with aircraft (3)	A4, distant & overflying
12	18:20:55	18:36:02	0-1	NW	53.0	54.4	61.0	67.0	75.7	57.9	Colnbrook aircraft paused (3)	A4, distant aircraft
12	19:01:32	19:12:46	Calm		60.0	63.4	66.4	69.0	73.2	64.1	Opposite Pub on A4 - with aircraft (4)	A4 - rush hour, distant aircraft
12	19:12:53	19:23:57	Calm		62.0	64.6	69.2	74.2	84.6	66.7	Opposite Pub - aircraft paused (4)	A4 quite busy, distant aircraft
12	22:47:55	23:01:13	0-1	W	50.2	51.8	56.0	61.6	66.7	53.7	Pippins School (1)	A4, distant traffic & aircraft
12	23:12:12	23:24:21	0-1	W	48.8	49.8	51.6	54.6	60.7	50.4	Colnbrook (3)	A4, distant aircraft
12	23:37:42	23:48:17	0-1	W	51.8	54.6	58.0	61.2	64.3	55.5	Opposite Pub (4)	A4, distant aircraft, HGV's
13	00:10:20	00:23:07	0-1	W	52.0	54.8	58.6	67.2	77.0	57.8	Opposite Pub (4)	A4, HGV's less frequent
13	00:37:48	00:43:18	0-1	W	46.6	47.6	49.0	53.0	58.7	48.2	Industrial estate (5)	Traffic M25/A4
13	00:50:09	01:00:52	0-1	W	47.2	48.4	50.4	53.0	59.5	49.0	Colnbrook (3)	A4 traffic
13	01:05:44	01:15:47	0-1	W	46.8	48.2	49.4	51.2	56.9	48.4	Pippins School (1)	A4 traffic

Table 5: **Schedule of Construction Activities and Predicted Noise Levels (for Phasing Overlap, see Chapter 3, Proposals)**

Project Phase	No. of Weeks (1)	Phase L_{Aeq} at 450 m (2)	L_{Aeq} at 450m during over-lapping phases (3)
Phase 1: Redevelop Clinical Waste Facility and new stack	22	60	62
Phase 2: Site Clearance and Demolition	8	61.2	63
Phase 3: Bunker construction	44	57.3	62
Phase 4: Piling Main Site	8	56.5	62
Phase 5: Main Slab Construction, Foundation and Concrete	44	57.3	62
Phase 6: Mechanical Installation including steel framework etc	44	57.6	62
Phase 7: Envelope and Building	16	51.2	58
Phase 8: Road Construction	12	51	54

(1) A number of the individual activities will run simultaneously

(2) Noise level at 450 m, ie representative of Poyle residential area (no attenuation for screening assumed)

(3) Phase overlap = noise levels at 450 m ie representative of the nearest properties, from potential simultaneous phases

Table 6: **Weekday Calculated Change in hourly L_{A10} Parameter for consented and EfW schemes**

Time	Hourly L_{10} Current Situation A	Hourly L_{10} Consented Situation B	Hourly L_{10} EfW Situation C	Increase Consented B-A	Increase EfW C-A
7 to 8	75.6	75.9	75.8	0.2	0.2
8 to 9	76.1	76.5	76.4	0.4	0.3
9 to 10	75.5	76.1	75.9	0.7	0.5
10 to 11	74.9	75.6	75.3	0.7	0.5
11 to 12	75.0	75.5	75.3	0.5	0.4
12 to 13	75.5	76.0	75.8	0.5	0.3
13 to 14	75.4	75.9	75.8	0.5	0.3
14 to 15	75.0	75.4	75.3	0.4	0.2
15 to 16	74.6	74.8	74.7	0.2	0.1
16 to 17	75.4	75.5	75.5	0.1	0.1
17 to 18	75.9	76.0	75.9	0.1	0.0
18 to 19	75.4	75.4	75.4	0.0	0.0

1. Source data for current situation = Quali-dat survey data April 1999
2. Weighting factor can be used to model peak hours. Has been derived from hourly waste arrival profile of similar facility
3 Assumes current figures for traffic flow

Table 7: **Weekend Calculated Change in hourly L_{A10} Parameter for consented and EfW Schemes**

Time	Hourly L_{10} Current Situation A	Hourly L_{10} Consented Situation B	Hourly L_{10} EfW Situation C	Increase Consented B-A	Increase EfW C-A
7 to 8	70.1	70.1	70.6	0.0	0.4
8 to 9	70.2	70.2	70.9	0.0	0.7
9 to 10	71.8	71.8	72.6	0.0	0.8
10 to 11	72.3	72.3	73.0	0.0	0.7
11 to 12	72.4	72.4	73.0	0.0	0.6
12 to 13	72.7	72.7	73.2	0.0	0.5
13 to 14	73.4	73.4	73.8	0.0	0.4
14 to 15	73.2	73.2	73.5	0.0	0.3
15 to 16	72.3	72.3	72.5	0.0	0.2
16 to 17	72.3	72.3	72.4	0.0	0.1
17 to 18	72.9	72.9	73.0	0.0	0.1
18 to 19	72.7	72.7	72.7	0.0	0.0

1. Source data for current situation = Quali-dat survey data April 1999
2. Weighting factor can be used to model peak hours. Has been derived from hourly waste arrival profile of similar facility
3. Assumes current figures; ie not growth

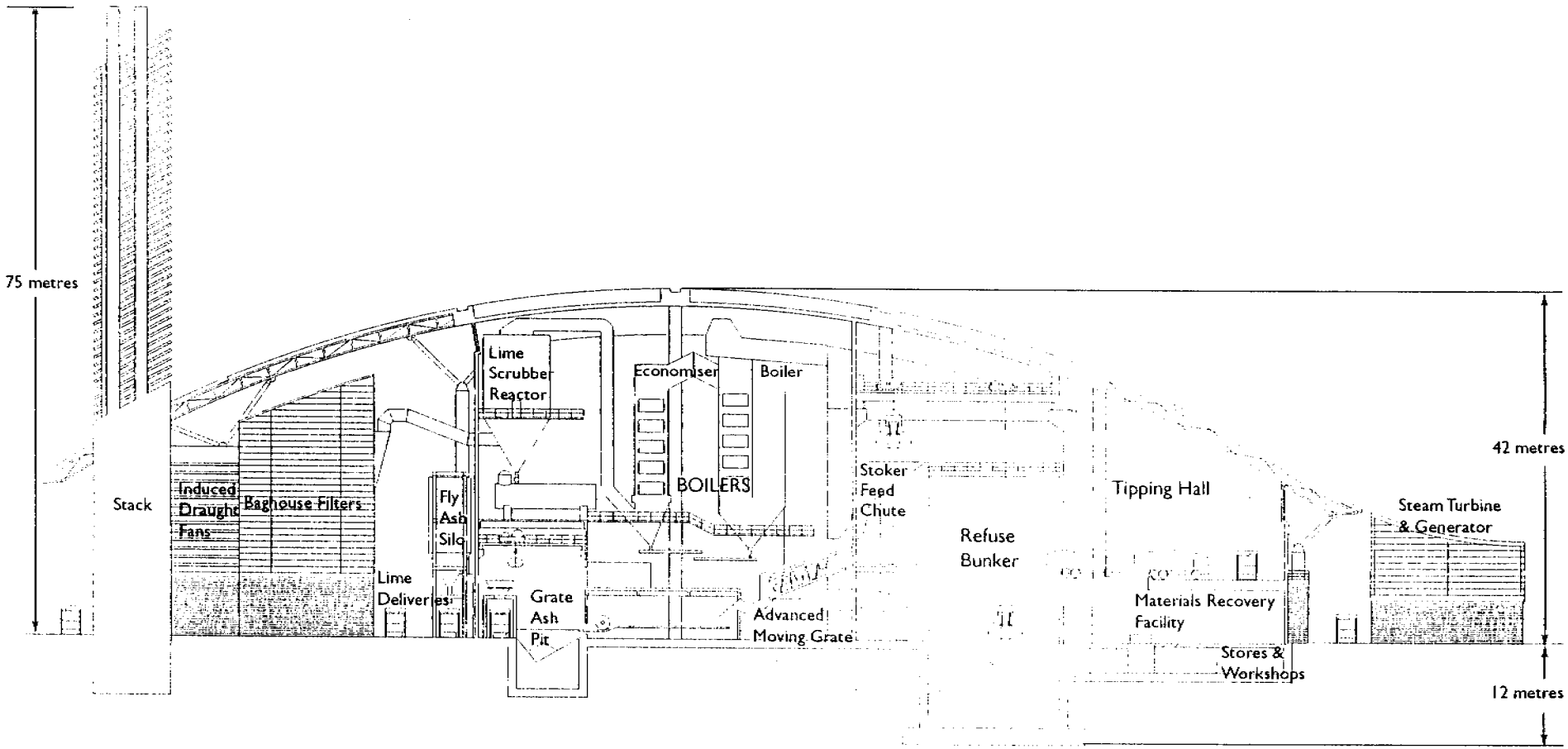


Figure 2 : Sectional View Of The Proposed EfW Plant

FIGURE 3 : Summary of Noise Levels at Pippins School and Colnbrook School between 4pm on the 8th Jan 1999 10am on the 15th Jan 1999

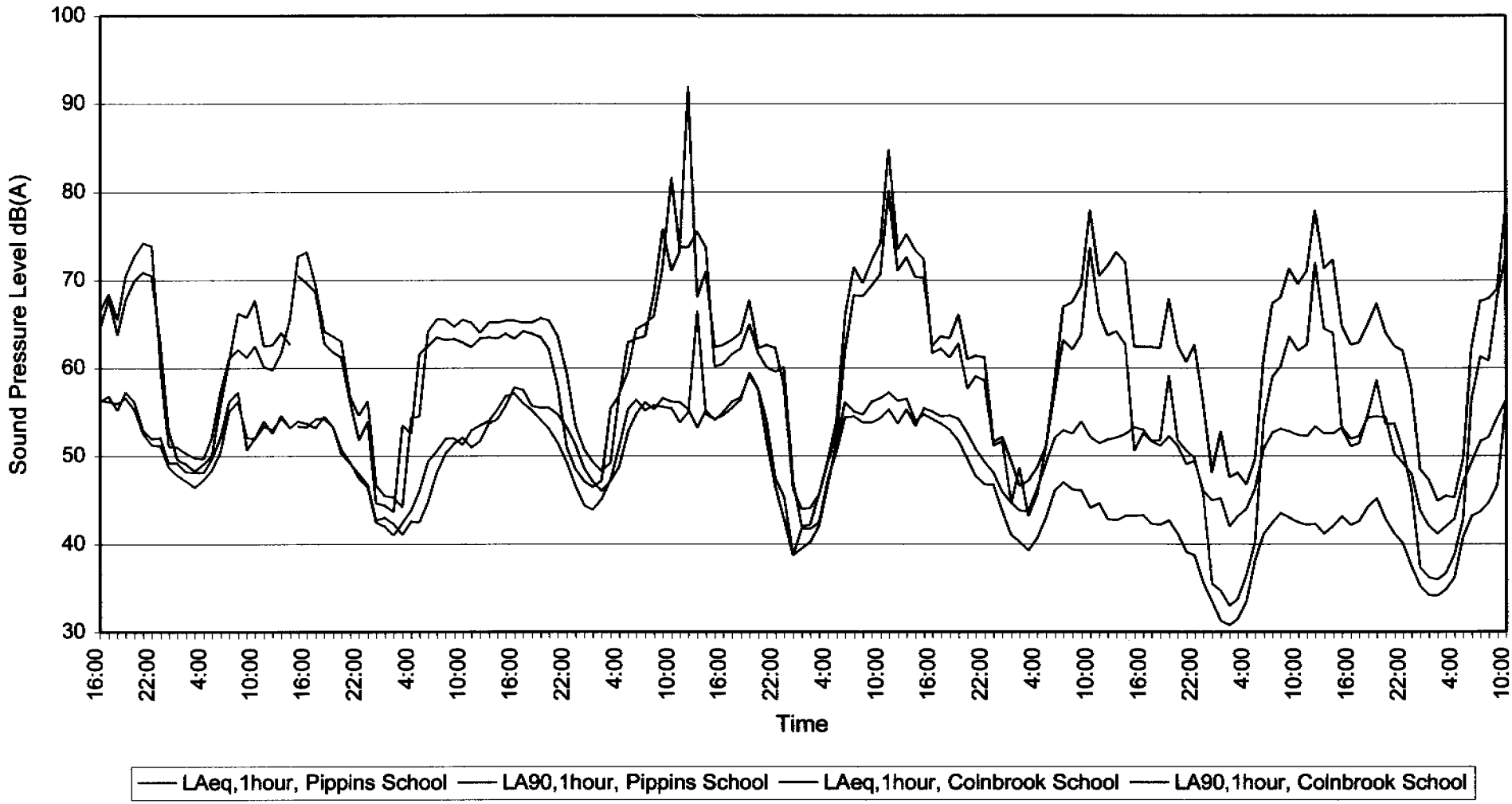


Figure 4 : Ambient Noise Environment : Pippins School, 4pm 8th Jan 1999 to Midday 9th Jan 1999 : Wind NW/NE < 5m/s

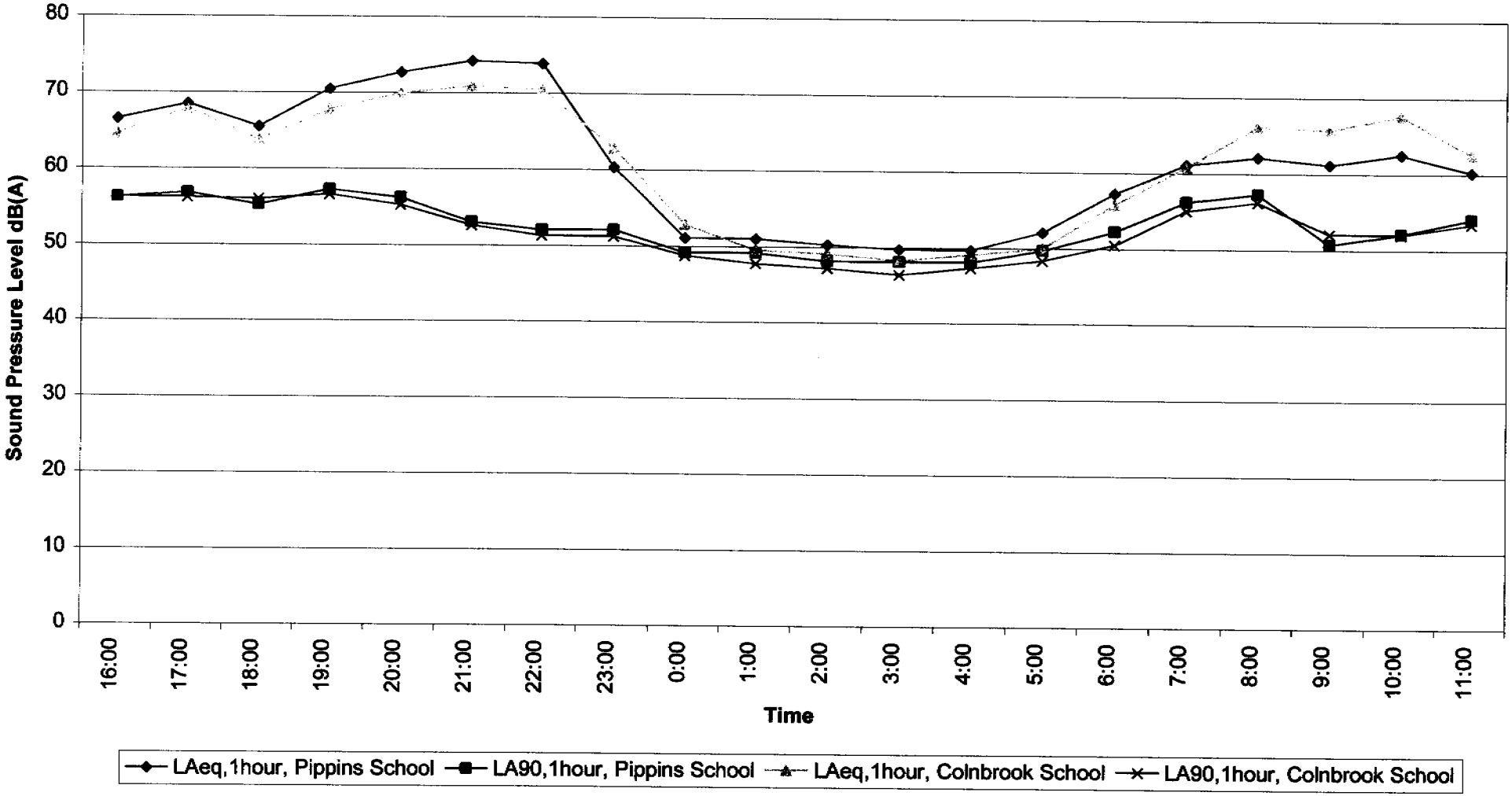


Figure 5 : Ambient Noise Environment : Pippins School and Colnbrook School, Midday 9th Jan 1999 to Midday 10th Jan 1999 : Wind NNW/NNE Light <<5m/s

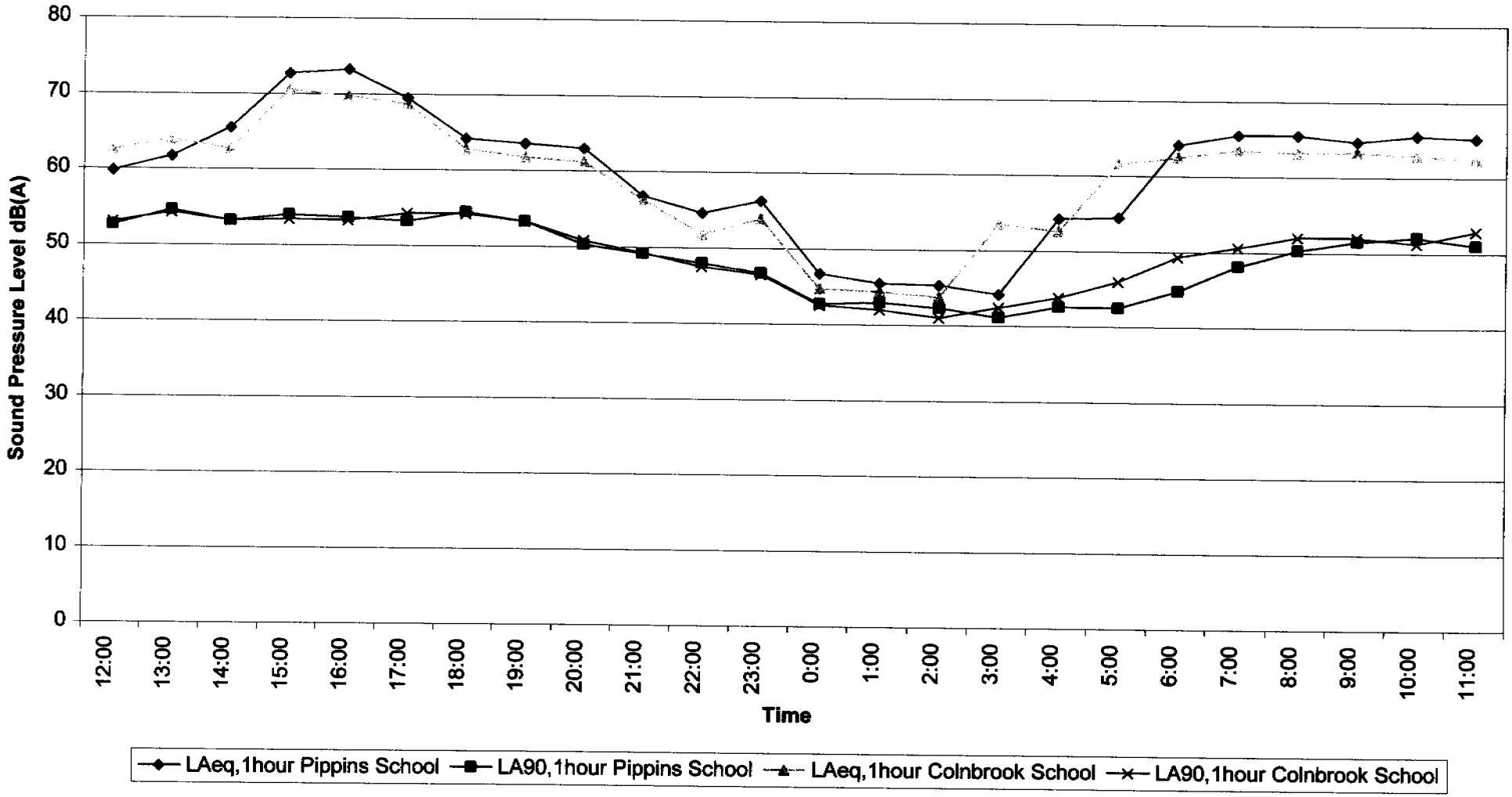


Figure 6 : Ambient Noise Environment : Pippins School and Colnbrook School, Midday 10th Jan 1999 to Midday 11th Jan 1999 : Wind NNE/NNW < 5m/s

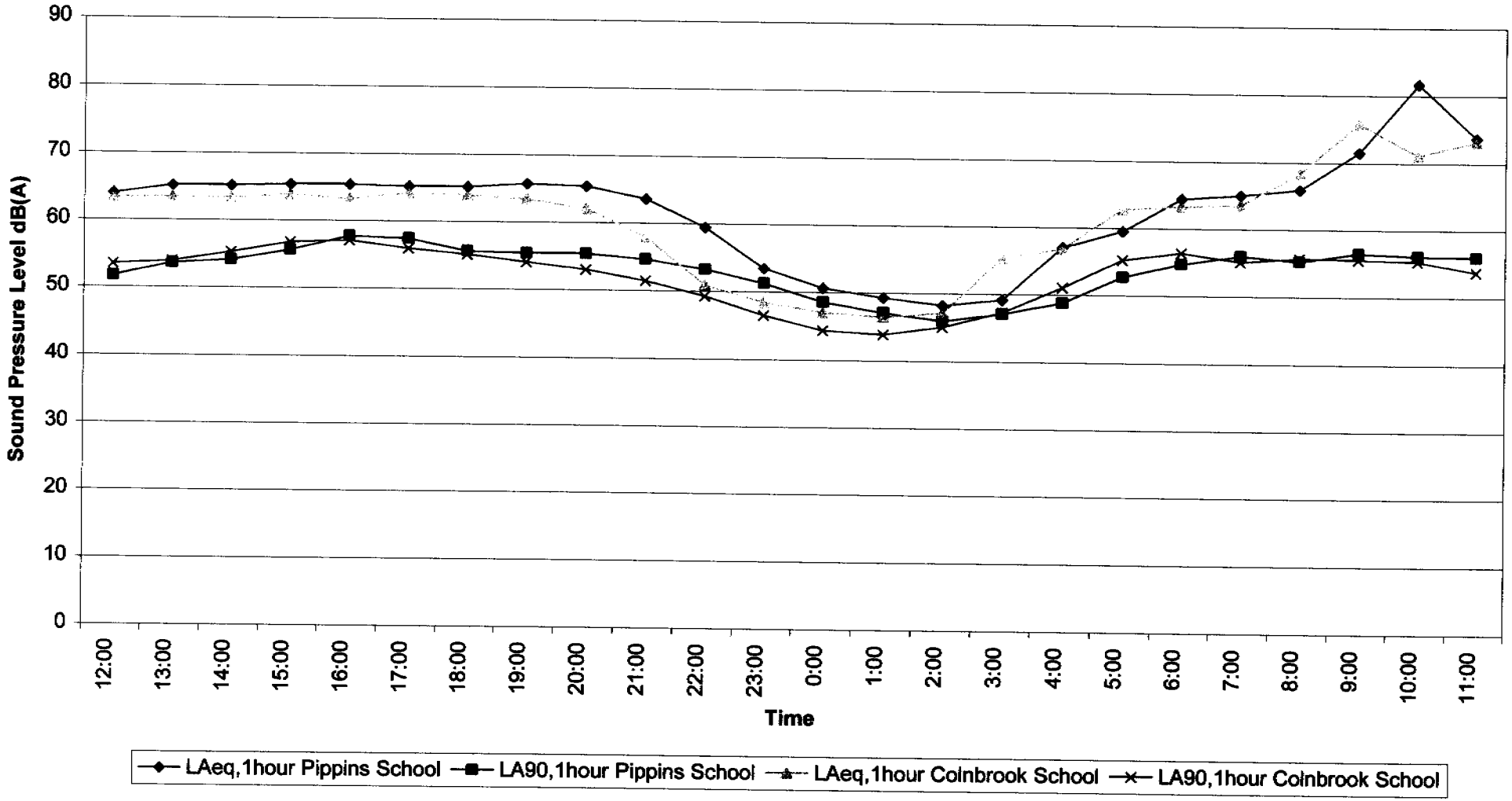


Figure 7 : Ambient Noise Environment : Pippins School and Colnbrook School, Midday 11th Jan 1999 to Midday 12th Jan 1999 : Wind NW backing S <5m/s to start but increasing

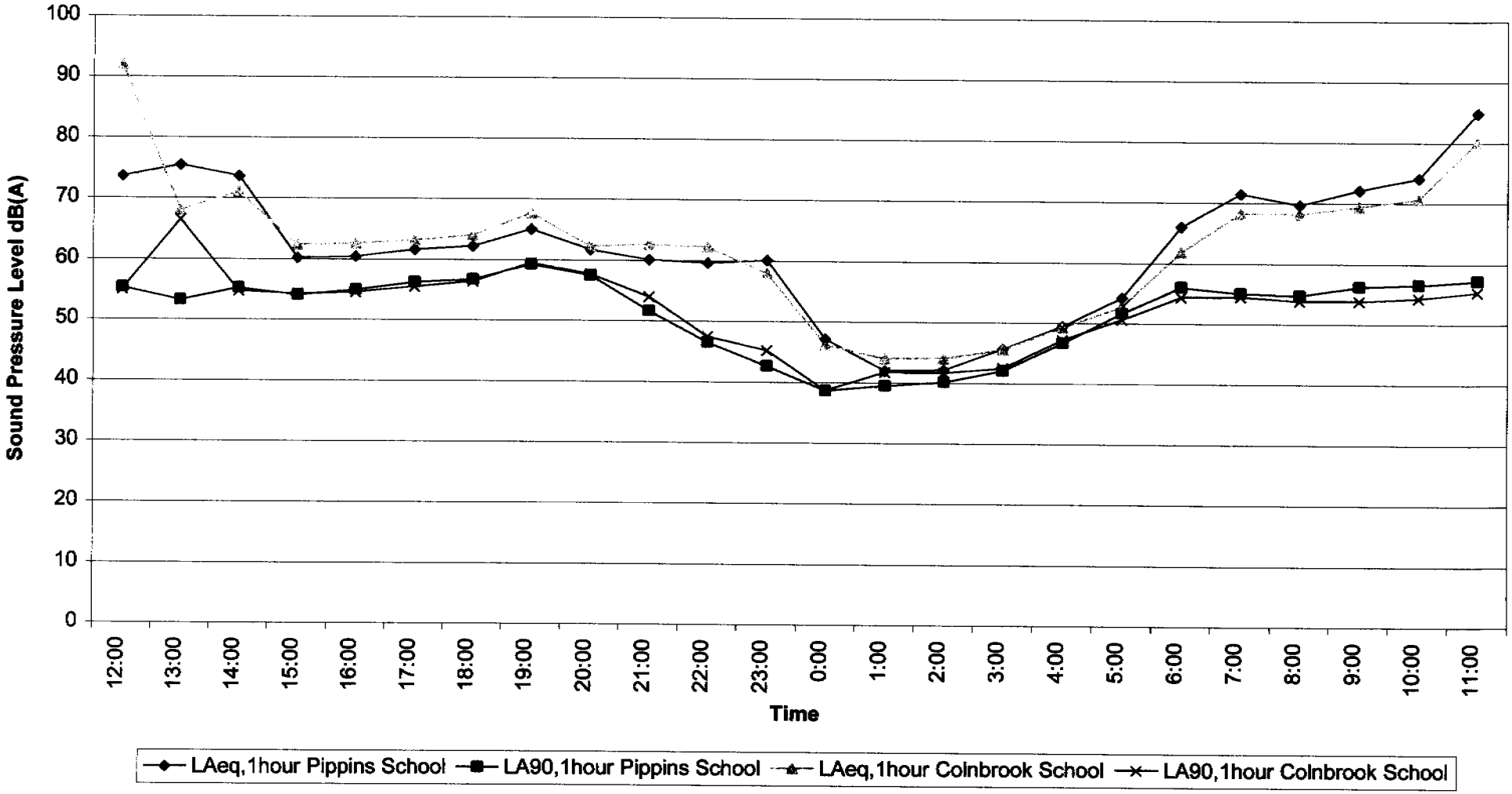


Figure 8 : Ambient Noise Environment : Pippins School and Colnbrook School, Midday 12th Jan 1999 to Midday 13th Jan 1999 : Wind W moderate to start but decreasing

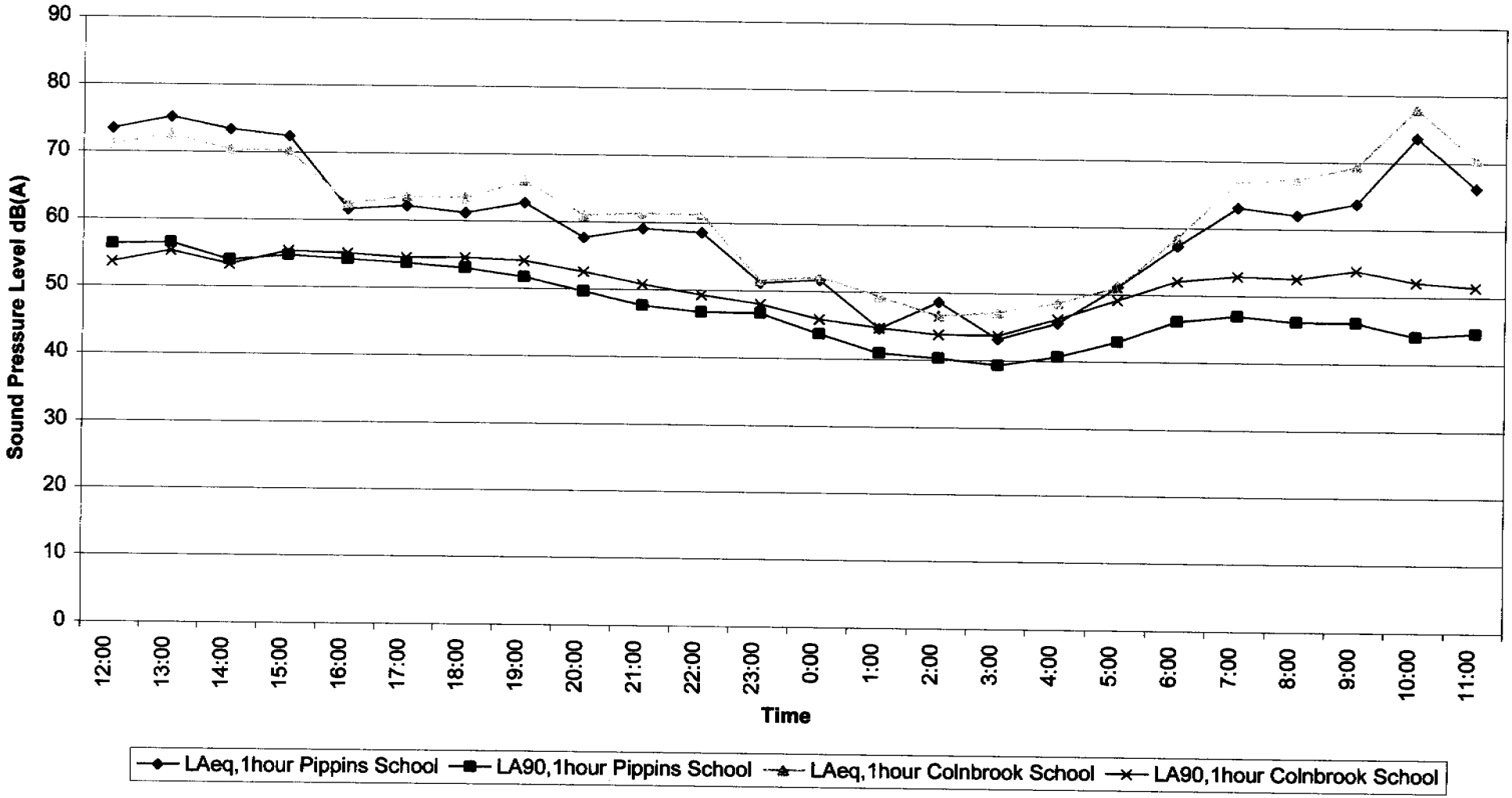


Figure 9 : Ambient Noise Environment : Pippins School and Colnbrook School, Midday 13th Jan 1999 to Midday 14th Jan 1999 : SW/W Moderate 4 - 7 m/s

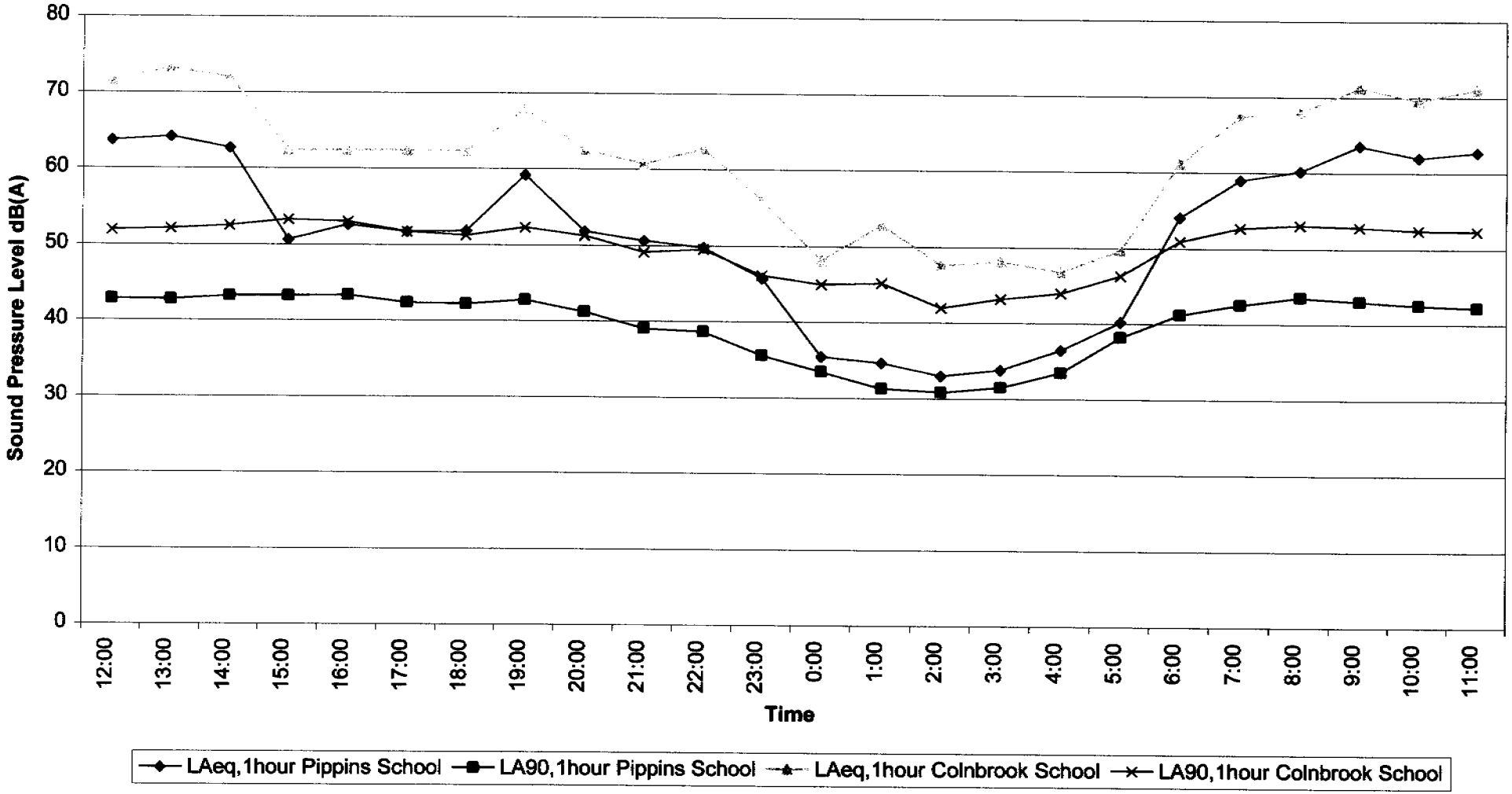
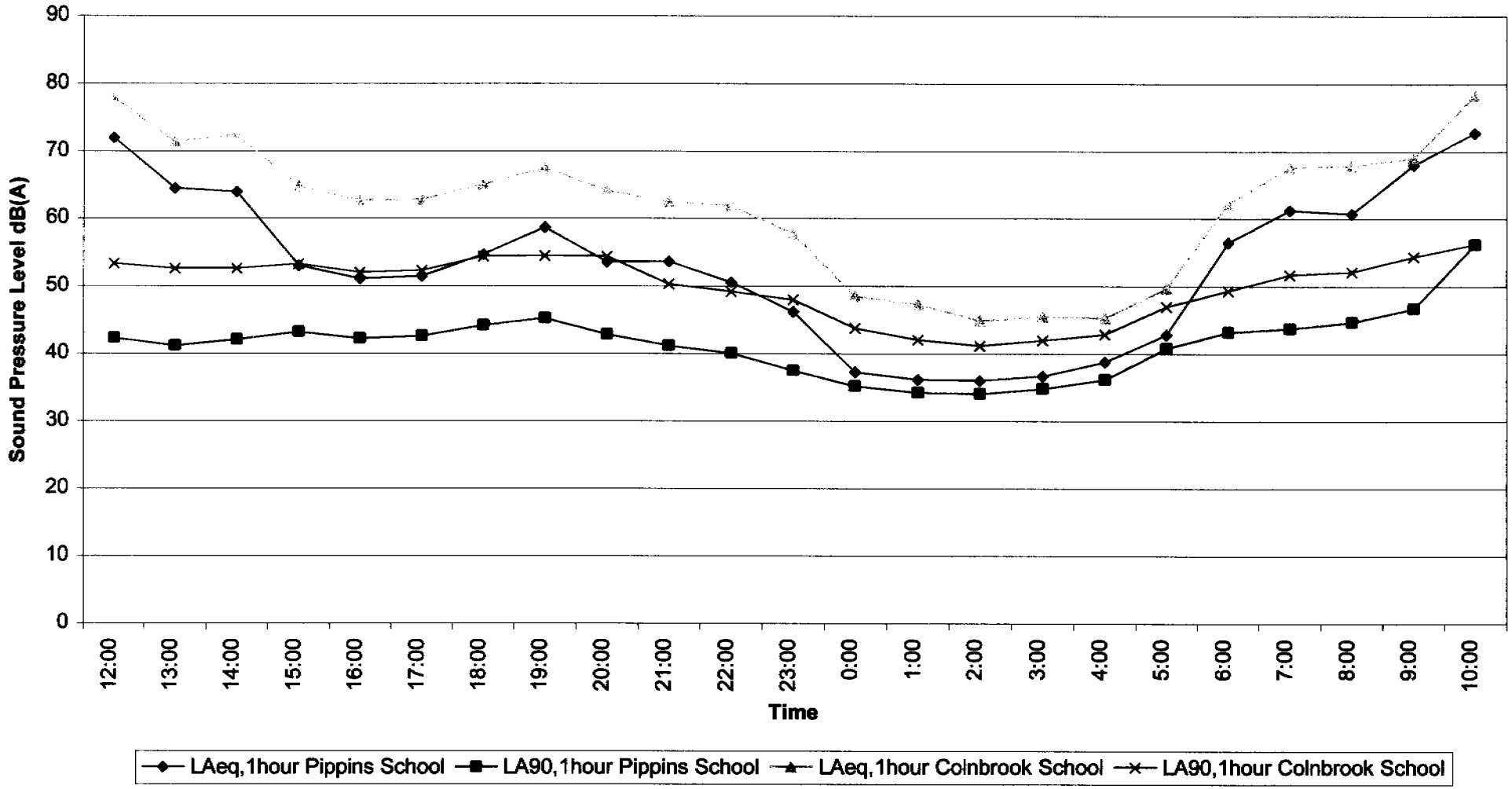


Figure 10 : Ambient Noise Environment : Pippins School and Colnbrook School, Midday 14th Jan 1999 to Midday 15th Jan 1999 : Wind SW/W, moderate



LAKESIDE

Energy from Waste

Non-Technical Summary of Environmental Statement

July 1999

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Energy from Waste

Non-Technical Summary of Environmental Statement

July 1999

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GRUNDON

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ADDENDUM TO THE LAKESIDE ENERGY FROM WASTE NON-TECHNICAL SUMMARY OF ENVIRONMENTAL STATEMENT

'A way with waste'
A DRAFT WASTE STRATEGY FOR ENGLAND AND WALES

1. The Lakeside Energy from Waste Environmental Statement refers to the Government's emerging waste strategy for England and Wales. After the Environmental Statement was finalised for printing, the Government published, under the title of 'A way with waste', its policy on waste management in England and Wales over the next twenty years.

2. 'A way with waste' is an important document which establishes Government policy for energy from waste. This addendum has been prepared by Adams Hendry to supplement the Non-Technical Summary of the Environmental Statement.

3. 'A way with waste' says that the need to curb the growth in the quantity of waste is fundamental to the Government's waste strategy. The Government sees waste reduction, alongside increased recovery of materials and energy, as the key to sustainable waste management.

4. The Landfill Directive creates a binding obligation to restrict the landfilling of municipal waste. There is therefore a pressing need to divert waste from landfill.

5. The Government says that "*modern incinerators have an important role to play in a system of integrated sustainable waste management. Incinerators are tightly regulated, and (the Government) are confident that these controls protect human health and the environment.*" The Government calculates that "*around 8 – 26 million tonnes of incineration capacity might be needed to meet the final target in the Landfill Directive*".

6. The Government emphasises that energy from waste should be linked with other initiatives. Energy from waste plants already form part of the Government's renewable energy strategy.

7. The broad conclusion of the Government's waste strategy is that if its objectives for sustainable waste management are to be achieved and the requirements of the Landfill Directive met, incineration with energy recovery must play a full and integrated part in local and regional solutions. The timescale for compliance with the Landfill Directive requires urgent action by the Government, local authorities, the waste management industry and the community at large.

ADAMS HENDRY
AUGUST 1999

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Non-Technical Summary

of Environmental Statement

Introduction

1. S. Grundon (Waste) Ltd. (referred to in this document as Grundon) is seeking consent to redevelop its existing waste management facility at Lakeside Road Industrial Estate, Colnbrook, Berkshire. The Estate is located between the M4 and the A4, west of the M25. Lakeside Road has direct access to the A4 (see Figure 1).

2. Grundon proposes to construct a new energy from waste (EfW) facility with a capacity to process up to 440,000 tonnes per annum of household, commercial and industrial waste. The facility will serve a catchment area including Slough, other unitary authorities in Berkshire and parts of Buckinghamshire, Surrey and London. A Visitor Centre to serve the EfW facility and provide facilities for environmental studies is proposed on Orlitts Lake South. The EfW facility can be served by rail by a new siding from the Colnbrook Branch Line, which passes alongside the site.

3. A planning application for the new facility has been submitted to Slough Borough Council and an application for Integrated Pollution Control (IPC) Authorisation has been made to the Environment Agency.

4. As required by the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, the planning application is accompanied by an environmental statement (ES). This document summarises the findings and conclusions of the ES in non-technical language.

5. Grundon agreed the scope of the ES with Slough Borough Council following consultation with other statutory bodies, including the Environment Agency and interested groups. The ES is based on the results of studies of potential environmental impacts, which have been carried out by specialist consultants. It sets out the results of an assessment of the likely impact of the proposals on the environment. The ES also explains why the scheme is needed, the consideration given to alternative sites, and describes measures proposed to reduce any environmental impacts.

6. In carrying out the environmental assessment, account has been taken of the potential implications for Grundon's proposal of other major development proposals in the area, including a fifth Heathrow Terminal, the associated proposals for a Logistics Centre and for Iver South Wastewater Treatment Works, and the London International Freight Exchange.

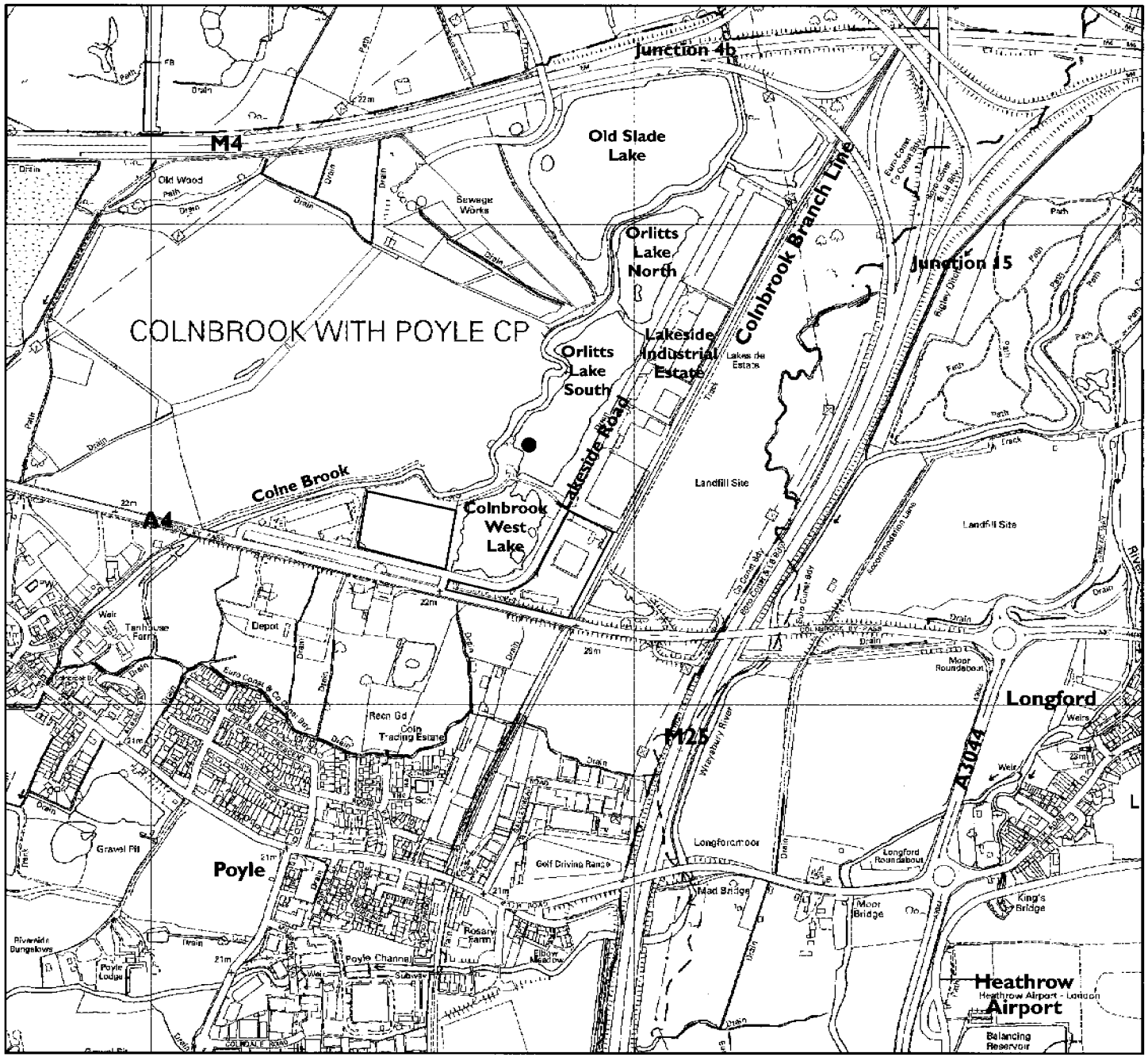

Figure 1 : **Site Location Plan**

Proposed Lakeside Energy from Waste Facility

Proposed Visitor Centre

Proposed Temporary Construction Compound

North

Scale. 1:12 500

500m

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright
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Need for the Scheme

7. Grundon's proposals have been prepared to meet the need for sustainable waste management as part of a strategy of waste minimisation, recycling and energy recovery. Heat and power will be recovered from the waste in an EfW plant and the residue (which will be much smaller than is currently the case without EfW) sent either for further use or to landfill. The proposed EfW facility will produce 30 Megawatts of electrical power, which will be transferred to the National Grid. This is enough electricity for 30,000 households.

8. The Government sees a national role for EfW in the implementation of both sustainable waste and energy strategies. It advises that, "alongside a move to a higher level of recycling, a move to a higher level of incineration with energy recovery is necessary over the next 10-15 years in order to develop a more sustainable waste management system" (Less Waste More Value, 1998).

9. The benefits of EfW are that it:

i. complements the expansion of recycling;
ii. reduces the volumes of unrecyclable waste;
iii. enables landfills to be more easily managed;
iv. recovers energy;
v. is cost-effective;
vi. is safe and reliable, and
vii. provides long-term security.

10. There are at present no EfW plants in the South East outside London. It is inevitable that some will be needed if the Government is to achieve its target of reducing the dependence on landfill. To ensure economic viability, an EfW plant may serve a wider area than a single waste disposal authority.

11. Regional waste planning guidance for London and the South East advocates self sufficiency at county level, a reduction in export of untreated waste from London to zero by 2010 and the landfill of only residues from recycling and non-inert waste after 2010. The strategy relies on the diversion of waste from landfill by providing reduction, treatment and disposal facilities for non-inert wastes allowing landfill to deal with the remaining waste.

12. In common with authorities in the rest of South East England, waste disposal authorities in the former county of Berkshire continue to dispose of most of the community's waste by landfill. Former Berkshire authorities currently export substantial quantities of their communities' waste out of their areas for landfill elsewhere.

13. The Berkshire Waste Local Plan is the statutory plan for the former county. It recognises that recycling and EfW are compatible and aims by 2006 to phase out landfill in Berkshire and the use of landfill outside the county for the disposal of Berkshire's waste.

14. The Local Plan's strategy is based on the availability of adequate landfill capacity and the successful implementation of 'industrial reprocessing' proposals. Approaching half way through the plan period, landfill is in much shorter supply than anticipated and household and other non-inert waste is still exported to other counties in the South East. The 'industrial reprocessing' proposals which were intended to facilitate the reduction in landfill have failed to materialise, placing considerably greater pressure on scarcer landfill resources.

15. No viable alternative could be identified to replace the role of EfW in resolving the waste and energy recovery issues that are faced in the former county of Berkshire and the rest of the South East. Landfill is not an acceptable long term option. The extent of current reliance on landfill, and its growing scarcity, strongly suggests that the Lakeside EfW facility should be of a sufficient size to help meet the needs of an area wider than the former county of Berkshire.

16. With direct access via the A4 to a wide network of principal roads, Grundon's Lakeside Road site already helps serve the waste management needs of waste disposal authorities in the former county of Berkshire, western parts of Surrey, South Bucks and west London. None of these areas has current proposals for EfW plants, although the draft Surrey Waste Local Plan suggests that one or more are required.

17. The environmental assessment therefore concluded that there is an urgent need for the Lakeside EfW facility to be provided as part of sustainable waste management and energy strategies for waste disposal authority areas in the former county of Berkshire and adjoining areas.

Alternatives

18. The only realistic alternative to the proposal is an EfW plant on another site. The Berkshire Waste Local Plan includes a list of criteria which has been used to identify preferred locations for such a plant.

19. The criteria include:

- large catchment area close to major sources of waste
- within or adjacent to industrial type development
- access to the primary road network
- avoidance of sensitive landscapes
- close links to the National Grid and the potential to develop district heating systems.

20. The Government's White Paper on sustainable transport states that sites should also be served by rail.

21. The Lakeside site meets the Local Plan criteria and can be served by rail. The site is already used for waste management and is on an industrial estate with direct access from the primary road network.

22. Before confirming the suitability of the Lakeside site, Grundon considered industrial estates in Slough, Langley, Colnbrook, Poyle, Stockley Park, Hillingdon, Iver and Uxbridge.

23. The Berkshire Waste Local Plan does not identify any sites for EfW in east Berkshire. In central and west Berkshire, it identifies possible sites for EfW at Smallmead, Reading, and Colthrop, Newbury.

24. The potential catchment area of Colthrop is limited. Part of the Smallmead allocation has already been developed and the site is not served by rail. Compared to the Lakeside site, Smallmead is less well located to serve the sub-regional catchment area.

25. The analysis of alternative sites concluded that none could be found which have any advantages over the Lakeside site as a location for an EfW facility.

The Scheme

26. The Grundon site at Lakeside Road currently houses a clinical waste incinerator (CWI) with a single chimney stack, a high density baling plant, a materials recovery facility (MRF), a vehicle workshop and offices.

27. Grundon already has consent to import and process 400,000 tonnes of waste per annum at its Lakeside Road site. To accommodate this volume, the company has consent to extend the existing MRF. Separately, it also has consent to increase the capacity of the existing CWI.

28. The proposed scheme will replace the consented materials recovery and waste reduction facility (a process which is currently followed by landfill) with a waste and energy recovery facility of similar capacity.

29. The CWI will be relocated and rebuilt within the site and clinical waste operations will continue throughout the construction period.

Description of the Proposals

Energy from Waste Facility

30. The EfW plant will be capable of processing approximately 440,000 tonnes of domestic, commercial and industrial waste per annum. Energy from the waste incineration process will be recovered and used to generate electricity. The plant will also be designed to facilitate the supply of heat to third parties as opportunities are identified.

31. An integral MRF within the EfW plant will also process mixed recyclable waste collected from households and commercial premises.

32. The existing CWI at Colnbrook provides a strategically important facility for the disposal of clinical wastes. The new CWI will provide updated facilities to treat the same range of wastes as the company's existing plant thus providing continuity of the current service.

33. The EfW and CWI plants will be designed to meet the latest emission limits as defined by European Directives on the Incineration of Waste and the Environment Agency and will utilise the latest proven technology.

34. Grundon aims to develop a rail link from the EfW plant to enable the Colnbrook Branch Line to be used for the import of wastes to the facility and the removal of residues, mainly ash.

Site Layout and Design

35. The design and location of the facility has been influenced by environmental and physical constraints and air traffic safety considerations. The proposed site layout is indicated in Figure 2.

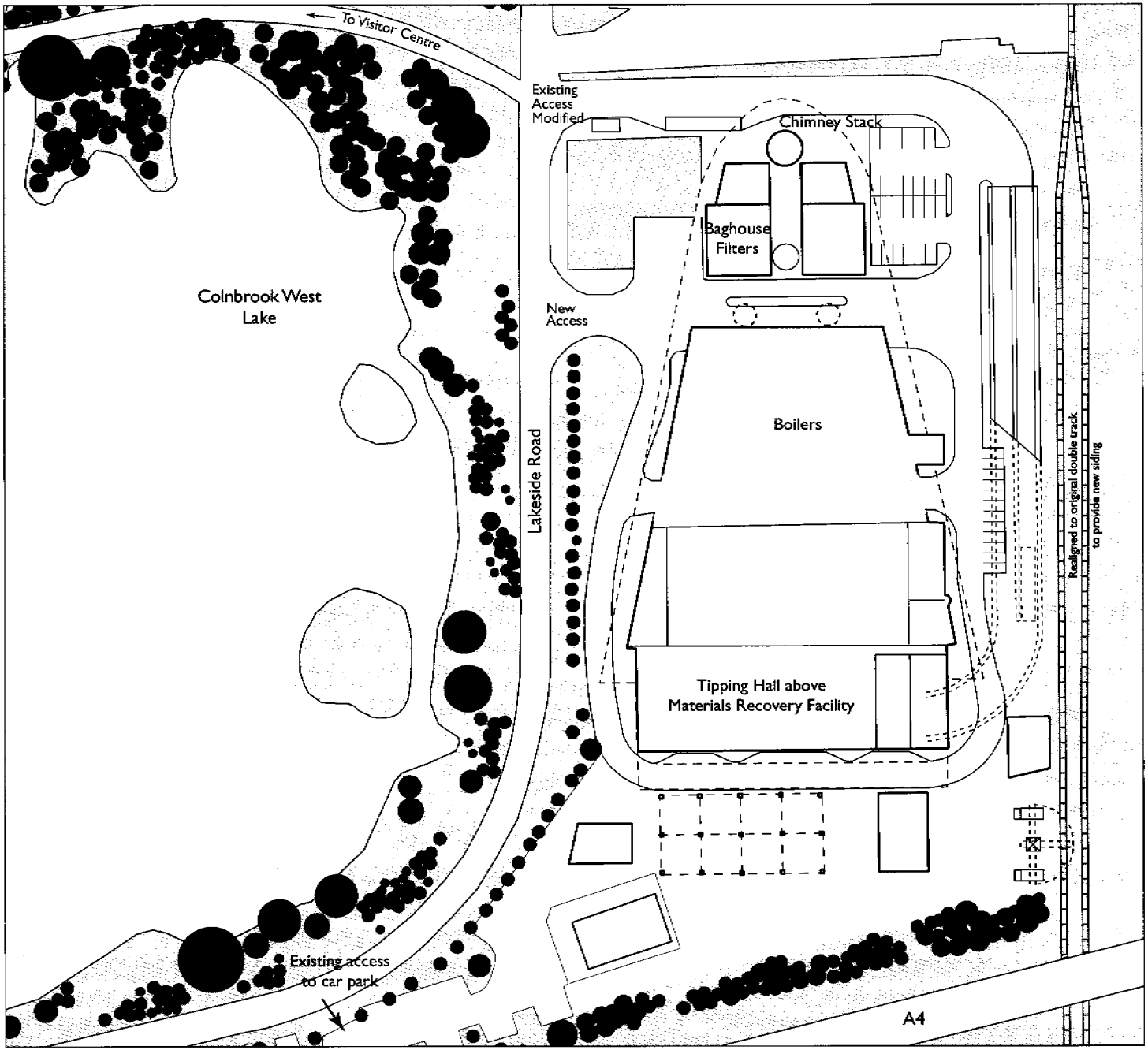
36. The principal new buildings at the Lakeside site will be the EfW and CWI plants and a new chimney stack 75 metres high, serving both plants. A section through the EfW plant is shown in Figure 3.

37. The height of the building housing the EfW plant will be 42 metres. This is the minimum height required to house the enclosed plant, and complies with advice from the Civil Aviation Authority.

Figure 2 : **Site Layout**

Clinical Waste Incinerator

Energy from Waste Plant



Source : The APP Partnership

Approximate scale.

50m

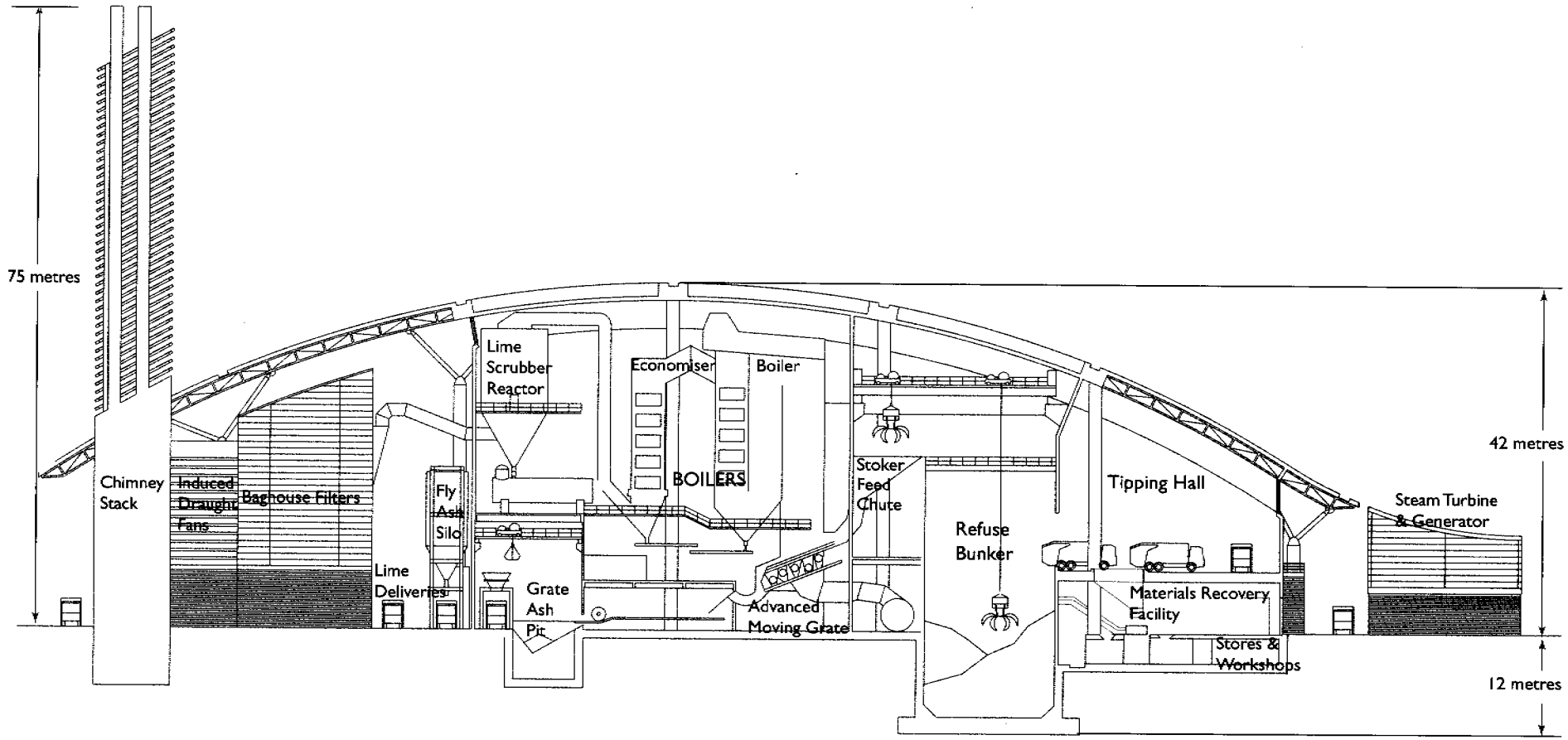


Figure 3 : **Section Through Proposed Energy from Waste Plant**

Source : The APP Partnership

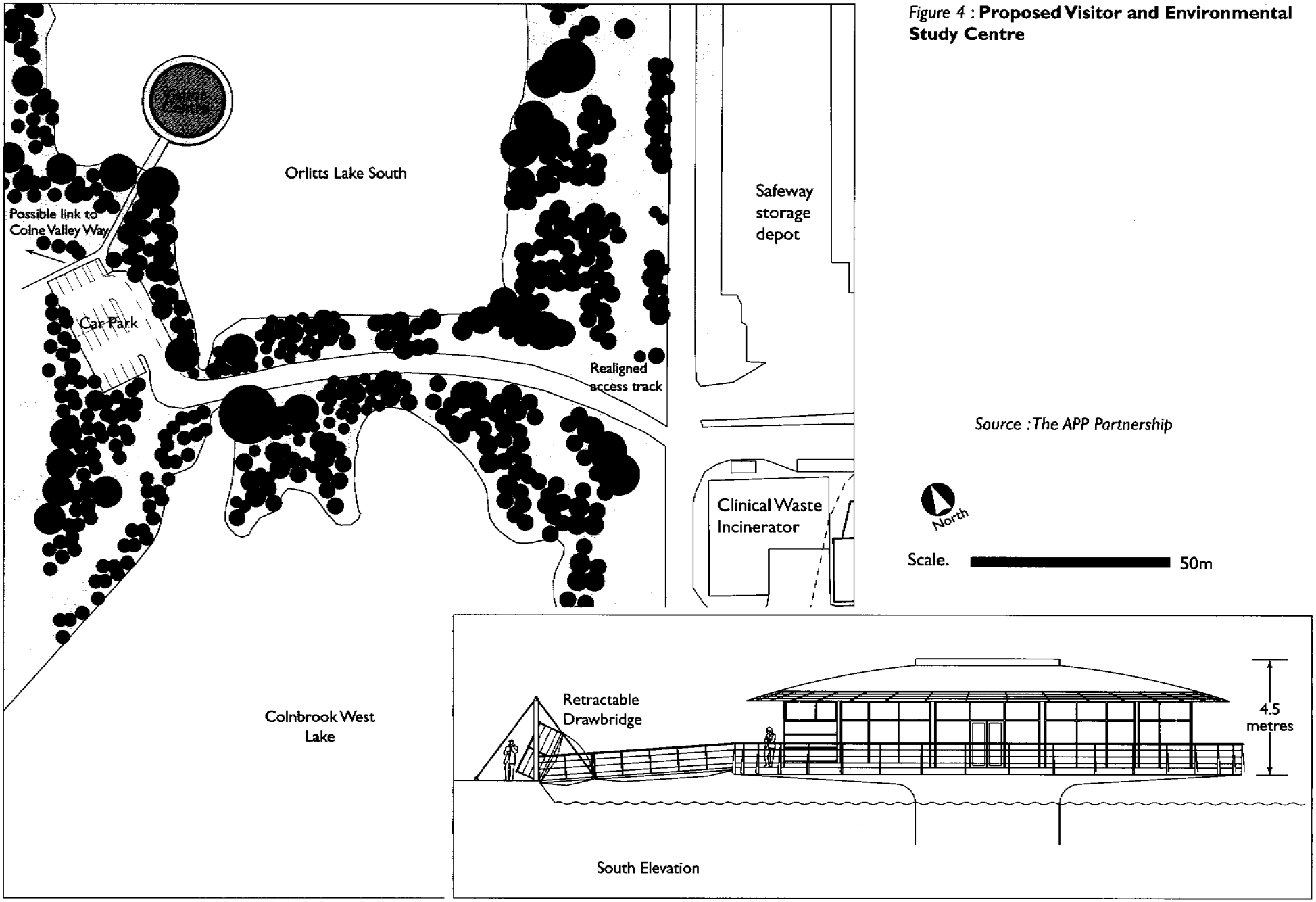


Figure 4 : **Proposed Visitor and Environmental Study Centre**

Source : The APP Partnership

Temporary Construction Compound

38. Part of Tanhouse Farm Landfill, a completed landfill to the west of the site, will be used temporarily for the storage of materials and equipment, contractors parking and offices during construction of the facility.

Visitor Centre

39. The proposals include the development of a Visitor and Environmental Study Centre on the south western edge of Orlitts Lake South. The centre will provide an educational facility for waste management (which is now part of the national curriculum). Because of its setting, the Centre will also be ideally situated to study the value of urban wildlife sites. The location of the Visitor Centre and an elevation of the building are shown in Figure 4.

Liaison Group

40. Grundon will set up a Local Liaison Group as soon as practicable. The purpose of the liaison group will be to provide a forum for discussing construction/operation of the plant and management of the Visitor Centre.

41. The membership of this group will include representatives from Grundon, the Environment Agency, English Nature, Members of local councils and other elected bodies.

Construction Programme

42. Construction of the scheme will take approximately 31 months, with 3 months for commissioning of the EfW plant.

Identifying the Environmental Issues

43. Following an analysis of the local planning policies and environmental constraints (see Figure 5) and consultations with the planning authorities, English Nature and the Environment Agency, it was decided that the environmental assessment should examine the effects of the proposals with respect to the following issues:

- Air quality
- Water Environment
- Ground Contamination
- Landscape
- Traffic
- Noise and Vibration
- Ecology
- Recreation
- Archaeology.

Assessment of Environmental Impacts

Air Quality

44. The air quality impact of the proposed EfW facility has been assessed with reference to current and proposed air quality standards and objectives.

45. Measurements from local monitoring sites show that the air quality in the vicinity of the Lakeside site generally meets air quality standards. However, the stringent air quality standards for nitrogen dioxide and particulate matter (substances present in the air emissions in the form of small particles) are not currently met close to major roads (including the M4 and M25) and Heathrow Airport.

46. The potential impact on air quality of emissions from the proposed EfW facility was assessed using a dispersion model. The results show that, in general, the contribution from the EfW facility to air pollution is not likely to be significant and is unlikely to result in increased risk to human health.

47. The assessment also shows that odorous emissions from the chimney stack and from handling and storage of waste will not be sufficient to cause odour nuisance.

48. Measures will be taken to control dust generation during demolition of the old plant and construction of the new plant. The release of dust from waste and ash handling will be prevented during operation of the plants.

Water Environment

49. The nearest watercourse to the site is the Colne Brook, which is about 200 metres from the EfW site, west of the proposed Visitor Centre. To the east is the Wraysbury River. There are a number of licensed surface water and groundwater abstractions within 2km of the site. However, none of these are used for public or private water supply.

50. The potential impacts on groundwater and surface water resulting from the construction and operation of the proposed EfW facility were assessed. Account was taken of water quality, drainage, water abstraction areas and floodplain areas.

51. Borehole investigations, carried out as part of the assessment, indicate that groundwater quality beneath the site appears to be good and that landfills in the vicinity of the site do not appear to significantly influence groundwater quality.

Figure 5 : **Planning Context**

- Proposed Lakeside Energy from Waste Facility
- Green Belt
- Flood Risk
- Conservation Area
- Business/Industrial Uses
- Wildlife Heritage Site
- Colnbrook Branch Line
- Proposed Visitor Centre
- Proposed Temporary Construction Compound

Note. The whole area is within the Colne Valley Regional Park

Source : *Royal Borough of Windsor & Maidenhead Local Plan; Draft for Adoption, 1998*
Hillingdon Unitary Development Plan 1998
The Local Plan for South Bucks 1989
The Review of the Local Plan for Slough; Deposit Draft 1999

North

Scale. 1:12 500

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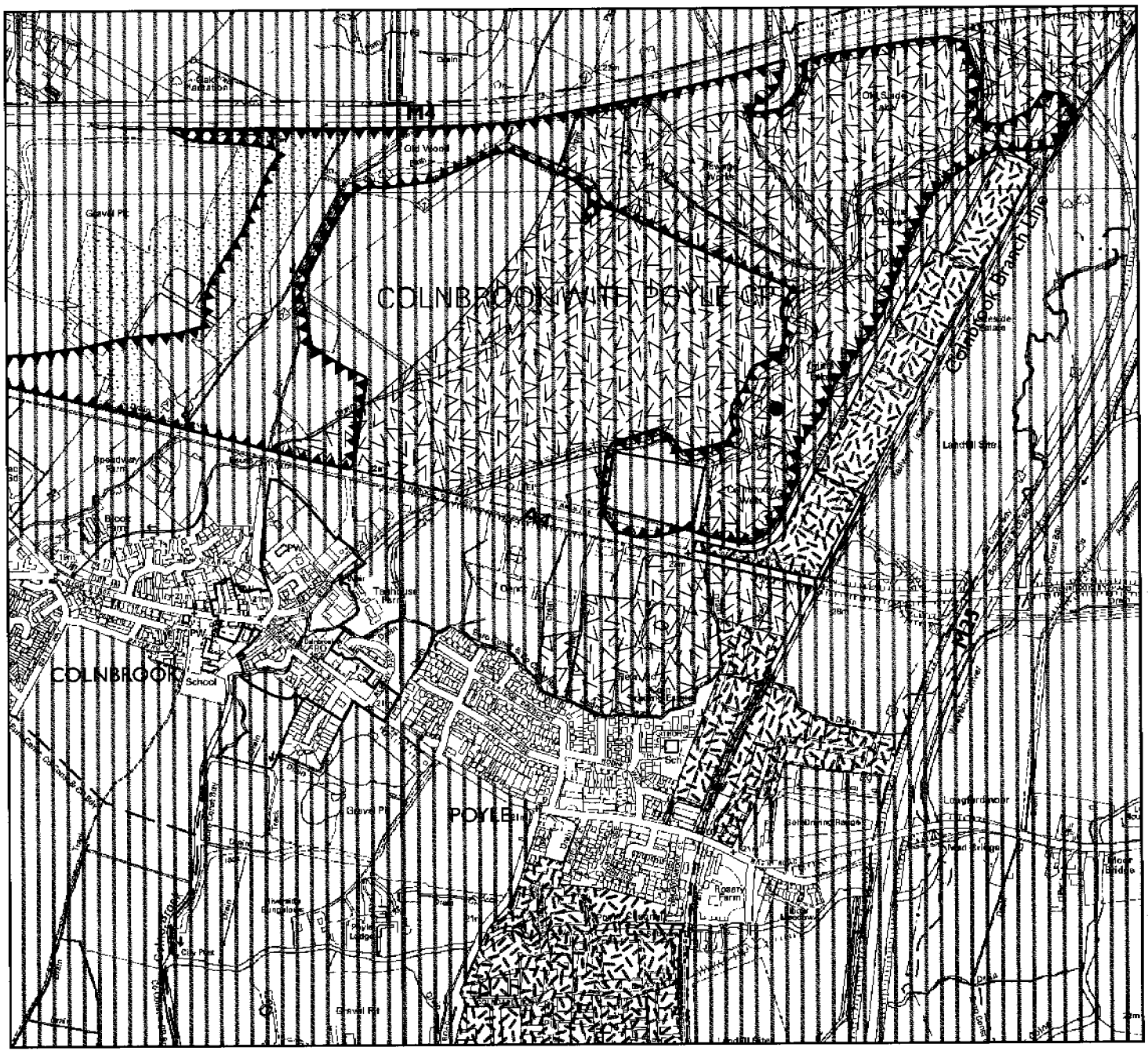
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Landfill Site
Gravel Pit
Sewage Works
Old Sludge Lagoons
Rosery Farm
Poyle Lodge
Poyle Bungalows
Tollhouse Farm
Blood Farm
Speedway Stadium
Old Slough Arm
Colnbrook Arm
Longford River
Colne Brook
Poyle Dairy
Poyle Manor
Poyle Stables
Poyle Estate
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Colnbrook Sewage Works
Colnbrook Sewage Treatment Works
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52. Construction works will affect local groundwater flows and levels during excavation activities and de-watering. However, with mitigation measures in place, the assessment concludes that the quality of the nearby surface water courses, and nearby abstractions will not be significantly affected by construction activities.

53. The operation of the new EfW facility will not result in any discharges of process effluent to sewers or local watercourses. Measures will be implemented to ensure that surface water drainage is of adequate quality prior to discharge and storage areas for oils and chemicals will be fully enclosed to contain any leaks and spills. Therefore, there are not expected to be any changes to the quality of groundwater or surface water resources.

54. Although the development may result in the slight loss of below ground floodplain storage capacity due to excavation works, the development of the site is not expected to affect flood risks.

Ground Contamination

55. Historical records show that the Lakeside site was used for gravel extraction and the construction of pre-cast concrete units prior to the 1970s when Grundon developed their waste reclamation plant. Records do not indicate any former uses which could give rise to potential concern of ground contamination.

56. Information obtained from the Environment Agency indicates that there are a number of commercial, industrial and domestic landfills within 250 metres of the Lakeside site. There is no evidence to suggest that the Lakeside site is influenced by adjacent landfills.

57. In the unlikely event that ground contamination is encountered at the site during construction of the EfW facility, appropriate remedial action will be taken in line with the relevant guidelines.

58. The risk assessment concluded that there are not likely to be any significant effects on the health and safety of site workers, on surface water or groundwater resources, arising from contamination at the site.

Landscape

59. The EfW site is surrounded by but lies outside the Green Belt designation. Tanhouse Farm Landfill, which will accommodate the construction compound, and the site of the Visitor Centre fall within the Green Belt designation.

60. The EfW plant itself does not have a direct impact on the Green Belt. Although visible over a long distance, the careful design of the building and proposed landscaping will provide an attractive feature which in its setting against existing industrial buildings, pylons, motorway and rail infrastructure will not have an adverse impact on the openness of the Green Belt.

61. Once construction is completed, Tanhouse Farm Landfill will be restored and the proposed planting will enhance the landscape of this part of the Green Belt.

62. The small scale of the proposed Visitor Centre means that it will not affect the function of the Green Belt in checking unrestricted growth of large built up areas and safeguarding the countryside from encroachment. Part of its purpose is to provide access to the lake areas and their nature conservation interest fulfilling some of the objectives of the Green Belt. The proposed planting round the lakes will also further enhance the landscape of the Green Belt.

63. The Lakeside site lies within the Colne Valley Regional Park. The redevelopment of the existing waste management site limits the potential impact on the park area. The Visitor Centre will provide public access to the park with the opportunity to observe wildlife on the lakes and in the surrounding area. Landscaping proposed as part of the scheme will also enhance this part of the park area.

64. The EfW building has been designed to produce the minimum size of building required to house the internal plant and to reduce the perceived mass of the building within the landscape. The Visitor Centre has been designed to reflect the appearance of the EfW plant. Landscape planting is proposed around the EfW site, Orlitts Lake South and North and Tanhouse Farm Landfill to assimilate the development into the surrounding environment.

65. The landscape within which the Lakeside EfW site lies reflects evidence of past disturbance, with damaged and degraded land use components. Transportation corridors, utilities and industrial developments are the dominant and intrusive elements along with other urban infrastructure. The proposals will not introduce an entirely new element into the existing landscape but replace the existing waste management plant and chimney stack with a more prominent and larger facility within an existing industrial estate. However, the other existing industrial elements will also remain dominant within the study area.

66. The Lakeside EfW facility will be a substantial structure, visible from a wide area. However, it will frequently be seen in the context of other industrial and urban structures. From most public vantage points it will be a distant feature. Nevertheless, its scale means that it will be more prominent from closer viewpoints. As the facility will be visible from a number of viewpoints, it has been designed to be an attractive landmark building.

67. The overall conclusion of the assessment is that the EfW facility will not have a significant impact on the character or quality of the landscape and in particular will not affect the openness of the adjoining Green Belt.

Traffic

68. During construction, access to the temporary working compound at Tanhouse Farm and the Lakeside EfW site will be from the A4 trunk road via Lakeside Road (i.e. the existing access to the site). This access will also be used once the EfW facility is operational. A further access from Lakeside Road will provide access to the CWI plant. An existing private track off Lakeside Road will be realigned to provide access to the Visitor Centre.

69. The EfW facility will operate 7 days a week, 24 hours a day. Only 10% of the weekly traffic will arrive and depart from the site during the week-end and only 10% of daily traffic will arrive and depart during the night. It is considered that this volume of traffic will not have a significant impact.

70. Existing 12 hour (7a.m. – 7 p.m.) daily traffic flows to the site are 344 heavy goods vehicle (HGV) movements and 120 light vehicle (cars and vans) movements. Grundon has consent to extend the CWI and MRF. There would be an average of 740 HGV movements and 300 light vehicle movements per day if these consents were implemented.

71. During the construction phase for the EfW facility, HGV movements will be significantly less than the current 344 daily HGV movements generated by the site.

72. During the week the operation of the EfW facility would generate 524 daily HGV movements and 80 light vehicle movements. This is less HGV traffic than the site would generate if CWI and MRF were extended in accordance with existing consents and authorisations.

73. Whilst the operation of the EfW facility will result in an increase in traffic using the Lakeside Road/A4 junction, the effects of this increase on the local highway network are not considered to be significant and the junction will be functioning well within capacity.

74. The site can be served by rail from the Colnbrook Branch Line. The predicted volume of road traffic will be significantly reduced if the rail operating companies can provide a rail service to the EfW facility.

Noise and Vibration

75. Noise monitoring was carried out at four locations to represent the residential areas of Poyle and Colnbrook.

76. The assessment shows that noise levels generated during the construction phase will generally be less than the existing day-time noise levels which are dominated by traffic and aircraft movements.

77. The assessment proposes a noise limit from operational plant which will mean that operation of the plant will not have any significant noise impact during normal operation.

78. There may be some noise associated with plant commissioning and testing. Local residents will be notified of any noisy testing via the Liaison Group.

Ecology

79. As the EfW facility could potentially alter air emissions from the site, the effects of the proposal on the ecology of a wide area were assessed.

80. The site of the proposed EfW facility has no ecological value as it is already a developed industrial site.

81. The site for the Visitor Centre car park is characterised by urban wasteland vegetation and is of low ecological value.

82. Four sites of international conservation significance lie within 20km of the proposed development. Windsor Forest and Great Park candidate Special Area of Conservation (cSAC) is 8km to the south west and Burnham Beeches cSAC is 11km to the north west. The proposed Thames Basin Heaths Special Protection Area (SPA) lies 20km to the south-west of the site.

83. The lakes adjacent to Lakeside Road, Colnbrook, are being considered for inclusion in the South West London Waterbodies potential SPA. This designation process is at a very early stage.

84. Four sites of national importance for nature conservation lie within 20km of the site. These are Staines Moor SSSI, Wraysbury and Hythe End Gravel Pits SSSI, Windsor Forest and Great Park SSSI and Burnham Beeches SSSI.

85. Slough Borough Council has identified the lakes off Lakeside Road as a non-statutory Wildlife Heritage Site, particularly for their populations of Kingfisher.

86. The assessment concludes that neither construction nor operation of the EfW facility or Visitor Centre are likely to have a significant effect on designated or potential areas of nature conservation importance.

87. Emissions to air during operation of the EfW plant are not considered likely to have a significant impact on the health of trees and plants.

Recreation

88. The proposed EfW facility is located within the Colne Valley Regional Park which is an important environmental resource for the surrounding urban areas. However, within the immediate surroundings of the proposed development site, recreational facilities are limited to footpaths, bridleways and fishing for members of local angling clubs.

89. There are a number of proposals to improve recreational facilities close to the development site. These include a SUSTRANS cycle route and a Linear Park proposal.

90. During construction of the EfW facility there will be limited impacts on recreational users resulting from noise and traffic. Mitigation measures are proposed to ensure that disturbance is kept to a minimum.

91. As part of the proposals a Visitor and Environmental Study Centre will be provided on Orlitts Lake South. This facility will improve access to the lake and provide information and study facilities on the operation of the EfW facility and on the nature conservation interests in the area.

92. Grundon is also prepared to provide a bridge over the Colne Brook providing a footpath/cycleway link with the proposed Linear Park. This would enable the Visitor Centre to be accessed by foot and cycle. Secure cycle parking will be provided at the Centre.

Archaeology

93. A 1km study area was defined around the Lakeside EfW site. This area is generally of high archaeological interest. The Grundon site and its immediate surroundings have been extensively worked for gravel and filled. Consequently, the site's archaeological potential is negligible and no impact on archaeological sites is likely as a result of the proposed scheme.

94. A number of listed buildings and the Colnbrook Conservation Area lie within the study area. These are located at some distance from the site and it is considered that neither the buildings nor their settings will be adversely affected by the proposals.

Conclusion

95. The establishment of an EfW facility at Lakeside Road would provide a waste treatment and recycling facility for Slough, Berkshire and a wider catchment area extending into Surrey, Buckinghamshire and Greater London.

96. The results of the environmental assessment show that, with mitigation measures in place, the proposal can be constructed and operated without any significant environmental effects.

AEAT- 5304 Issue 3

Lakeside Energy from Waste, Colnbrook

Air quality impact assessment

A report produced for S Grundon (Waste) Ltd

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NON-TECHNICAL SUMMARY

0.1 The impact of the proposed Lakeside Energy from Waste (EfW) facility, Colnbrook on air quality has been assessed with reference to air quality standards and objectives for the pollutants released. Air quality standards considered within the assessment included those derived from the United Kingdom National Air Quality Strategy and from the European Council Air Quality Daughter Directive, standards recommended by the Expert Panel on Air Quality Assessment and the World Health Organisation. Other pollutants were assessed by comparison with Environment Agency Environmental Assessment Levels.

0.2 The air quality in the region of the proposed facility has been assessed on the basis of measurements from continuous and static sites in the vicinity of the proposed facility. These measurements show that the air quality at background locations in the region generally meets the air quality standards. However, the most stringent air quality standards for nitrogen dioxide and particulate matter are not currently met close to major roads (e.g. M25 and M4) or on Heathrow Airport. DETR forecasts of air quality at the London Hillingdon monitoring site, 30m from the M4 suggest that the concentrations of nitrogen dioxide and particulate matter will continue to exceed the most stringent standards for these pollutants in 2005. However, these most stringent objectives will be exceeded at locations throughout the United Kingdom: the extent of this exceedence is such that DETR intend to replace these objectives with less stringent alternatives.

0.3 Modelling studies carried out by BAA in connection with Heathrow Terminal 5 indicate that elevated concentrations will continue to occur in the immediate vicinity of the airport. However, these modelling studies also show that the influence of the airport on air quality declines rapidly with distance from the airport. Cumulative impacts from the airport and the proposed facility were therefore considered for the pollutant of most concern, nitrogen dioxide, on the basis that concentrations in the immediate vicinity of the airport remain at recently measured values.

0.4 The impact on air quality of emissions from the proposed Energy from waste facility has been assessed using the dispersion model ADMS Version 2.2. Modelling was carried out for a range of operating scenarios for stack heights between 65 and 75 m. Model results for 20 pollutants show that in general the contribution from the facility to pollutant concentrations is small. However, total concentrations of nitrogen dioxide and particulate matter, taking account of background concentrations, are predicted to exceed the most stringent air quality objective limits. These objectives would not be met irrespective of the operation of the Energy from Waste facility. It is therefore concluded that discharges from the facility are unlikely to have a significant impact on ambient air quality and thus cause a risk to human health.

0.5 The impact on air quality of the traffic generated on the A4 Colbrook Bypass by operation of Energy from waste facility has been compared with that for Grundon's existing materials recycling facility (MRF) operating at consented capacity for the year 2005. The predicted pollutant concentrations have also been compared with estimates of current concentrations. The predictions show that the air quality at roadside

locations is expected to improve markedly in future years irrespective of the operations on the site. The proposed Energy from Waste facility will generate less traffic than the existing MRF operating at consented capacity which will lead to marginally reduced roadside pollutant concentrations.

0.6 Odours from the site will be controlled by means of a number of measures. These include the incineration of ventilation air. During normal operation the extraction of air from the plant through the burners will be sufficient to limit fugitive releases of odour. Modelling studies based on estimated rates of odour emission show that the impact of odorous discharges from the stack will not be sufficient to cause odour nuisance.

0.7 A number of activities on the site have the potential to create dust. The escape of dust from the site from most of these activities will be limited by enclosure of operations. Measures to control dust generation during the demolition of the old plant and the construction of the new plant have been developed.

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SECTION A INTRODUCTION

BACKGROUND

1.1 S Grundon (Waste) Ltd are a major force in the UK Waste Management Industry. The company currently owns and operates an advanced materials recovery and clinical waste incineration facility at Lakeside Road in Colnbrook.

1.2 Grundon now intends to move ahead with the development of a major new waste facility at Lakeside Road, including a energy from waste plant, clinical waste incineration plant and materials recovery facility. The site is strategically situated on the A4 Colnbrook Bypass, close to Heathrow Airport and at the focal point of a projected inter-modal rail facility. It is ideally situated to satisfy a major need relating to municipal waste, light industrial waste and commercial waste and will perform a key role in the company's integrated waste processing system.

1.3 S Grundon (Waste) Ltd's consultants, Adams Hendry, have identified the possible impact on air quality as an important environmental concern in their scoping study. S Grundon (Waste) Ltd therefore employed AEA Technology Environment to carry out a detailed assessment of the air quality impact of the proposed facility. AEA Technology Environment brings together over 650 professional environmental experts and has over 20 years experience of air quality assessments. This specialist report describes our assessment of the air quality impact.

THE GENERAL APPROACH

1.4 The general approach to air quality assessment taken was as follows:

- to review the air quality in the vicinity of the proposed works on the basis of available monitoring data and modelling studies;
- to assess the rates of emission of pollutants under worst case operation allowed under expected authorisation conditions;
- to model the contribution to ground level concentrations from the facility using a dispersion model under a range of operating conditions;
- to predict total concentrations of pollutants with the facility in operation taking account of background concentrations obtained at monitoring sites in the area and the expected changes in background concentrations as a result of planned developments in the area;
- to compare predicted total concentrations of pollutants with air quality standards and guidelines;
- to assess the risk to human health from pollutants for which air quality standards and guidelines are not available;
- to assess the impact of the potential emissions from traffic using the facility, fugitive dust and odour emissions.

SECTION B REVIEW OF AIR QUALITY

INTRODUCTION

2.1 The air quality in a particular area may be assessed by reference to a framework of standards and guidelines. Measurements of air pollutant concentrations at monitoring stations in the area may be compared to standards and guideline values. Concentrations at other locations and for future years are then inferred on the basis of the measurements and on the basis of modelling studies. In this chapter, we review:

- air quality standards and guidelines;
- the available air pollutant monitoring data;
- relevant modelling studies other developments.

AIR QUALITY STANDARDS AND GUIDELINES

2.2 The main pollutants of concern in the vicinity of a energy from waste facility arise as the result of the combustion of the waste and associated material handling operations. The main pollutants are:

- nitrogen dioxide;
- sulphur dioxide;
- particulate matter;
- carbon monoxide;
- hydrogen chloride;
- hydrogen fluoride;
- dioxins and furans;
- polycyclic aromatic hydrocarbons;
- lead and other heavy metals.

Some of these pollutants are covered by statutory regulations that set air quality standards or objectives for air pollutant concentrations. For others there are no statutory regulations: for these materials reference is made to guidelines from the World Health Organisation and reference levels published by the Environment Agency. Appendix 1 provides further information concerning the health effects associated with exposure to pollutants and the setting of standards and guide values for air quality impact assessment.

Nitrogen dioxide

2.3 Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen: together they are referred to as NO_x. All combustion processes in air produce NO_x, though the colourless gas NO usually predominates. The conversion of NO to the red-brown gas NO_2 takes place in the atmosphere via reaction with chemically active species such as ozone. In urban areas, where the oxidizing capacity of the atmosphere may be limited, nitric oxide concentrations often exceed those of nitrogen dioxide. It is nitrogen dioxide which is associated with adverse effects upon human health, particularly with regard to exacerbation of symptoms associated with respiratory illness.

2.4 Exposure to nitrogen dioxide can bring about reversible effects on lung function and airway responsiveness. It may also increase reactivity to natural allergens. Repetitive

exposure in animals can produce changes in lung structure, lung metabolism and lung defences against bacterial infection. Animal toxicological studies suggest that peak concentrations contribute more to toxicity than does duration of the exposure although the latter is still important. Exposure to nitrogen dioxide may put children at increased risk of respiratory function and may lead to poorer lung function in later life. There is some evidence to suggest that women exposed to raised concentrations of nitrogen dioxide as a result of using gas cookers and open gas fires may have impaired lung function.

2.5 Present EC legislation (Council Directive 85/203/EEC) has set a limit of 104.6 ppb (200 $\mu g\ m^{-3}$) expressed as a 98th percentile of hourly means in a calendar year. In addition, the Directive also provides for guide values of 70.6 ppb (135 $\mu g\ m^{-3}$) and 26.2 ppb (50 $\mu g\ m^{-3}$) expressed as 98th and 50th percentiles of hourly means respectively.

2.6 The Expert Panel on Air Quality Standards (EPAQS,1996) recommended a standard of 150 ppb as an hourly mean. In addition, EPAQS concluded that a longer-term standard was also desirable in order to protect against possible cumulative effects on the health of the population. The Government as part of its National Air Quality Strategy (1997) accepted 150 ppb as an hourly mean as the standard for nitrogen dioxide, with the achievement of this value by 2005 as a provisional objective. The Government also adopted the further provisional objective of 21 ppb as an annual mean to be achieved by 2005. These provisional objectives were included within the Air Quality Regulations, 1997.

2.7 EC Directive 96/62/EC on ambient air quality assessment and management- the so-called Air Quality Framework Directive will have an important impact on air quality policy. The first Air Quality Daughter Directive, on which the UK achieved a Common Position in 1998, establishes legally binding limit values for nitrogen dioxide to be achieved by 1 January 2005 and 2010. The Common Position includes a one hour limit value for nitrogen dioxide of 104.6 ppb (200 $\mu g\ m^{-3}$), not to be exceeded more than 18 times per year, and an annual limit value of 21 ppb (40 $\mu g\ m^{-3}$). These limit values are to be achieved by 1 January 2010. In addition, the Air Quality Daughter Directive sets an annual mean limit of 15.7 ppb (30 $\mu g\ m^{-3}$) to protect vegetation.

2.8 The National Air Quality objectives have recently been reviewed by the Government (1999). An analysis of monitoring data showed that the Air Quality Daughter Directive's 1 hour limit value is marginally more stringent than the Strategy hourly objective. The Government has therefore decided to replace the National Strategy objective with the Daughter Directive limit for the purposes of Local Air Quality management.

2.9 The Review of the National Air Quality Strategy also concluded that on the evidence to date, achieving the annual nitrogen dioxide objective at the roadside is likely to be very challenging in London and may also be difficult in some other major conurbations. The measures necessary could have major transport implications and cannot be justified in cost and benefit terms. For this reason, and because of continuing uncertainties, the annual objective will remain as a provisional objective. The provisional objective will be reviewed in two years time: in reaching its final decision, the Government has promised to ensure that local authorities do not feel forced to take extreme measures which would lead to serious disruption or damage to their local economies. The Government has also proposed a new national objective for the protection of vegetation of 15.7 ppb (30 $\mu g\ m^{-3}$) to protect vegetation for 31 December 2000 in order to comply with the Air Quality Daughter Directive. However, the Government has proposed that this should be a

national objective and not one that will be included in Air Quality Regulations for the purposes of local air quality management.

Sulphur dioxide

2.10 The predominant source of sulphur dioxide in the United Kingdom is from the combustion of sulphur-containing fuels, principally coal and heavy oils. It is an irritant when inhaled because of its acidic nature and high concentrations may cause breathing difficulties in people exposed to it. Recent studies have shown that people suffering from asthma may be especially susceptible to adverse affects of sulphur dioxide and that, within the range of concentrations that occur in pollution episodes, it may provoke attacks of asthma.

2.11 Until relatively recently, air quality guidelines and standards for sulphur dioxide were expressed in conjunction with values for Black Smoke or other measures of particles. This originated from pioneering work in the UK in the smogs of the 1950s and 1960s and forms the basis of the EC Directive (80/779/EEC) on smoke and sulphur dioxide. More recent research has addressed the effects of sulphur dioxide acting alone: exposures of the order of minutes have been shown to exhibit adverse effects on human health. Such research has been incorporated into two influential health based reviews:

- The Expert Panel on Air Quality Standards (EPAQS) have recommended an air quality standard for sulphur dioxide of 100 ppb measured over a 15 minute averaging period.
- The World Health Organisation (WHO) guidelines set a figure for a short averaging period of 175 ppb (500 $\mu g\ m^{-3}$) for a 10 minute mean exposure.

2.12 As part of the National Air Quality Strategy (NAQS), the Government adopted the provisional objective of achieving the standard of 100 ppb measured on a 15 minute averaging time basis at a 99.9th percentile by 2005, i.e. on all but 35 periods of 15 minutes, assuming complete data capture in a year. The objective was included within the Air Quality Regulations, 1997.

2.13 Since the National Air Quality Strategy was published, the Common Position on the Air Quality Daughter Directive achieved in June 1998 included a 1 hour limit value for sulphur dioxide of 350 $\mu g\ m^{-3}$ (131.1 ppb) , not to be exceeded more than 24 times per year and a 24 hour limit value of 125 $\mu g\ m^{-3}$ (46.8 ppb) not to be exceeded more than 3 times per year. These limit values are to be achieved by 1 January 2005. The Directive's limit values are however less stringent than the Strategy objective which is derived from the level recommended by EPAQS. The Daughter Directive also introduces two national objectives to protect ecosystems: 7 ppb (20 $\mu g\ m^{-3}$) as an annual average and 7 ppb (20 $\mu g\ m^{-3}$) as a winter average (1 October to 31 March) to be achieved by 2000.

2.14 The National Strategy objectives have recently been reviewed (1999). The Government has decided to retain the provisional objective of achieving the standard of 100 ppb measured on a 15 minute averaging time basis at a 99.9th percentile by 2005 as a firm objective. Working towards the more stringent objective for the end of 2005 will ensure that any action needed to drive concentrations down is set in hand in good time to meet the requirements of the Directive by the end of 2004. The Government proposes to adopt the objectives to protect ecosystems but compliance will be monitored at a

national level and the objectives will not be included in Regulations for the purposes of local air quality management.

Particulate matter

2.15 Particulate matter in the atmosphere is composed of a wide range of materials arising from a variety of sources. Examples of man-made sources are: carbon particles from incomplete combustion; ash; recondensed metallic vapours; and so-called secondary particles or aerosols, formed by reactions in the atmosphere. As well as being emitted directly from combustion sources, man-made particles can arise from : mining, quarrying and construction operations; brake and tyre wear in motor vehicles; and from road dust resuspended by traffic or strong winds. Natural sources of particles include wind-blown dust and sea-salt, and biological particles such as pollens and fungal spores.

2.16 In the 1950s and 1960s, the effects of the high levels of airborne particles, in combination with sulphur dioxide, in the notorious smogs were clear. In the last few years, research has demonstrated associations between a range of health outcomes-respiratory and cardiovascular effects and mortality- and various measures of particle concentrations at much lower levels than in earlier smog studies. The Expert Panel on Air Quality Standards (EPAQS) adopted a risk management approach and sought to identify a level at which the effects on a population as a whole would be relatively small. Using this approach, EPAQS identified a level at which one might expect one additional hospital admission (for respiratory disorders) per day in a population of one million. This value, 50 $\mu g\ m^{-3}$ as a running 24-hour mean, was recommended as a standard for PM_{10} (particulate matter with characteristic aerodynamic diameter less than 10 μm measured following specified procedures).

2.17 As part of the National Air Quality Strategy1997, the Government adopted the EPAQS standard of 50 $\mu g\ m^{-3}$ as a running 24 hour mean as a provisional objective to be achieved at the 99th percentile (i.e. on all but 4 days per year assuming perfect operation of the monitoring station with 100% data capture in the year) by 2005. The provisional objective was included within the Air Quality Regulations 1997.

2.18 Since the Strategy was published, the UK achieved a Common Position on the Air Quality Daughter Directive in June 1998 which included a 24 hour limit value for PM_{10} of 50 $\mu g\ m^{-3}$, not to be exceeded more than 35 times per year and an annual limit of 40 $\mu g\ m^{-3}$. These limit values are to be achieved by 1 January 2005. The Directive also includes indicative Stage 2 limit values to be achieved by 1 January 2010. The 24 hour Stage 2 limit value for PM_{10} is 50 $\mu g\ m^{-3}$, not to be exceeded more than 7 times per year and the annual Stage 2 limit value is 20 $\mu g\ m^{-3}$.

2.19 The Government has recently prepared a Review of the UK National Air Quality Strategy (1999). It concluded that action should be concentrated in the short term on achieving the Stage 1 limit values in the Air Quality Daughter Directive by December 31 2004. The Government have therefore proposed to amend the NAQS objectives to provide a new annual objective of 40 $\mu g\ m^{-3}$ and a new 24 hour objective of 50 $\mu g\ m^{-3}$ with a maximum of 35 exceedences per year for 31 December 2004. The Government intends to retain the existing NAQS objective of 50 $\mu g\ m^{-3}$ as 99th percentile of daily maximum running 24 hour means as an indicative level for 31 December 2005. The Government will also introduce a new indicative annual level of 20 $\mu g\ m^{-3}$ and 24 hour level of 50 $\mu g\ m^{-3}$ with a maximum of 7 exceedences per year for 31 December 2009.

2.20 The new objectives and new indicative values for particles refer to the gravimetric reference method of measurement in the Air Quality Daughter Directive. This method differs from the Tapered Element Oscillating Microbalance (TEOM) method commonly used for continuous monitoring throughout the United Kingdom. Using the TEOM method, the new annual objective would be approximately 31 $\mu g\ m^{-3}$ and the number of exceedences of the 50 $\mu g\ m^{-3}$ daily objective would be approximately 7-20. The new indicative levels for 2009 would be an annual limit of 16 $\mu g\ m^{-3}$ and the number of exceedences of the 50 $\mu g\ m^{-3}$ daily objective would be very approximately 1-4.

Carbon monoxide

2.21 Carbon monoxide is a colourless and odourless gas which at very high concentrations can lead to severe poisoning. This results in loss of consciousness or, at sufficiently elevated concentrations, death. The effects of carbon monoxide arise from the interference of the gas with the processes which transport oxygen around the body and by blocking essential biochemical reactions in cells. Exposure of humans to carbon monoxide in air is manifest in raised levels of carboxyhaemoglobin in the blood, which replaces the normal oxygen carrier haemoglobin in red blood cells.

2.22 At lower levels of exposure, this action of carbon monoxide can lead to effects on the heart and on the brain. People who suffer from coronary artery disease, and who are subject to bouts of angina are likely to be at risk if their oxygen transport is impaired. Equally, mental activity could be affected by reductions in oxygen supply resulting from exposure to carbon monoxide. Such changes could affect hand-eye co-ordination, for example.

2.23 The Expert Panel on Air Quality Standards (EPAQS) has recommended a standard for carbon monoxide of 10 ppm (1165 $\mu g\ m^{-3}$) as a running 8-hour average. The Government accepted 10 ppm as a running 8 hour mean as the standard for carbon monoxide and adopted the objective of achieving the standard by 2005 . The objective was included in the Air Quality Regulations ,1997.

2.24 In December 1998, the European Commission published a proposal for a further daughter directive which sets limit values for carbon monoxide. This proposal includes a limit value of 1000 $\mu g\ m^{-3}$ (about 8.5 ppm) as an 8-hour mean to be achieved by 2005.

2.25 The Government has recently carried out a review of National Air Quality Strategy. As a result of this review, the Government proposes to adopt a new objective of achieving the 10 ppm (1160 $\mu g\ m^{-3}$) level in all areas by 31 December 2003.

Hydrogen chloride

2.26 There are no statutory air quality standards for hydrogen chloride. The Environment Agency has adopted reference values known as Environmental Assessment Levels (EAL) for many substances for which air quality standards have not been defined. The EAL is the concentration of a substance which the Agency regards as a comparator value to enable a comparison of the environmental effects of different substances. The long term EAL for hydrogen chloride is 7 $\mu g\ m^{-3}$ as an annual mean. The short term EAL for hydrogen chloride is 700 $\mu g\ m^{-3}$ as an hourly mean.

Hydrogen fluoride

2.27 There are no statutory air quality standards for hydrogen fluoride. The Environment Agency has published a short term EAL of 250 $\mu g\ m^{-3}$ as an hourly mean for hydrogen fluoride as fluorine.

Dioxins and furans

2.28 Dioxins and furans are a group of organic compounds that are formed as a result of combustion in the presence of chlorine, for example in power generation, waste incineration and industrial coal burning. Natural sources include wind blown material and the products of forest fires.

2.29 Dioxins are carcinogenic and are taken up by man largely by ingestion with food and water. The World Health Organisation has recommended a Tolerable Daily Intake (TDI) of 1-4 $pg\ kg^{-1}$ body weight per day: however, almost all individuals in the UK presently exceed the lower value. Typical exposure of the UK population in 1992 is around 2.4 $pg\ kg^{-1}$ body weight per day (MAFF 1997). The UK's Committee on the Toxicity of Chemicals in Food, Consumer Products and the Environment recommended the adoption of a tolerable daily intake for PCDDs and PCDFs of 10 $pg\ kg^{-1}$ body weight per day.

Polycyclic aromatic hydrocarbons

2.30 The Expert Panel on Air Quality Standards (EPAQS) has recently proposed in draft a standard of 0.25 $ng\ m^{-3}$ of benzo (a) pyrene as an annual average. The Environment Agency has recommended a maximum deposition rate for PAHs (total anthracene, benzo(a) anthracene, benzo (k) fluoranthene, benzo(a)pyrene, chrysene, phenanthrene, fluoranthene, indeno(1,2,3-cd)pyrene, napthalene, benzo (ghi) perylene) released to land via deposition of 3.9 $mg\ m^{-2}\ day^{-1}$.

Lead

2.31 Most of the lead in the air is in the form of fine particles with an aerodynamic diameter of less than 1 μm. Direct human exposure to lead occurs through food, water, dust and soil and air. Most people receive the largest portion of their daily lead intake via food, although other sources may be important in specific areas. Lead exhibits toxic biochemical effects in humans which are manifest in the synthesis of haemoglobin, acute or chronic damage to the nervous system, effects on the kidneys, gastrointestinal tract, joints and the reproductive system. In conditions of low-level and long-term lead exposure such as are found in the general population, the most critical effects are those on haem biosynthesis, erythropoieses, the nervous system and blood pressure.

2.32 An ambient air quality standard of 2 $\mu g\ m^{-3}$ as an annual average exists within the EU via Directive 82/884/EEC. In their 1987 publication, the World Health Organisation set a guideline for lead at 0.5-1 $\mu g\ m^{-3}$ also as an annual average, but have recently revised this guideline to 0.5 $\mu g\ m^{-3}$ as an annual average.

2.33 The Government adopted the revised WHO guideline figure of 0.5 $\mu g\ m^{-3}$ as an annual mean as the standard for lead in its National Air Quality Strategy, 1997 with the objective of achieving the standard by 2005.

2.34 In May 1998, EPAQS published its recommendation for an air quality standard for lead. The Panel recommended an air quality standard for lead in air of 0.25 μg m^{-3} measured as an annual mean, in order to protect young children (the group regarded by the panel as those most vulnerable to impairment of brain function). At this level, the Panel concluded that any effects on the health of children would be so small as to be undetectable.

2.35 In June 1998, the Common Position on the Air Quality Daughter Directive included a limit value for lead of 0.5 μg m^{-3} as an annual mean to be achieved by 1 January 2005.

2.36 The National Air Quality Strategy has recently been reviewed, 1999. The review concluded that revised National Strategy should include two objectives for lead - 0.5 μg m^{-3} as an annual mean to be achieved by 31 December 2004 and 0.25 μg m^{-3} as an annual mean to be achieved by 31 December 2008.

Health Risk Assessment for Metals

2.37 There is no legislation covering the concentrations of metals other than lead in the ambient air. The Environment Agency has published Environmental Assessment Levels for these substances based on World Health Organisation Air Quality Guidelines (for cadmium, manganese, mercury, vanadium) or Health and Safety occupational exposure limits. The occupational exposure limits provide an assessment of the toxicological effects of a pollutant on the adult human workforce. Protection factors have been applied to the limits to allow for the different sensitivity of other receptor populations, for example, children, the elderly or those with diseases such as asthma, and for different patterns of exposure. The protection factor applied to long term exposure to metals in deriving long-term Environmental Assessment Levels is typically 100. The Environment Agency Guidance recommends that the effects of exposure at concentrations less than 0.2% of the Environmental Assessment Level be considered insignificant. More detailed assessment of substances considered insignificant is not warranted.

2.38 More detailed consideration may be required for more substances present at more significant concentrations. WHO Air Quality Guidelines have established guideline values for metallic substances emitted from waste incinerators. The Guidelines provide data on the uptake by inhalation, ingestion from water and food and dermal contact where relevant. Available data are indicated on the kinetics and metabolism to assess the magnitude of body burden from long-term low-level exposures and to characterise the mode of toxic action. Data is then presented on the lowest concentrations at which adverse effects are observed in humans, animals and plants. The Guidelines report the concensus reached by scientists on protection factors to be applied to allow for uncertainty in the data, for possibly undetected effects on particularly sensitive members of the population, synergistic effects of multiple exposures and the adequacy of existing data. The Guidelines then provide guideline values based on the assessment. Substances were assessed qualitatively in terms of their carcinogenicity. For potentially carcinogenic substances, methods of quantitative assessment of the average relative risk are presented based on the most reliable human studies. These methods allow the risk associated with a lifetime exposure to 1 μg m^{-3} of the substances to be calculated. The risk model is assumed to be linear.

2.39 The possible routes of exposure (via inhalation, ingestion of food and water and dermal contact) of the population in the vicinity of the proposed incinerator were considered in the light of the WHO Guidelines. No special circumstances were identified that would render the WHO Guidelines inapplicable. For example, we are not aware of any special methods of food production or unusual patterns of food consumption carried out in the vicinity that might increase uptake.

2.40 The WHO Guideline values for the non-carcinogenic substances may be compared with the Environmental Assessment levels. The Environmental Assessment Levels for these substances were generally at least as stringent as the WHO Guidelines.

Arsenic

2.41 Inorganic arsenic compounds are established human carcinogens. Lung cancer is considered as the critical effect following exposure via inhalation.

2.42 There are no statutory air quality standards for arsenic. WHO Air Quality Guidelines concluded that because arsenic is carcinogenic and there is no known safe threshold, no safe level for arsenic can be recommended. The guidelines also conclude that at an air concentration of 1 $\mu g\ m^{-3}$, a conservative estimate of lifetime risk is $3 . 10^{-3}$.

2.43 The Environment Agency has published a long term EAL for arsenic and its compounds of 0.2 $\mu g\ m^{-3}$ as arsenic as an annual mean and a short term EAL of 6 $\mu g\ m^{-3}$ as arsenic as an hourly mean. The Environment Agency has also set an EAL for releases to land via deposition of a maximum deposition rate (averaged over a period of 50 years) of 0.02 mg $m^{-2}\ day^{-1}$ for arsenic.

Antimony

2.44 There are no statutory air quality standards for antimony. The Environment Agency has published a long term EAL for antimony and its compounds of 5 $\mu g\ m^{-3}$ as antimony as an annual mean and a short-term EAL of 150 $\mu g\ m^{-3}$ as antimony as an hourly mean.

Cadmium

2.45 There are no statutory air quality standards for cadmium. WHO Air Quality Guidelines concluded that guidelines for cadmium should be based on the risks for renal accumulation by dietary exposure. WHO recommended that in rural areas present levels of 1-5 ng m^{-3} should not be allowed to increase. In urban areas without agricultural activities, and in industrialized areas, levels of 10-20 ng m^{-3} may be tolerated.

2.46 The Environment Agency has published a long term EAL for cadmium and its compounds of 0.005 $\mu g\ m^{-3}$ as cadmium as an annual mean and a short term EAL of 1.5 $\mu g\ m^{-3}$ as cadmium as an hourly mean. The Environment Agency has also set an EAL for releases to land via deposition of a maximum deposition rate (averaged over a period of 50 years) of 0.009 mg $m^{-2}\ day^{-1}$ for cadmium to limit the take up in food crops.

Chromium

2.47 Chromium compounds are categorized in classes depending on the potential to form chemical bonds with other substances. The health risks associated with divalent and

trivalent chromium differs from that for hexavalent chromium and they are assessed separately.

2.48 There are no statutory air quality standards for chromium. WHO Guidelines for Europe concluded that because hexavalent chromium is carcinogenic and there is no known safe threshold, no safe level for hexavalent chromium can be recommended. The WHO Guidelines also concluded that at an air concentration of 1 $\mu g\ m^{-3}$ hexavalent chromium, the lifetime risk is estimated to be 4. 10^{-2}.

2.49 The Environment Agency has published a long term EAL for chromium and its divalent and trivalent compounds of 5 $\mu g\ m^{-3}$ as chromium as an annual mean and a short-term EAL of 150 $\mu g\ m^{-3}$ as chromium as an hourly mean. The Environment Agency has also set an EAL for releases to land via deposition of a maximum deposition rate (averaged over a period of 50 years) of 1.5 $mg\ m^{-2}\ day^{-1}$ for chromium. The Environment Agency has published a separate long term EAL for hexavalent chromium compounds of 0.1 $\mu g\ m^{-3}$ as chromium as an annual mean and a short-term EAL of 3 $\mu g\ m^{-3}$ as chromium as an hourly mean.

Cobalt

2.50 There are no air quality standards for cobalt. The Environment Agency has published a long term EAL for cobalt compounds of 0.2 $\mu g\ m^{-3}$ as cobalt as an annual mean and a short-term EAL of 6 $\mu g\ m^{-3}$ as cobalt as an hourly mean. The Environment Agency has also set an EAL for releases to land via deposition of a maximum deposition rate (averaged over a period of 50 years) of 0.49 $mg\ m^{-2}\ day^{-1}$ for cobalt.

Copper

2.51 There are no air quality standards for copper. The Environment Agency has published a long term EAL for copper compounds of 10 $\mu g\ m^{-3}$ as copper as an annual mean and a short-term mean short term EAL of 200 $\mu g\ m^{-3}$ as copper as an hourly mean. The Environment Agency has also set an EAL for releases to land via deposition of a maximum deposition rate (averaged over a period of 50 years) of 0.25 $mg\ m^{-2}\ day^{-1}$ for copper.

Manganese

2.52 There are no air quality standards for manganese. WHO Guidelines for Europe recommend a guideline value of 1 $\mu g\ m^{-3}$ as an annual mean. The Environment Agency has published a long term EAL for manganese compounds of 1 $\mu g\ m^{-3}$ as manganese as an annual mean and a short term EAL of 1500 $\mu g\ m^{-3}$ as manganese as an hourly mean.

Mercury

2.53 There are no air quality standards for mercury. The Environment Agency has published a long term EAL for mercury compounds of 1 $\mu g\ m^{-3}$ as mercury as an annual mean and a short term EAL of 15 $\mu g\ m^{-3}$ as mercury as an hourly mean. The Environment Agency has also set an EAL for releases to land via deposition of a maximum deposition rate (averaged over a period of 50 years) of 0.004 $mg\ m^{-2}\ day^{-1}$ for mercury.

Nickel

2.54 There are no air quality standards for nickel. WHO Guidelines for Europe concluded that because nickel is carcinogenic, no safe level for nickel can be recommended. The WHO Guidelines also concluded that at an air concentration of 1 $\mu g\ m^{-3}$ nickel, the lifetime risk is estimated conservatively to be 4. 10^{-4} (1 in 2500).

2.55 The Environment Agency has published a long term EAL for nickel and compounds of 0.2 $\mu g\ m^{-3}$ as nickel as an annual mean and a short-term EAL of 6 $\mu g\ m^{-3}$ as nickel as an hourly mean. The Environment Agency has also set an EAL for releases to land via deposition of a maximum deposition rate (averaged over a period of 50 years) of 0.11 mg $m^{-2}\ day^{-1}$ for nickel.

Thallium

2.56 There are no air quality standards for thallium. The Environment Agency has published a long term EAL for thallium compounds of 1 $\mu g\ m^{-3}$ as thallium as an annual mean and a short-term EAL of 30 $\mu g\ m^{-3}$ as thallium as an hourly mean.

Vanadium

2.57 There are no statutory air quality standards for vanadium. WHO Air Quality Guidelines concluded that below 1 $\mu g\ m^{-3}$ (with an averaging time of 24 hours) environmental exposure to vanadium is not likely to have adverse effects on health.

2.58 The Environment Agency has published a short-term EAL of 1 $\mu g\ m^{-3}$ as vanadium.

Summary table

2.59 Table 1 summarises the air quality standards and guidelines applied in this study for impact assessment. The selected standards and guidelines are in general the most stringent available for each pollutant.

Table 1: **Air quality standards and guidelines applied in this study**

Pollutant	Limit value	Averaging time	Frequency of exceedence	To be achieved by
Nitrogen dioxide	200 $\mu g\ m^{-3}$	One hour average	18 times per year	31 December 2004
	40 $\mu g\ m^{-3}$	Annual average		31 December 2005 (provisional)
	150 ppb	One hour average	Maximum	31 December 2005
Sulphur dioxide	100 ppb	15 minute average	99.9 th percentile	31 December 2005
	350 $\mu g\ m^{-3}$	1 hour average	24 times per year	31 December 2004
	125 $\mu g\ m^{-3}$	24 hour average	3 times per year	31 December 2004
Particulate matter	40 $\mu g\ m^{-3}$	Annual average		31 December 2004
	50 $\mu g\ m^{-3}$	24 hour average	35 times per year	31 December 2004
	50 $\mu g\ m^{-3}$	Maximum running 24 hour means	99 th percentile	31 December 2004 (indicative value)
	20 $\mu g\ m^{-3}$	Annual average		31 December 2009 (indicative value)
	50 $\mu g\ m^{-3}$	24 hour average	7 times per year	31 December 2009 (indicative value)
Lead	0.5 $\mu g\ m^{-3}$	Annual average		31 December 2004
	0.25 $\mu g\ m^{-3}$	Annual average		31 December 2008
Carbon monoxide	10 ppm	Running 8 hour mean	Maximum	31 December 2003
Standards from DETR Review of UK National Air Quality Strategy, January 1999				

Table 1(continued): **Air quality standards and guidelines applied in this study**

Pollutant	Limit value	Averaging time	Source
Hydrogen chloride	7 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	700 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
Hydrogen fluoride	250 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
Benzo (a) pyrene	0.25 $ng\ m^{-3}$	Annual average	Expert Panel on Air Quality Standards
PAHs	3.9 $mg\ m^{-2}\ day^{-1}$	Average deposition rate	EA Technical Guidance Note E1
Arsenic	3. 10^{-3} $(\mu g\ m^{-3})^{-1}$	Lifetime risk	WHO Guidelines for Europe
	0.2 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	6 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
	0.02 $mg\ m^{-2}\ day^{-1}$	Average deposition rate	EA Technical Guidance Note E1
Antimony	5 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	150 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
Cadmium	0.005 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	1.5 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
	0.009 $mg\ m^{-2}\ day^{-1}$	Average deposition rate	EA Technical Guidance Note E1
Chromium (VI)	4. 10^{-2} $(\mu g\ m^{-3})^{-1}$	Lifetime risk	WHO Guidelines for Europe
Chromium (VI)	0.1 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
Chromium (VI)	3 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
Chromium (II, III)	5 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
Chromium (II, III)	150 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
Chromium	1.5 $mg\ m^{-2}\ day^{-1}$	Average deposition rate	EA Technical Guidance Note E1
Cobalt	0.2 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	6 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
	0.49 $mg\ m^{-2}\ day^{-1}$	Average deposition rate	EA Technical Guidance Note E1
Copper	10 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	200 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
	0.25 $mg\ m^{-2}\ day^{-1}$	Average deposition rate	EA Technical Guidance Note E1
Manganese	1 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	1500 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
Mercury	1 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	15 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
	0.004 $mg\ m^{-2}\ day^{-1}$	Average deposition rate	EA Technical Guidance Note E1
Nickel	4. 10^{-4} $(\mu g\ m^{-3})^{-1}$	Lifetime risk	WHO Guidelines for Europe
	0.2 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	6 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
	0.11 $mg\ m^{-2}\ day^{-1}$	Average deposition rate	EA Technical Guidance Note E1
Thallium	1 $\mu g\ m^{-3}$	Annual average	EA Technical Guidance Note E1
	30 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1
Vanadium	1 $\mu g\ m^{-3}$	Hourly average	EA Technical Guidance Note E1

AIR QUALITY MONITORING DATA

2.60 The concentrations of air pollutants are routinely monitored at a number of locations in the vicinity of the proposed facility. In addition, there have been a number of short-term monitoring studies carried out with reference to specific developments in the area, most notably Heathrow Terminal 5. The monitoring data are summarised below. Fig. 1 shows the location of monitoring points.

Continuous monitoring sites

2.61 Pollutant concentrations are monitored continuously at DETR Automatic Monitoring Network sites in the vicinity of the proposed site at:

- London Hillingdon - Junction of Keats Way and Sipson Road, West Drayton, Middlesex. OS Grid Reference: TQ069786. The monitoring station is within a self-contained, air-conditioned housing located on an open grass area approximately 2.5 metres from the kerb of a residential road. The site is bordered on three sides by residential roads and on the fourth by the busy M4 motorway, approximately 30 metres distance. The manifold inlet is approximately 3 metres high. The general area is open and protected from the M4 by trees.
- Hounslow Roadside . OS Grid Reference: TQ175781. A kerbside location 8 metres from the A4 and elevated section of the M4. Average flow 155, 000 vehicles per day (A4 and M4).
- London Teddington-National Physical Laboratory, Queens Road, Teddington. OS Grid Reference: TQ156706 The monitoring station is within an existing building located on the roof of a building within the grounds of the National Physical Laboratory. The nearest road is approximately 500 metres from the monitoring station. The manifold inlet is approximately 15 metres high (1.5 metres above the roof OD the building).

2.62 Tables 2-4 summarise the pollutant concentrations measured at the DETR continuous network sites.

Table 2: **Pollutant concentrations measured at London Hillingdon**

Pollutant	Statistic	Concentration	
		1998	1997
Nitrogen dioxide	Annual average	27 ppb	31 ppb
	Maximum hour	103 ppb	172 ppb
	Hourly, 18 exceedences	75 ppb	106 ppb
Oxides of nitrogen	Annual average	96 ppb	110 ppb
	Maximum hour	778 ppb	975 ppb
	Hourly, 18 exceedences	589 ppb	781 ppb
Carbon monoxide	Maximum hour	8.9 ppm	13.9 ppm
	Maximum 8 hour		7 ppm
Sulphur dioxide	Maximum 15 minute average	66 ppb	97 ppb
	Hourly, 24 exceedences	24 ppb	33 ppb
	24 hour, 3 exceedences	12 ppb	17 ppb
	Annual mean	5 ppb	5 ppb
	Winter mean	5 ppb	5 ppb
Particulate matter , PM_{10}	Mean	20 $\mu g\ m^{-3}$	25 $\mu g\ m^{-3}$
	24 hour, 35 exceedences	32 $\mu g\ m^{-3}$	42 $\mu g\ m^{-3}$
	24 hour, 20 exceedences	36 $\mu g\ m^{-3}$	47 $\mu g\ m^{-3}$
	24 hour, 7 exceedences	50 $\mu g\ m^{-3}$	64 $\mu g\ m^{-3}$
	24 hour, 4 exceedences	51 $\mu g\ m^{-3}$	73 $\mu g\ m^{-3}$
	24 hour, 1 exceedence	59 $\mu g\ m^{-3}$	88 $\mu g\ m^{-3}$

Table 3: **Pollutant concentrations measured at Hounslow Roadside**

Pollutant	Statistic	Concentration
		1998
Nitrogen dioxide	Annual average	39 ppb
	Maximum hour	109 ppb
	Hourly, 18 exceedences	99 ppb
Oxides of nitrogen	Annual average	139 ppb
	Maximum hour	1179 ppb
	Hourly, 18 exceedences	851 ppb
Carbon monoxide	Maximum hour	9.3 ppm

Table 4: **Pollutant concentrations measured at London Teddington**

Pollutant	Statistic	Concentration	
		1998	1997
Nitrogen dioxide	Annual average	17 ppb	18 ppb
	Maximum hour	70 ppb	144 ppb
	Hourly, 18 exceedences	61 ppb	96 ppb
Oxides of nitrogen	Annual average	25 ppb	37 ppb
	Maximum hour	401 ppb	668 ppb
	Hourly, 18 exceedences	261ppb	539 ppb
Sulphur dioxide	Maximum 15 minute average	92 ppb	76 ppb
	Hourly, 24 exceedences	28 ppb	37 ppb
	24 hour, 3 exceedences	14 ppb	22 ppb
	Annual mean	3 ppb	4 ppb
	Winter mean	4 ppb	5 ppb

2.63 The monitoring results for these three DETR Network monitoring sites show that pollutant concentrations are in most cases already below the amended NAQS objective limits. Sulphur dioxide measurements for 1997 and 1998 at London Hillingdon and at London Teddington indicate that the NAQS objectives and EC Daughter Directive limits are currently met. Carbon monoxide measurements at London Hillingdon for 1997 and 1998 and Hounslow Roadside for 1998 also meet the NAQS objective. For these pollutants, future reductions in concentrations are expected as emissions from industrial sources and motor vehicles decrease as a result of closer regulation of emissions.

2.64 Nitrogen dioxide concentrations at LondonTeddington during 1997 and 1998 also met the NAQS objectives. Future reductions in concentrations are expected as a result in the reduction of emission of oxides of nitrogen from motor vehicles.

2.65 However, the hourly mean objective for nitrogen dioxide was exceeded slightly at London Hillingdon during 1997 (but not for 1998). The hourly mean objective was not exceeded during 1998 at the Hounslow Roadside site. The indicative provisional annual average objective of 21 ppb was exceeded at London Hillingdon and at Hounslow Roadside during 1998.

2.66 Particulate matter, PM_{10}, concentrations at London Hillingdon met the new annual objective for 31 December 2004 during 1997 and 1998. However, the measured concentrations exceeded the new indicative annual level for 31 December 2009. Few locations in England can currently meet the indicative level because of long distance transport of the pollutant. Concentrations at the site also met the new 24 hour objective during 1998 although the objective value may have been exceeded in 1997. The indicative objectives of 50 $\mu g\ m^{-3}$ as 99th percentile of daily maximum running 24 hour means and 50 $\mu g\ m^{-3}$ with a maximum of 1-4 exceedences measured by TEOM were not achieved at the London Hillingdon site during 1997 or 1998. Reductions in PM_{10} concentrations are expected in future years as the result of reductions in the emissions from motor vehicles and other combustion sources.

2.67 Pollutant concentrations have also been monitored on behalf of the Highways Agency at the following locations:

- Cranford Park School during 1993/4. OS Grid Reference TQ099784. In residential area approximately 100 m north of the M4.
- M25 Motorway Staines. OS Grid Reference TQ027737. This site is near the clockwise carriageway of the M25 between junctions 13 and 14. The motorway has 4 lanes in each direction; traffic flows average approximately 180,000 vehicles per day with peak hourly flows of 12,000 vehicles. This section is one of the busiest on the M25 and is often congested during peak periods.

2.68 Measured annual average concentrations of oxides of nitrogen and carbon monoxide at Cranford Park school shown in Table 5 were reported by Underwood et al, 1996 (BAA/811).

2.69 Pollutant concentrations measured at the Staines M25 site shown in Table 6 were summarised by APEG, 1999 (Source apportionment of airborne particulate matter in the United Kingdom. Report of the Airborne Particles Export Group, January 1999).

Table 5: Pollutant concentrations at Cranford Park School during 1993/4

Pollutant	Annual average concentration
Nitrogen dioxide	25 ppb
Oxides of nitrogen	64 ppb
Carbon monoxide	0.7 ppm

Table 6: Pollutant concentrations at the Staines M25 site

Pollutant	Statistic	Concentration	
		1997	1996
Nitrogen dioxide	Annual average	26 ppb	30 ppb
	Maximum hourly	112 ppb	129 ppb
	98 %ile hourly	60 ppb	75 ppb
Oxides of nitrogen	Annual average	170 ppb	202 ppb
	Maximum hourly	937 ppb	1156 ppb
	98 %ile hourly	538 ppb	580 ppb
Carbon monoxide	Maximum 1 hour	8.2 ppm	22.2 ppm
	Maximum 8 hour	5.8 ppm	17 ppm
	Annual average	0.9 ppm	1.65 ppm
Particulate matter, PM_{10}	Annual average	26.6 $\mu g\ m^{-3}$	31.2 $\mu g\ m^{-3}$
	Maximum 1 hour	164 $\mu g\ m^{-3}$	184 $\mu g\ m^{-3}$
	Maximum 24 hour	82 $\mu g\ m^{-3}$	125 $\mu g\ m^{-3}$
	99% ile 24 hour	70 $\mu g\ m^{-3}$	99 $\mu g\ m^{-3}$

2.70 Tables 5 and 6 shows that the concentration of nitrogen dioxide exceeded the NAQS provisional annual average objective of 21 ppb at both the Cranford Park School site during 1993/4 and at the Staines M25 site during 1996 and 1997. It is expected that these concentrations will decrease substantially in future years as a result of reductions in emissions from motor vehicles.

2.71 Carbon monoxide concentrations at the Staines M25 site exceeded the objective value of 10 ppm as an 8-hour average during 1996 but not during 1997. Significant reductions in carbon monoxide concentrations are expected in future years as a result of the reduction in emissions from motor vehicles.

2.72 The annual average PM_{10} concentration at the Staines M25 site achieved the objective of 31 $\mu g\ m^{-3}$ (for TEOM) during 1997 but just failed to meet the objective in 1996. The provisional objective of 50 $\mu g\ m^{-3}$ as 99th percentile of daily maximum running 24 hour means was not achieved in either year. Significant reductions in PM_{10} concentrations are expected in future years.

2.73 Pollutant concentrations have also been monitored by AEA Technology on behalf of BAA most recently at the following locations:

- Old Apron, LHR2. OS Grid Reference TQ084767. The site is located on the northern side at the eastern end of the northern runway at Heathrow Airport.
- Lapwing Sports ground. OS Grid Reference TQ098769. The site was located to the east of the airport. Monitoring was carried out at the site between May 1993 and April 1994.

2.74 Measured concentrations are summarised in Tables 7 and 8.

Table 7: **Pollutant concentrations at the Old Apron site on Heathrow Airport**

Pollutant	Statistic	Concentrations			
		1996	1995	1994	1993
Nitrogen dioxide	Annual average	33 ppb	32 ppb	32 ppb	30 ppb
	Maximum hour	224 ppb	187 ppb	151 ppb	113 ppb
Oxides of nitrogen	Annual average	89 ppb	86 ppb	99 ppb	93 ppb
	Maximum hour	1282 ppb	860 ppb	1447 ppb	941ppb
Carbon monoxide	Annual average	0.7 ppm	0.7 ppm	0.7 ppm	0.7 ppm
	Maximum hour	11.6 ppm	7.0 ppm	12.8 ppm	6.0 ppm
	Maximum 8 hour	9.5 ppm	4.0 ppm	9.2 ppm	3.5 ppm
Particulate matter, PM_{10}	Annual average	27 $\mu g\ m^{-3}$	27 $\mu g\ m^{-3}$		
	Maximum hourly average	152 $\mu g\ m^{-3}$	493 $\mu g\ m^{-3}$		
	Maximum daily average	99 $\mu g\ m^{-3}$	76 $\mu g\ m^{-3}$		
	Maximum running 24 hour average	102 $\mu g\ m^{-3}$	85 $\mu g\ m^{-3}$		

Table 8 : **Annual average pollutant concentrations at the Lapwing Sports Ground 1993/94**

Pollutant	Annual average concentration
Nitrogen dioxide	23 ppb
Oxides of nitrogen	59 ppb
Carbon monoxide	0.6 ppm

2.75 The monitoring results for the Old Apron site indicate that the annual average concentration of nitrogen dioxide on the airport exceeded the NAQS provisional objective. Maximum hourly concentrations also exceeded the 150 ppb objective during 1994, 1995 and 1996.

2.76 Carbon monoxide concentrations at the Old Apron site were less than the objective of 10 ppm as an 8-hour average.

2.77 The annual average concentration of PM_{10} at the Old Apron site was less than the 31 $\mu g\ m^{-3}$ value applied for TEOM measurements. However, it is likely that the provisional objective of 50 $\mu g\ m^{-3}$ as a 99th percentile running 24 hour mean was exceeded at the site.

2.78 Monitoring results from the Lapwing site indicate that the provisional objective for nitrogen dioxide of 21 ppb as an annual average was slightly exceeded during 1993/94.

Diffusion tubes

2.79 Annual average concentrations of nitrogen dioxide have been measured at a number of locations by Slough Borough Council. The measurements were taken at kerbside sites (1-5 m from a busy road), intermediate sites (20-30 m from the same or equivalent road) and background sites (>50 m from any busy road). The results are shown in Table 9. Table 9 shows that the provisional objective of 21 ppb was met, for example, in 1997 at all background sites in the Borough and at all intermediate sites except Cooper Way. Concentrations at the kerbside sites on Farnham Road and Windsor Road exceeded the objective. Of particular interest is the measurement at Daventry Close, which was 4.7 ppb (22% of the objective limit) less than the objective limit. Daventry Close is in a residential area of Poyle, approximately 600 m from the proposed energy from waste facility, 500 m from the M25 motorway and 1200 m from the western perimeter of Heathrow Airport.

2.80 Measurements of nitrogen dioxide concentrations are also taken in Hillingdon, Slough and Staines as part of the National NO2 Diffusion Tube Survey. Annual average nitrogen dioxide concentrations are shown for 1996 and 1997 in Table 10 . These results show that the NAQS objective was exceeded at some kerbside locations in Slough and Staines, but was not exceeded at other national survey diffusion tube sites in Hillingdon, Slough or Staines.

Table 9: **Annual average nitrogen dioxide concentrations measured by diffusion tube in Slough Borough**

Site	Classification*	Grid Reference	Annual mean, ppb		
			1995	1996	1997
Burlington Road	I	497300 179950	16.7	20.4	17.3
Hencroft Street	B	497925 179450	18.3	19.0	15.1
Tamar Way	B	501510 178630	18.8	20.1	16.2
Queens Road	B	497625 180575	18.0	16.4	16.7
Essex Avenue	I	496200 181900	17.7	17.2	16.9
Kent Avenue	B	496450 181875	16.0	18.3	15.3
Farnham Road	K	496175 181310	27.4	26.3	23.8
Mallard Drive	I	494825 180775	17.3	17.0	15.5
Windsor Road	K	497500 179850	22.2	27.3	23.0
Mitchell Close	B	495450 179480	19.6	20.0	18.3
Ragstone Road	I	496900 179150		19.1	19.9
Cooper Way	I	495600 179550		19.7	23.9
Oldway Lane	B	493620 180220			16.5
Dolphin Road	B	498820 179700			15.5
Tweed Road	I	501550 177840			18.4
Daventry Close	B	503520 176730			16.3
Denny Road	B	500090 178730			15.9
* Kerbside, Intermediate or Background					

Table 10: **Annual average nitrogen dioxide concentrations measured by diffusion tubes, national survey**

Site	Classification	OS Grid Reference	Concentration, ppb	
			1997	1996
Hillingdon 3N	B	5094 1813	12.1	
Hillingdon 5N	I	5107 1808	12.9	
Hillingdon 1N	K	5105 1808	16.6	
Staines 1N	K	5035 1716	25.7	26
Staines 2N	I	5034 1713	16.5	20
Staines 3N	B	5035 1719	20.8	20
Slough 2N	I	4973 1800	17.3	20
Slough 5N	B	4965 1819	15.5	16
Slough 6N	B	4975 1795	15.1	19
Slough 1N	K	4975 1799	23	27

Table 11: **Annual average metal concentrations**

		Concentration, ng m^{-3}			
		1991/2	1992/3	1993/4	1994/5
Central London	Cadmium	1	0.4	1.1	0.8
	Chromium	6	5.4	5.5	2.8
	Copper	24	13	14	15
	Iron	913	891	745	812
	Manganese	15	21	34	11
	Nickel	5	5.2	5.4	3
	Zinc	65	59	65	85
	Vanadium	15	12	15	7
	Cobalt		0.3	0.3	0.8
Brent	Cadmium	1	0.6	0.7	0.8
	Chromium	5	3	2	1.1
	Copper	19	21	12	16
	Iron	574	465	473	503
	Manganese	15	7	8	8
	Nickel	12	11	7	7
	Zinc	61	43	61	45

Multi-element sites

2.81 The concentrations of a number of elements are measured at multi-element sites at Bridge Place, Central london and at Neasden Library in Brent.

2.82 The annual average concentrations of trace elements are shown in Table 11 for the years 1990/1 to 1994/5. Comparison with the limits shown in Table 1 indicates that current background levels are currently trivial in comparison with the guidance limits except in the case of cadmium. For cadmium the background levels are approximately 20% of the guidance limit.

MODELLING AND FORECASTING STUDIES

Heathrow Terminal 5

2.83 Extensive modelling of pollutant concentrations in the vicinity of the proposed Energy from waste facility has been done in connection with the proposed development of Heathrow Airport Terminal 5 by BAA. Underwood et al (ref BAA 802, BAA 811, BAA 820 in Section F) have modelled the contributions to pollutant concentrations in the vicinity of the airport from:

- Aircraft;
- Aircraft engine testing;
- Airside road vehicles;
- Airport boiler houses;
- Road vehicles on perimeter roads;
- Road vehicles in the near Heathrow Region;
- Emissions from the remainder of the United Kingdom.

2.84 The models were developed over a number of years and predictions revised over the course of successive reports. However, the changes in predicted concentrations are generally relatively small: for the purpose of this study, differences between the results between studies have been ignored.

2.85 Fig.2 shows modelled annual average oxides of nitrogen concentrations in the vicinity of the airport (BAA 812) during 1993. Fig.2 shows the highest concentrations over the airport itself and along the M4 and M25 motorways. The highest concentrations on the airport are shown at the eastern end of the northern runway close to the Old Apron monitoring site.

2.86 The model results for 1993 have been compared with pollutant concentrations measured at the Lapwing, Old Apron and Cranford Park School monitoring sites. The model significantly overestimated concentrations of pollutants at the three monitoring sites as shown in Table 12.

Table 12: **Comparison of modelled and measured annual average concentrations**

	Oxides of nitrogen, $\mu g\ m^{-3}$		Carbon monoxide, $\mu g\ m^{-3}$		Nitrogen dioxide, $\mu g\ m^{-3}$	
	Modelled	Measured	Modelled	Measured	Modelled	Measured
Lapwing	307	113	1134	696	81	44
Old Apron	524	172	1354	812	92	55
Cranford Park School	329	122	1074	812	82	48

Table 13: **Modelled pollutant concentrations**

Pollutant	Site	Concentration, $\mu g\ m^{-3}$		
		1993	2016 Four Terminals	2016 Five Terminals
Oxides of nitrogen	Lapwing Sports Ground	348	259	302
	Northumberland House	290	209	243
	Coach Park	424	268	329
	Perry Oaks	356	269	350
	Unwin Avenue	368	298	373
	Viscount Way	388	338	426
	Northside Staff Car Park	295	203	262
Carbon monoxide	Lapwing Sports Ground	1135	736	750
	Northumberland House	1062	587	629
	Coach Park	1319	647	705
	Perry Oaks	1028	618	740
	Unwin Avenue	1220	587	849
	Viscount Way	1341	661	1005
	Northside Staff Car Park	986	549	673
Sulphur dioxide	Lapwing Sports Ground	33.6	31.3	33.6
	Northumberland House	29.7	28.1	30.1
	Coach Park	34.1	29.7	32.5
	Perry Oaks	30.4	29.3	34.7
	Unwin Avenue	35.2	34.1	38.6
	Viscount Way	40.3	40.1	46.0
	Northside Staff Car Park	26.4	24.5	28.7

2.87 Nevertheless, the model results are able to show the general pattern of concentrations. Thus concentrations are highest on the airport itself and alongside the M4 and M25 motorways. The modelling results show that the contribution of airport sources to modelled concentrations decreases with distance from the airport. Thus Fig.3 shows (BAA802) that airport sources will contribute less than 20% to oxides of nitrogen concentrations in areas to the west of the M25 in 2016 if Terminal 5 is built. Model results also show that the proportional contribution from airport sources in earlier years will be smaller still.

2.88 The Heathrow Airport models have been used to predict concentrations of pollutants at a number of locations around the perimeter of the airport. Predictions were made of the concentrations at these sites for 1993 and for 2016 with and without Terminal 5. Model predictions of annual average concentrations are shown in Table 13.

2.89 The results shown in Table 13 show that:

- the concentrations at all perimeter locations are similar in magnitude;
- the concentrations at perimeter locations are expected to decrease in future years if Terminal 5 is not built;
- the concentrations at perimeter locations are expected to remain about the same in future years if Terminal 5 is built.

2.90 Comparison of the results in Table 12 with those in Table 13 indicates that the concentrations of pollutants at the Old Apron site are greater than those at perimeter locations.

LIFE proposals

2.91 Proposals have been made to develop an inter-modal rail facility) on land adjacent to the Grundons site. The London International Freight Exchange ('LIFE' facility) would generate significant additional traffic particularly on the A4 Colnbrook Bypass. The LIFE Environmental Statement (RPS Clouston, 1999) includes an assessment of the impact of this additional traffic on air quality in the vicinity of the A4 Colnbrook Bypass. The Environmental Statement estimated the expected increase in nitrogen dioxide and PM_{10} concentrations as a result of the increased traffic flows from LIFE in the proposed operating year 2011. It was estimated that the LIFE scheme would produce an increase in annual average nitrogen dioxide concentrations at roadside locations near the A4 London Road at Brands Hill of 1.2 ppb compared to the no LIFE scheme case. Similarly it was estimated that the 99th percentile 24 hour mean PM_{10} concentration would increase by 0.5 $\mu g\ m^{-3}$ compared to the no LIFE scheme case.

DETR Forecasts

2.92 Estimated concentrations of nitrogen dioxide and PM_{10} at the London Hillingdon site and for nitrogen dioxide at the London Teddington site in future years have been published by DETR based on existing measurements and national forecasts of reductions in emissions : the estimates are shown in Table 14.

Table 14: **DETR estimates of concentrations at London Hillingdon and London Teddington in future years**

Pollutant	Estimate	Value
Nitrogen dioxide, Hillingdon	Annual average, 2005	22.7 ppb
	Annual average, 2009	19.7 ppb
PM_{10}, Hillingdon	Annual mean,TEOM, 2004	22 $\mu g\ m^{-3}$
	Annual mean, EU, 2004	29 $\mu g\ m^{-3}$
	Annual mean, TEOM, 2005	21 $\mu g\ m^{-3}$
	Annual mean,TEOM, 2009	19 $\mu g\ m^{-3}$
	Annual mean, EU, 2009	25 $\mu g\ m^{-3}$
	99th percentile, TEOM, 2005	70 $\mu g\ m^{-3}$
	99th percentile, TEOM, 2009	65 $\mu g\ m^{-3}$
	90th percentile, EU, 2004	45 $\mu g\ m^{-3}$
	90 th percentile, EU,2009	41 $\mu g\ m^{-3}$
	98th percentile, EU, 2004	65 $\mu g\ m^{-3}$
	98 th percentile, EU,2009	61 $\mu g\ m^{-3}$
	Days > 50 $\mu g\ m^{-3}$, EU, 2004	20
	Days > 50 $\mu g\ m^{-3}$, EU, 2009	14
Nitrogen dioxide, Teddington	Annual average, 2005	13.5 ppb
	Annual average, 2009	11.8 ppb

2.93 The forecasts indicate that nitrogen dioxide concentrations are expected to exceed the indicative annual level of 21 ppb at London Hillingdon slightly in 2005 but are expected to meet this objective by 2009. Nitrogen dioxide concentrations at London Teddington already meet the indicative objective and further reductions in concentration are expected in future years. PM10 concentrations at London Hillingdon are expected to meet the objectives for 2004, but not the objectives for 2009. The indicative level for PM_{10} for 2005 of 50 $\mu g\ m^{-3}$ (TEOM) as the 99 th percentile of 24 hour rolling means is unlikely to be met.

SECTION C STACK DISPERSION MODELLING

INTRODUCTION

3.1 The emissions discharged from the stack potentially have a significant impact on air quality in the vicinity of the energy from waste facility. The concentrations of pollutants are dispersed in the atmosphere by atmospheric turbulence so that ground level concentrations are generally several orders of magnitude lower than the emission concentrations. These processes may be modelled using a dispersion model.

3.2 This section provides estimates of the rate of emission of pollutants from the energy from waste facility and makes use of a dispersion model to predict ground level concentrations. The predicted ground level concentrations are compared with air quality standards and guidelines.

EMISSIONS OF POLLUTANTS

3.3 The emissions of pollutants into the atmosphere from waste incinerators are controlled by the Environment Agency under Integrated Pollution Control Regulations made under Section 2 of the Environmental Protection Act 1990. Incinerator operators proposing to release pollutants into the environment require authorisation from the Environment Agency. The authorisation for incinerators contains specific emission limits for pollutants. These emission limits are set on the basis of environmental standards relevant to the process and benchmark release levels taking account of the principles of Best Available Techniques Not Entailing Excessive Costs (BATNEEC) and Best Practicable Environmental Option (BPEO).

3.4 Municipal Waste Incinerators are subject to the requirements of EC Directives 89/369/EEC and 89/429/EEC on the prevention of air pollution from new and existing municipal waste incineration plants respectively. The Directives set emission limits shown in Table 15 for plants with capacity greater than 3 tonnes per hour.

3.5 The Hazardous Waste Incineration Directive , EC Directive 94/67/EC applies to most Clinical Waste Incinerators with emission limits shown in Tables 16-18. The EC has also produced a Draft Waste Incineration Directive with similar emission limits. Although the Draft Directive has no legal status and its future is uncertain, most new waste incineration plant is designed to achieve the emission limits. Environment Agency Guidance S2 5.01 states that most technologies used for new plant can meet the type of limit included with the Draft Directive relatively easily.

3.6 In practice, the pollutant abatement technologies applied will limit the emission concentrations to levels below the limit values. Table 19 (IPC Process Guidance Note S2 5.01) shows expected emission concentrations for municipal waste incinerators.

Table 15: **Municipal Waste Directive Limits**

Pollutant	Concentration limit, mg m^{-3}	Conditions
Total dust	30	7 day rolling average
	39	Daily average
HCl	50	7 day rolling average
	65	Daily average
CO#	100	Hourly average. 90% of measurements taken in any 24 hours must be less than 150 mg m^{-3}
HF	2	Periodic sample
SO_2	300	Periodic sample
Pb + Cr + Cu + Mn	5	Periodic sample. applies to metals and their compounds expressed as metal
Ni + As	1	Periodic sample. applies to metals and their compounds expressed as metal
Cd + Hg	0.2	Periodic sample. applies to metals and their compounds expressed as metal
VOCs#	20	Periodic sample. As total carbon
# CO and VOC limits apply to combustion gases prior to gas cleaning as a measure of combustion performance		

Table 16: **Maximum plant emission limits (daily average values) as specified in the Hazardous Waste Incineration Directive and the Draft Directive on the incineration of Waste (June 1998)**

Pollutant	Limit
Total dust[a]	10 mg m^{-3}
Gaseous and vaporous organic substances (total organic carbon)	10 mg m^{-3}
Hydrogen fluoride	1 mg m^{-3}
Hydrogen chloride	10 mg m^{-3}
Sulphur dioxide	50 mg m^{-3}
Nitric oxide and nitrogen dioxide, as nitrogen dioxide (Draft Directive only)	200 mg m^{-3}
Carbon monoxide	50 mg m^{-3}
Dioxins and furans (ITEQ)	0.1 ng m^{-3}
[a] 95% hourly averages for each 24 hour period Concentration reference conditions are 273 K, 101.3 kPa; dry; 11% v/v O_2	

Table 17: **Maximum plant emission limits (half-hourly average values) as specified in the Hazardous Waste Incineration Directive and the Draft Directive on the Incineration of Waste (June 1998)**

Pollutant	Limit
Total dust[a]	30 mg m^{-3}
Gaseous and vaporous organic substances (total organic carbon)	20 mg m^{-3}
Hydrogen fluoride	4 mg m^{-3}
Hydrogen chloride	60 mg m^{-3}
Sulphur dioxide	200 mg m^{-3}
Carbon monoxide	100 mg m^{-3}
Nitric oxide and nitrogen dioxide, as nitrogen dioxide (Draft Directive only)	400 mg m^{-3}

Concentration reference conditions are 273 K, 101.3 kPa; dry; 11% v/v O_2

Table 18: **Maximum plant emission limits (average values over the sample period of a minimum of 30 minutes and a maximum of 8 hours) as specified in the Hazardous Waste Incineration Directive and the Draft Directive on the Incineration of Waste (June 1998)**

Pollutant	Limit
Cadmium Thallium	total 0.05 mg m^{-3}
Mercury	0.05 mg m^{-3}
Antimony Arsenic Lead Chromium Cobalt Copper Managanese Nickel Vanadium	total 0.5 mg m^{-3}
Concentration reference conditions are 273 K, 101.3 kPa; dry; 11% v/v O_2	

Table 19: **Expected emission concentrations from incinerators (EA Process Guidance Note S2 5.01)**

Pollutant	Abatement method	Expected emission concentration
CO	MWI:Stepped hearth after lime scrubbing, activated carbon injection and fabric filters	15-30 mg/m3
VOC	MWI:Stepped hearth after lime scrubbing, activated carbon injection and fabric filters	<3 mg/m3
PAH	Activated carbon injection, bag filtration	<10 ug/m3
NOx	MWI: moving grate with : primary and secondary air control of the conditions on each section of the grate and optimisation of primary to secondary air distribution; secondary air optimised using computational fluid dynamics; flue gas recirculation	250-300 mg/m3
NOx	As above and with dry urea or ammonia injection and possible use of water cooled grates	80 mg/m3
Dioxins	Flue gas recirculation, urea or ammonia injection,lime scrubbing, activated carbon injection and fabric filters	< 0.1 ng/m3
Particulate	Bag filters	<10 mg/m3 <25 mg/m3 as a spot measurement
Sulphur dioxide	Lime injection, fabric filter	10-90, mean 50 mg/m3
Hydrogen chloride	Lime injection, fabric filter, good waste mixing	30 mg /m3; 60 mg/m3 peak hourly
Hydrogen fluoride		< 1 mg/m3
Ammonia	Dry scrubbing	10 mg/m3
Mercury	MWI:Stepped hearth after lime scrubbing, activated carbon injection and fabric filters	7-50 ug/m3
Cadmium and thallium	MWI:Stepped hearth after lime scrubbing, activated carbon and fabric filters	1-30 µg/m3
Other metals, mostly lead and zinc	MWI:Stepped hearth after lime scrubbing, activated carbon and fabric filters	0.2-0.5 mg/m3

3.7 For this assessment, it has been assumed that the IPC authorisation limits will be set at around the EC Draft Waste Incineration Directive limits for the Energy from waste plant and for the clinical waste incinerator.

3.8 The specified waste throughput for the Energy from waste plant will be 400,000 tonnes per annum through two incineration streams each with a capacity of 27 tonnes per hour. Each of the incineration streams will discharge through a separate flue up the same stack. It is anticipated that the stack discharge will have the characteristics shown in Table 20. Calculated rates of emission per incineration stream based on the Draft Waste Incineration Directive are shown in Table 21. Rates of emission for PAHs have been estimated on the basis of typical emission concentrations shown in Table 19. The emission limits will not be exceeded in normal operation so that the rate of emission will be less in practice than the values shown in Table 21. The assumption that the plant always operates at the emission limt results in a conservative assessment of the air quality impact.

3.9 The waste throughput for the clinical waste incinerator will be 2 tonnes per hour through 2 incineration streams each with a capacity of 1 tonne per hour. Each of the incineration streams will discharge through a separate flue up the MWI stack. It is anticipated that the stack discharge will have the characteristics shown in Table 22. Calculated rates of emission per incineration stream based on the Draft Waste Incineration Directive are shown in Table 23.

Table 20: **Stack discharge characteristics -energy from waste facility.**

Discharge rate per stream	40 m^3s^{-1} at reference conditions 273 K, 101.3 kPa, 11% v/v oxygen, dry
Temperature of discharge	145 °C
Moisture content	18 % v/v
Oxygen content	11 % v/v
Discharge velocity	> 15 $m\ s^{-1}$

Table 21: **Maximum rates of emission from the Energy from waste plant, per stream**

	Emission rate, g/s		
	Daily mean	Half hour average	30 minute-8 hour average
PM	0.4	1.2	
VOC.	0.4	0.8	
HF	0.04	0.16	
HCl	0.4	2.4	
SO_2	2.0	8.0	
NO_x	8.0	16.0	
CO	2.0	4.0	
PAHs	0.0004		
Dioxins and furans	$4.0.\ 10^{-9}$		
Cadmium Thallium			TOTAL $2.0.10^{-3}$
Mercury			$2.0.10^{-3}$
Antimony Arsenic Lead Chromium Cobalt Copper Manganese Nickel Vanadium			TOTAL $2.0.10^{-2}$

Table 22: **Stack discharge characteristics for clinical waste incinerator.**

Discharge rate	2.8 m^3s^{-1} at reference conditions 273 K, 101.3 kPa, 11% v/v oxygen, dry
Temperature of discharge	145 °C
Moisture content	18 % v/v
Oxygen content	13 % v/v
Discharge velocity	> 15 $m\ s^{-1}$

Table 23: **Maximum rates of emission from the clinical waste incinerator**

	Emission rate, g/s		
	Daily mean	Half hour average	30 minute-8 hour average
PM	0.028	0.084	
VOC	0.028	0.056	
HF	0.003	0.011	
HCl	0.028	0.17	
SO_2	0.139	0.56	
NO_x	0.556	1.12	
CO	0.139	0.28	
Dioxins and furans	$2.78.\ 10^{-10}$		
Cadmium Thallium			TOTAL $1.39.10^{-4}$
Mercury			$1.39.10^{-4}$
Antimony Arsenic Lead Chromium Cobalt Copper Manganese Nickel Vanadium			TOTAL $1.39.10^{-3}$

THE DISPERSION MODEL

3.10 Ground level concentrations of pollutants and rates of deposition have been modelled using the dispersion model ADMS-2. ADMS-2 is an up-to-date dispersion model in which the boundary layer structure is characterised by the height of the boundary layer and the Monin-Obukhov length, a length scale dependent on the friction velocity and heat flux at the surface. The model represents the concentration distributions as Gaussian in stable and neutral conditions, but the vertical distribution is non-Gaussian in convective conditions to take account of the skewed structure of the vertical component of turbulence. The model contains a meteorological preprocessor which calculates the required boundary layer parameters from surface heat flux, wind speed and boundary layer height data. Complex modules within the model allow for the effects of plume rise and the presence of buildings. Alternative models such as the US EPA models ISCST3 and AERMOD were considered, but ADMS-2 was preferred on the grounds of it providing a better representation of the physical processes of dispersion, an established track record of use in similar studies and greater flexibility of operation.

3.11 The dispersion of pollutants is affected by meteorological conditions such as the wind speed, wind direction, boundary layer height and surface heat flux. For this study, statistically analysed meteorological data for 1988-1997 for Heathrow Airport, immediately to the east of the proposed site, was used to represent meteorological conditions. The surface roughness of the surrounding area also affects dispersion and was assumed to be 0.2 m, characteristic of rough agricultural land.

3.12 The energy from waste facility will be housed in a large building, approximately 45 m high, 180 m long and 90 m wide, aligned at 15° with respect to north. A large building of this size may effect the dispersion of pollutants from the stack because the turbulence caused by the building can result in the grounding of the plume. The building was therefore taken account of in the dispersion modelling.

3.13 Particulate matter and pollutants adsorbed onto the surface of particulate matter may be deposited in the area of the facility by dry deposition or by washout in rain. For the purposes of this assessment we have estimated a dry deposition velocity of 0.05 cm s^{-1} [Jones, 1983] and taken a washout coefficient calculated from 0.0001 $P^{0.64}$, s^{-1} where P is the precipitation rate in mm h^{-1}.

3.14 The model was used to model a number of scenarios as shown in Table 24. The range of scenarios investigated allows the effect of stack height and operation at full and reduced load to be considered. It shows both the separate and combined effects of operation of the clinical waste incinerator and the energy from waste facility. Contour plots ('isopleths') showing the predicted distribution of ground level concentrations (for all pollutants) around the facility for an emission rate of 1 g per second were generated. The mass emission rates presented in table 23 were used to estimate the increments to ground level concentrations for each of the pollutants.

RESULTS

3.15 Annual average concentrations for a 1 g/s emission rate are shown in Figs. 4 and 5. Figs. 4 and 5 show isopleths of concentration superimposed on a map of the area. For example in Fig. 4, the annual average ground level is predicted to exceed 0.18 μg m^{-3} for a 1 g/s emission rate within the area bounded by the 0.18 contour. Similarly the annual average ground level is predicted to exceed 0.03 μg m^{-3} for a 1 g/s emission rate within the area bounded by the 0.03 contours. The annual average ground level is predicted to be less than 0.03 μg m^{-3} for a 1 g/s emission rate outside the area bounded by the 0.03 contours. For other rates of emission, the ground level concentration may be calculated by multiplying the predicted ground level concentration in μg m^{-3} shown on the Figure by the rate of emission of the pollutant in g/s.

3.16 Annual average concentrations of pollutants approach the highest levels in the area to the NNE of the facility between the disused railway and the M25. However, the contribution to concentrations decreases rapidly with distance from the stack so that the contribution from the discharge at the M4/M25 interchange is approximately half of the highest value. The stack contribution to pollutant concentrations is rather less to the south and west of the stack because prevailing winds are from the south west. For example, the annual average contributions to pollutant concentrations at Colnbrook, Poyle and Longford and at the Greyhound Public House on the A4 (GR034773) are less than 20% of the maximum contribution. Annual average concentrations of relevant pollutants based on the maximum daily mean rates of emission given in Tables 21 and 23 are shown in Table 25.

3.17 Maximum modelled hourly ground level concentrations are shown in Figs.6 and 7. Figs.6 and 7 show isopleths of concentration superimposed on a map of the area. The largest modelled hourly concentrations are approximately 200 m NE and NW of the

stack. The highest modelled hourly concentrations on the M25 and at the Public House on the A4(GR034773) are approximately half this maximum modelled value. The maximum hourly concentration decreases rapidly with distance from the stack. The highest modelled hourly concentrations at Colnbrook, Poyle, Longford and Harmondsworth and at the M4/M25 interchange are approximately one third of the maximum at the location of greatest impact close to the stack. Maximum hourly average concentrations at the location of greatest impact of relevant pollutants based on the maximum half hourly average rates of emission given in Tables 21 and 23 are shown in Table 26. Maximum oxides of nitrogen concentrations based on the daily average rate of emission are also shown in Table 26. Examination of Table 26 shows that the 65 m high stack has a greater impact than the 75 m stack. It also shows that the greatest impact occurs when the plant is operating at capacity with two incinerator streams in operation.

3.18 The maximum contribution to 99.8 th percentile hourly average oxides of nitrogen concentrations is shown in Table 27 . Table 27 shows concentration predictions based both on the maximum daily emission concentration (200 mg/m3) and the maximum half-hourly emission concentration (400 mg/m3).

Table 24: **Model scenarios**

Scenario	Stack height, m	Effective stack diameter, m	Discharge velocity, ms^{-1}	Notes
A	75	2.52	15	MWI, 1 stream
B	75	3.56	15	MWI, 2 streams
C	65	3.56	15	MWI, 2 streams
D	65	2.52	15	MWI, 1 stream
E	75	2.52	10	MWI, 1 stream, reduced load operation
F	75	0.74	15	CWI
G	70	3.56	15	MWI, 2 streams
H	75	3.62	15	MWI, 2 streams + CWI

Table 25: **Annual average concentrations of pollutants at the location of greatest impact**

Pollutant	Concentration, $\mu g\ m^{-3}$								
	A	B	C	D	E	F	G	H	Guideline
PM	0.10	0.13	0.22	0.17	0.10	0.019	0.17	0.13	40 (PM_{10})
VOC	0.10	0.13	0.22	0.17	0.10	0.019	0.17	0.13	
HF	0.01	0.01	0.02	0.02	0.01	0.002	0.02	0.01	
HCl	0.10	0.13	0.22	0.17	0.10	0.0197	0.17	0.13	
SO_2	0.49	0.63	1.10	0.87	0.49	0.097	0.83	0.63	
NO_x	1.95	2.51	4.40	3.46	1.97	0.39	3.31	2.52	40 (NO_2)
PAHs	0.0001	0.00013	0.00022	0.00017	0.0001	0.000019	0.00017	0.00013	
Dioxins and furans	$0.98.10^{-9}$	$1.26.10^{-9}$	$2.20.10^{-9}$	$1.73.10^{-9}$	$0.99.10^{-9}$	$1.94.10^{-10}$	$1.7.10^{-9}$	$1.26.10^{-9}$	
Cadmium	$4.88.10^{-4}$	$6.28.10^{-4}$	$1.10.10^{-3}$	$8.66.10^{-4}$	$4.93.10^{-4}$	$9.7.10^{-5}$	$8.28.10^{-4}$	$6.29.10^{-4}$	0.005
Thallium	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL		1
Mercury	$4.88.10^{-4}$	$6.28.10^{-4}$	$1.10.10^{-3}$	$8.66.10^{-4}$	$4.93.10^{-4}$	$9.7.10^{-5}$	$8.28.10^{-4}$	$6.29.10^{-4}$	1
Antimony	$4.88.10^{-3}$	$6.28.10^{-3}$	$1.10.10^{-2}$	$8.66.10^{-3}$	$4.93.10^{-3}$	$9.7.10^{-4}$	$8.28.10^{-3}$	$6.29.10^{-3}$	5
Arsenic	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	0.2
Lead									0.25
Chromium									0.1 (VI)
									5 (II or III)
Cobalt									0.2
Copper									10
Manganese									1
Nickel									0.2
Vanadium									-

Table 26: **Predicted maximum hourly contributions to concentrations**

	Concentration ug/m3								
Pollutant	A	B	C	D	E	F	G	H	Guideline
PM	6.53	11.23	15.82	9.28	5.49	0.85	13.34	11.58	
VOC	4.35	7.49	10.54	6.18	3.66	0.57	8.90	7.92	
HF	0.87	1.50	2.11	1.24	0.73	0.11	1.78	1.54	250
HCl	13.06	22.46	31.63	18.55	10.98	1.7	26.69	23.15	700
SO_2	43.52	74.88	105.44	61.84	36.68	1.9	88.96	77.17	350
NO_x (400 mg m^{-3})	87.04	149.76	210.88	123.68	73.21	11.33	177.92	154.34	287(NO_2)
NO_x (200 mg m^{-3})	43.52	74.88	105.44	61.84	36.6	5.67	88.96	77.17	287(NO_2)
CO	21.76	37.44	52.72	30.92	18.3	2.83	44.48	38.58	
Cadmium	0.011	0.019	0.026	0.015	0.009	0.001	0.022	0.019	1.5
Thallium	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	30
Mercury	0.011	0.019	0.026	0.015	0.009	0.001	0.022	0.019	15
Antimony	0.109	0.187	0.264	0.155	0.092	0.014	0.222	0.193	150
Arsenic	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL			6
Lead									-
Chromium									3 (VI)
									150 (II or III)
Cobalt									6
Copper									200
Manganese									1500
Nickel									6
Vanadium									1

Table 27: **Maximum contribution to 99.8 th percentile oxides of nitrogen concentrations.**

Emission concentration, mg/m3	Concentration, ug/m3								
	A	B	C	D	E	F	G	H	Guideline
200	32	49	70	48	27	3.9	61	55	191
400	65	98	140	91	55	7.8	122	111	191

Table 28: **Maximum contribution to 99.9 th percentile 15 minute average sulphur dioxide concentrations**

Emission concentration, mg/m3	Concentration, ug/m3								
	A	B	C	D	E	F	G	H	Guideline
50	11	19	26	18	10	1	20	21	266
200	45	75	103	71	38	4	90	84	266

Table 29: **Maximum contribution to 99 th percentile 24 hour average PM_{10} concentrations**

	Concentration, µg/m3							
	A	B	C	D	E	F	G	H
99th percentile	1.0	1.8	2.4	1.7	0.9	0.1	1.8	2.1

3.19 The maximum contribution to 99.9 th percentile 15 minute average sulphur dioxide concentrations is shown in Table 28. Table 28 shows concentration predictions based both on the maximum daily emission concentration (50 mg m^{-3}) and the maximum half-hourly emission concentration (200 mg m^{-3}). The 99.9 th percentile 15 minute average concentrations have been calculated from 99.9th percentile hourly average concentrations by multiplying by 1.34 following Environment Agency Guidance.

3.20 Table 29 shows the maximum contribution to the 99 th percentile daily average particulate material concentrations based on the daily average rates of emission shown in Table 21 and 23. Upper bound estimates of the 99 th percentile 24 hour average concentrations have been determined from the 99.9 th percentile hourly average by multiplying 0.62 following Environment Agency Guidance.

3.21 Fig. 8 shows the predicted rates of deposition (wet plus dry) of heavy metals for a 1 g/s emission rate and for a 75 m stack. Fig. 8 shows the highest rates of deposition close to the stack with deposition rates falling by a factor of 5 within 500m of the stack.

3.22 Table 30 shows predicted rates of deposition of metals at the location of maximum impact.

Table 30: **Predicted rates of metal and PAH deposition at the location of maximum impact**

	Rates of metal deposition, mg m^{-2} day^{-1}								
	A	B	C	D	E	F	G	H	Guide
Arsenic	0.0022	0.0042	0.0044	0.0023	0.0015	$1.4 .10^{-4}$	0.0043	0.0044	0.02
Cadmium	0.0002	0.0004	0.0004	0.0002	0.0001	$1.4 .10^{-5}$	0.0004	0.0004	0.009
Chromium	0.0022	0.0042	0.0044	0.0023	0.0015	$1.4 .10^{-4}$	0.0043	0.0044	1.5
Cobalt	0.0022	0.0042	0.0044	0.0023	0.0015	$1.4 .10^{-4}$	0.0043	0.0044	0.49
Copper	0.0022	0.0042	0.0044	0.0023	0.0015	$1.4 .10^{-4}$	0.0043	0.0044	0.25
Mercury	0.0002	0.0004	0.0004	0.0002	0.0001	$1.4 .10^{-5}$	0.0004	0.0004	0.004
Nickel	0.0022	0.0042	0.0044	0.0023	0.0015	$1.4 .10^{-4}$	0.0043	0.0044	0.11
PAHs	0.00004	0.00008	0.00008	0.00004	0.00003	$0.3 .10^{-5}$	0.00008	0.00008	3.9

IMPACT ASSESSMENT

3.23 The modelled concentrations are compared below with relevant air quality standards and guidelines. The assessment takes account of background concentrations as appropriate. For those pollutants where air quality objectives are set as part of the UK National Air Quality Strategy, the assessment identifies locations, if any, where exceedence of the objectives is predicted. At other locations, where no exceedence of an objective is predicted, no significant health effects would be expected (United Kingdom National Air Quality Strategy). For most other pollutants, including metals, following Environment Agency guidance (E1), the emission is considered to be insignificant if:

- the predicted maximum annual average ground level concentration from the incinerator stack is less than 0.2% of the long term Environmental Assessment Level;
- the predicted deposition rate on land is less than 0.2% of the maximum deposition rate for land;
- the predicted maximum hourly average ground level concentration is less than 0.2% of the short term Environmental Assessment Level.

The risk of death from cancer associated with heavy metal emissions has been assessed following World Health Organisation guidelines. The risk is compared with other lifetime risks. The Environmental Assessment Levels for metals are generally more stringent than World Health Organisation Guidelines for these substances. Non-cancer health effects from metals have therefore been compared with Environmental Assessment Levels.

Nitrogen dioxide

3.24 For the purposes of this assessment we have estimated current background nitrogen dioxide concentrations on the basis of measurements at :

- the London Hillingdon continuous monitoring site in a residential area close to the M4 motorway;
- the Old Apron continuous monitoring site on Heathrow Airport;
- the diffusion tube site at Daventry Road, Poyle;
- the roadside monitoring site on the M25 at Staines.

3.25 In order to estimate background concentrations for 2005 and to compare predictions with National Stategy objectives we have assumed that:

- concentrations at London Hillingdon will decrease in line with DETR forecasts for the site;
- concentrations at the Old Apron site will not decrease from 1996 levels;
- concentrations of nitrogen dioxide at the Daventry Road site will decrease from 1997 levels by a factor of 0.72 in line with DETR recommendations for background locations;
- concentrations of nitrogen dioxide at the M25 site will decrease by a factor of 0.7 from 1997 levels in line with the reduction forecast by DETR at other roadside sites.

3.26 Annual average total nitrogen dioxide concentrations have then been estimated following DETR guidance which recommends that it can be assumed that 20% of nitrogen oxides from the stack at the point of maximum impact is converted to nitrogen dioxide. The total annual average nitrogen dioxide was calculated as the sum of 20% of the annual average oxides of nitrogen concentration at the location of greatest impact and the appropriate background concentration. Table 31 shows that the contribution of the energy from waste emissions to annual average nitrogen dioxide concentrations is small (less than 1.3% for a 75 m high stack) even though it has been conservatively assumed that:

- the plant operates at capacity at all times;
- the plant operates at its emission limits for oxides of nitrogen at all times;
- the calculations have been based on the modelled concentrations at the location of greatest impact.

Table 31 **Annual average nitrogen dioxide concentrations**

	Concentration, ppb					
	Background, 1996/7	Background, 2005	Stack contribution		Total	
			75 m stack	65 m stack	75 m stack	65 m stack
London Hillingdon	31	23	0.26	0.46	23	23
Old Apron	33	33	0.26	0.46	33	33
Daventry Road, Poyle	16	12	0.26	0.46	12	12
M25 Staines	26	21	0.26	0.46	21	21

150 ppb - std. hourly

Table 32: **Maximum modelled nitrogen dioxide concentration**

	Concentration, ppb				
	Background, 2005	Maximum stack contribution		Total concentration during peak hour	
		75 m stack	65 m stack	75 m stack	65 m stack
Colnbrook	12	24	28	48	52
Poyle	12	46	58	69	82
Longford	33	24	27	90	93
Harmondsworth	33	16	17	82	83
M25	21	59	73	101	115
M25/M4 Interchange	23	28	72	75	78
Stanwell Moor	33	13	17	79	83
Bedfont Court	33	20	23	86	89
West Drayton, near M4 roadside	23	19	25	65	71
Public House	23	38	49	84	95
Maximum impact location	12	78	110	102	134
Mad Bridge	33	41	50	107	116

3.27 The calculations show that the indicative limit of 21 ppb for 2005 included within the National Strategy will be exceeded at many near road sites and on Heathrow Airport irrespective of whether the energy from waste plant is in operation. However, it is recognised by DETR that there will be widespread exceedences of this indicative limit at near road locations in the London area. The contribution from the energy from waste plant to annual average nitrogen dioxide concentrations at the location of greatest impact is predicted to be less than 2% of the NAQS objective for the 75 m stack.

3.28 Table 32 shows the modelled concentrations during the hour of maximum impact at relevant locations. The calculations have assumed that:

- the plant operates at capacity;
- the oxides of nitrogen concentration in the discharge is at the half-hour average limit (400 mg m^{-3});
- there is sufficient ozone in the atmosphere and the plume is sufficiently well-mixed that all the oxides of nitrogen are converted to nitrogen dioxide at the receptors;
- the background concentration during the worst hour is conservatively assumed to be twice the annual average background concentration;
- 1 ppb of nitrogen dioxide is equivalent to 1.91 $\mu g\ m^3$.

3.29 Table 32 shows that on this very conservative basis, the stack emissions from a 65 m or 75 m stack are not sufficient to cause exceedence of the NAQS objective of 150 ppb during the hour of maximum impact.

3.30 Table 33 shows the 99.8% ile stack contribution to concentrations at relevant locations. Table 33 also shows background concentrations added to the 99.8%ile stack contribution. The calculations have assumed that:

- the plant operates at capacity;
- the oxides of nitrogen concentration in the discharge is at the half-hour average limit (400 mg m^{-3});
- there is sufficient ozone in the atmosphere and the plume is sufficiently well-mixed that all the oxides of nitrogen are converted to nitrogen dioxide at the receptors;
- the background concentration during the 99.8%ile hour is conservatively assumed to be twice the annual average background concentration;
- 1 ppb of nitrogen dioxide is equivalent to 1.91 ug/m3 .

3.31 Table 33 shows that concentrations calculated on this conservative basis meet the revised National Strategy objective of 100 ppb at all relevant locations for the 75 m high stack. The objective would be exceeded for a 65 m stack in the industrial area close to the stack and close to the M25 roadside. However, it is particularly unlikely that the discharge concentration would remain at the half-hour average limit value for sufficient periods. Table 19 shows that, in practice, emission concentrations of oxides of nitrogen are expected to be typically 80-300 mg m^{-3} as a result of the abatement measures to be employed. Reducing the emission concentrations to these levels will result in predicted concentrations markedly less than the revised National Strategy objective. It is concluded that it is unlikely that the revised National Strategy objective for NO_2 will be exceeded as a result of emissions from the energy from waste facility.

Table 33: **99.8 th percentile hourly average concentrations**

	Concentration, ppb				
	Background, 2005	99.8%ile stack contribution		Total concentration during 99.8%ile hour	
		75 m stack	65 m stack	75 m stack	65 m stack
Colnbrook	12	17	21	41	45
Poyle	12	16	21	40	45
Longford	33	17	21	83	87
Harmondsworth	33	10	12	76	78
M25	21	55	68	97	110
M25/M4 Interchange	23	25	30	71	76
Stanwell Moor	33	8	9	74	75
Bedfont Court	33	9	12	75	78
West Drayton, near M4 roadside	23	18	19	64	65
PH	23	17	36	63	82
Maximum impact location	12	55	79	79	103
Mad Bridge	33	14	21	80	87

Sulphur dioxide

3.32 Table 34 shows the 99.9 th %ile contribution from the stack to 15 minute average concentrations for a range of discharge conditions. The calculation has assumed that :

- the plant operates at capacity;
- the sulphur dioxide concentration in the discharge is at the 200 mg m-3 limit
- 1 ppb sulphur dioxide is equivalent to 267 ug/m3.

3.33 In order to take account of background concentrations, a conservative estimate of the background concentration during the 99.9 th percentile 15 minute period of twice the annual mean value at London Hillingdon during 1997 (5 ppb) has been added to the stack contribution.

3.34 Table 34 shows that the predicted 99.9 th%ile 15 minute average concentrations are less than the 100 ppb National Strategy objective for 75 m and 65 m high stacks. The values in Table 34 (based on the half hour emission limit of 200 mg/m3) may also be compared with the Daughter Directive 1 hour objective of 131 ppb not to be exceeded more than 24 times per year (131 ppb). The values in Table 34 based on the daily emission limit of 50 mg/m3 may be compared with the Daughter Directive 24 hour objective of 46.8 ppb not to be exceeded more than 3 times per year. In each case the predicted concentrations are considerably less than the objectives.

3.35 The predicted annual average ground level contribution to sulphur dioxide concentrations at the location of maximum impact are shown in Table 25. The calculation has assumed that :

- the plant operates at capacity;
- the sulphur dioxide concentration in the discharge is at the 50mg m^{-3} limit.

3.36 In order to take account of background concentrations, the annual mean value at London Hillingdon during 1997 (5 ppb) was added to the stack contribution. Thus the maximum annual average concentration at the location of maximum impact is estimated to be 5.5 ppb for a 65 m stack and 5.3 ppb for a 75 m stack. (Note 1 ppb sulphur dioxide is equivalent to 2.67 µg m^{-3}). These values may be compared with the proposed national annual objective for the protection of eco systems of 7 ppb. It is concluded that sulphur dioxide emissions from the plant are not predicted to result in the exceedence of the national objective for the protection of the eco system. The impacts of emissions on vegetation are addressed in the Ecological Assessment by Ecological Planning & Research Ltd (April 1999).

Table 34: **Predicted sulphur dioxide concentrations**

	Concentration, ppb				
Discharge concentration, mg/m3	Background	Maximum stack contribution		Total concentration during peak hour	
		75 m stack	65 m stack	75 m stack	65 m stack
200	5	28	39	38	49
50	5	7	10	17	20

Table 35: **Predicted total PM_{10} concentrations at the location of maximum impact**

Statistic	Concentration, $\mu g\ m^{-3}$				
	Background	Stack contribution		Total	
		75 m	65 m	75 m	65 m
Annual mean, EU, 2004	29	0.13	0.22	29	29
99 th percentile, 2005	70	1.8	2.4	72	72

Particulate material

3.37 Table 35 shows annual average contributions from the stack to particulate material concentrations at the location of maximum impact for a range of discharge conditions. These estimates have made use of the following assumptions:

- the plant operates at capacity;
- the particulate concentration in the discharge is at the 10 mg m^{-3} limit;
- all particulate material is present as PM_{10}.

3.38 The largest concentration (0.22 µg m^{-3}) predicted on this conservative basis is small compared to the revised annual average objective of 40 µg m^{-3}. In order to take account of the background PM10 concentration, we have added the stack contribution to the DETR estimates for 2005 for London Hillingdon. The background concentration at London Hillingdon is likely to provide a conservative estimate of concentrations in the area because it is close to the M4 motorway. Table 35 shows the calculated annual mean contribution, background concentration and total concentration. The total concentration is predicted to be less than the annual objective for 2004 of 40 µg m^{-3}.

3.39 Table 35 also shows percentile contributions from the stack to particulate material concentrations at the location of maximum impact for a range of discharge conditions. These estimates have made use of the following assumptions:

- the plant operates at capacity;
- the particulate concentration in the discharge is at the 10 mg m^{-3} limit;
- all particulate material is present as PM_{10}.

3.40 In order to take account of background concentrations, percentile stack contributions have been added conservatively to percentile background concentrations as shown in Table 35. Table 35 shows that the stack contribution makes little difference to the PM_{10} concentrations. Comparing the predicted concentrations in Table 35 with the National Strategy objectives, it is concluded that:

- the contribution from the stack is small (approximately 2%) compared to the objective limits and to the contribution from other sources;
- the proposed National Strategy for annual average PM_{10} concentrations (40 µg m^{-3}) is likely to be met;
- the indicative value of 50 µg m^{-3}(TEOM) as the 99 th percentile of 24 hour running averages by 2005 will not be achieved even without the EfW plant in place.

Carbon monoxide

3.41 The maximum hourly carbon monoxide concentrations shown in Table 26 are small (approximately 5 % or less) compared with the National Strategy 8 hour average objective of 10 ppm (1135 µg m^{-3}). Maximum 8 hour average concentrations are typically less than 70 % of the maximum hourly concentration. It is therefore unlikely that carbon monoxide concentrations resulting from the stack emissions will result in the exceedence of National Strategy objectives.

Hydrogen chloride and hydrogen fluoride

3.42 Modelled annual average concentrations of hydrogen chloride and hydrogen fluoride are shown in Table 25. The modelled concentration of hydrogen chloride is approximately 2% of the Environment Agency long term Environmental Assessment Level (EAL) for a 75 m stack and 3% of the level for a 65 m stack. There is no long-term EAL for hydrogen fluoride. Modelled maximum hourly average concentrations of hydrogen chloride and hydrogen fluoride are shown in Table 26. The modelled concentration of hydrogen chloride is approximately 4% of the Environment Agency short term Environmental Assessment Level for a 75 m stack and 5% of the EAL for a 65 m stack. The modelled concentration of hydrogen fluoride is less than 1% of the short-term EAL. These values are based on the predicted maximum rates of emission from the EfW plant shown in Table 21 and will in practice overestimate the concentrations because the rate of emission will in practice be less than the maximum rate of emission.

Cadmium and thallium

3.43 Table 25 shows the modelled annual average concentration of total cadmium and thallium at the location of maximum impact. The estimate may be compared with the EAL for cadmium (5 ng m^{-3}) if it is assumed that:

- the plant operates at maximum capacity;
- the plant operates at its emission limits for cadmium and thallium,
- all the material present is cadmium (for which the guideline concentration is the lowest);
- the total concentration in the environment may be calculated by adding the process contribution to average background concentrations in Brent, (see Table 11) typically less than 1 ng m^{-3}.

3.44 On this conservative basis, total environmental concentrations will not exceed 35% of the EAL value for the 75 m stack. The modelled contribution from the process itself is less than 15 % of the EAL. In practice, as shown in Table 19, emission concentrations of cadmium at municipal waste incinerators are typically much less than the limit value shown in Table 18. It follows that the annual average ground level concentrations will be markedly less than the EAL at the location of maximum impact in practice. Figs.6 and 7 show that for other locations further from the stack, for example residential locations around the energy from waste facility, the concentrations will be smaller still.Table 30 shows that maximum predicted rates of deposition of cadmium are approximately 4% of the Environment Agency guide value.

3.45 Table 26 shows the maximum hourly concentration of total cadmium and thallium at the location of maximum impact. The predicted concentrations are less than 2% of the short term EAL (1.5 µg m^{-3}).

3.46 It is concluded that it is unlikely that the emissions of cadmium and thallium from the Energy from waste facility will lead to exceedences of the Environmental Assessment Levels.

Mercury

3.47 Table 25 shows the modelled annual average concentration of mercury at the location of maximum impact. The estimate may be compared with the long term EAL for mercury (1 mg m^{-3}) if it is assumed that:

- the plant operates at maximum capacity;
- the plant operates at its emission limits,
- the total concentration in the environment may be calculated by adding the process contribution to average background concentrations in West London, typically 0.1-0.3 ng m^{-3}.

3.48 On this basis, Table 25 shows that annual average environmental concentrations of mercury are less than 0.2% of the EAL. Table 30 shows the maximum predicted rate of mercury deposition. For the 75 m stack the maximum modelled rate of deposition is approximately 4% of the Environment Agency maximum deposition rate.

3.49 Table 26 shows the maximum hourly concentration of mercury at the location of maximum impact. The predicted concentrations are less than 0.2% of the short term EAL (15 µg m^{-3}).

3.50 It is concluded that the risk of exceeding the Environmental Assessment Levels for mercury is not significant.

Other metals

3.51 Table 25 shows the modelled annual average total concentrations of other metals at the location of maximum impact.

3.52 The estimate may be compared with the long term EAL for for each metal if it is assumed that:

- the plant operates at maximum capacity;
- the plant operates at its emission limits for other metals,
- the concentration of each metal in the emission is the limit value for total metals;
- all the chromium is present in its hexavalent form .

3.53 The predicted annual average concentrations of each of these metals calculated on this basis is less than 20 % of their long term EALs. Table 30 shows that predicted rates of deposition are also less than 22% of the Environment Agency guide value. In practice, the emission of "other metals" is made up predominantly of lead and zinc, with other metals being present in municipal wastes at concentrations less than the concentrations in coal. It is estimated that chromium, antimony, arsenic, cobalt, copper, manganese, nickel and vanadium individually make up less than 10% of the "other metals" emission. Furthermore, hexavalent chromium is only expected to make up around 10% of the chromium emission. Ambient environmental concentrations of these metals (other than lead) are small. It is therefore unlikely that process emissions of these metals will lead to environmental concentrations in the atmosphere exceeding the Environmental Assessment Levels.

3.54 The concentration of lead in the environment in past years has been significant as a result primarily of road vehicle emissions. The concentration in the environment is expected to decrease markedly in future years as a result of the banning of leaded fuel to be introduced in 2000 to lower than 0.1-0.2 $\mu g\ m^{-3}$ by 2005 even at busy roadsides, except in the vicinity of certain individual industrial plants. Adding this value to the maximum possible process contribution of 0.011 $\mu g\ m^{-3}$ results in total concentrations less than EPAQS standard of 0.25 $\mu g\ m^{-3}$.

3.55 Table 26 shows the maximum hourly concentration of other metals at the location of maximum impact based on the conservative assumptions above. The predicted concentrations are less than 30% of the most stringent short term EAL (1 $\mu g\ m^{-3}$ for vanadium).

3.56 It is concluded that the concentrations of "other metals" are small compared with Environmental Assessment Levels.

3.57 There is a risk of cancer associated with the inhalation or ingestion of some heavy metals, most notably arsenic, hexavalent chromium and nickel, over long periods of time. Table 36 shows the incremental risk based on WHO risk factors and the modelled concentrations of heavy metals at the location of greatest impact for a 75 m stack.

3.58 There are no residential properties in the location of greatest impact. At locations further from the stack and towards the south west where there are significant numbers of residential dwellings the concentration and the risk is significantly less. For example, the annual average contributions to pollutant concentrations at Colnbrook, Poyle and Longford and at the Public House on the A4 (GR034773) are less than 20% of the contribution at the location of greatest impact and it is therefore estimated that the risk is thus 20% of the value at the location of greatest impact. Thus a person living at these locations during 50 years of plant operation would be exposed to an incremental risk of 1:1,100,000.

3.59 There is considerable debate with respect to what level of risk is considered to be acceptable. The Royal Commission on Environmental Pollution [RCEP, 1993] has stated :

> *There is a consensus among regulatory authorities in the United Kingdom and the USA that incremental risks of death greater than 1 in 10,000 (10^{-4}) are too high to be acceptable; and that [an annual] risk of 1 in 1,000,000 represents a reasonable upper bound beyond which measures to achieve a further reduction in risk would not be justified in terms of the benefit gained.*

3.60 A target annual risk of 1 in 1,000,000, equivalent to a 1 in 14,300 lifetime risk has been adopted in this report. The risks shown in Table 36 are the additional risks that the local population might face as a result of heavy metal emissions from the plant. In the absence of the facility, the risk of contracting a fatal cancer is approximately 1 in 5. For comparison the lifetime fatal risk from road accidents, accidents in the private home and fire are 1 in 143, 1 in 154 and 1 in 952 respectively.

3.61 On this basis it is concluded that emissions of metals from the facility are not predicted to produce an unacceptable risk to health for the local residents.

Table 36: **Incremental risk of cancer from heavy metal emissions**

Metal	Incremental lifetime cancer risk, $(\mu g\ m^{-3})^{-1}$	Estimated maximum annual concentration[a], $\mu g\ m^{-3}$	Incremental lifetime cancer risk
Arsenic	0.003	0.0006	1:560000
Chromium VI	0.04	0.00006[b]	1:420000
Nickel	0.0004	0.0006	1:420000
Total risk			1:220000

[a] Assuming arsenic, chromium and nickel each comprise 10% of "other metal emissions"
[b] Assuming 10% of chromium is present as hexavalent chromium

Dioxins

3.62 An assessment of the potential health risks associated with the PCDD and PCDF emissions released from the stack of the plant was carried out. The release from the plant was considered to continue over thirty years at a constant rate equivalent to the likely emission limit (Table 21). Emission scenarios A-E (Table 24) were investigated. Comparing Scenario H with Scenario B in Table 25 shows that operation of the clinical waste incinerator does not increase significantly the maximum ground level concentrations of dioxins. Scenario B in Tables 37 and 38 is therefore representative of the combined exposure from the energy from waste facility and the clinical waste incinerator.

3.63 PCDDs and PCDFs released from the chimney will be dispersed in the atmosphere and this process was modelled to predict the maximum ground level concentration. At ground level the PCDDs and PCDFs will then impact on other environmental media such as air, soil and surface water in both the local river system and reservoirs. From the various environmental media, uptake will occur into the local ecosystem and so finally to foodstuffs which are consumed by humans. The exposure routes assessed included intake of soil, water, and food (including breast milk) and inhalation. As PCDD and PCDF effects are thought to be long term in consequence annual average values of concentration were used. The methodology calculated the soil concentration resulting from deposition at the point of greatest annual average PCDD and PCDF concentration. The concentrations in vegetation both above and below ground arising from the soil and deposition were then calculated. The intake of fodder crops into animals were then assessed to estimate the animal tissue and milk concentrations. The human exposure resulting from the operation of the plant was then calculated for several different human types; infants, children in several age categories, non-farming adults and farmers.

3.64 The exposure assumptions and study methodology followed that given in HMIP 1996. Site specific assumptions were made as follows; an average rainfall of 600mm per year, an average annual temperature of 10°C, the area of water bodies for deposition to occur to was taken as 11,400,000 m^2, the area of the River Colne watershed was taken as 1018 km^2. The long term (1952 to 1999) annual mean flow in the river has been measured by the Environment Agency as 3.97 m^3 per second. As the incinerator is not yet operating a default profile of the 17 congeners of concern was taken from HMIP 1996. Assumptions were also made about the average dietary behaviour based on the Ministry of Agriculture Fisheries and Food's Total Diet Study. Clearly the population as a whole contains a range of dietary behaviours. Other assumptions were made about the behaviour of people exposed to the emissions. These assumptions made were designed to ensure that under prediction of the exposure did not occur. In consequence the results will tend to provide an upper bound of the possible exposure arising from the operation of the plant.

3.65 Table 37 shows the exposure to PCDDs and PCDFs for various types of people(exposures as pg TEQ per kg body weight per day). Table 38 shows the possible exposure as a percentage of the Tolerable Daily Intake (10 pg per kg body weight per day)

3.66 The conclusion of the risk assessment is that the exposure arising from the energy from waste facility is a small fraction (2.41% for a hypothetically maximally exposed adult and for a 75 m high stack), of the tolerable daily intake for PCDDs and PCDFs of 10 pg kg^{-1} body weight per day recommended by the UK's Committee on the Toxicity of Chemicals in Food, Consumer Products and the Environment. The exposure from the energy from waste facility with a 75 m stack is 6-24% of the World Health Organisation Tolerable Daily Intake of 1-4 pg kg^{-1} body weight per day and approximately 10% of the

typical exposure of the UK population in 1992. The assessment has been based on the hypothetically most exposed adult and on the worst case ground level concentrations. It is therefore concluded that the risk to human health from emissions of dioxins and furans is small.

Table 37: **Exposure to PCDDs and PCDFs for Various Types of People (exposures as pg TEQ per kg body weight per day)**

Case	A	B	C	D	E
Max ground level concentration (fg TEQ/m3)	0.84	1.10	1.95	1.58	0.91
local adult resident	0.02	0.03	0.05	0.04	0.03
local school child aged 11 to 16	0.03	0.03	0.06	0.05	0.03
Local school child aged 5 to 11	0.04	0.06	0.10	0.08	0.05
Local child aged 1-6	0.04	0.06	0.10	0.08	0.05
Local breast feeding baby	0.14	0.18	0.33	0.27	0.16
Local farmer	0.07	0.09	0.16	0.13	0.07
Local child of a farmer	0.13	0.17	0.31	0.25	0.14
Local farmer's baby	0.22	0.28	0.50	0.40	0.23
Hypothetical Maximally Exposed Adult	0.18	0.24	0.42	0.34	0.20

Table 38 : **Possible Exposure as a percentage of the Tolerable Daily Intake (10 pg per kg body weight per day)**

Case	a	b	c	d	e
local adult resident	0.23	0.31	0.54	0.44	0.25
local school child aged 11 to 16	0.26	0.34	0.61	0.49	0.28
Local school child aged 5 to 11	0.44	0.57	1.00	0.82	0.47
Local child aged 1-6	0.44	0.57	1.00	0.82	0.48
Local breast feeding baby	1.41	1.83	3.33	2.66	1.58
Local farmer	0.69	0.91	1.58	1.33	0.75
Local child of a farmer	1.33	1.75	3.08	2.49	1.41
Local farmer's baby	2.16	2.83	4.99	3.99	2.33
Hypothetical Maximally Exposed Adult	1.83	2.41	4.24	3.41	2.00

SECTION D TRAFFIC EMISSIONS, ODOUR AND DUST

4.1 The traffic movements on nearby roads associated with the proposed energy from waste facility have been assessed in terms of their potential effects on air quality.

4.2 Many operations taking place at the site have the potential to create odour and dust. These operations and the measures employed to control odour and dust impacts are described below.

TRAFFIC EMISSIONS

4.3 The numbers of vehicle movements associated with the plant for the following three cases are shown in Table 39 :

- the existing MRF and CWI facility, operating at consented capacity;
- the new energy from waste facility operating at capacity.

The traffic impact assessment indicates that the proposed energy from waste facility will generate significantly less HGV and LGV traffic than the consented facilities. The reduction in the volume of waste to be removed from the site under the proposal and the relocation of the Grundon vehicle workshops will reduce the numbers of vehicles using the site. Although Grundon proposes to remove the bottom ash by rail (120,000 tonnes per annum), this figure has been included in the traffic impact assessment to give the a worst case estimate of traffic movements.

4.4 The traffic arriving at the site and departing from it will travel along the A4 Colnbrook Bypass in either direction depending on the source or destination of the load. The effect of the changes to the traffic on the A4 Colnbrook Bypass was assessed using the Highways Agency Design Manual for Roads and Bridges following the recommendations of DETR's pollutant specific guidance. In carrying out the assessment it has been assumed that:

- 45% of the traffic associated with the site travels along the bypass between the site and the M4 junction at Brands Hill (in line with the traffic impact assessment);
- average daily traffic flows on the A4 have been obtained from on automatic traffic count surveys carried out by Qualidat 11-21 April 1999 ;
- traffic flows from non-site traffic will increase by 2.5% by 2005;
- the traffic generated by the current operation is 344 heavy duty vehicles and 120 light duty vehicles per day on weekdays only (5.5 days) with an additional 16 heavy duty vehicles on Sundays ;
- the proportion of heavy duty vehicles (HGVs) on the A4 has been obtained from on automatic traffic count surveys carried out by Qualidat 11-21 April 1999;
- the annual average background oxides of nitrogen concentration was 28 ppb in 1997, based on nitrogen dioxide concentration measurements at Daventry Road , Poyle and typical nitrogen dioxide:oxides of nitrogen ratios for background locations;
- the annual average background oxides of nitrogen concentrations will decrease by a factor of 0.6 from 1997 levels by 2005 based on DETR Pollutant Specific Guidance to Local Authorities;
- the annual average background carbon monoxide concentration was 0.6 ppm and would be 0.3 ppm in 2005

- the annual average background PM_{10} concentration was 25 $\mu g\ m^{-3}$ in 1997 based on measurements from London Hillingdon;
- the annual average background PM_{10} concentration would be 22 $\mu g\ m^{-3}$ in 2005 based on DETR predictions for London Hillingdon;
- the nearest residential property is 15 m from the centre of the road;
- vehicles currently travel at 96 km h^{-1}: in 2005, the speed limit will be reduced to 80 km h^{-1},

4.5 Predicted annual average oxides of nitrogen concentrations are shown in Table 40. Table 40 shows that oxides of nitrogen at roadside locations along the A4 are expected to decrease markedly between now and 2005. It shows that the operation of the energy from waste plant will have little effect on roadside concentrations. DETR Pollutant Specific Guidance for nitrogen dioxide indicates that it is unlikely that the annual average objective for nitrogen dioxide of 21 ppb will be exceeded if the annual average oxides of nitrogen concentration at kerbside locations is less than 60 ppb. The Guidance also indicates that it is unlikely that the the annual average objective for nitrogen dioxide of 21 ppb will be exceeded at background locations if the annual average oxides of nitrogen concentration is less than 40 ppb. Current advice from DETR suggests that the term kerbside relates to locations within 5 m of the kerb. Table 40 thus shows that it is likely that the objective is currently exceeded alongside the A4 Colnbrook Bypass: it also suggests that it is possible that the objective will be exceeded in 2005 irrespective of whether the energy from waste plant is built. However, the energy from waste plant will result in slightly lower oxides of nitrogen concentrations as a result of the slight reduction in traffic compared to the currently authorised operation.

4.6 Predicted 99th percentile 24 hour average PM_{10} concentrations are shown in Table 41. Table 41 shows that PM_{10} concentrations at roadside locations along the A4 are expected to decrease markedly between now and 2005. It shows that the operation of the energy from waste plant will have little effect on roadside concentrations. Table 41 shows that the objective of 50 $\mu g\ m^{-3}$ as the 99 th percentile of 24 hour running averages is likely to be exceeded at roadside locations along the A4 in 2005 irrespective of the operation of the energy from waste plant. However, as discussed in 2.19, it is expected that the objective will be revised shortly because widespread exceedences are predicted throughout the country. Table 41 shows that the proposed revised objectives will be met irrespective of the operation of the EfW plant.

4.7 Predicted maximum 8 hour average carbon monoxide concentrations are shown in Table 42. Table 42 shows that CO concentrations at roadside locations along the A4 are expected to decrease markedly between now and 2005. It shows that the operation of the energy from waste plant will have little effect on roadside concentrations. Comparing the predicted values with the 10 ppm objective indicates that it is unlikely that the objective will be exceeded.

4.8 It is concluded that the changes in traffic on the A4 Colnbrook Bypass resulting from the operation of the energy from waste facility will result in a slight improvement in the air quality at roadside locations compared to the currently planned operation as the result of reductions in traffic using the facility although the improvement is unlikely to be measurable.

4.9 There are a number of other developments in the area that might potentially affect the traffic flow on the A4. These include the London International Freight Exchange and the

Heathrow Terminal 5 Logistics Centre. Each of these developments could result in incrementally increased pollutant concentrations along the A4 Colnbrook bypass. However, the energy from waste plant will generate less traffic than the existing MRF operating at authorised capacity and so will offer a small incremental improvement in air quality in each development case.

Table 39: **Daily vehicle movements associated with future operations at the site**

	Daily vehicle movements			
	Existing facility at authorised capacity		New facility	
	Heavy duty	Light duty	Heavy duty	Light duty
Weekday (5.5 days per week)	740	300	524	80
Weekend	0	0	188	0
Weekday night	0	0	58	0
Weekend night	0	0	12	0

Table 40: **Roadside annual average oxides of nitrogen concentrations**

			Concentration, ppb		
	Traffic flow, vehicles per hour	Fraction HDV	Road	Background	Total
1999	778	0.106	59	28	87
2005, planned	805	0.111	26	16	42
2005 with EfW	800	0.110	26	16	42

Table 41: **Roadside PM10 concentrations**

Case	Concentration, ug/m3					
	Roadside, annual average	Background, annual average, TEOM	Total 99%ile, 24 hr running mean, TEOM	Background annual average, gravimetric	Total annual average gravimetric	90th percentile 24 hour, gravimetric
1999	3.8	25	81	33	37	61
2005, planned	1.4	22	66	29	30	48
2005 with EfW	1.4	22	66	29	30	48

Table 42: **Roadside carbon monoxide concentrations**

Road	Case	Traffic flow, vehicles per hour	Fraction HDV	Maximum 8hour average concentration, ppm
A4	1999	778	0.106	7
A4	2005, planned	805	0.111	3
A4	2005 with EfW	800	0.110	3

ODOURS

4.10 Odour may arise at the energy from waste facility from:

- raw materials handling;
- stack flue gas where there is poor combustion control or poor dispersion;
- ash handling.

4.11 Odour will be controlled by means of the following measures:

- enclosing odorous areas
- confining waste to designated areas;
- the use of doors, normally self closing between potentially odorous indoor areas;
- ensuring that putrescible waste is incinerated within an agreed timescale;
- regular cleaning of waste handling areas, with disinfection of putrescible waste handling areas and clinical waste storage containers;
- designing areas to facilitate cleaning;
- transporting waste and ash in covered vehicles;
- ensuring good dispersion from the stack;
- preventing anaerobic conditions by aeration and turning of waste and storage over short timescales;
- drawing air from odorous areas, principally the refuse storage bunkers, at a rate that will ensure that odour is captured;
- incineration of the extracted air prior to release to destroy odours in the MSW incinerators;
- external doors to limit odour spread during incinerator shutdown while still allowing vehicle access
- use of deodorant sprays during incinerator shutdown.

4.12 The destruction of odorous air by incineration is considered the most effective method of dealing with odour.

Ventilation

4.13 Effective control will depend on the enclosing of odorous areas and drawing air from odorous area at a rate which will ensure that odour is captured. The main odorous areas are potentially:

- the tipping hall;
- the materials reclamation facility;
- the refuse storage bunkers;
- the stoker feed chutes;
- the ash pit.
- clinical waste storage areas

4.14 The total volume of these areas is estimated to be 150,000 m^3. A useful rule of thumb is that extracting air at a rate to provide one air change per hour will limit fugitive release of odours from a well-sealed industrial building. Thus an extraction air flow of 42 $m^3 s^{-1}$ will be sufficient to limit fugitive release of odours from the building. The design gas

flow for the MSW incinerator is approximately 40 Nm^3 s^{-1} per stream. The air requirements for one incinerator stream extracted from the odorous areas of the building should therefore limit fugitive odour release. The availability of two incinerator streams at the plant will thus provide backup capacity for odour treatment during periodic shutdown.

Incinerator shutdown

4.15 Both incinerators will be shut down on some occasions because of inadequate raw material supply or because of breakdowns. Little odour generation will occur when no material is stored. However, there may be short periods when neither incinerator stream is in operation and large quantities of waste are stored as a result of, for example, breakdown. Under these circumstances fugitive emissions of odour from the facility may occur. It is estimated that the rate of fugitive loss under most meteorological conditions will be approximately 42 m^3 s^{-1} equivalent to one air change per hour. The odour concentration of untreated air in waste storage facilities depends on the amount of putrescible material in the waste and the time of storage. Typically odour concentrations are in the range 100-1500 ou m^{-3}. Rates of odour emission are thus likely to be in the range 4200 - 63000 ou/s with a typical value of 21000 ou/s. The potential for odour complaints for such releases may be assessed using the so-called dmax equation [Valentin and North, 1980]:

$$d_{max} = (2.2 \times E)^{0.6}$$

where

d_{max} is the maximum distance of complaints during meteorological conditions unfavourable to dispersion, m;

E is the rate of odour emission, ou/s.

4.16 The estimated maximum complaint distance is estimated to be approximately 700 m. The meteorological conditions giving rise to complaints- stable low wind speed conditions usually occurring at night are relatively rare and occur approximately 10% of the time. There are few residential properties within 700 m of the facility, with the edge of Poyle approximately 500 m southwest of the facility. Thus for significant odour complaints to arise it will be necessary for the following conditions to occur simultaneously:

- shutdown of both incinerator streams;
- significant quantities of putrescible material held in storage;
- stable low wind speed atmospheric conditions;
- a north east wind.

4.17 It is unlikely that such a combination of conditions will occur except on rare occasions and so it is unlikely that complaints will arise.

Stack odour

4.18 Incineration of odorous air will result in the destruction of most odorous substances. However, in practice, some residual odour will remain so that the gases discharged from the stack may have an odour concentration estimated to be approximately 1000 ou m^{-3}, although the odour will have different characteristics from that of the waste materials.

With two incinerator streams in operation, there is thus the potential for an odour emission of around 100,000 ou/s from the stack. The dispersion modelling results shown in Fig.5 have been used to estimate ground level odour concentrations during meteorological conditions least favourable to dispersion. Maximum hourly ground level concentrations are thus estimated to be 0.3 ou m^{-3} and 0.5 ou m^{-3} in the industrial estate to the north of the facility for 75 m stack and 65 m stack respectively . Short term peak concentrations may be approximately 10 times this value , i.e. 3-5 ou m^{-3}. Concentrations at the nearest residential properties are predicted to be approximately half these values. Furthermore, the meteorological conditions giving rise to the maximum ground level concentration occur infrequently. Odour complaints are unlikely to arise for short term peak odour concentrations less than 3 ou m^{-3} [Valentin and North, 1980]. It is concluded that a 65 or 75 m high stack will be sufficient to prevent odour nuisance.

Odour during demolition of the old plant

4.19 The potential for odour emissions during the demolition of the old plant will be minimised by removing all dry deposits, dust and ash residues by vacuuming prior to any work taking place followed by a complete washdown of the plant. During washdown all drainage systems will be sealed and the site perimeter bunded. All washdown water will be collected and promptly tankered away following testing.

Dust

4.20 The following activities have the potential for dust generation:

- demolition of the existing plant;
- construction activities;
- refuse handling;
- lime handling;
- grate ash handling;
- fly ash handling.

4.21 Demolition and construction debris consists primarily of large particles with a relatively small proportion of fine material. Fine particles may become airborne and transported from their initial source when the wind speeds are above approximately 3 m s^{-1}. However, particles greater than approximately 100 µm will settle out within a few metres of the source. Smaller particles in the range 30-100 µm will settle within approximately 100 m of the source. The smallest particles, particularly those less than 10 µm, may be prevented from settling by atmospheric turbulence and will be transported further from their source. A significant proportion of fly ash is in the sub 10 µm particle ranges.

4.22 The nearest residential properties are a few hundred metres away from the site, to the south. At this distance, most of the larger particle dust generated by operations at the site will have settled out.

4.23 The main dust-generating activities are described and the mitigating measures applied are described below.

Demolition of the existing plant

4.24 The demolition of the existing plant will take place in several stages, which may run in parallel with construction of parts of the new plant. The main structures to be cleared will be:

- chimney;
- main building;
- clinical waste incinerator;
- floor slab.

4.25 The plant will be cleaned to remove all dry deposits, dust and ash residues by vacuuming prior to any work taking place.

4.26 It is likely that chimney will be dismantled by hand in sections. Debris will be lowered internally down the chimney. The debris will be loaded onto lorries which will be sheeted for transport away from the site.

4.27 The main building will be demolished using a combination of a muncher, excavator and crane to remove various component parts. Reusable components will be removed prior to dismantling of the incinerator using oxyacetylene cutting equipment and cranes to lift large sections.

4.28 Large concrete floor slabs will be broken up by means of jackhammers, monbert machines and JCBs. The concrete will be crushed and used for fill during reconstruction where possible, with the remaining material transported off-site in sheeted lorries.

4.29 Demolition activities will incorporate the following practices to reduce the risk of dust impacts:

- careful dismantling of large components;
- prompt removal of debris;
- sheeting of lorries during transportation of debris materials;
- watering of materials particularly during crushing and during windy conditions.

Construction activities

4.30 The site will be cleared of debris prior to the start of construction activities. The main dust generating activities during construction are then:

- aggregate handling;
- foundation piling;
- site traffic on paved and unpaved roadways.

4.31 Dust generation during aggregate handling will be limited by wetting the aggregate when there is a significant risk of dust generation during priods of dry weather. It is likely that the site foundations will be piled using continuous flight augers, which are preferred because they are cleaner and quieter. Paved roads around the site will be swept regularly to prevent build up of dusty materials. Unpaved roadways on site will be wetted to prevent dust generation during dry weather periods.

Refuse handling

4.32 Lorries delivering waste materials to the site will be totally enclosed or covered by tarpaulins/nets to prevent the escape of dust or waste material during transfer to and from the site.

4.33 The unloading of municipal waste from lorries will take place under cover in a tipping hall. Air will be extracted from the main tipping area and incinerated, filtered and discharged through an elevated stack. The extraction of air will minimise the possibility of fugitive dust losses from the tipping area.

Lime handling

4.34 Lime will be delivered to the site in enclosed tankers. The tankers will discharge via pneumatic conveyor to the lime silo. Conveying air extracted from the top of the silo will pass through a bag filter prior to discharge.

4.35 Any material spilled during transfer operations will be promptly cleared up by vacuuming.

Grate ash handling

4.36 The ash from the furnace grate will be cooled in a water bath prior to magnetic separation of ferrous metals. The wet ash will be stored in pits before being removed from the site in covered vehicles. The wet ash material has little potential for dust generation. Spilled material will be cleared up promptly.

Fly ash handling

4.37 Fly ash will be transferred to dedicated sealed tankers for removal from the site. The transfer operation will take place via an enclosed connection, with displaced air extracted and passed through a bag filter prior to discharge .

SECTION E CONCLUSIONS

5.1 The impact of the proposed energy from waste facility on air quality has been assessed with reference to air quality standards and objectives for the pollutants released. Relevant air quality standards and objectives considered in the assessment include:

- National Air Quality Strategy objectives;
- Expert Panel on Air Quality Standards recommendations;
- World Health Organisation Air Quality Guidelines;
- EC Directives on air quality;
- Environment Agency Guidance.

5.2 The air quality in the region of the proposed facility has been assessed on the basis of measurements from :

- DETR AUN continuous monitoring sites at London Hillingdon, London Teddington and Hounslow Roadside;
- Highways Agency monitoring sites on the M25 at Staines and at Cranford Park School;
- continuous monitoring sites on London Heathrow airport;
- diffusion tube measurements carried out by Slough Borough Council;
- diffusion tube measurements from the National Diffusion Tube Network.

5.3 These measurements show that the air quality at background locations in the region generally meets the air quality standards. However, the most stringent air quality standards for nitrogen dioxide and particulate matter are not currently met close to major roads (e.g. M25 and M4) or on Heathrow Airport. DETR forecasts of air quality at the London Hillingdon monitoring site 30m from the M4 suggest that the concentrations of nitrogen dioxide and particulate matter will continue to exceed the most stringent standards for these pollutants in 2005. However, these most stringent objectives will be exceeded at locations throughout the United Kingdom: the extent of this exceedence is such that DETR intends to replace these objectives with less stringent alternatives.

5.4 Modelling studies carried out by BAA in connection with Heathrow Terminal 5 indicate that elevated concentrations will continue to occur in the immediate vicinity of the airport. However, these modelling studies also show that the influence of the airport on air quality declines rapidly with distance from the airport.

5.5 The impact on air quality of emissions from the proposed energy from waste facility has been assessed using the dispersion model ADMS Version 2.2. Modelling was carried out for a range of operating scenarios for stack heights between 65 and 75 m. Model results for 20 pollutants show that in general the contribution from the facility to pollutant concentrations is small. However, total concentrations of nitrogen dioxide and particulate matter , taking account of background concentrations, are predicted to exceed the most stringent air quality objective limits: these objectives would not be met irrespective of the operation of the energy from waste facility. It is therefore concluded that discharges from the facility are unlikely to cause a risk to human health.

5.6 The impact on air quality of the traffic generated on the A4 Colnbrook Bypass by operation of the energy from waste facility has been compared with that planned for the

existing recycling operation on the site for the year 2005. The predicted pollutant concentrations have also been compared with estimates of current concentrations. The predictions show that the air quality at roadside locations is expected to improve markedly in future years irrespective of the operations on the site. The proposed energy from waste facility will improve air quality slightly compared with the planned recycling operation.

5.7 Odours from the site will be controlled by means of a number of measures. These include the incineration of ventilation air . During normal operation the extraction of air from the plant through the burners will be sufficient to limit fugitive releases of odour. Modelling studies based on estimated rates of odour emission show that the impact of odorous discharges from the stack will not be sufficient to cause odour nuisance.

5.8 A number of activities on the site have the potential to create dust. The escape of dust from the site from most of these activities will be limited by enclosure of operations. Measures to control dust generation during the demolition of the old plant and the construction of the new plant have been developed.

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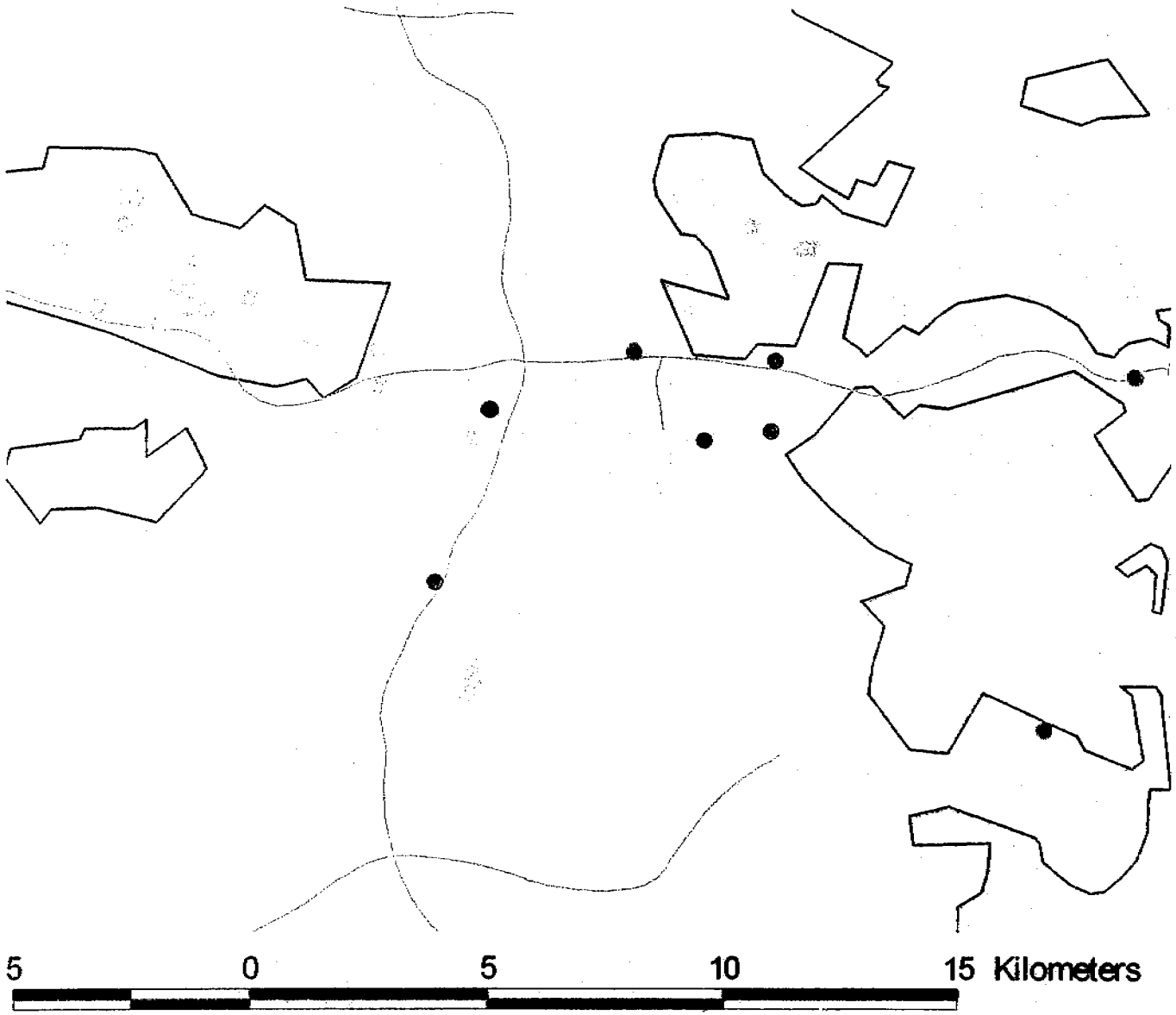


Fig.1: Monitoring sites

Figure 2 **Modelled oxides of nitrogen concentration around Heathrow Airport, 1993**

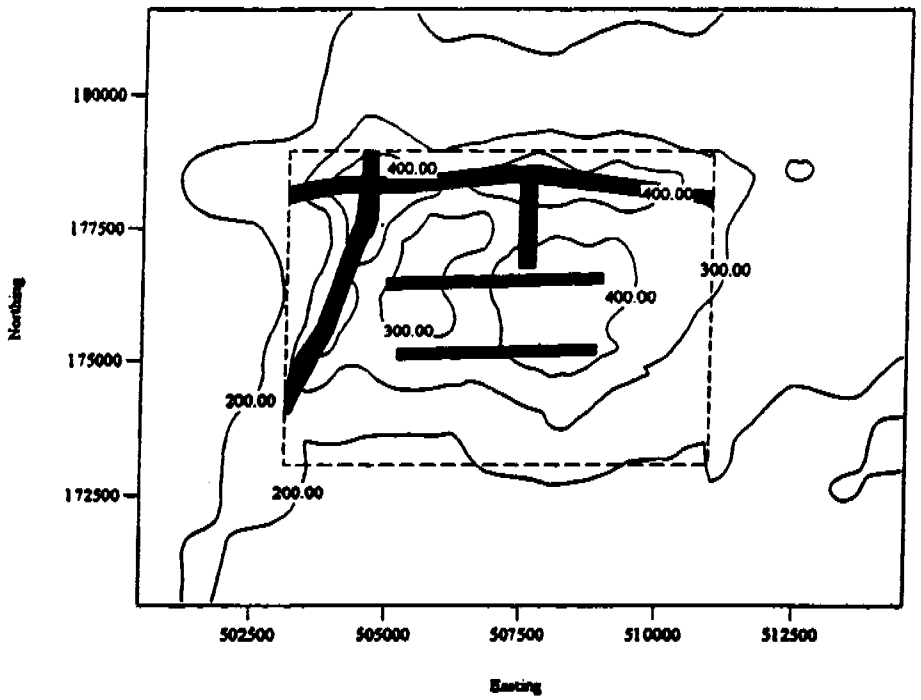
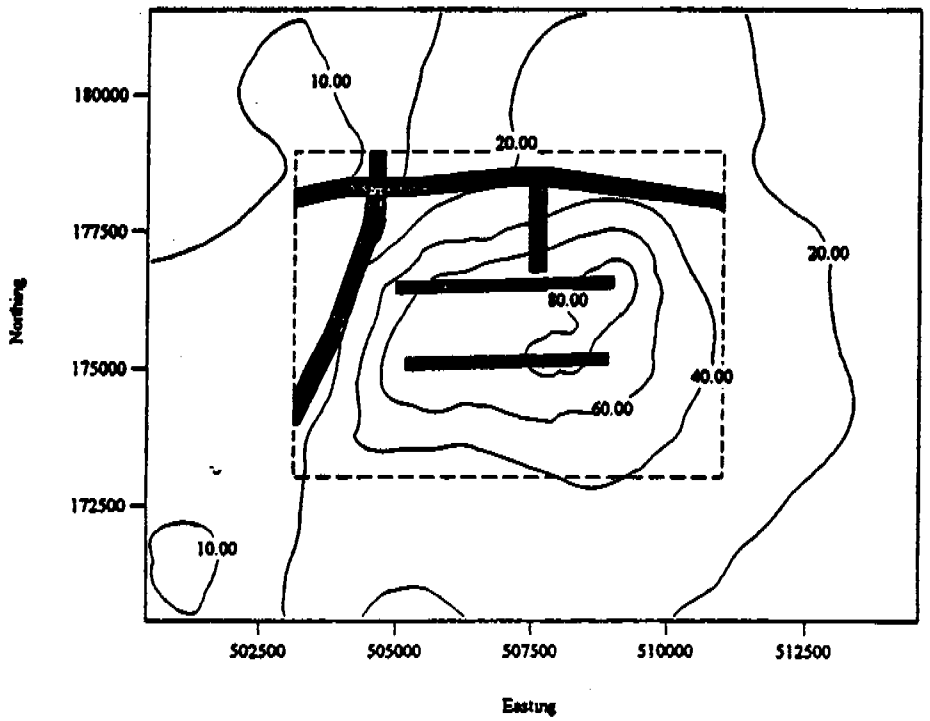


Figure 3 **Percentage of oxides of nitrogen concentration derived from airport sources: 2015 with Terminal 5**



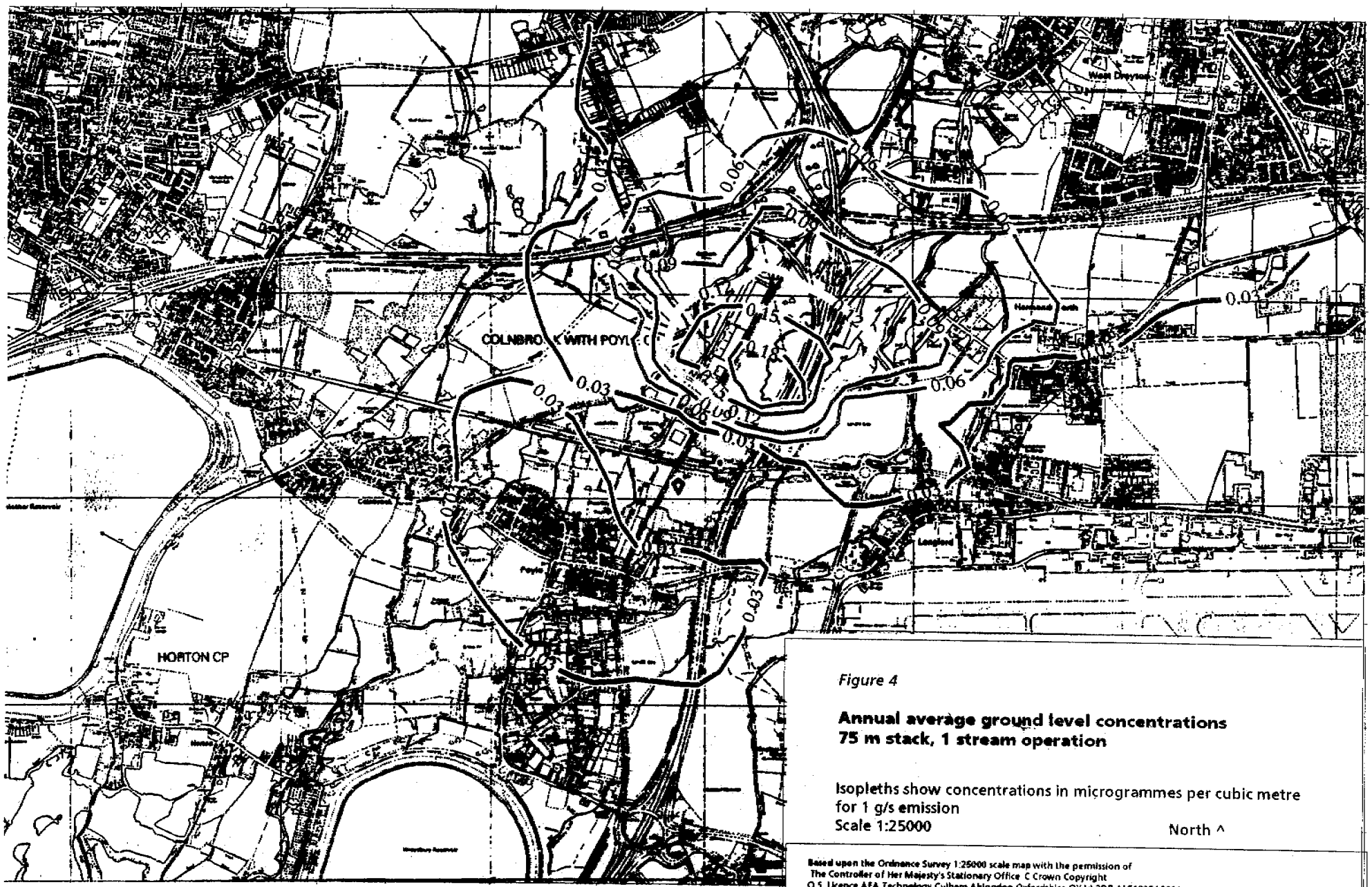


Figure 4

Annual average ground level concentrations
75 m stack, 1 stream operation

Isopleths show concentrations in microgrammes per cubic metre for 1 g/s emission
Scale 1:25000 North ^

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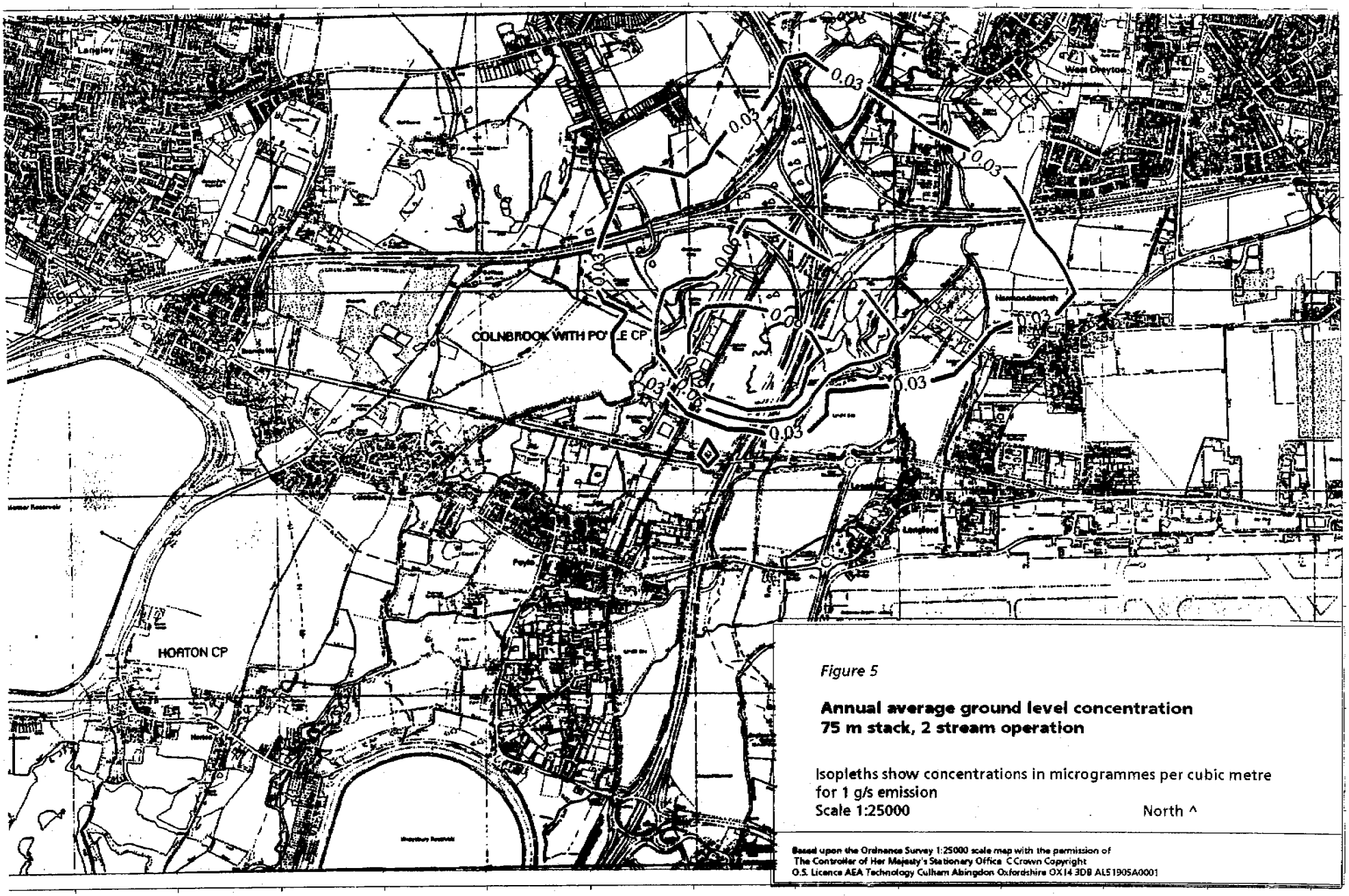

Figure 5

Annual average ground level concentration
75 m stack, 2 stream operation

Isopleths show concentrations in microgrammes per cubic metre for 1 g/s emission
Scale 1:25000 North ^

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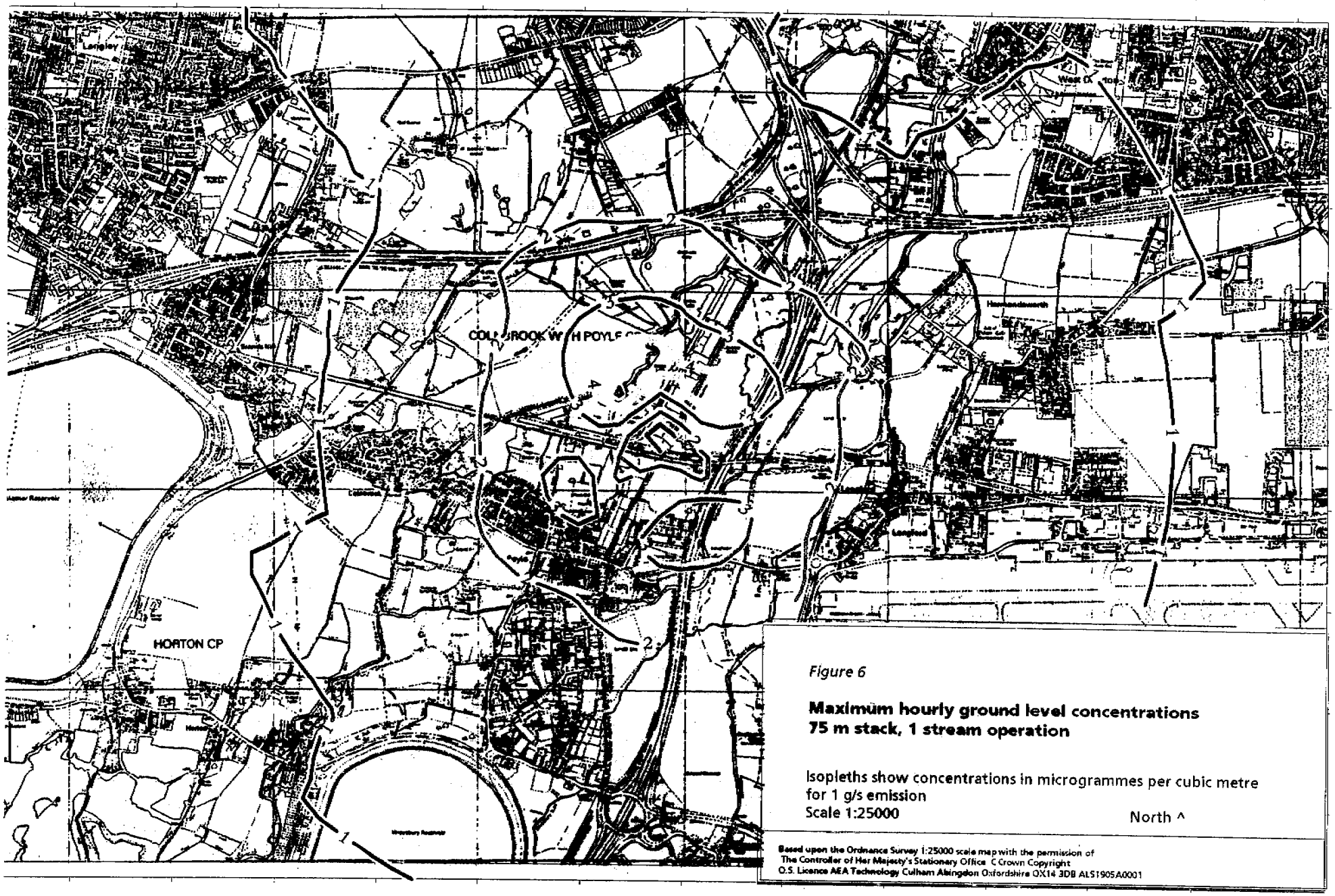

Figure 6

Maximum hourly ground level concentrations
75 m stack, 1 stream operation

Isopleths show concentrations in microgrammes per cubic metre for 1 g/s emission
Scale 1:25000 North ^

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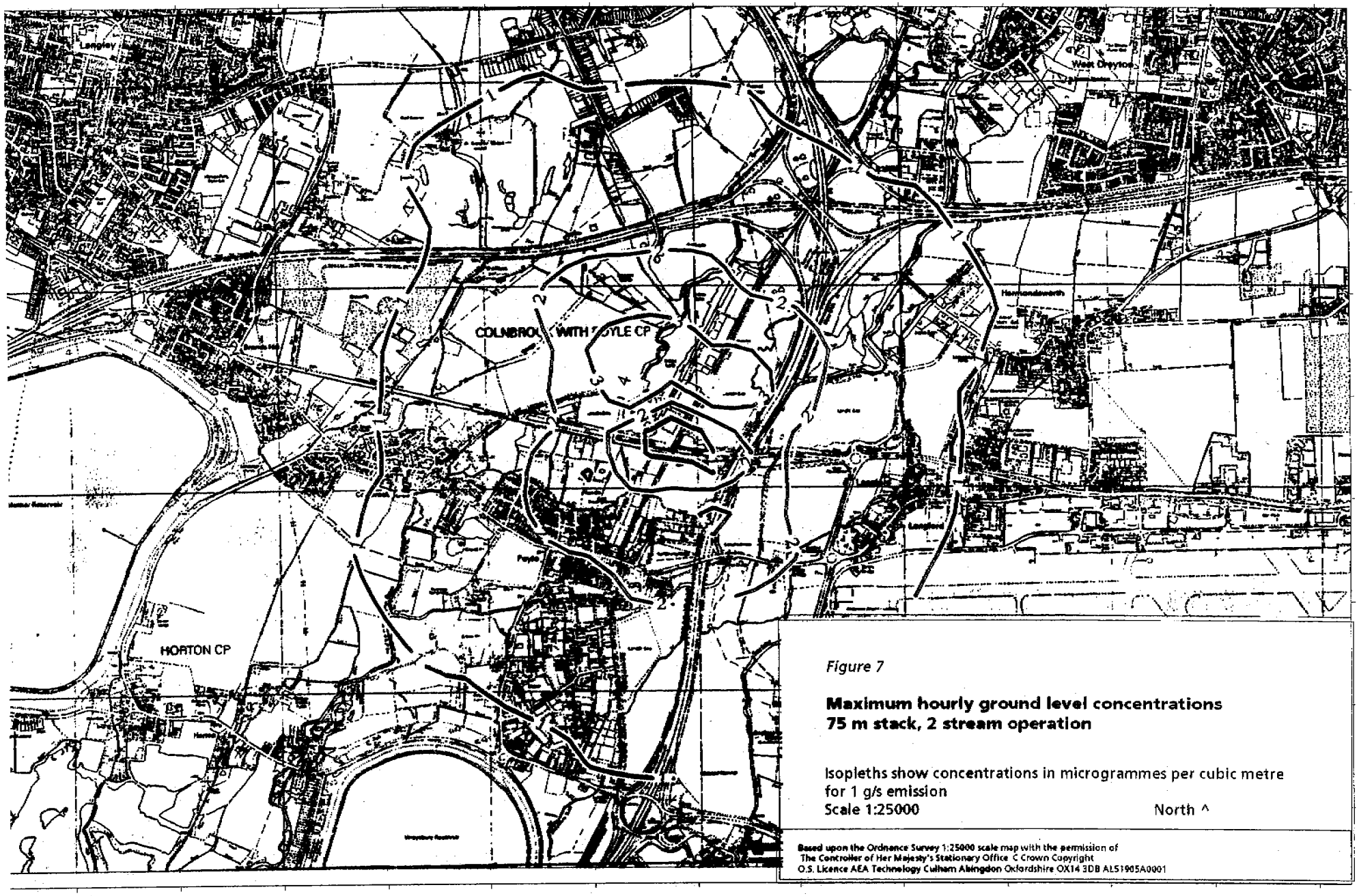

Figure 7

Maximum hourly ground level concentrations
75 m stack, 2 stream operation

Isopleths show concentrations in microgrammes per cubic metre for 1 g/s emission
Scale 1:25000 North ^

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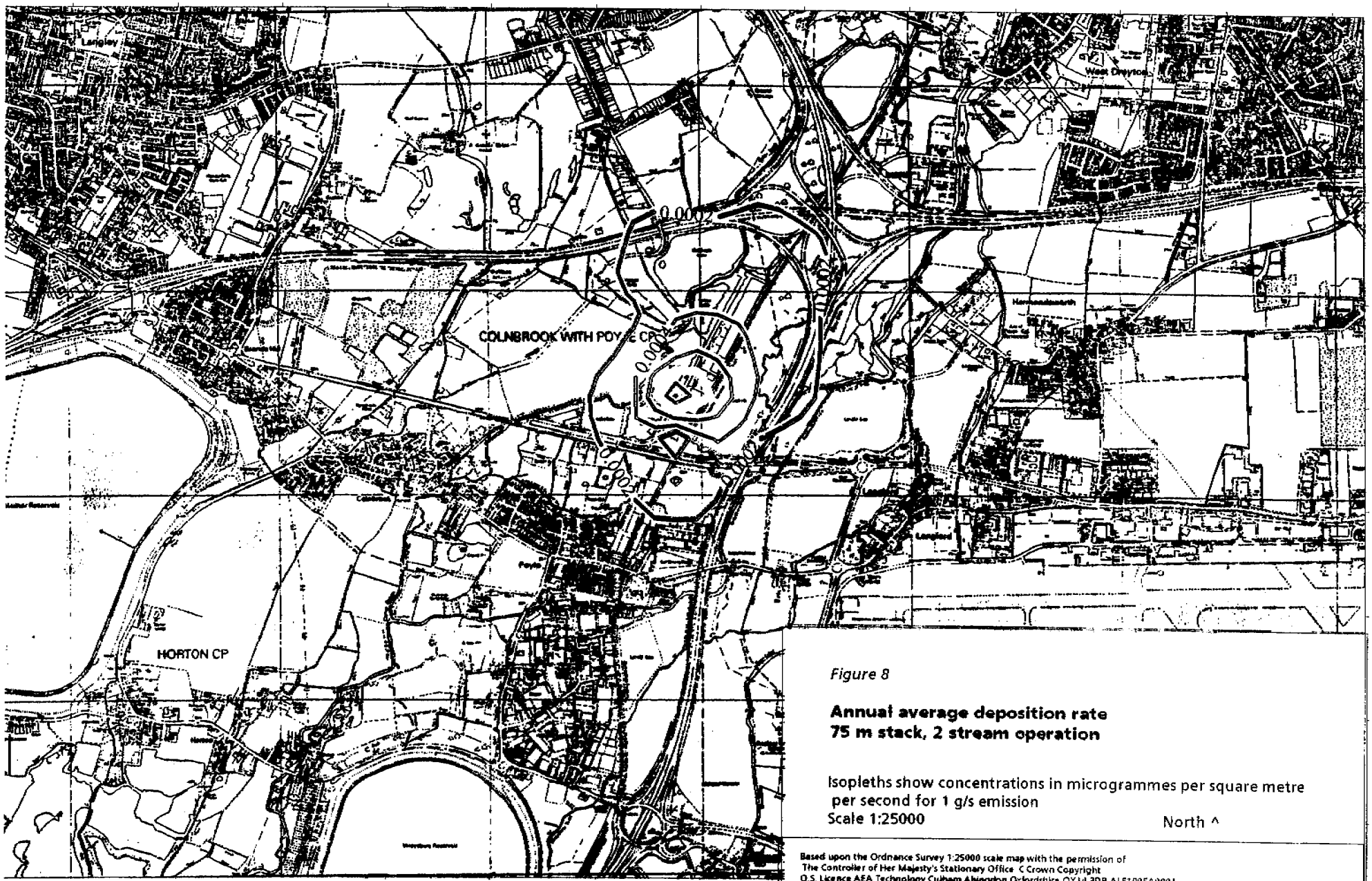

Figure 8

Annual average deposition rate
75 m stack, 2 stream operation

Isopleths show concentrations in microgrammes per square metre per second for 1 g/s emission

Scale 1:25000 North ^

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Appendix 1: Health Risk Assessment Criteria

INTRODUCTION

A1 Health effects from the proposed Waste to Energy facility have been assessed in the Air Quality Impact Assessment by comparison with air quality standards and guidelines. The standards and guidelines referred to are:

- UK National Air Quality Strategy objectives for nitrogen dioxide, carbon monoxide, sulphur dioxide, lead and particulate material, PM_{10};
- WHO Guidelines for Europe;
- Environment Agency Environmental Assessment Levels for releases to air;
- Environment Agency Maximum deposition rates.

A2 This Appendix provides details of the background to the setting of these standards and guidelines.

A3 Health effects from dioxins and furans have been assessed following the method described in the Her Majesty's Inspectorate of Pollution 1996 Report "Risk Assessment of Dioxin Releases from Municipal Waste Incineration Processes". The approach is described in this Appendix.

NATIONAL AIR QUALITY STRATEGY POLLUTANTS

General

A4 The National Air Quality Strategy has adopted a health effects based approach to setting national air quality standards and objectives. The Expert Panel on Air Quality Standards (EPAQS) was set up by the Secretary of State for the Environment in 1991 following the undertaking, in the Environment White Paper 'This Common Inheritance' published in September 1990, to establish an expert panel to advise the Government on air quality standards. The terms of reference of the Panel are:

> 'To advise, as required, on the establishment and application of air quality standards in the United Kingdom, for purposes of developing policy on air pollution control and increasing public knowledge and understanding of air quality, taking account of the best available evidence of the effects of air pollution on human health and the wider environment, and of the progressive development of the air quality monitoring network.'

Nitrogen dioxide

A5 The health effects of nitrogen dioxide have been assessed by EPAQS in four main ways:

- by experimental exposure of volunteers with and without asthma to the gas;
- by assessment of the effects on groups of people of variations in ambient concentrations of nitrogen dioxide, using daily symptoms or lung function measurements;
- by assessing changes in hospital admissions or mortality in a population in relation to changes in ambient concentrations; and
- by comparing the health of groups of people who have had different long-term exposures.

A6 The Panel recommended an Air Quality Standard for nitrogen dioxide in the United Kingdom of 150 ppb measured as an hourly average. The Panel consider that a longer-term Standard is also desirable, but believe that there is as yet insufficient evidence from which to determine an appropriate value. The Panel recommended that this be reconsidered within the next three years and, in the meantime, also recommended a strategy of reduction in the annual average concentration of nitrogen dioxide. As a result of this recommendation to reduce annual average concentrations, the Government adopted the provisional objective of 21 ppb as an annual mean to be achieved by 2005.

Carbon monoxide

A7 EPAQS considered evidence linking carbon monoxide to possible effects on the heart and on the brain, since these two organs are crucially dependent upon a high rate of oxygen consumption and might therefore be affected by any impairment of the mechanisms of oxygen delivery. People at special risk from carbon monoxide, such as those with heart and lung disease, the foetus, the very young and the elderly were given special consideration.

A8 After reviewing the large amount of evidence on the health effects of carbon monoxide, the Panel have concluded that the people most susceptible to exposure to carbon monoxide are those with angina and disease of the coronary arteries. The evidence suggests that the lowest level of carboxyhaemoglobin at which effects can be detected in such people lies between 3 and 4%. The Panel have therefore concluded that ambient atmospheric concentrations of carbon monoxide should be such that the concentration of carboxyhaemoglobin in the blood of people breathing that air over a prolonged period should not exceed 2.5%, thus allowing a safety margin. It is possible to relate blood carboxyhaemoglobin levels to atmospheric concentrations of carbon monoxide by use of mathematical formulae. This relationship shows that carboxyhaemoglobin concentrations would be kept below 2.5% when breathing the following concentrations of carbon monoxide at maximum levels of activity:

10 ppm for 8 hours
25 ppm for 1 hour
50 ppm for 30 minutes
87 ppm for 15 minutes.

A9 It is apparent from the results of air monitoring referred to above that an 8-hour standard provides the tightest control. The Panel therefore recommended an Air Quality Standard for carbon monoxide in the United Kingdom of 10 ppm. In order to ensure that maximum concentrations are not missed by arbitrary averaging periods, the Panel recommended that a running 8-hour average be used for the Standard.

Particulate matter, PM_{10}

A10 EPAQS considered evidence has come from epidemiological studies of populations. Most studies have considered short-term effects on health and these have been of two types: first, analyses of health events, such as patterns of mortality or episodes of hospitalisation, relating these in time to episodes of air pollution, and, secondly, analyses over longer periods of the inter-relations between health events and routinely recorded concentrations of air pollutants.

A11 The Panel recommended an Air Quality Standard for PM_{10} in the United Kingdom of 50 μg/m3 measured as a 24-hour running average. It also recommended that this Standard be reviewed after a period of, at most, five years in the light of any new data. The Panel further recommend that the Government's programme of air pollution controls should aim to ensure that there is a decline in both peak and annual average concentrations of PM_{10}. The Government adopted the value of 50 μg/m3 measured as a 24-hour running average as a provisional objective to be achieved at the 99th percentile (i.e. on all but 4 days per year) by 2005.

Sulphur dioxide

A12 EPAQS considered evidence on the effects on health of the lower concentrations of sulphur dioxide to which we may be exposed in the ambient air. These effects have been studied in a number of different ways, including exposure of volunteers to sulphur dioxide in the air they are breathing and by examination of the effects on members of the population who have been exposed to episodes of atmospheric pollution. Special consideration was given to people with chronic lung disease or asthma.

A13 The Panel recommend an Air Quality Standard for sulphur dioxide in the United Kingdom of 100 ppb, measured over a 15 minute averaging period. The Government adopted as a provisional objective the achievement of this standard at a 99.9th percentile (i.e. on all but 35 periods of 15 minutes) by 2005.

Lead

A14 EPAQS reported that the most substantial evidence of effects of low levels of lead on health relates to effects on the central nervous system and, in particular, on the developing brain of children. EPAQS considered many studies that have investigated the relationships between blood lead (or sometimes tooth lead) in children and IQ.

A15 For the purposes of setting an Air Quality Standard for lead the Panel concluded that the critical health effect is on the intelligence of young children. A Standard which provides adequate protection against impairment of intelligence in children will also prevent the other toxic effects that have been linked with higher exposures.

A16 The Panel recommended a concentration of lead in air of 0.25 μg/m3 as an annual average as an Air Quality Standard at which the Panel considered any effects on health of children to be so small as to be undetectable and at which the vulnerable will be protected.

METALS

General

A17 WHO Air Quality Guidelines have established guideline values for metallic substances emitted from waste incinerators. The Guidelines provide data on the uptake by inhalation, ingestion from water and food and dermal contact where relevant. Available data are indicated on the kinetics and metabolism to assess the magnitude of body burden from long-term low-level exposures and to characterise the mode of toxic action. Data is then presented on the lowest concentrations at which adverse effects are observed in humans, animals and plants. The Guidelines report the consensus reached by scientists on protection factors to be applied to allow for uncertainty in the data, for possibly undetected effects on particularly sensitive members of the population, synergistic effects of multiple exposures and the adequacy of existing data. The Guidelines then provide guideline values based on the assessment. Substances were assessed qualitatively in terms of their carcinogenicity. For potentially carcinogenic substances, methods of quantitative assessment of the average relative risk are presented based on the most reliable human studies. These methods allow the risk associated with a lifetime exposure to 1 μg m-3 of the substances to be calculated. The risk model is assumed to be linear.

A18 Occupational Exposure Limits are published annually by the Health and Safety Executive (EH40). These provide an assessment of the toxicological effects of a pollutant. The Limits are based on an assessment and review of the available evidence relating to the health effects of exposure to heavy metals and public consultation. The available evidence and the basis for setting the limit are presented in summary in EH64 Summary criteria for occupational exposure limits. The HSE lists occupational exposure limits relating to two averaging times depending on the mode of effect- 8 hour time weighted average (TWA) exposure limits and 15 minute reference period Short Term Exposure Limits (STEL). Occupational exposure standards (OES) are set for those substances for which it is possible to identify a no-adverse-effect level. Maximum exposure levels are set for chemicals where there is concern or doubt over the actual no- effect level.

A19 The Environment Agency has published Environmental Assessment Levels (EAL) for releases to air. The main sources of information used for setting EALs are World Health Organisation Guidelines for Europe and Health and Safety Occupational Exposure Limits.

A20 In deriving EALs for long term exposure from occupational limits two factors need to be taken into consideration: the duration of exposure of the general population compared with the work force and the sensitivity of the group at risk. The weekly exposure of the local population could be up to 168 hours per week (7*24 hours) rather than 40 hours (5*8 hours). Exposure of the general population may extend over 52 weeks compared with the average working year of 44 weeks. On this basis the minimum protection factor would be 4.96 (i.e. 168/40*52/44). In addition there may be no recovery period between exposures and exposure could be for a lifetime rather than a working lifetime and so an additional protection factor of 2 has been introduced giving a total protection factor of 10. It is also anticipated that the general population will contain more sensitive individuals, for example, children, the elderly or those with diseases such as asthma. A factor of 10 has been applied to allow for the differences between the population mean and the response of sensitive individuals. Combining the safety factors for exposure and sensitivity gives a long term air quality standard of 1/100 th of the 8 hour occupational exposure

limit. For those substances for which there is some doubt about the no-effects limit and for which MELs are set, an additional factor of 5 is used in deriving long term EALs from 8 hour TWA exposure limits- i.e. the long term EAL is 1/500th of the MEL.

A21 Short term EALs have also been derived from Occupational Exposure Limits. The values are based usually on the short term exposure limits (STELs). Where STELs are not listed then a value of 3 times the 8 hour TWA has been used. Since STELs are by definition appropriate for consideration of short term impacts, there is no need for additional safety factors relating to the duration of exposure. A safety factor of 10 is used to account for the differences in sensitivity and differences in averaging time between the STEL (15 minute) and the short term EAL. Where the substance attracts a maximum exposure limt value then an additional safety factor of 5 may be applied.

A22 The Environment Agency also provides Maximum Deposition Rate limits for deposition of metals (arsenic, cadmium, chromium, cobalt, copper, lead, mercury and nickel) from air onto soil and vegetation. The Maximum Deposition Rate is the quantity of pollutant which can be added to the soil over 50 years before selected soil quality criteria are exceeded. For heavy metals, the limits have been derived principally from soil quality criteria presented in the Department of Environment Code of Practice for Agricultural Use of Sewage Sludge, 1989 or from other expert judgement. The soil quality criteria have been set on the basis of extensive research to maintain the long term viability of agricultural activities and to ensure that animal or human health is not put at risk through the food chain. A full discussion of the scientific basis on which the Code is founded is contained in "Sewage Sludge in Agriculture- Environmental Costs and Benefits". The MDR has been calculated from:

$$MDR = \frac{(SQC - AMB) \times D \times d}{T}$$

where SQC is the soil quality criteria
AMB is the median ambient soil pollutant concentration
d is the mixing depth for the pollutant, 0.075 m
D is the soil density, 1000 kg m-3
T is the evaluation period over which deposition occurs, 50 years

A23 The Environment Agency method suggests the calculation of an Environmental Index (EI) for each substance released such that:

$$EI = \frac{c}{EAL} + \frac{d_r}{MDR}$$

where c is the maximum annual average ground level concentration and EAL is the long term EAL
d_r is the maximum annual average deposition rate and MDR is the maximum deposition rate.

A24 The transfer of heavy metals from atmospheric emission into the human food chain is a complex process. A number of alternative models have been developed that predict the daily dose received by Hypothetically Maximally Exposed Individual. A more complex model has been used elsewhere to assess the potential exposure pathways for human exposure in connection with the development of a proposed incinerator at Chineham,

Hampshire (Integra North Energy Recovery Facility, Air Quality Assessment, October 1998). The model calculates the daily dose received by the Hypothetically Most Exposed Individual as a result of inhalation or ingestion of locally grown food. The exposures arising due to the consumption of food were assessed with reference to the following food groups:

- milk and dairy products;
- eggs;
- beef;
- lamb;
- pork;
- chicken;
- root vegetables;
- leafy vegetables;
- potatoes;
- legumes;
- fruit;
- cereals.

A25 The daily dose received was then compared with reference doses promulgated by the US EPA. The reference dose is an estimate of the daily exposure which appears to present low risk of adverse effects during a lifetime of exposure. The purpose of the reference dose is to provide a benchmark against which other doses may be considered. Doses which are less than the reference dose are not likely to be of concern. Doses which are significantly greater than the reference dose may indicate that inadequate margins of safety could exist for exposure to that chemical. The reference dose is an approximate number, and while doses higher than the reference dose have a higher probability of producing an adverse effect, it should not be inferred that such doses are by definition unacceptable or of concern. A Hazard Quotient was calculated for each of the metals considered by dividing the calculated dose by the reference dose..

A26 Table A1 shows calculated Hazard Quotients presented in the Integra North Air Quality Assessment. Table A1 also shows the predicted maximum annual average ground level concentrations, estimated rates of deposition by wet and dry deposition, EALs, MDRs and Environmental Indices (EI). Comparison of the Hazard Quotient with the Environmental Index, indicates that the Environment Agency method presents the more pessimistic assessment of the incinerator. The Environment Agency method has therefore been used in this assessment because:

- it is more conservative;
- it will be applied by the regulator, the Environment Agency;
- it is simpler and more readily checked by an independent assessor.

Table A1: **Comparison of Hazard Index and Environmental Index, Integra North**

	Concentration, $\mu g\ m^{-3}$	Hazard index	Environmental Assessment Level, $\mu g\ m^{-3}$	Deposition rate, $mg\ m^{-2}\ day^{-1}$	Maximum Deposition Rate, $mg\ m^{-2}\ day^{-1}$	Environmental Index
Lead	$2.01.10^{-4}$	$1.43.10^{-4}$	0.25*	$3.97.10^{-5}$	1.1	0.00084
Chromium	$1.81.10^{-4}$	$1.85.10^{-7}$	5	$3.57.10^{-5}$	1.5	6.10^{-5}
Copper	$2.01.10^{-4}$	$2.29.10^{-5}$	10	$3.97.10^{-5}$	0.25	0.000179
Nickel	$2.01.10^{-4}$	$2.49.10^{-5}$	0.2	$3.97.10^{-5}$	0.11	0.001366
Arsenic	$2.01.10^{-4}$	$8.51.10^{-4}$	0.2	$3.97.10^{-5}$	0.02	0.002989
Cadmium	$1.01.10^{-4}$	$1.14.10^{-4}$	0.005	$1.99.10^{-5}$	0.009	0.022416
Mercury	$2.01.10^{-4}$	$3.94.10^{-3}$	1	$3.97.10^{-5}$	0.004	0.010122
Cobalt	$2.01.10^{-4}$	$3.39.10^{-6}$	0.2	$3.97.10^{-5}$	0.49	0.001086
* EPAQS standard						

Antimony

A27 The health effects resulting from exposure to antimony and its compounds have been reviewed by the Health and Safety Executive. EH64: Summary criteria for occupational exposure limits reviews data on the mechanisms through which antimony and its compounds affect health, health effects data from studies of animals and humans. It considers groups at extra risk and deficiencies in the knowledge base. EH64 advises that the key adverse health effect is carcinogenicity. Although it was not possible to conclude that lung cancer in humans was caused by antimony or its compounds because of limitations in the available data, there remains concern about the carcinogenic potential of antimony and its compounds. It was not possible to identify a level of exposure below which adverse effects would not occur. A maximum exposure limit of 0.5 mg m^{-3} as an 8 hour time weighted average was set for occupational exposure on the basis that it was reasonably practicable for industry to control exposure to that level.

A28 The Environment Agency long term EAL is set at 1% of the occupational exposure limit at 5 $\mu g\ m^{-3}$. A short term EAL of 150 $\mu g\ m^{-3}$ has also been derived from the 8 hour occupational exposure limit by applying a factor of 0.3.

Arsenic

A29 WHO Air Quality Guidelines for Europe review the available data relating to the health effects from exposure to arsenic. It reviews the routes of exposure, the methods of absorption, distribution, biotransformation and elimination in the human body. It considers the effects on animals and humans and evaluates human health risks. Lung cancer is considered to be the critical effect following inhalation. An increased incidence of lung cancer has been seen in several occupational groups exposed to inorganic arsenic compounds. Because arsenic is carcinogenic and there is no known safe threshold, no safe level for arsenic can be recommended. At an air concentration of 1 $\mu g\ m^{-3}$ arsenic , a conservative estimate of lifetime risk is $3.\ 10^{-3}$.

A30 The health effects resulting from exposure to arsenic and its compounds have been reviewed by the Health and Safety Executive. EH64: Summary criteria for occupational exposure limits reviews data on human health effects. The critical health effect is cancer of the respiratory tract. It was not possible to identify a no-adverse-effect level. The maximum exposure limit was set at 0.1 mg m^{-3} as an 8 hour time weighted average, which was well below the exposure level at which raised incidence of respiratory tract cancer has been observed, and below the no-effect level for respiratory tract irritation.

A31 The Environment Agency has set a long term EAL at 1/500 of the occupational exposure limit, at 0.2 µg m^{-3}. A short term EAL of 150 µg m^{-3} has also been derived from the 8 hour occupational exposure limit by applying a factor of 0.06. The Environment Agency also sets a maximum deposition rate for arsenic of 0.02 mg m-2 day-1 based on a value proposed by MAFF to protect consumers against accumulation in agricultural foodstuffs.

Cadmium

A32 WHO Air Quality Guidelines for Europe review the available data relating to the health effects from exposure to cadmium. It reviews the routes of exposure, the methods of absorption, distribution, biotransformation and elimination in the human body. It considers the effects on animals and humans and evaluates human health risks. It was concluded that guidelines for cadmium should be based on the risks for renal accumulation by dietary exposure. WHO recommended that in rural areas present levels of 1-5 ng m-3 should not be allowed to increase. In urban areas without agricultural activities, and in industrialised areas, levels of 10-20 ng m-3 may be tolerated.

A33 The Health and Safety Executive have set a long term 8 hour time weighted average maximum exposure limit of 0.025 mg m-3.

A34 The Environment Agency has set a long term EAL, based on the WHO Guidelines of 5 ng m-3. A short term EAL of 150 µg m^{-3} has also been derived from the 8 hour occupational exposure limit by applying a factor of 0.06.

A35 In order to limit the risks from dietary exposure, the Environment Agency has also set a maximum deposition rate of 0.009 mg m-2 day-1 based on the limits on soil concentrations (3 mg /kg dry matter) shown in The Sludge (Use in Agriculture) Regulations 1989 SI1263 and in the Department of the Environment Code of Practice for Agricultural Use of Sewage Sludge.

Chromium

A36 WHO Air Quality Guidelines for Europe review the available data relating to the health effects from exposure to chromium. It reviews the routes of exposure, the methods of absorption, distribution, biotransformation and elimination in the human body. It considers the effects on animals and humans and evaluates human health risks. Chromium compounds are categorised in classes depending on the potential to form chemical bonds with other substances. The health risks associated with divalent and trivalent chromium differs from that for hexavalent chromium and they are assessed

separately. It was concluded that because hexavalent chromium is carcinogenic and there is no known safe threshold, no safe level for hexavalent chromium can be recommended. At an air concentration of 1 µg m-3 hexavalent chromium , the lifetime risk was estimated to be 4. 10^{-2}.

A37 The health effects resulting from exposure to chromium and its compounds have been reviewed by the Health and Safety Executive. EH64: Summary criteria for occupational exposure limits reviews data on human health effects. The critical health effects from hexavalent chromium compounds were due to their ability to cause ulceration, their sensitising potential and their carcinogenicity. It was not possible to identify a no-effect level. The maximum exposure limit was set at 0.05 mg m^{-3} as an 8 hour time weighted average. No short term limit was set.

A38 The Environment Agency has set a long term EAL at 1/500 of the occupational exposure limit, at 0.1 µg m^{-3}. A short term EAL of 3 µg m^{-3} has also been derived from the 8 hour occupational exposure limit by applying a factor of 0.06.

A39 In order to limit the risks from dietary exposure, the Environment Agency has also set a maximum deposition rate of 1.5 mg m-2 day-1 based on the limits on soil concentrations (400 mg /kg dry matter) shown in the Department of the Environment Code of Practice for Agricultural Use of Sewage Sludge.

Cobalt

A40 The health effects resulting from exposure to cobalt and its compounds have been reviewed by the Health and Safety Executive. EH64: Summary criteria for occupational exposure limits reviews data on human health effects. Cobalt metal, cobalt salts and cobalt naphthenate have been reported to cause allergic dermatitis in various industries. Repeated occupational exposure has resulted in asthma and other lung disease. Despite heavy occupational exposure to cobalt-containing dust in the past, very few cases of cancer have been reported in cancer-exposed workers. Overall from limited information available there was no clear evidence that cobalt metal or its compound is carcinogenic in humans. It was not possible to identify a no- effect level in relation to lung disease. Furthermore in individuals who have been sensitised to cobalt by inhalation, producing an asthma response, reactions may occur at very low exposure levels. The maximum exposure limit was set at 0.1 mg m^{-3} as an 8 hour time weighted average. No short term limit was set.

A41 The Environment Agency has set a long term EAL at 1/500 of the occupational exposure limit, at 0.2 µg m^{-3}. A short term EAL of 6 µg m^{-3} has also been derived from the 8 hour occupational exposure limit by applying a factor of 0.06.

A42 The Environment Agency has set a maximum deposition rate of 0.49 mg m-2 based on Dutch soil quality criteria (Circular on Intervention Values for Soil Remediation, Ministry of Housing, Spatial Planning and Environment, 1994)

Copper

A43 The Health and Safety Executive have set a long term 8 hour time weighted average occupational exposure standard of 1 mg m-3 for copper. A short term exposure limit

(15 minute exposure)of 2 mg m-3. These values are based on the no-adverse-effects of no -effects level. The Environment Agency has derived a long term EAL (10μg m^{-3}) from the 8 hour standard by dividing by 100: the short term EAL (200 μg m^{-3}) has been derived from the occupational exposure standard by dividing by 10.

A44 The Environment Agency has also set a maximum deposition rate of 0.25 mg m-2 day-1 based on the limits on soil concentrations (80 mg /kg dry matter) shown in The Sludge (Use in Agriculture) Regulations 1989 SI1263 and in the Department of the Environment Code of Practice for Agricultural Use of Sewage Sludge.

Manganese

A45 WHO Air Quality Guidelines for Europe review the available data relating to the health effects from exposure to mercury. It reviews the routes of exposure, the methods of absorption, distribution, biotransformation and elimination in the human body. It considers the effects on animals and humans and evaluates human health risks. The effects on the central nervous system and the lungs were regarded as the most significant. Available data from epidemiological studies suggest that the lowest-observed-adverse-effect concentration of manganese is about 7 μg m^{-3}. An annual average of 1 μg m^{-3} was recommended as a guideline value. This value incorporates a sufficient margin of protection for the most sensitive population group. The Environment Agency has adopted the guideline value as a long term EAL.

Mercury

A46 WHO Air Quality Guidelines for Europe review the available data relating to the health effects from exposure to mercury. It reviews the routes of exposure, the methods of absorption, distribution, biotransformation and elimination in the human body. It considers the effects on animals and humans and evaluates human health risks. The toxic effects of mercury and its compounds depend on the chemical form of mercury. The main forms are elemental mercury vapour, inorganic divalent mercury compounds and methyl mercury compounds. A guideline for human inhalation of mercury value of 1 μg m^{-3} was recommended, irrespective of the form of mercury in the air. However, this value was considered to be probably far above an acceptable level if postdeposition effects (i.e. increase in methyl mercury compounds in the diet) were taken into account.

A47 The health effects resulting from exposure to mercury and its compounds have been reviewed by the Health and Safety Executive. EH64: Summary criteria for occupational exposure limits reviews data on human health effects. The effects of principal concern were central nervous system and kidney damage. The available animal data on the effects of repeated inhalation of elemental mercury vapour indicate a no-adverse-effects level of about 0.1-0.2 mg m-3. An occupational exposure standard was set at 0.025 mg m-3 as an 8 hour time weighted average to allow for interspecies variability and inadequacies in the database.

A48 The Environment Agency has adopted the WHO guideline of 1 μg m^{-3} as a long term EAL. It has also set a maximum deposition rate of 0.004 mg m-2 day-1, based on the

limits on soil concentrations (1 mg /kg dry matter) shown in The Sludge (Use in Agriculture) Regulations 1989 SI1263 in order to ensure that animal or human health is not put at risk through the food chain.

Nickel

A49 WHO Air Quality Guidelines for Europe review the available data relating to the health effects from exposure to nickel. It reviews the routes of exposure, the methods of absorption, distribution, biotransformation and elimination in the human body. It considers the effects on animals and humans and evaluates human health risks. The key criterion for the assessment of nickel is its carcinogenic potential. Because of its carcinogenic properties, no safe level can be recommended for nickel. At an air concentration of 1 $\mu g\ m^{-3}$, a conservative estimate of the lifetime risk is $4 . 10^{-4}$.

A50 The health effects resulting from exposure to nickel and its compounds have been reviewed by the Health and Safety Executive. EH64: Summary criteria for occupational exposure limits reviews data on human health effects. The critical effects are sensitisation and cancer. Maximum exposure limits of 0.5 mg m-3 and 0.1 mg m-3 as long term 8 hour time weighted averages were set for insoluble and soluble inorganic nickel compounds respectively.

A51 The Environment Agency has derived a long term EAL (0.2 $\mu g\ m^{-3}$) from the soluble 8 hour standard by dividing by 500: the short term EAL (6 $\mu g\ m^{-3}$) has been derived from the occupational exposure standard by applying a factor of 0.06. It has also set a maximum deposition rate of 0.11 mg m-2 day-1, based on the limits on soil concentrations (50 mg /kg dry matter) shown in The Sludge (Use in Agriculture) Regulations 1989 SI1263 in order to ensure that animal or human health is not put at risk through the food chain.

Vanadium

A52 WHO Air Quality Guidelines for Europe review the available data relating to the health effects from exposure to vanadium. It reviews the routes of exposure, the methods of absorption, distribution, biotransformation and elimination in the human body. It considers the effects on animals and humans and evaluates human health risks. The acute and chronic effects of vanadium exposure on the respiratory system were regarded as the most significant effects. Available data from occupational studies suggested that the lowest-observed-adverse-effect level of vanadium was 20 $\mu g\ m^{-3}$, based on chronic upper respiratory tract symptoms. A guideline level of 1 $\mu g\ m^{-3}$ was suggested as a 24 hour average.

A53 The Environment Agency has set a short term EAL of 1 $\mu g\ m^{-3}$ with a 1 hour averaging time. The reduced averaging time increases the stringency of the limit.

DIOXINS

A54 Dioxins are carcinogenic and are taken up by man largely by ingestion with food and water. The World Health Organisation has recommended a Tolerable Daily Intake (TDI)

of 1-4 pg kg^{-1} body weight per day: however, almost all individuals in the UK presently exceed the lower value. Typical exposure of the UK population in 1992 is around 2.4 pg kg^{-1} body weight per day (MAFF 1997). The UK's Committee on the Toxicity of Chemicals in Food, Consumer Products and the Environment recommended the adoption of a tolerable daily intake for PCDDs and PCDFs of 10 pg kg^{-1} body weight per day.

A55 PCDDs and PCDFs released from the chimney will be dispersed in the atmosphere and this process was modelled to predict the maximum ground level concentration. At ground level the PCDDs and PCDFs will then impact on other environmental media such as air, soil and surface water in both the local river system and reservoirs. From the various environmental media, uptake will occur into the local ecosystem and so finally to foodstuffs which are consumed by humans. The exposure routes assessed included intake of soil, water, and food (including breast milk) and inhalation. As PCDD and PCDF effects are thought to be long term in consequence annual average values of concentration were used. The methodology calculated the soil concentration resulting from deposition at the point of greatest annual average PCDD and PCDF concentration. The concentrations in vegetation both above and below ground arising from the soil and deposition were then calculated. The intake of fodder crops into animals were then assessed to estimate the animal tissue and milk concentrations. The human exposure resulting from the operation of the plant was then calculated for several different human types; infants, children in several age categories, non-farming adults and farmers. The calculated exposure was then compared with the TDI.

A56 The exposure assumptions and study methodology followed that given in HMIP 1996. Site specific assumptions were made as follows; an average rainfall of 600 mm per year, an average annual temperature of 10°C, the area of water bodies for deposition to occur to was taken as 11,400,000 m^2, the area of the River Colne watershed was taken as 1018 km^2. The long term (1952 to 1999) annual mean flow in the river has been measured by the Environment Agency as 3.97 m^3 per second. As the incinerator is not yet operating a default profile of the 17 congeners of concern was taken from HMIP 1996. Assumptions were also made about the average dietary behaviour based on the Ministry of Agriculture Fisheries and Food's Total Diet Study. Clearly the population as a whole contains a range of dietary behaviours. Other assumptions were made about the behaviour of people exposed to the emissions. These assumptions made were designed to ensure that under prediction of the exposure did not occur. In consequence the results will tend to provide an upper bound of the possible exposure arising from the operation of the plant.

OTHER SUBSTANCES

Hydrogen chloride

A57 The health effects resulting from exposure to hydrogen chloride have been reviewed by the Health and Safety Executive. EH64: Summary criteria for occupational exposure limits reviews data on human health effects. The critical health effect is irritation which is experienced immediately upon exposure; 5 ppm was irritating and 10 ppm was described as a maximum acceptable concentration for prolonged exposure. A short

term occupational exposure standard (15 minute reference period) of 5 ppm (7.45 mg m-3) was set to control primary irritant effects.

A58 The Environment Agency has derived a short term EAL (700 μg m^{-3}) from the occupational exposure standard by dividing by 10 (approximately).

Hydrogen fluoride

A59 The health effects resulting from exposure to hydrogen fluoride have been reviewed by the Health and Safety Executive. EH64: Summary criteria for occupational exposure limits reviews data on human health effects. The critical health effect is irritation with a no-effect level reported at 3 ppm. A short term occupational exposure standard was set at 3 ppm (2.46 mg m-3) to prevent significant irritation and minimise the occurrence of flourishes.

A60 The Environment Agency has derived a short term EAL (250 μg m^{-3}) from the occupational exposure standard by dividing by 10 (approximately).

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Non-Technical Summary

1.1 This non-technical summary of the Geology, Soils and Contamination Technical Background report relates to proposals for the development by S Grundon (Waste) Ltd of a new Energy from Waste (EfW) Facility comprising an EfW plant, Materials Recovery Facility (MRF) and Clinical Waste Incineration Plant (CWI). Colnbrook.

1.2 The Geology, Soils and Contamination Technical Background report has been compiled by EAG ENVIRON. The report has drawn upon information provided by Grundon on the details and specification of the proposed development.

1.3 The technical background report considers the environmental impacts of the proposals on land contamination issues, taking into account the characteristics of the underlying soils and environment and historic and current activities at both the site and in the surrounding area.

1.4 The site covers an area of 2.7 hectares and the nearest residential properties are located 350m from the site in Poyle.

1.5 The site was formerly used for gravel extraction and the construction of pre-cast concrete units. The gravel pits created on the site during gravel extraction works were infilled prior to the development of the current waste facility on the site.

1.6 The potential impacts of this scheme, in terms of ground contamination, relate primarily to construction work as this will involve the excavation of substantial quantities of earth from the site.

1.7 In order to determine the nature of this material, a limited soil and groundwater investigation was carried out at the site.

1.8 Gas monitoring was subsequently undertaken to determine whether landfill gas was being generated at the site and to determine whether landfill gas generated in nearby landfills was migrating onto the site.

1.9 None of the soil samples contained elevated concentrations of the contaminants tested, suggesting that material used to infill the former gravel pits on the site was in the main uncontaminated.

1.10 On the basis of these results, it is expected that contaminated soil is

unlikely to be encountered during the construction works.

1.11 None of the groundwater samples contained significantly elevated concentrations of the contaminants tested indicating that the groundwater beneath the site is not contaminated.

1.12 The groundwater results also indicate that landfills in the vicinity of the site do not significantly influence groundwater quality, which appears to be good.

1.13 The subsequent gas monitoring results indicate that the site is not affected by landfill gas. There, furthermore, is no evidence to suggest that landfill gas generated by surrounding landfills is migrating onto the site.

1.14 Therefore, there are not expected to be any significant impacts on groundwater quality and resources resulting from construction works at the site.

1.15 However, the potential for the presence of pockets of contamination derived from historical activities on the site being found in areas not covered by the site investigation cannot be discounted at this time.

1.16 In the unlikely event that ground contamination is encountered at the site, appropriate remediation action will be taken in line with the relevant guidelines and current practices.

1.14 In conclusion, on the basis of the information contained in this report, the proposed development does not present any particular problems of ground conditions that cannot be managed.

1.0 INTRODUCTION

THE LAKESIDE ENERGY FROM WASTE FACILITY, COLNBROOK ENVIRONMENTAL STATEMENT

1.1 This document is the Geology, Soils and Contamination Technical Background report which supports the Environmental Statement for the Lakeside Energy from Waste Facility, Colnbrook. The Environmental Statement comprises the following documents:

- A Non-Technical Summary;
- A Main Report, which describes the project, identifies the potentially significant effects and sets out a range of measures for the mitigation of significant adverse effects, addressing components developed subsequent to the conclusion of the main EA process; and
- Technical Background Reports.

1.2 The ES is supported by 7 Technical Background reports, each of which addresses a particular environmental topic and has been prepared by specialists in the relevant field. The Technical Background reports cover the following topics:

- Landscape and Visual Impacts;
- Ecology;
- Water Environment;
- Air Quality;
- Traffic;
- Noise and Vibration; and
- Geology, Soils and Contamination.

PURPOSE OF THIS REPORT

1.3 This report assesses the presence and nature of ground contaminants (including groundwater) on site and immediate surrounds, and the potential risks to the environment and human health from construction activities and operation of the site in view of the proposals. The impacts of ground contamination have the potential to affect a variety of receptors, including surface and groundwater resources, air quality, ecology and site workers. The report specifically identifies:

- contaminants which may affect building materials and could cause constraints to engineering works;
- hazardous components of soils and other materials, which will have to be removed from the site during construction to other disposal facilities;
- risks to on and off-site receptors as a result of contaminants being released or disturbed during construction; and
- the potential for build up of soil gases.

1.4 The significant implications of ground contamination are limited, since the proposals do not involve substantive changes in land use at the site.

STRUCTURE OF THIS REPORT

1.5 The remainder of this report is laid out as follows:

- Section 2 Approach and Methodology;
- Section 3 A brief description of the Project;
- Section 4 Baseline Environment;
- Section 5 Site Specific Effects; and
- Section 6 Mitigation.

2.0 APPROACH AND METHODOLOGY

INTRODUCTION

2.1 This section describes the scope and methodology adopted in the assessment of effects related to geology, soils and contamination due to the disturbance of potentially contaminated land.

SPATIAL AND TEMPORAL SCOPE

Spatial scope

2.2 Geology, soils and contamination effects are assessed with regard to the following areas:

- land to be occupied by permanent infrastructure (including the Tanhouse Farm Construction Site and the Visitor and Environmental Interpretation Centre):
- construction sites and any land likely to be disturbed during construction; and
- areas within 250 metres of the above. This radius represents the consultation zone, within which planning conditions for landfill gas investigation and design precautions are often imposed.

Temporal scope

2.3 Geology, soils and contamination effects are assessed in relation to the construction phase only. The operational phase of the development is not expected to have any significant implications for geology, soils and contamination due to the nature of the development, with the possible exception of the effects of potential contaminants (if present) on building materials. It should be noted, however, that impacts occurring during construction could

result in long-term effects, which may appear during operation, due to delay in the movement of contaminants and landfill gas along migration pathways. Where appropriate this has been assessed.

SOURCES OF IMPACTS

Construction phase

2.4 During the construction phase, the main impacts of the project will be associated with the excavation works, including that for the main refuse storage bunker. Such impacts could include:

- health and safety of the workforce;
- implications of taking the spoil offsite;
- alteration of groundwater flows and the effects on migration of pollutants (to be dealt with in the background Report to the Environmental Statement by EAG ENVIRON on the Water Environment (July 1999)).

Operational phase

2.5 During operation of the EfW Facility, impacts could include the alteration of groundwater flows, due to underground structures, and the potential accumulation of atmospheric pollutants by deposition. These aspects are addressed in the background reports to the Environmental Statement by EAG ENVIRON on the Water Environment (July 1999) and the Air Quality Impact Assessment by AEA Technology (August 1999).

ASSUMPTIONS AND LIMITATIONS

2.6 The assessment is based on the following assumptions:

- that the current design of the site will not significantly change;
- that impacts of the proposed LIFE (London International Freight Exchange) scheme and other schemes (see Section 3.19), are as identified in the background report to the Environmental Statement by EAG ENVIRON on the Water Environment (July 1999)); and
- that current baseline information is as identified.

2.7 Potentially contaminative land uses, which may have existed between the dates of OS surveys, may not be shown on historic maps.

ESTABLISHMENT OF BASELINE AND SOURCES OF INFORMATION

2.8 Baseline conditions are assumed to be those prevailing at the commencement of construction. The approach to the establishment of baseline conditions comprised a review of the following:

- published data (e.g. Terminal 5 Reports) and publicly available data (e.g. from the Environment Agency (EA));
- data obtained from RPS plc, the team carrying out the EA of the LIFE scheme; and
- data collected during the site investigation as part of the current study.

2.9 The main sources of information are as follows:

- Ordnance Survey (OS) and National Grid maps at 1:10,000, 1:10,560, 1:2500 and 1:1250, from earliest available editions;
- hydrological and hydrogeological information collected from published sources such as the British Geological Survey (BGS) and the EA;
- records of waste disposal licences using the Aspinwall & Co SITEFILE 1996 Edition and from information held by the EA; and
- IPC Authorisations for the site.

2.10 Fieldwork gathered data relating to:

- site character and site use and neighbouring uses and surroundings;
- presence of any surface water bodies or services; and
- samples of soils, groundwater and landfill gas (i.e. carbon dioxide and methane) samples taken at the site during site investigation works.

PREDICTION METHODS

Introduction

2.11 A qualitative risk assessment has been carried out on baseline conditions of geology, soils and contamination using the following conceptual source-pathway-receptor model:

- Resource/Receptor : potentially affected resources or receptors are identified;
- Hazard Identification : the contaminant source is characterised in terms of the nature of the hazard;
- Exposure Assessment : the exposure pathway is characterised; and
- Risk Characterisation to the Resource/Receptor: an assessment of the potential significance of the risk to the resource/receptor is carried out.

The assessment assesses the nature of the underlying geology and soils at the site and the risk of contamination to identified resources/receptors.

2.12 The potential risks have been characterised as potentially significant, not significant or no effect. The potential risks to resources and receptor groups have been characterised on the basis of a combination of the impact category and likely degree of contamination (low, moderate or high). The potential scale of risk resulting from each contaminant, prior to mitigation, has been characterised as significant or non-significant.

HAZARD IDENTIFICATION

2.13 The principal contaminant groups posing specific hazards to human health and the environment are categorised. These categories include heavy metals (whether of concern for human, animal or plant health), volatile, semi-volatile and water soluble organic pollutants, inorganic non-metallic contaminants, asbestos, radiation, pathogens, gases, combustible or explosive substances.

Exposure assessment pathways

2.14 Three categories of pathway are defined as follows:

- Direct — Where there is direct contact between contaminant and resource/receptor and there is thus no dilution of the contaminant on contact with the receptor;
- Indirect — Where a contaminant must travel through another media (such as air or a permeable soil matrix) to reach the resource receptor and therefore some dilution of the contaminant would occur before reaching the receptor; and
- None — Where natural barriers remain in place which would effectively prevent contact between contaminant and resource/receptor.

EVALUATION CRITERIA

2.15 To assess the analytical data generated by the investigation, the results are compared with a number of guidelines, as follows:

- the UK Department of the Environment ICRCL (Interdepartmental Committee for the Redevelopment of Contaminated Land) guidelines (1983, 2nd Edition);
- the Dutch Ministry of Housing, Spatial Planning and the Environment guidelines for soil and groundwater contamination (Soil Protection Act 1994);
- Landfill Gas criteria detailed in Waste Management Paper No. 27 (Department of the Environment 1991) Landfill Gas: A technical memorandum on the monitoring and control of landfill gas; and
- the Building Regulations 1991, Approved Document C.

3.0 THE PROJECT

GENERAL FEATURES

3.1 The project comprises the construction of a new Energy from Waste (EfW) facility capable of processing approximately 440,000 tonnes per annum of municipal solid waste (MSW), commercial and industrial waste. An integral materials recovery facility (MRF) will process mixed recyclable waste. Energy will be recovered from the waste incineration process. A new clinical waste incinerator (CWI) plant facility will be developed to provide updated facilities to treat the range of wastes currently processed at the company's existing plant.

3.2 The proposed facilities will be located on a 2.7 hectare site, owned by Grundon, within the Lakeside Industrial Estate. The site is currently occupied by a clinical waste incinerator, a Materials Reclamation Facility (MRF), the company's administrative offices, a transport depot and vehicle parking areas (see Figure 3.1 for existing site layout). The site is adjacent to the Colnbrook Branch Line, and to the south west of the M4/M25 Interchange. The site is approximately 5.5 km south east of Slough and 1 km to the north west of Heathrow airport.

3.3 The proposed EfW facility will incorporate two incineration streams and a single turbine connected to a generator of approximately 30MW capacity, producing electricity at 11kV. The generator will be connected to the national Grid via a transformer and an underground cable (see Figure 3.2).

3.4 A single stack (approximately 75m in height), housing four flues, will serve both the EfW and CWI plants. The main building housing both the EfW and MRF plants will be 42 m high. The building form will be curved metallic shell, designed to minimise the risk of wind vortex formation towards the airport.

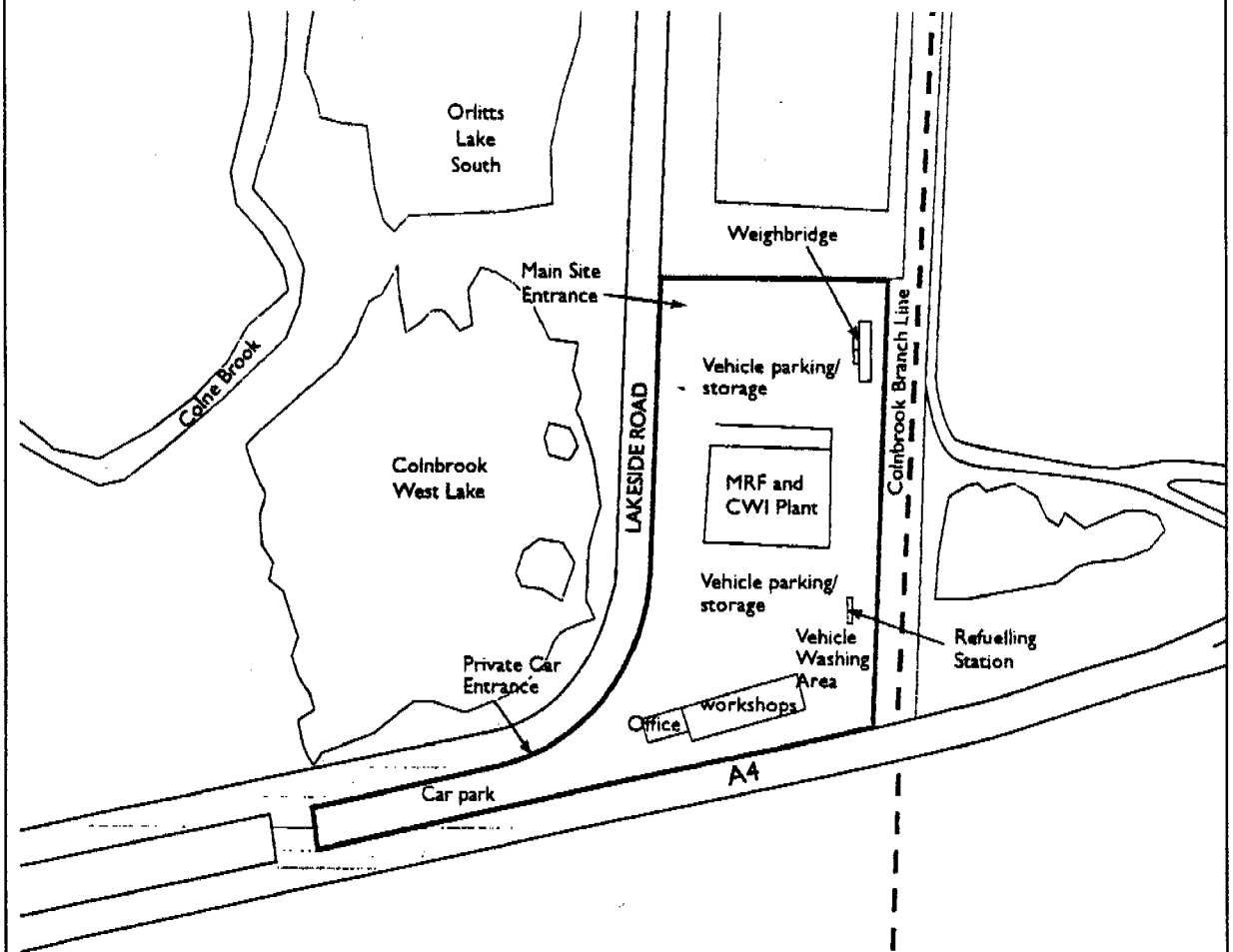
3.5 Waste for processing by the EfW will be stored in a main refuse storage bunker within an enclosed tipping hall with dimensions of about 68 m by 23.5m. The enclosed tipping hall will contain 11 tipping bays for the direct reception of waste into the storage bunker. The storage bunker will be of concrete construction and have the capacity to store refuse equivalent to 4.9 days burn at the full load rate of about 54 tonnes per hour.

Figure 3.1
Existing Site Layout

Scale: Diagrammatic; Not to Scale

NORTH

Source: Grundon



Key:

1. Advanced moving grate
2. Clinical waste incinerator plant
3. Tipping Hall over MRF
4. Bunker
5. Boilers
6. Baghouse filters
7. Stack
8. Lime silo
9. Lime deliveries
10. Fly ash collection
11. Grate ash Collection
12. Wastewater treatment
13. Water treatment
14. Condensers
15. Steam turbines
16. Transformers
17. Rail loading facility
18. Staff/visitor parking
19. Car park
20. Weighbridge
21. Gatehouse
22. Existing offices
23. Existing car park
24. Ramp
25. Control room
26. Workshops

Figure 3.2
Proposed EfW Facility Site Layout

Scale: Not to Scale

NORTH

Based upon the Ordnance Survey 1:10 000 scale map with the permission of The Controller of Her Majesty's Stationery Office Crown Copyright
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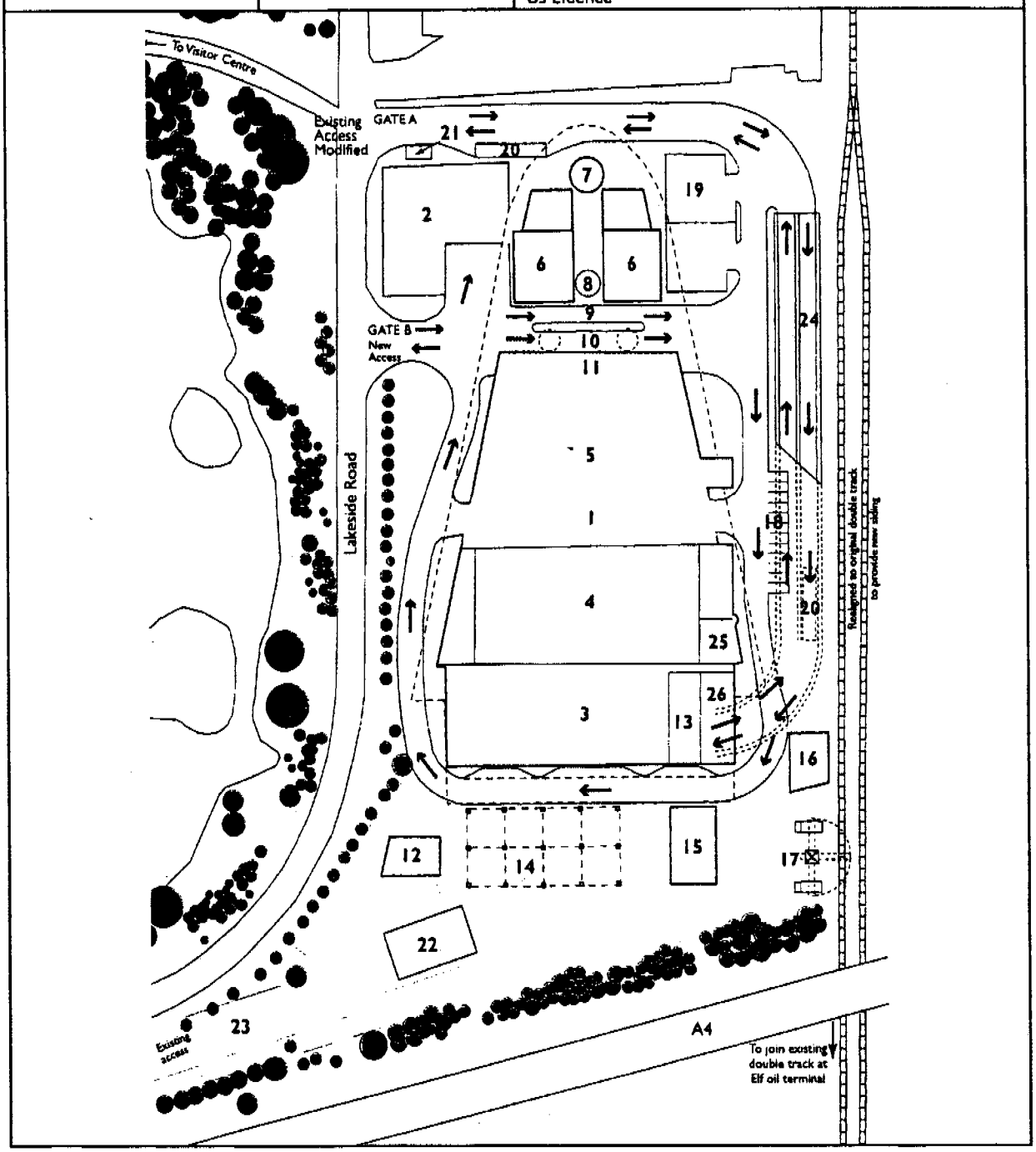


3.6 An abatement plant will be fitted to control NOx emissions, involving flue gas re-circulation and selective non-catalytic NOx reduction. Acid gases, including hydrogen fluoride, hydrogen chloride and sulphur dioxide, will be neutralised by a semi-dry lime injection system within the scrubber vessel. Water will be evaporated and any dry residues collected at the flue-gas scrubbing vessel outlet. An activated carbon injection system will be used to control emissions of mercury, other heavy metals and polychlorinated dibenzodioxins and dibenzo furans (PCDDs and PCDFs). A baghouse filter will be used to control emissions of particulate matter.

3.7 The residues from air pollution control equipment and furnace bottom ash will be the main solid residues generated by the EfW process. Approximately 16,000 kg of furnace bottom ash will be produced per hour at full load. The furnace bottom ash will be quenched to cool the ash and reduce dust emissions. Following sorting and magnetic separation, the ash will be stored in a pit with capacity for arisings generated over four days plant operation at full load.

3.8 The MRF facility will process mixed recyclable materials from commercial and industrial premises together with pre-sorted recyclables from household waste collection (MRW). The main functions of the MRF will be to segregate MRW into different homogenous waste streams, and to segregate recyclable paper, cardboard and plastics.

3.9 The new CWI plant is expected to have an incineration capacity of 17,000 tonnes per annum, based on a total facility throughput of 2 tonnes per hour. The facility will process the same range of wastes as is currently authorised for the existing plant.

3.10 The project also includes a small Visitor and Environmental Interpretation Centre to be located on Orlitts Lake, and a construction compound to be located at the Tanhouse Farm landfill site.

UNDERGROUND STRUCTURES

3.11 The proposed project will incorporate a number of significant underground structures that will be of relevance in relation to excavation of soil at the site and the implications of potential changes to groundwater regime during operation. These will include:

- the Main Storage Bunker, which will have approximate dimensions of 54m x 18m x 12 m depth, giving a total volume of about 11,700 m3;
- the lower level of the MRF will have approximate dimensions of 54m x 26m x 5 m depth, giving a total volume of about 7,000 m3;
- the Grate Ash pit, which will have approximate dimensions of 20m x 9m x 7 m depth, giving a total volume of about 1,300 m3; and,
- the Chimney base, which will have approximate dimensions of 8m x 8m x 7 m depth, giving a total volume of about 450 m3.

3.12 Other underground structures relating to foundation bases or underground storage tanks have not been defined at this stage, but would be expected to be of small dimensions relative to those major structures described above. Soakaway chambers will be provided and are expected to be of 5m radius, and will be located in the gravel underlying the site. These will accept all surface water drainage from the site.

3.13 The current intention is that sheet piling will be used to form cofferdams for the construction of the main underground structures. It is understood that the sheet pile walls will be used to provide support for the concrete lining for walls of the structures. Groundwater seepage would be collected and pumped out of the excavations. The resulting dewatering effluent will be treated to remove suspended matter and oil, prior to discharge (probably back to ground).

CONSTRUCTION AT TANHOUSE FARM LANDFILL

3.14 Apart from the main site, the Tanhouse Farm landfill will be used as a construction lay-down area. Preparation of the site for this use will require an extra 500mm layer of clay capping, plus concrete hard-standing over the entire area (190x150m = 2.85 ha). The site will be drained to soakaway via oil interceptors, and will also be provided with perimeter drains.

THE VISITOR AND ENVIRONMENTAL INTERPRETATION FACILITY

3.15 The visitor centre will be located on a concrete caisson of 6m radius, which is to be located within Orlitt's Lake. Access to the visitor centre will be via a draw-bridge from the tongue of land between Orlitt's Lake and West Colnbrook. Car parking will be provided for 20 vehicles, and a new access road (*circa* 100m long) will be constructed from Lakeside Road.

SPOIL USE AND DRAINAGE

3.16 Any spoil excavated on sire during development will be screened and re-used wherever feasible.

3.17 Domestic sewage will be conveyed to a biological treatment plant, as at present, with the treated effluent discharged to groundwater *via* a soakaway.

3.18 Surface water drainage will be segregated between clean – roofs and landscaped areas – and potentially contaminated drains, dealing with roads and chemicals storage areas.

OTHER SIGNIFICANT PROPOSALS IN VICINITY OF THE PROPOSED EFW PLANT

3.19 In considering the current proposals, some consideration of the potential impact of other existing planned projects is required. The main proposals of relevance to the current scheme, in relation to cumulative impacts are:

- the proposed British Airports Authority (BAA) Logistics Centre for Heathrow Terminal 5 (T5), which will occupy land immediately east of the EfW plant site between the Poyle freight railway line and the M25, and is intended for materials storage related to the construction of T5;
- the proposal to construct a sludge de-watering centre to the north west of the site at Iver South Sewage Treatment Works, which will be required due to the T5 proposals;
- the London International Freight Exchange (LIFE) proposals for a major new rail freight interchange on land to the west of the site and on the T5 Logistics Centre site once T5 has been completed.

3.20 None of the above proposals are likely to have significant impacts on Land Contamination.

4.0 BASELINE ENVIRONMENT

INTRODUCTION

4.1 Information on geology, soils and contamination was obtained from the following sources:

- Historical map records held at the British Library;
- Slough Borough Council, which holds records of unlicensed landfills;
- Environment Agency, which holds records of licensed abstractions and general information on the hydrogeology of the area, as well as details of licensed landfills;
- Reports produced for Thames Water Utilities Ltd. and the former Thames Water Authority on groundwater regime and resources in the Colne Valley;
- British Geological Survey (BGS) geological maps; and,
- Analytical soil and groundwater results obtained during an intrusive site investigation at the existing Grundon facility.

HISTORICAL MAP RECORDS

4.2 The historical and present uses of the site are reviewed by reference to historical maps, related archive material and discussions with on-site personnel. Tables 4.1 – 4.3 summarise these results and indicates former activities at these sites and in the surrounding area. Particular reference is made to the potential for past uses to have caused contamination. Selected historical maps are given in Figures 4.1-4.4.

Table 4.1: Summary of History of the existing Grundon facility

Map Reviewed	Date	Site Use	Surrounding Use
Buckinghamshire First Edition 25"	1875	The site was undeveloped (i.e. in greenfield use). A small drainage channel, aligned north-south, was present on the south western area of the site, joining the Colne Brook some 175m north west of the site.	The site was surrounded by land in greenfield use.
Buckinghamshire Second Edition 25"	1899	The site remained unchanged.	The Great Western Railway (Staines Branch) had been developed, aligned north east – south west, to form the eastern site boundary
1:10,560	1900	The site remained unchanged.	No significant changes.
1:10,560	1912	The site remained unchanged.	The A4 Colnbrook by-pass formed the southern site boundary at this time. A gravel pit had been excavated 550m east of the site.
1:10,560	1920/ 1915	The site remained unchanged.	The gravel pit 550m east of the site was no longer evident.
Buckinghamshire Revised Edition 25" Figure 4.1	1925	The northern area of the site was occupied by a gravel pit (covering approximately 25% of the total site area). Several railway sidings serving this pit had been developed along the eastern site boundary.	There were no significant changes.
Buckinghamshire Second Revised Edition 25"	1932	The site formed part of a sand and ballast works and a raised road had been developed on the southern area of the site, enabling vehicle access from Bath Road, located on an embankment in this area due to the railway.	The gravel pit on the site had expanded considerably off-site to the north west.

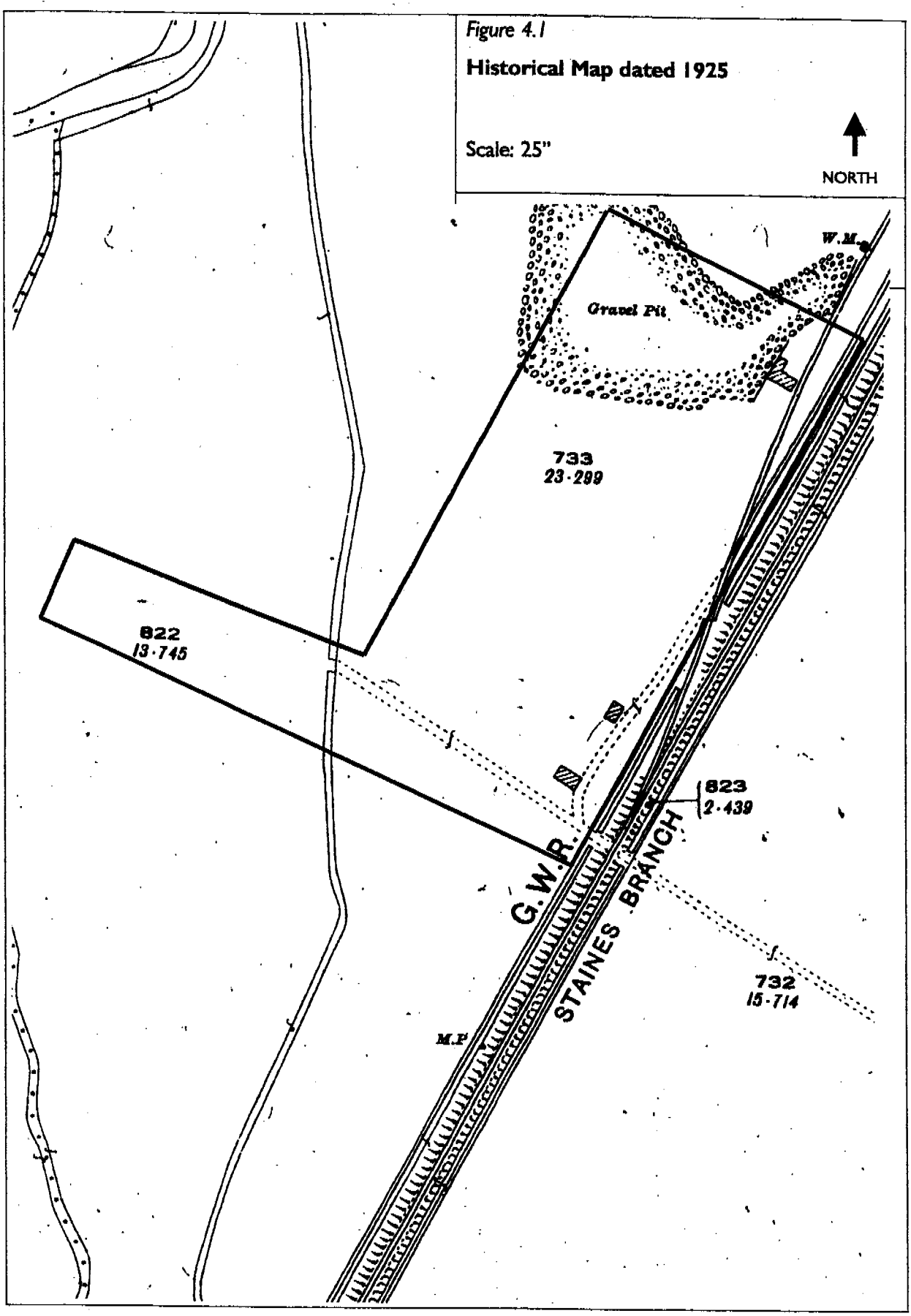


Figure 4.1
Historical Map dated 1925
Scale: 25"
NORTH
W.M.
Gravel Pit
733
23·299
822
13·745
823
2·439
G.W.R.
STAINES BRANCH
732
15·714
M.P.

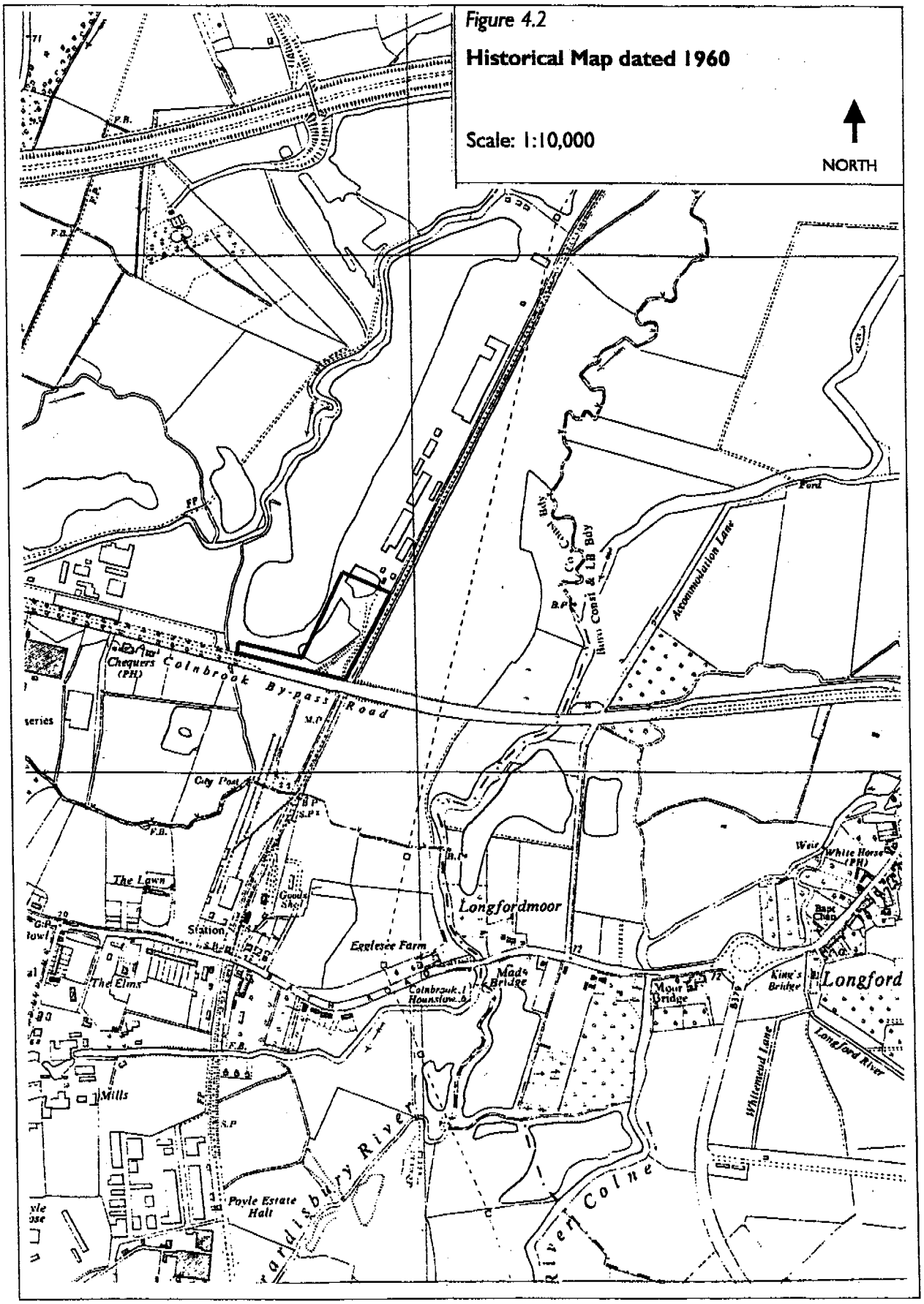


Figure 4.2
Historical Map dated 1960
Scale: 1:10,000
NORTH
Chequers (PH)
Colnbrook By-pass Road
Colnbrook Bdy
Horton Court & LB Bdy
Accommodation Lane
Pond
City Post
The Lawn
Goods Shed
Station
The Elms
Eggesee Farm
Longfordmoor
Colnbrook Hounslow
Mads Bridge
Mour al Bridge
King's Bridge
Longford
Longford River
Whitemead Lane
White Horse (PH)
Mills
Poyle Estate Hall
Yardisbury River
River Colne

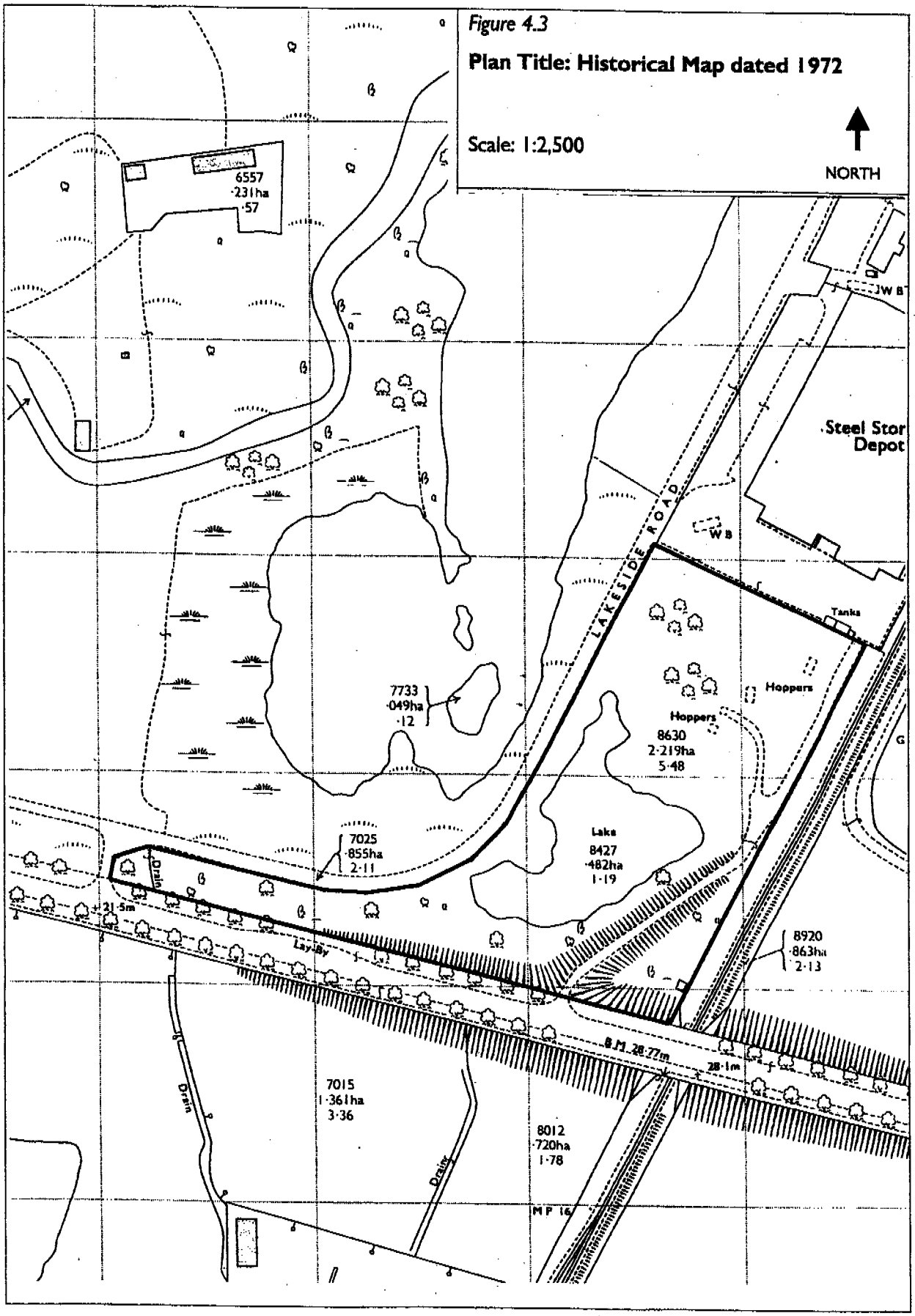


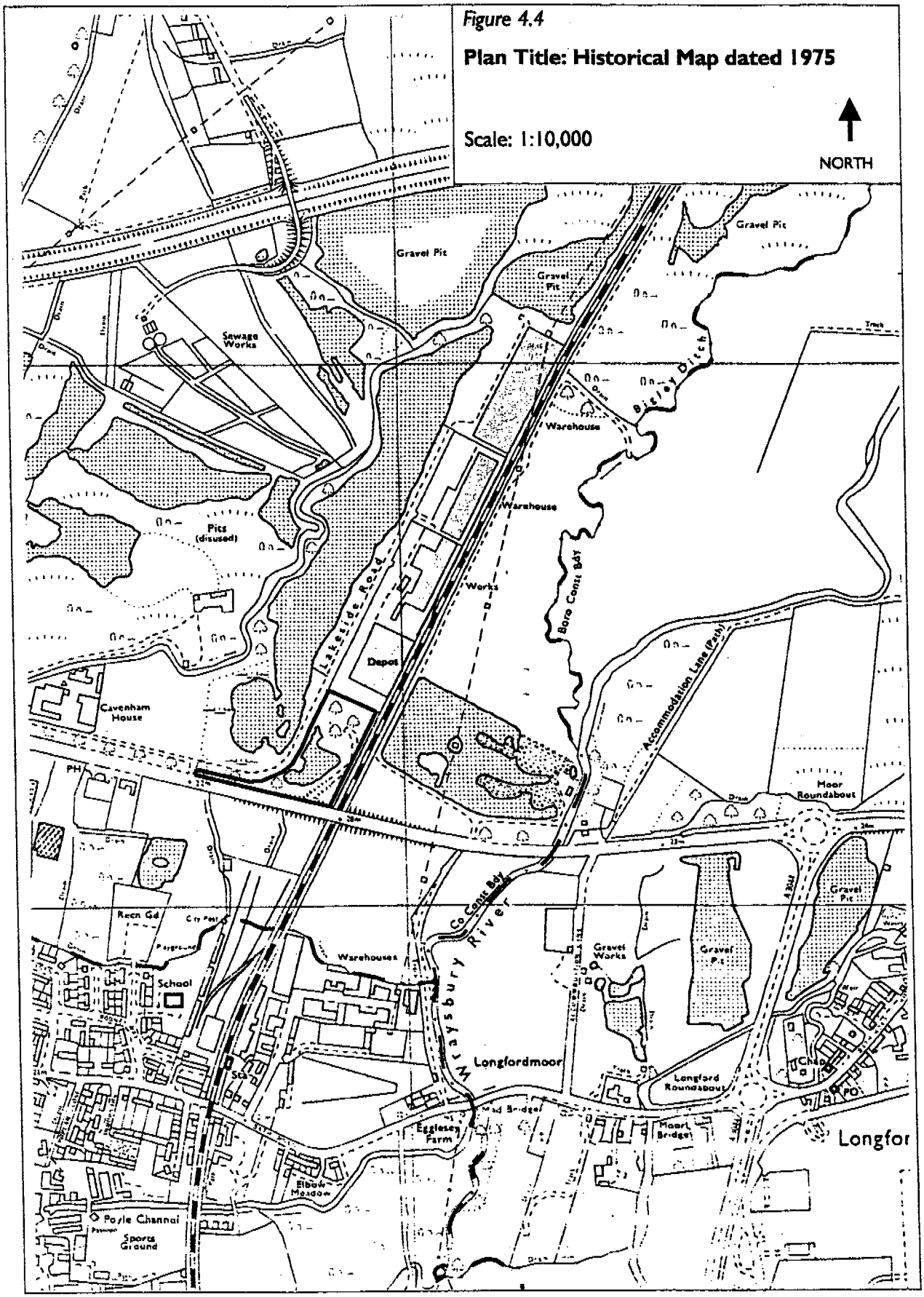
Figure 4.3
Plan Title: Historical Map dated 1972
Scale: 1:2,500
NORTH
6557
·231ha
·57
Steel Stor
Depot
LAKESIDE ROAD
Tanks
Hoppers
Hoppers
8630
2·219ha
5·48
7733
·049ha
·12
7025
·855ha
2·11
Lake
8427
·482ha
1·19
8920
·863ha
2·13
Drain
21·5m
Lay-by
28·77m
28·1m
7015
1·361ha
3·36
8012
·720ha
1·78
Drain
Drain
MP 16

Figure 4.4

Plan Title: Historical Map dated 1975

Scale: 1:10,000

NORTH



Map Reviewed	Date	Site Use	Surrounding Use
1:10,560 Figure 4.2	1960	A further gravel/sand pit had been excavated on the central and southern areas of the site, occupying approximately 40% of the total site area.	Several unidentified buildings had been developed approximately 50m north of the site and beyond. Further pits were located 25m west (this pit is 150m at its widest point and is some 950m in length) and 250m and 400m north west of the site respectively.
1:10,560	1971	There were no significant changes.	There were no significant changes.
1:2500 Figure 4.3	1972/ 1973	The gravel pit on the northern area of the site was no longer evident (presumed to be infilled). The pit occupying the central and southern areas of the site had decreased in size by c. 5-10% and now formed a lake.	The large pit 25m west of the site formed a large lake. The unidentified works immediately north of the site comprised a steel storage depot. A reinforcing steel works was located further north, 100m from the site. A large lake was evident 25m east of the site (a former gravel pit). This lake extends over 300m. A second steel storage depot was located 100m south of the site.
1:10,000 Figure 4.4	1975	No significant changes.	No significant changes, although in the wider area, several further gravel pits had been infilled with water.
1:10,000	1989	The lake on-site had been infilled and the raised road on the southern area of the site no longer evident. Two unidentified buildings occupying <25% of the total site area had been developed on the central and southern areas of the site.	The majority of the lake 25m east of the site had been infilled and was under development. A lake had been developed 25m north of the western most tip of the site. The gravel pits 250m and 400m north west of the site, and much of the area in their vicinity were marked as landfill.

4.3 Since the late 1970s Grundon has operated a waste management facility at the Lakeside site. The facility currently comprises offices, a vehicle workshop, MRF, high density bailing plant and CWI plant, together with associated areas for lorry parking. A waste management licence was granted to Grundon for a waste reduction and reclamation plant (MRF) at the

site in 1980. A further licence was granted to the company in 1989, to operate a 1 tonne per hour clinical waste incineration plant.

Table 4.2: Summary of History of Tanhouse Farm Construction Site

Map Reviewed	Date	Construction Site Use	Surrounding Use
1:10,560	1900	The construction compound site was undeveloped (i.e. in greenfield use).	The area surrounding the construction compound site was also undeveloped (i.e. in greenfield use). The Colne Brook formed the northern boundary of the construction compound site.
1:10,560	1920/ 1915	The construction compound site remained unchanged	No significant changes
Buckinghamshire Second Revised Edition 25"	1938	The construction compound site remained unchanged	The A4 Colnbrook by-pass formed the southern boundary of the site. A sand and ballast works was present 150m east
1:10,560	1960	The construction compound site remained unchanged	A large lake had formed c. 20m east of the site and several unidentified buildings had been developed immediately west. Further lakes were located north and 50m south-west and on the area formerly occupied by the sand and ballast works to the east.
1:10,560	1971	No significant change	No significant change
1:10,000	1975	No significant change	No significant change
1:10,000	1989	The site was occupied by a lake	The former sand and ballast work site had been developed and the former lake, presumably, infilled.

Table 4.3: Summary of History of the proposed Visitor and Environmental Interpretation Facility

Map Reviewed	Date	Use of proposed Visitor and Environmental Interpretation Facility site	Surrounding Use
1:10,560	1900	The construction compound site was undeveloped (i.e. in greenfield use)	The area surrounding the proposed Visitor and Environmental Study Centre site was also undeveloped (i.e. in greenfield use). The Colne Brook formed the western boundary of this site
1:10,560	1912	Drainage channels bisected the site into north and south and a second channel formed the eastern site boundary	There were no significant changes
1:10,560	1920/ 1915	The site remained unchanged	There were no significant changes
Buckingham-shire Revised Edition 25"	1925	The site remained unchanged	A gravel pit was located approximately 100m south-east
Buckingham-shire second Revised Edition 25"	1938	With the exception of the eastern area of the site, there were no significant changes. The eastern area of the site was occupied by part of a larger lake extending to the north-east and south-east. The drainage channel in this area was no longer evident.	A sand and ballast works had developed in the vicinity of the gravel pit located approximately 100m south-east.
1:10,560	1960	The site remained largely unchanged	Additional lakes appeared 25-50m and 250m west and 150m south-east in the area formerly occupied by the sand and ballast works
1:10,560	1971	There were no significant changes	There were no significant changes
1:2500	1972/ 1973	There were no significant changes	There were no significant changes

Map Reviewed	Date	Use of proposed Visitor and Environmental Interpretation Facility site	Surrounding Use
1:10,000	1975	There were no significant changes	Further lakes were present in the wider surrounds including those 150m north, 300m west north-west and 250m east
1:10,000	1989	There were no significant changes	The lakes west of the Colne Brook were no longer evident

SLOUGH BOROUGH COUNCIL

4.4 Planning records held by Slough Borough Council indicate that the existing Grundon facility was used for gravel extraction and the construction of pre-cast concrete units prior to being used as a waste reclamation plant. The site was also used for rail purposes in the early part of this century. Records do not indicate any contamination issues at the site in terms of leakages or other pollution or nuisance incidents or any enforcement or prosecutions on site.

4.5 The Council is unaware of any remediation having taken place at the site, or the installation of gas monitoring equipment.

4.6 The original planning permission for the waste reclamation plant showed that an underground storage tank for diesel (c. 50,000 litre capacity) was located east of the offices. The tank still remains on the site.

4.7 The Council holds no record of any unlicensed landfills being present at the site. However, the proposed construction site is located on Tanhouse Farm Landfill (also known as Colnbrook Area 22/Tanhouse Farm Area 22). The Council is aware of two other former landfill sites in the vicinity. These landfills, Colnbrook Bypass (1) and Colnbrook Bypass (4), and Colnbrook Area 22, are outlined in Table 4.2 below.

4.8 There are no Local Authority Air Pollution Control (LAAPC) Authorisations on the site.

ENVIRONMENT AGENCY RECORDS

4.9 Additional information on the location and nature of landfills in the vicinity of the site was obtained from the Environment Agency. All information received, including the nature of infill and details of any monitoring boreholes, is given in Table 4.4. The location of the landfills in Table 4.4 are shown in Figure 4.5.

4.10 The existing clinical waste incineration plant operated by Grundon is authorised by the Environment Agency to incinerate up to one tonne per hour of clinical and other waste materials. There are currently no releases to controlled waters or sewers from the clinical waste incineration plant. Within 2km of the site, there are no other IPC Authorisations in operation. The materials reclamation facility is covered by a waste management licence. The licence was originally issued in June 1980 (WDA/155) and has been subsequently modified in July 1988, November 1989, January 1990, April 1993 and March 1996. The waste management licence authorises the facility to deposit waste not exceeding 1100 tonnes/day.

4.11 A limited amount of the waste transported to the Grundon facility for incineration contains radioactive substances from hospital sources. A radioactive substances consent (RAS 13) for the storage and subsequent disposal of this radioactive waste is held by Grundon.

Table 4.4: Summary of Landfill Information received from the Environment Agency

Landfill	Location	Distance (m) and Direction from site	Infill	Dates of filling	Purpose	Monitoring
Colnbrook Bypass (1)	TQ 042 773	25m East	Industrial (Types A-D)	1977-1991	Gravel extraction down to clay	

Landfill	Location	Distance (m) and Direction from site	Infill	Dates of filling	Purpose	Monitoring
Colnbrook Bypass (4) (Boyers Area C)	TQ 039 770	50m South	Mixed including: Inert Industrial Difficult (Types A-D)	1985-1996	Gravel extraction down to clay	14 boreholes along southern perimeter, monitored monthly – gas has been detected
Colnbrook Bypass (22)/ Tanhouse Farm Area 22 (Tanhouse Farm construction site)	TQ 035 773	200m West	Industrial Type B	1990-1995		Gas monitoring undertaken monthly/weekly as site is producing gas. No evidence of gas migration
Tanhouse Farm (1)	TQ 033 777	200m North West	Industrial	1977-1989		EA holds no monitoring information

GEOLOGY OF THE SITE

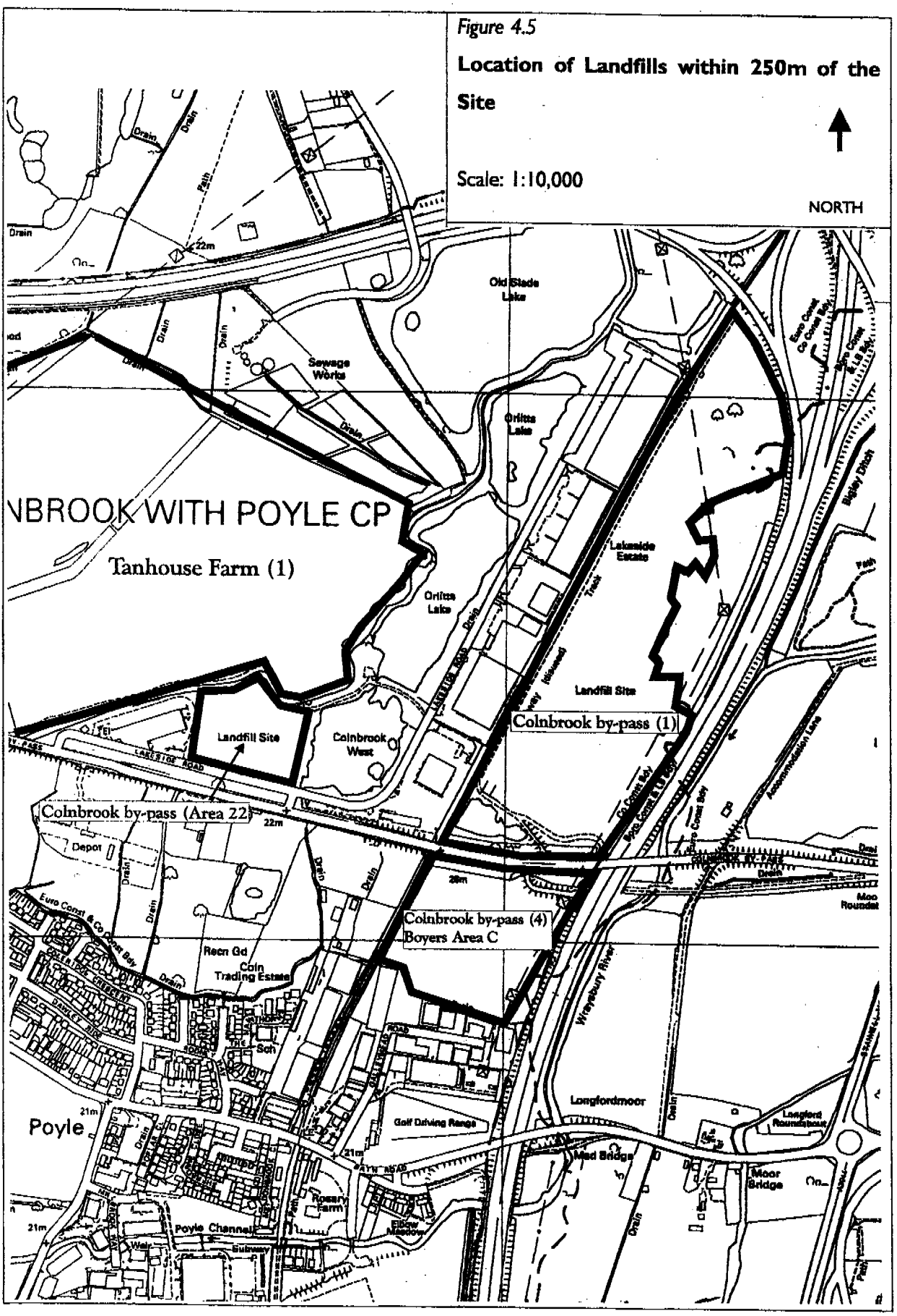
4.12 The nature of the underlying soils and geology can have a significant influence on the possible movement of mobile contaminants and their attenuation by natural geochemical processes such as adsorption. Generally mobile contaminants move most freely through coarse textured sediment strata, such as sands and gravels, which are both porous and highly permeable. This is because the volumes and rates of groundwater flow through such strata are greater than in low permeability strata such as clays. Further, the specific surface areas

Figure 4.5

Location of Landfills within 250m of the Site

Scale: 1:10,000

NORTH



of individual grains of sand or gravels are far smaller than those of the clays and silts. Thus, the adsorptive capacities of the latter types of particles and lithologies, for removing contaminants from soil solution or groundwater, are far greater than for sands and gravels. More details are given in the background report to the Environmental Statement by EAG ENVIRON on the Water Environment (July 1999).

4.13 Information on the geology of the site was obtained from the following sources: British Geological Survey (BGS) maps (specifically 1:10,000 solid and drift geology map TQ 07 NW and 1:50,000 solid and drift geology map (Windsor 269)) and borehole records resulting from site investigation works at the site.

4.14 The BGS maps of the area indicate that the western corner of the site is directly underlain by alluvial deposits associated with nearby watercourses (River Colne, Colne Brook and Poyle Channel). These alluvial deposits comprise clays, gravels and occasional peat layers. The alluvial deposits are underlain by Flood Plain Gravels (a river terrace deposit) which are shown to outcrop at ground level over the rest of the site.

4.15 The lithologies of all of the drift deposits are similar comprising largely gravels, sands and silts. However, even within individual units the grain-size of the deposits varies widely, although grain-size tens to decrease with the age of the deposit. Overall though the deposits are highly porous and permeable, dominated by gravels with variable amounts of sands and silts. Gravel thicknesses to the west of the River Colne range from 1-11m. The gravel and sand deposits in the immediate vicinity of the Proposed Lakeside EfW Plant have been extensively extracted, and the superficial deposits have been substantially altered by both the extraction process and subsequent land-filling of former extraction pits. These drift deposits are underlain, in turn, by the London Clay (<90m thick) and the Reading Beds (16-22m thick), both of Palaeocene age. The Reading Beds are further underlain by the Cretaceous aged, Chalk.

4.16 The London Clay consists of blue, fissured clays, and is of considerable thickness. The Old Slade Lake, which is north of the site (see Figure 4.1), was created by extraction of clay deposits. The London Clay is in excess of 50m thickness in the vicinity of the site, and becomes thicker to the South West of the site.

4.17 The London Clay forms a largely impermeable barrier (aquiclude) isolating the surface Drift deposits from the underlying Reading beds and the Upper Chalk, which is a regionally important aquifer.

4.18 Records of three borehole logs excavated at the site in 1978 have been made available by Grundon and generally confirm the expected sequence. The strata encountered in these boreholes are summarised in Table 4.5.

Table 4.5: Stratigraphy of the Site

Geology	Depth (m)	Thickness (m)
Drift		
Fill/Made Ground (brown silty clay, sand with stones, concrete and brick)	0.15-1.40	1.25
Alluvium (firm dark brown silty CLAY with roots and stones)	0.0-0.60	0.6
Flood Plain Gravel (part of the River Terrace deposits comprising fine to coarse sandy flint GRAVEL)	2.25-3.9	1.65
Solid		
London Clay (firm to stiff brown grey silty fissured clay)		
Harwich Formation (sand with pebbles)		
Lambeth Group comprising the Reading Formation (clay and sand) and overlying the Upnor Formation (sand, locally pebbly at base)		
Chalk		
Gault (mudstone)		
Lower Greensand Group		

HYDROGEOLOGY

4.19 The alluvial deposits underlying the site are considered to be relatively permeable and water bearing. The geological map and borehole records from the site however, indicate that there is not a significant thickness of Alluvium at the site and it may have been excavated and replaced with fill materials in some places.

4.20 The Flood Plain Gravels have been confirmed as water bearing. Groundwater was encountered within the three boreholes at depths between 0.75m and 2.60m. The River Gravels, in this area, are classified by the EA as a major aquifer with soils of high leaching potential. The groundwater is, therefore, vulnerable to pollution and the potential for rapid transmission of pollutants through the deposits is high. This classification exists largely because the Gravels are abstracted for public water supply, approximately 10km west of the site, at Dorney and Bray.

4.21 The London Clay and Reading Beds are low permeability strata classified as a non aquifer by the EA. The Chalk, which underlies these low permeability units, is the main aquifer of the region and is classified by the EA as a major aquifer. The Chalk is capable of producing high yields of groundwater and is widely abstracted from as a public drinking water supply. Generally, the London Clay isolates the gravel aquifer from the underlying Upped Chalk.

4.22 According to the EA there are 7 licensed groundwater abstractions within a 2km radius of the site as detailed in Table 4.6. None of the licensed groundwater abstractions are for public water supply. There are no abstractions from the Chalk within 2km of the site.

4.23 The EA holds no information on groundwater quality at the site or in the vicinity, or any records of past incidents of groundwater contamination at the site.

4.24 The regional groundwater flow regime is disrupted by obstructions to flow. These include clay lined reservoirs[1] to the south of the proposed Lakeside EfW Plant, and the clay bunds around Perry Oaks STW, the various lined landfills (locally Tanhouse Farm is important) and the Central Terminal Area at Heathrow. These structures tend to cause an upgradient increase in groundwater level, with a corresponding down gradient decrease.

[1] Wraysbury, King George VI and Staines Reservoirs

Table 4.6: Summary of Licensed Groundwater Abstractions within a 2km radius of the site, received from the Environment Agency

National Grid Reference	Distance and Direction from the Site	Purpose of Abstraction	Source of Abstraction	Authorised quantity (m^3 per annum)
TQ 0263 7666	1.2km West South West	Sand and gravel washing	River Gravel	700,000
TQ 025 771	1.25km West	Agriculture	River Gravel	10,001
TQ 025 777	1.3km West North West	Washing sand and gravel etc.	River Gravel	643, 272
TQ 029 762	1.4km South West	Industrial	River Gravel	454
TQ 045 759	1.5km South East	Spray Irrigation	River Gravel	2,273
TQ 046 755	1.7km South South East	Spray Irrigation Agriculture	River Gravel	1,072
TQ 047 755	1.8km South South East	Spray Irrigation Irrigation under glass	River Gravel	600 627

4.25 Discussions with the EA (Groundwater Department) has indicated that the site does not lie within a Groundwater Source Protection Zone[2]

4.26 As part of this assessment, groundwater quality at the site was investigated and samples were obtained from four boreholes established at the site.

LOCAL REGIME

4.27 The groundwater of the area is in hydraulic continuity with the River Colne system. In the vicinity of the existing incinerator, the local groundwater regime is influenced by the lined – and effectively impermeable - Tanhouse Landfill to the North West, the semi-permeable Larbourne Farm landfill to the North, discharge from Old Slade Lake, recharge from the

[2] A zone delineated by the EA around a public water supply in relation to the groundwater travel time within a saturated aquifer. Within Zone I or Zone II certain, more sensitive planning applications (including those for petrol stations) may be restricted.

Colne Brook and the gravel pits. Future baseline groundwater levels could be affected by the impact of the proposed sludge dewatering plant at Iver South to the North West of the site and changes in recharge should the LIFE scheme be implemented.

4.28 The formation of the impermeable landfill at Tanhouse Farm has been estimated to have raised the groundwater level immediately to its North by 0.5m (ref. 2). To the North of the landfill groundwater flows are directed to the South West and South East by this obstruction. To the West of the Proposed Lakeside EfW Plant site, Orlitt's Lake drains the surrounding gravels to the North, discharging to a collector drain at the south. The seepage from Orlitt's Lake to the tributary, *via* the gravels, has been estimated at 35 m^3/day (ref. 2). The flow direction is due South.

SIGNIFICANCE OF GEOLOGY AND HYDROGEOLOGY

4.29 The site is located within a moderately sensitive hydrogeological location given the nature of underlying deposits and nearby surface water resources. The borehole logs at the site indicate it is immediately underlain by alluvium and made ground comprising both clay and gravel. These deposits would allow the migration of pollutants (if present) both laterally into the nearby watercourse (Colne Brook) and downwards to the major aquifer (Flood Plain Gravels). Groundwater resources within the gravels are abstracted at several locations within 2km of the site (the closest being 1.2km west south west).

4.30 The River Gravels are further underlain by the London Clay and Reading Beds. The presence of these low permeability strata is likely to prevent the downward movement of any mobile contaminants (if present) into the major Chalk aquifer at depth (a sensitive receptor to contamination) reducing its sensitivity.

4.31 There is a high degree of hydraulic continuity between groundwater and the rivers in the Colne Valley. The site is considered to be hydrologically sensitive due to the proximity of the Colne Brook (200m west) which forms part of the wider River Colne system and ultimately flows into the River Thames, 6km downstream. This water course has been given a classification of C (fairly good quality) by the EA and would be a sensitive receptor to site derived contamination (if present), particularly as the Colne Channel is abstracted (downstream) to maintain a series of lakes.

Sampling

4.32 The intrusive soil investigation at the existing Grundon site comprised the following:

- excavation of four boreholes (BH1-BH4) using 150mm cable-percussion techniques to a maximum depth of 8m below ground level (bgl). The boreholes were completed as 50mm combined gas and groundwater monitoring wells (shown in Figure 4.6);
- dynamic headspace analysis for the presence of Volatile Organic Compounds (VOCs) was undertaken on all soil samples collected;
- soil and groundwater sampling from the four sampling locations;
- chemical testing on the soil samples by an independent laboratory; and
- selected testing of groundwater samples by an independent laboratory.

4.33 The soil and groundwater samples were analysed for a variety of determinands (refer to Appendix 3 for complete list). Where possible evidence of asbestos containing materials (ACMs) was found in soil samples, samples were screened for asbestos. In order to assess the particular influence of landfill leachates on groundwater quality, addition tests were carried out of Biochemical Oxygen Demand (BOD), ammonia, nitrate and nitrite and phosphate concentrations.

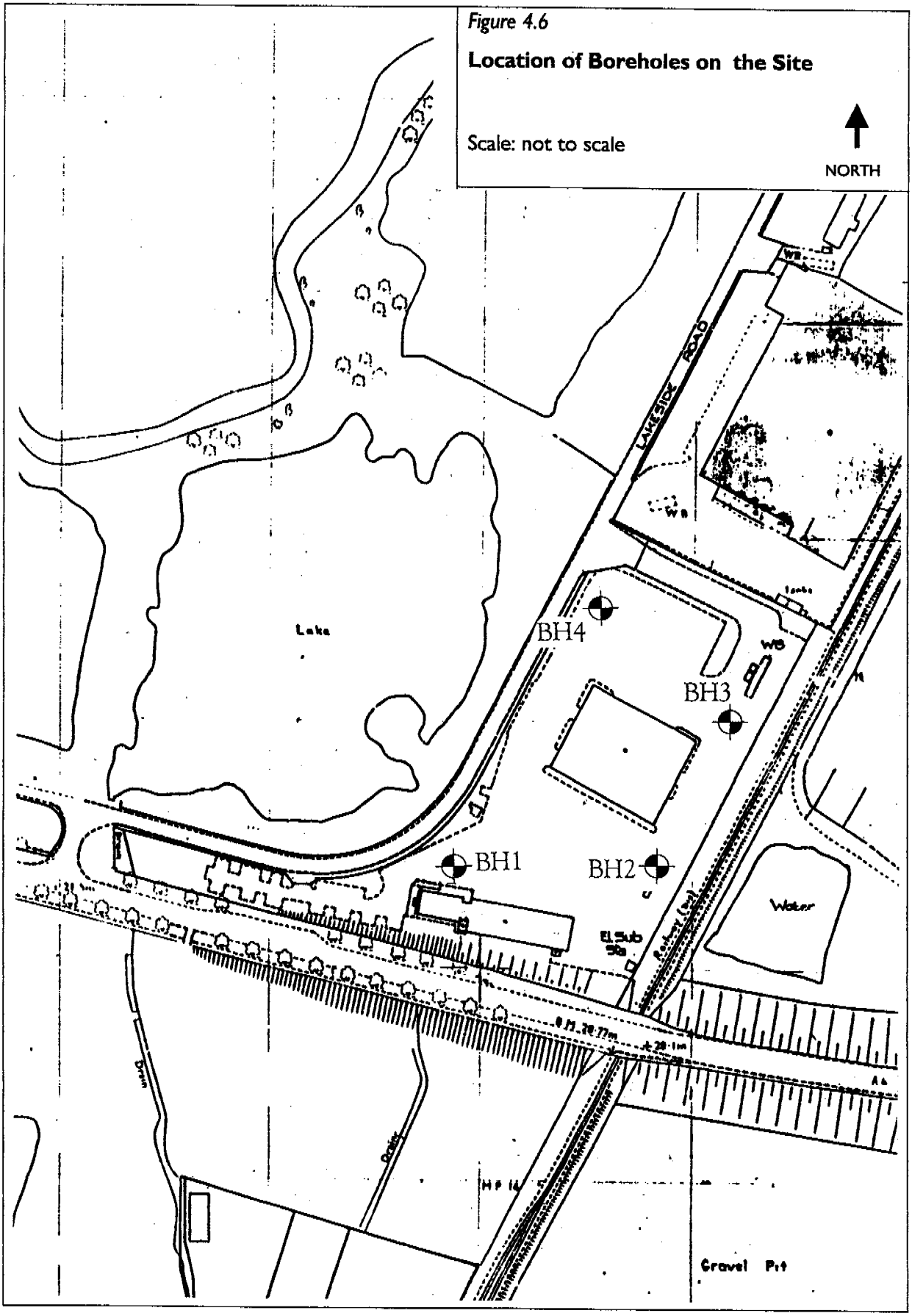
4.34 The methodology for the site investigation, including landfill gas monitoring, is given in Appendix 1. Field observations and on-site testing are also summarised in Appendix 1. Appendix 2 contains the soil analytical results whilst Appendix 3 contains the groundwater analytical results and subsequent landfill gas monitoring results.

Figure 4.6

Location of Boreholes on the Site

Scale: not to scale

NORTH



4.35 None of the available soil samples contained elevated concentrations of the contaminants tested. The range of concentrations of determinands tested are given in Table 4.7. Although the ground underlying the site has been impacted by historical landfilling, the analytical results of the available soil samples suggest that the material used for backfilling was uncontaminated. The results also suggest that widespread contamination at the site does not exist.

Table 4.7: Soil Results

Soil	Range of Concentrations
PH	7.4-11.0
Sulphate	<200-4600 mg/kg
Monohydric Phenol	<3 mg/kg
Total Cyanide	<5 mg/kg
Toluene Extractable Metals	<500-2900 mg/kg
Polycyclic Aromatic Hydrocarbon Screening	<10 – 220 mg/kg
Asbestos Screen (Boreholes 1, 2 and 3)	None detected (not detected above analytical detection limit (<0.01%))
Arsenic	5-26mg/kg
Cadmium	<0.5mg/kg
Chromium	6-50 mg/kg
Lead	8-60mg/kg
Mercury	<0.3 mg/kg
Copper	14-44 mg/kg
Nickel	9-43 mg/kg
Zinc	14-100 mg/kg

4.36 The results of the groundwater analysis indicate that the majority of the organic contaminants analysed (VOCs and sVOCs) were at levels lower than the detection limit. There were two exceptions. Phenol was detected in concentrations exceeding the analytical detection limit (generally 1µg/l). The concentrations of phenol reported are in the range 1.2-1.6 µg/l, which are low. Trichlorofluoromethane (a CFC) was found at a low level of 4 µg/l in the sample from borehole 3 (the analytical detection limit is 1µg/l). This substance was not detected in

the other boreholes. On the basis of these results, groundwater beneath the site does not appear to be contaminated.

4.37 Levels of trace metals in groundwater were below the respective analytical detection limits.

4.38 Nitrate, ammonia and phosphate were not found at levels in excess of the analytical detection limit of 50µg/l. The absence of these substances suggests that the landfills in the vicinity of the site do not significantly influence groundwater quality, which appears to be good.

Discussion of Results

4.39 The available soil data indicate that the material used for backfilling at the site was uncontaminated and unlikely to include putrescible or chemical waste capable of generating significant quantities of landfill gases and leachates. The data also suggests that widespread contamination at the site does not exist. Thus there are not expected to be any potential impacts to building materials or potential constraints on engineering works.

4.40 The available groundwater data indicate that groundwater beneath the site is generally of reasonable quality suggesting that the landfill activity in the surrounding area does not significantly influence groundwater quality.

4.41 However, the locations of the boreholes installed during the site investigation were limited due to operational restrictions in place at that time. The potential for the presence of contamination derived from historical landfilling operations (if undertaken on site) in areas not covered by these investigations cannot be discounted at this time.

Landfill Gas Monitoring Results

4.42 One landfill gas monitoring visit was undertaken with readings taken on 11 March 1999. Three of the four gas monitoring wells (BH1, BH2 and BH3) were monitored for methane, carbon dioxide and oxygen. BH4 was unable to be monitored due to an obstruction on the grid cover. The results of the gas monitoring are given in Appendix 4 and summarised below.

4.43 Levels of methane were found to be below the detection limit of the instrument (0.1%).

4.44 Carbon dioxide was detected at a slightly elevated concentration (2.4% by volume) in one of the monitoring wells (BH1 – located in the southern area of the site). Although this concentration is above the 1.5% threshold set by the Building Regulations 1991, Approved document C, it is considered that this slightly elevated concentration is unlikely to be indicative of the possible presence of putrescible material at the site. Rather, the slightly elevated concentration is thought to be attributable to the natural microbial processes that occur in the silty deposits underlying the site.

4.45 Flow rate and gas pressure were also measured in the boreholes. No significant flow rates were recorded.

LANDFILL GAS MONITORING SUMMARY

4.46 The gas monitoring results indicate that the ground underlying the site is not generating significant volumes of landfill gas and it is unlikely that such gases are migrating onto site from the two gassing landfills in the vicinity.

5.0 DEVELOPMENT IMPLICATIONS

EXISTING GRUNDON FACILITY

Introduction

5.1 The results of the soil investigation indicate that the site is largely uncontaminated, although results from one groundwater sample showed a very slightly elevated level of hydrocarbon. None of the soil samples analysed contained elevated concentrations of the contaminants tested and the results do not indicate significant widespread ground or groundwater contamination beneath the site. Further, subsequent gas monitoring results indicate that the site is not generating significant volumes of landfill gas and it is unlikely that such gases are migrating onto site from adjacent gassing landfills.

5.2 The significance of contamination depends on two factors:

- the intended after-use of the site, since stricter standards are normally appropriate for sensitive end uses, such as houses, gardens and allotments, than for industrial developments or railway uses; and
- the potential sensitivity of surrounding resources and receptors to exposure to contamination or releases of contaminants from the site.

5.3 The EfW scheme does not constitute a significant change in the land use. Therefore the first of the above points is not relevant. The sensitivity of the surrounding resources and receptors is dealt with in the following general risk assessment with regard to the presence hydrocarbons in groundwater at the site.

RESOURCE/RECEPTORS

5.4 In terms of the risk assessment for the site, as outlined in paragraph 2.11, the following resource/receptors have been identified:

- groundwater resources present in the underlying gravels. Groundwater present within the gravels in the surrounding area is abstracted and is susceptible to pollution;
- nearby surface water bodies, including the Colne Brook and Colnbrook West and Orlitts' Lakes. The water quality of these water bodies is susceptible to pollution; and
- site workers and the general public in the immediate area in terms of health issues.

HAZARD IDENTIFICATION

5.5 The available site investigation results suggest that there is only one contaminant source present at the site. A slightly elevated concentration of hydrocabon was detected in one of the groundwater samples taken at the site.

EXPOSURE ASSESSMENT

5.6 The pathways through which hydrocarbons can migrate and their categories are shown in Table 5.1.

Table 5.1: Potential Exposure Assessment for Hydrocarbons at the Site

Pathway	Category
Groundwater - Hydrocarbons are potentially mobile contaminants and as a result, they can enter groundwater present within the permeable river gravels underlying the site. The hydrocarbons can then migrate both laterally and vertically within the groundwater	Direct
Ingestion – hydrocarbons present in groundwater and within the soil matrix	Direct

Groundwater resources

5.7 A low concentration of hydrocarbons was detected in a single groundwater sample from the site. Groundwater present in the River Gravels is abstracted for sand and gravel washing and agricultural purposes in the surrounding area. The closest of these abstractions is 1.2km from the site. Due to the distance of these abstractions and the resulting dilution and dispersion it is considered that none of the groundwater abstractions from the gravels is sensitive to impacts on quality. Therefore, the groundwater resources within the River Gravels are not considered to be at risk from the hydrocarbons detected at the site during the site investigation.

Surface water bodies

5.8 The groundwater beneath the site is in hydraulic continuity with the Colne Brook and the River Colne system as a whole. However, the direction of flow is to the south and away from both the Colne Brook and the River Colne. Therefore, hydrocarbons present within groundwater beneath the site are unlikely to migrate into these surrounding receptors and surrounding surface water bodies are not considered to be at risk from the levels of hydrocarbons detected in groundwater at the site.

Site workers and the general public

5.9 It is considered highly unlikely that either site workers or the general public will either ingest groundwater at the site containing slightly elevated concentrations hydrocarbons or ingest soil containing hydrocarbons present in the permeable matrix. If such an event did occur, there is considered to be negligible risk to the health of the those concerned.

OTHER CONSIDERATIONS

5.10 Some areas of the site could not be sampled since it is a working plant. There is a possibility that pockets of contamination may be present in areas that could not be sampled. Consideration needs to be given to the management. Should pockets of contaminated soil or groundwater become evident during construction works, this will require appropriate management. Consideration will need to be given to the following issues:

- spoil use and disposal;
- water pollution prevention;
- health and safety; and
- air quality.

Spoil use and disposal

5.11 At present, the information regarding the quantities of spoil to be generated by the development is incomplete. Main areas where spoil will be generated are the following:

- the excavation of the bunker pit;
- the excavation of the grate ash bunker pit;
- lowering of ground levels beneath the flue gas cleaning equipment;
- the excavation of the Material Recycling Facility; and
- the excavation of the chimney.

5.12 The site investigation and supplementary information from previous works at the site indicate that the site is underlain by alluvium, gravel, made ground and clay. It is envisaged that the bulk of the material excavated at the site would therefore be inert material[3] and uncontaminated. Based on the site investigation findings, it is likely that the material excavated from the site would be acceptable for disposal at most licensed landfill sites. It is concluded that the likely level of contamination and rate of spoil generation will both be too

[3] This implies that the material is not biodegradable, and unlikely to generate gases due to decay.

low to affect the capacity of appropriately licensed sites in the local area to accept the excavated material.

5.13 Inert spoil could be re-used. This would be expected to be possible in most cases. Potential end uses for the spoil generated by the scheme could include:

- general cover material and fill; or
- for landscaping works at the site.

5.14 However, some spoil may not be suitable for such re-use due to poor engineering characteristics or the occurrence of contamination. Where excavated soil requires off-site disposal, appropriate chemical testing will be carried out to ensure that all spoil is disposed at appropriately licensed sites[4].

5.15 Some residual concerns relate to the storage of contaminated spoil within construction sites and dust generation, during both handling and transport. Issues regarding the implications of spoil disposal for air quality, and surface and groundwater pollution prevention are dealt with in the individual Background reports to the Environmental Statement on the Air Quality Impact Assessment by AEA Technology (August 1999) and the Water Environment by EAG ENVIRON (July 1999), respectively.

Water Pollution Prevention

5.16 The potential impacts of water contamination and disposal of contaminated water are dealt with in the Background report to the Environmental Statement on the Water Environment (July 1999) by EAG ENVIRON. In summary, the main issues relate to the release of particulate bound contaminants to the aqueous phase, contaminated water run-off (during the use of dust suppression water sprays, and following rainfall) and requirements for the disposal of contaminated groundwater.

[4] i.e. in line with the Code of Construction Practice and the Environmental Protection (Duty of Care) Regulations 1990 and following The Code of Practice, "Waste Management The Duty of Care", published in March 1996 by the Department of the Environment.

5.17 Control measures to prevent effects from any potential historic contamination at the site in areas not revealed by these investigations or soil contamination from construction site operations will be drawn up. Reference will be made to the Pollution Prevention Guidelines (PPGs) produced by the Environment Agency and in particular PPG 5 - Working at Demolition and Construction Sites, Works In, Near or Liable to Affect Watercourses.

5.18 Reference will also be made to the following PPGs that deal with the prevention of pollution at construction sites:

- General Guide to the Prevention of Pollution of Controlled Waters (PPG 1);
- Above Ground Oil Storage Tanks (PPG 2); and
- the Use and Design of Oil Separators in surface Water Drainage Systems (PPG 3).

Health and safety

5.19 Site construction workers are an important receptor group liable to exposure to potential soil contamination during construction works. The principal exposure pathways for site workers are:

- inhalation of dust during excavation of materials in dry conditions (indirect pathway); and,
- direct ingestion of contaminated soil through eating, drinking or smoking on site, due to a lack of properly controlled hygiene procedures.

5.20 Field observations and on-site testing did not record any elevated concentrations of contaminants in the soil. Therefore the risk to site workers from inhaling or ingesting contaminated soil, during construction, is considered to be low. However, the potential for the presence of contamination in areas not sampled during the investigations cannot be discounted at this time.

5.21 Provisions will be made to ensure that risks to site workers and the general public are minimised. A full working method statement to meet Health and Safety Executive approval will be required for the site to meet the requirements of the Control of Substances

Hazardous to Health Regulation (1994) (COSHH) and the Construction and Design Management (CDM) Regulations.

Air quality

5.22 The field surveys indicate soils, which could be a source of dust, are not contaminated. Should it be suspected that the source of dusts emitted might be contaminated, then the dust itself could be of a noxious or potentially toxic nature. Materials in certain areas, such as buildings to be demolished, may be contaminated with asbestos. A working method statement for dealing with asbestos, if present, would be required under the CDM regulations (see above). The EfW proposals do not present any problems in relation to dust control or contaminated land that are atypical of normal development sites and construction practice.

TANHOUSE FARM CONSTRUCTION SITE

5.23 As detailed in 3.11, an extra 500mm layer of clay capping plus concrete hard standing over the entire (2.85ha) will be laid down to prepare this site for use as a construction lay-down area.

5.24 The site will be drained to soakaway via oil interceptors and will also be provided with perimeter drains. In addition, good practice in construction site management (as detailed in 6.5 for example) will be implemented. Grundon is committed to best practice in relation to control of construction site run-off and appropriate measures will be taken to prevent land contamination and protect surrounding groundwater and surface water resources.

5.25 With these measures in place, the use of Tanhouse Farm landfill as a construction lay down area is not expected to result in any significant implications in relation to contamination.

5.26 The Visitor and Environmental Interpretation Facility is to be located on a concrete caisson of 6m radius within Orlitt's Lake. The method of construction has not been worked up as yet. However, regardless of method of construction, the construction of the Centre is not an issue on terms of land contamination.

6.0 MITIGATION MEASURES

MITIGATION OF CONSTRUCTION EFFECTS

6.1 A Code of Construction Practice (COCP) will form part of the environmental management control measures to be implemented during construction. Immediately after a contract has been placed, and prior to work commencing an Environmental Management Plan (EMP) will be produced by the Contractor for approval by Grundon. The EMP will set out how the Contractor intends to operate the construction and work sites and will set out specific control measures necessary to deliver the particular requirements of the COCP.

6.2 The COCP will set out:

- the general principles to be applied during construction and context within which mitigation measures will operated and be developed;
- the general provisions for construction site operations; and
- the particular environmental aspects which need to be considered throughout the period of the construction works.

6.3 The COCP should include provisions for, among other aspects, adequate construction site drainage and the storage of oil and chemicals. These aspects are discussed in the background report on the Water Environment (July 1999) by EAG ENVIRON. In any event, the construction contractors should take account of advice on the layout of the construction site and the surface drainage system as given in:

- PPG2 on above ground storage tanks;
- PPG3 in relation to the use of oil separators in drainage systems; and,
- PPG5 on construction works in, near or liable to affect watercourses.

SOIL CONTAMINATION

Existing Grundon Site

6.4 Based on the results of intrusive soil investigation, widespread or significant contamination at the site is not expected to be encountered. However, in the event of isolated pockets of soil contamination being found during construction works, in areas not covered by the site investigation, minor remediation works may be necessary.

6.5 Given the likely small scale of occurrence (if any) remediation works would be expected to comprise excavation and disposal.

HEALTH AND SAFETY ON WORKING SITES

6.6 The site is located in a predominantly light industrial with commercial properties in the wider area. The nearest residential properties to the site are located some 350m to the south of the site. Therefore, the majority of people that could be exposed to works at the site would be restricted to those involved in the construction and operation of the site, and to a lesser extent, workers at adjoining premises.

6.7 Risks due to exposure of workers to contaminated soil will be minimised by:

- designation of suitably qualified personnel as Safety Officers responsible for all health and safety aspects at each work site – in line with regulatory requirements; and
- display of workers' safety information sheet widely over each site, covering hygiene issues (e.g. eating on-site), clothing requirements, and the use of safety equipment and emergency procedures.

6.8 These measures will form part of the Working Method Statement as set out in section 5.2.2. Implementation of comprehensive health and safety plans, incorporating measures to be adopted at the site, will also give confidence and aid the protection of the public, who work in close proximity to the site and to those that live in the wider area. Close attention will be required to various other factors that may impinge upon health and safety. These include:

the methods used for limiting dust emissions from the sites; the prevention of leakages or spillages migrating off-site; and, ensuring that vehicles transporting contaminated soil are covered and thoroughly cleaned before leaving the site. The evaluation of spoil disposal transport routes will explicitly consider the potential for exposure of site workers and the general public to contamination.

6.9 The Method Statement and plan will comply with the requirements of the Control of Substances Hazardous to Health Regulations (1994).

Tanhouse Farm construction site

6.10 Given that this site is only to be used as a construction lay down area, contaminated soil is not expected to be encountered. With the preparations highlighted in 6.5 – 6.7, within the overall framework of the COCP, it is anticipated that the use of the Tanhouse Farm landfill will not have any significant impacts on land contamination or groundwater resources.

SUMMARY

6.11 The following conclusions can be drawn:

- The site investigation did not reveal significant contamination of either soil or groundwater at the site;
- No methane was detected in the gas monitoring boreholes at the site;
- There is considered to be a low risk of off-site contamination;
- An intrusive soil investigation covering the central areas of the site (currently occupied by Grundon waste management operations) will take place following site clearance. There may be a need to handle to contamination not revealed due to limitations imposed by sampling a working site; and
- Mitigation measures will be addressed in the COCP and the Working Method Statement. Both the COCP and Working Method Statement will comply the requirements of the appropriate rules and regulations.

Appendix I: Site Investigation Methodology and Results

Boreholes and installations

1 Four boreholes (BH1-BH4) were drilled using 150mm cable-percussion techniques to a maximum depth of 8m below ground level (bgl). The boreholes were completed as 50mm groundwater monitoring wells.

2 Following a 24hr recovery period in order to allow the wells to recharge with formation water, the wells were then developed using a submersible pump to remove 5 well volumes of water. Well development is undertaken to allow the gravel-filter pack to grade and come into close contact with the well screen to form an efficient sediment filter. Following development, the wells were then purged of 3 well volumes in order that a representative sample of formation water could be collected. The samples are taken from the bottom of the well using dedicated sampling equipment.

Sample aquitsion and on-site analysis

3 Soil arisings from the boreholes were examined visually and any unusual odours were noted. The appearance and type of soil was recorded, and selected samples were tested, by dynamic headspace analysis, for the presence of volatile organic compounds using a PID. Dynamic headspace analysis refers to the manual agitation of a bagged soil sample to facilitate volatilisation of organic compounds present in the soil into the headspace above (i.e. soil gas) which is then analysed using the PID. A wide spectrum of organic vapours, including aromatics, amines, alkanes (>C4), certain chlorinated solvents, alkenes and heterocyclics can be detected by the PID (i.e. the PID would detect solvents which have been used on site and components of petrol).

4 The soil logging and results of the sample headspace analysis are presented in the excavation logs and are discussed below.

5 Soil samples were retained on the basis of on-site observations (e.g. odour, staining, volatile soil gas readings, etc.) and being representative of soil strata or fill materials encountered.

Retained samples were placed in containers appropriate to the type of analysis being undertaken and stored in cool boxes maintained at a low temperature to avoid the loss of volatile compounds. Selected samples were then sent for chemical testing at an independent laboratory.

6 Groundwater samples were obtained from each of the monitoring well installations (BH1-BH4). Prior to sampling, the wells were developed and purged in order to bring the gravel filter-pack tight to the standpipe and to draw representative groundwater into the standpipes for sampling.

Ground Conditions

7 Maximum thicknesses of 0.2m reinforced concrete and/or tarmacadam were encountered at each of the four borehole sampling locations. Deposits of made ground were encountered at each sampling location. It was proved to thickness' ranging between (not including hardstanding) 0.2m and 1.5m. The made ground was found to comprise medium dense sandy gravelly hardcore fill with brick and concrete.

8 Natural strata immediately underlying the made ground was found to consist of soft to firm silty gravelly clay underlain by varying thickness' of loose to medium dense sand and gravel. These alluvial gravels were not encountered during the drilling of BH4. The gravels were, in turn, underlain by the London Clay formation encountered at depths of between 4.7m and 7.4m bgl.

9 The soil strata encountered in the boreholes are detailed in the borehole logs at the end of this Appendix.

10 Groundwater was encountered in all boreholes drilled at depths of between 3.1m and 4.8m bgl. The strike depths are consistent with the presence of the alluvial sands and gravels that underlie the site.

Field evidence of contamination

11 During the drilling of BH1, BH2, BH3 and BH4, no physical evidence (i.e. unusual odours, hydrocarbon staining) of hydrocarbon contamination or the presence of landfill was noted. However, within the made ground recorded in BH1 and BH2, thin horizons of black granular clinker material were noted at shallow depths ranging between 0.8m bgl (BH2) and 1.3m bgl (BH1). This material can potentially contain elevated concentrations of metals. Samples of this material were collected and submitted for chemical analysis. No physical evidence of contamination was noted within natural strata underlying the made ground deposits.

12 No visible evidence of landfill-derived leachate, hydrocarbon sheens, hydrocarbon product or associated odours were observed in the groundwater at any location during drilling or subsequent development, purging and sampling of the four wells.

Soil gas headspace testing

13 Soil samples were "headspace" tested for the presence of volatile organic compounds, using a photoionisation detector (HNU DL101). This instrument screens for a wide spectrum of organic compounds, including chlorinated solvents and aromatics, but does not indicate the specific compound. "Headspace" testing refers to the manual agitation or shaking of a bagged soil sample to facilitate volatilisation of organic compounds present in the soil into the headspace immediately above the sample. After agitation, vapour in the headspace is monitored using the PID. The values are not an absolute measurement of hydrocarbon concentrations in soil, but are a response to the hydrocarbon vapours that are present in the soil pore spaces.

14 All soil samples recorded low concentrations of VOCs (0.1-0.6ppmv). The results of the soil gas testing are shown on the excavation logs (Annex ?).

LANDFILL GAS MONITORING

Introduction

15 The Site History Review, summarised in Table 4.1, and the information received from the Environment Agency, indicate the presence of two gassing landfills located within 250m of the site (Colnbrook by-pass 4 and Colnbrook by-pass 22/Tanhouse Farm Area 22). It was considered that a potential for the migration of landfill gases onto the subject site from these sources existed.

16 The four monitoring wells installed during the site investigation were completed as combined gas and groundwater monitoring wells to facilitate the future monitoring of landfill gas and groundwater.

Background information on landfill gas

17 Landfill gas is produced as a result of the decomposition of organic materials such as paper, vegetation, wood, etc. The principal components of landfill gas are methane and carbon dioxide, but other gases such as hydrogen sulphide can also be present. Landfill gas can present a hazard to site workers during construction activities (e.g. carbon dioxide is heavier than air and may accumulate in service trenches, etc.), and can enter buildings, thus presenting a hazard to occupants in terms of asphyxiation or explosion.

18 Methane is a flammable asphyxiating gas, the flammable range being 5 to 15% by volume. In air, carbon dioxide is a non-flammable, toxic gas, with a long-term exposure limit of 0.5% by volume, and a short-term exposure limit of 1.5% by volume. Waste Management Paper No. 27 (Department of the Environment 1991) states that the level of concern for carbon dioxide is 1.5% by volume and for flammable gas (i.e. methane) it is 1% by volume.

19 The Building Regulations 1991, Approved Document C, states that there is a need to consider possible measures to prevent gas ingress into new buildings if concentrations of carbon dioxide above 1.5% are detected in the ground and that measures are definitely required at concentrations above 5%. Approved Document C also states that where methane concentrations do not exceed 1% and that the floor of the building to be constructed is suspended and ventilated, no further protection needs to be provided.

Appendix 2: Soil Analytical Results

Table 2A Soil Analytical Results

Borehole	BH1	BH1	BH1	BH2	BH2	BH2	Guide Value
Sample Depth (m)	0.5	0.3	4.5	0.5	3.0	4.8	
pH	9.0	8.3	7.9	9.1	8.4	8.0	>9(2)
Sulphate as SO_4	4600	730	<200	760	<200	450	2000#/50000+
Monohydric Phenol	<3	<3	<3	<3	<3	<3	5#/1000+
Total Cyanide	<5	<5	<5	<5	<5	<5	250(1)/5000+
TEM	2900	<500	500	2700	<500	650	5000(2)
PAH screening	<10	<10	<10	<10	<10	<10	1000*
Asbestos Screen	ND			ND			
Arsenic	14	18	5	9	5	20	40*
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	15*
Chromium	21	39	6	22	6	43	1000*
Lead	60	36	8	26	9	14	2000*
Mercury	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	20*
Copper	32	30	18	22	20	29	130*
Nickel	16	28	9	10	9	43	70*
Zinc	68	100	14	37	15	68	300*

All results expressed in mg/kg dry weight basis except for pH

- = No analysis undertaken
ND = Not detected above Analytical Detection Limit (<0.01% for asbestos & <2) c/s for Radiation
# = ICRCL Industrial Threshold
* = ICRCL "open space" Threshold
+ = ICRCL Industrial Action Guideline
1 = Guideline for complex Cyanide
2 = Widely Accepted guideline
3 = Dutch B Guideline
4 = Dutch I Guideline

Table 2A cont'd Soil Analytical Results

Borehole	BH3	BH3	BH4	BH4	BH4	BH1	Guide Value
Sample Depth (m)	0.7	6.0	1.6	3.1	6.5	7.6	
pH	11.0	8.4	8.9	8.0	7.4	7.7	>9(2)
Sulphate as SO_4	540	410	1200	210	440	250	2000#/50000+
Monohydric Phenol	<3	<3	<3	<3	<3	<3	5#/1000+
Total Cyanide	<5	<5	<5	<5	<5	<5	250(1)/5000+
TEM	<500	900	1400	<500	<500	<500	5000(2)
PAH screening	<10	<10	220	<10	<10	<10	1000*
Asbestos Screen	ND						
Arsenic	26	15	17	6	19	11	40*
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	15*
Chromium	28	50	33	27	48	46	1000*
Lead	28	16	42	14	17	18	2000*
Mercury	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	20*
Copper	19	30	44	14	32	26	130*
Nickel	16	40	26	25	43	40	70*
Zinc	32	85	60	35	89	81	300*

All results expressed in mg/kg dry weight basis except for pH

- = No analysis undertaken
ND = Not detected above Analytical Detection Limit (<0.01% for asbestos & <2)c/s for Radiation

= ICRCL Industrial Threshold

* = ICRCL "open space" Threshold
+ = ICRCL Industrial Action Guideline

1 = Guideline for complex Cyanide
2 = Widely Accepted guideline

3 = Dutch B Guideline
4 = Dutch I Guideline

Annex 3: Groundwater Analytical Results

Table 3A: Groundwater Major Ions Data; all expressed as mg/l

Sample	Borehole 1	Borehole 2	Borehole 3	Borehole 4
Calcium as Ca	150	130	150	90
Magnesium as Mg	15	11	14	5.2
Sodium as Na	110	85	86	70
Potassium as K	14	11	12	9.6
Total Hardness as $CaCO_3$	430	370	430	250
Total Alkalinity as $CaCO_3$	420	325	360	230
Sulphate as SO_4	48	50	66	48
Chloride as Cl	160	140	150	100
Nitrate as NO_3	<0.05	<0.05	<0.05	<0.05
Conductivity uS/cm	1300	1100	1200	920
pH	7.1	7.2	7.2	7.2

Table 3B: Volatile Hydrocarbon Data (by Head Space GC-MS); all expressed as micrograms/litre

Borehole	BH1	BH2	BH3	BH4
Vinyl chloride	<10	<10	<10	<10
Chloroethane	<1	<1	<1	<1
Trichlorofluoromethane	<1	<1	4	<1
1,1-Dichloroethene	<1	<1	<1	<1
1,1,2-trichloro-1,2,2-trifluoroethane	<25	<25	<25	<25
Dichloromethane	<25	<25	<25	<25
trans-1,2 Dichloroethene	<1	<1	<1	<1
MTBE	<1	<1	<1	<1
1,1 -Dichloroethane	<1	<1	<1	<1
Chloroform	<1	<1	<1	<1
1,1,1-Trichloroethane	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1	<1
Benzene	<1	<1	<1	<1
Carbon tetrachloride	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1
Bromodichloromethane	<1	<1	<1	<1
cis-1,3 Dichloropropene	<1	<1	<1	<1
Toluene	<1	<1	<1	<1
trans-1,3 dichloropropene	<1	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1
Dibromochloromethane	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1
Chlorobenzene	<1	<1	<1	<1
Ethyl benzene	<1	<1	<1	<1
m,p-Xylenes	<1	<1	<1	<1
Bromoform	<1	<1	<1	<1
o-Xylene	<1	<1	<1	<1
1,1,2,2 Tetrachloroethane	<1	<1	<1	<1
1,3,5 Trimethylbenzene	<1	<1	<1	<1
1,2,4 Trimethylbenzene	<1	<1	<1	<1
1,3 Dichlorobenzene	<1	<1	<1	<1
1,4 Dichlorobenzene	<1	<1	<1	<1
1,2 Dichlorobenzene	<1	<1	<1	<1
Naphthalene	<1	<1	<1	<1

Table 3C: Semi-Volatile Organic Carbon Data (by GC-MS); all expressed as micrograms/litre

Borehole		BH1	BH2	BH3	BH4
PAH	naphthalene	<1	<1	<1	<1
	2-chloronaphthalene	<1	<1	<1	<1
	acenaphthylene	<1	<1	<1	<1
	acenaphthene	<1	<1	<1	<1
	fluorene	<1	<1	<1	<1
	phenanthrene	<1	<1	<1	<1
	anthracene	<1	<1	<1	<1
	fluoranthene	<1	<1	<1	<1
	pyrene	<1	<1	<1	<1
	benz(a)anthracene	<1	<1	<1	<1
	chrysene	<1	<1	<1	<1
	benzo(b)fluoranthene	<1	<1	<1	<1
	benzo(k)fluoranthene	<1	<1	<1	<1
	benzo(a)pyrene	<1	<1	<1	<1
	indeno(123-cd)pyrene	<1	<1	<1	<1
	dibenzo(ah)anthracene	<1	<1	<1	<1
	benzo(ghi)perylene	<1	<1	<1	<1
PHENOLS	phenol	1.2	1.6	1.5	1.1
	2-chlorophenol	<1	<1	<1	<1
	2-methylphenol	<1	<1	<1	<1
	4-methylphenol	<1	<1	<1	<1
	2-nitrophenol	<1	<1	<1	<1
	2,4-dimethylphenol	<1	<1	<1	<1
	2,4-dichlorophenol	<1	<1	<1	<1
	2,6-dichlorophenol	<1	<1	<1	<1
	4-chloro-3-methyl phenol	<1	<1	<1	<1
	2,4,6-trichlorophenol	<1	<1	<1	<1
	2,4,5-trichlorophenol	<1	<1	<1	<1
	4-nitrophenol	<1	<1	<1	<1
	2,3,4,6-tetrachlorophenol	<1	<1	<1	<1
	pentachlorophenol	<1	<1	<1	<1
PHTHALATES	dimethylphthalate	<1	<1	<1	<1
	diethyl phthalate	<1	<1	<1	<1
	di-n-butyl phthalate	<1	<1	<1	<1
	butyl benzyl phthalate	<1	<1	<1	<1
	di-n-octyl phthalate	<1	<1	<1	<1

Table 3C: Semi-Volatile Organic Carbon Data (by GC-MS); all expressed as micrograms/litre cont'd

Borehole		BH1	BH2	BH3	BH4
ETHERS	bis(2-chloroethyl)ether	<1	<1	<1	<1
	bis(2-chloroisopropyl)ether	<1	<1	<1	<1
	4-chlorophenyl phenyl ether	<1	<1	<1	<1
	bromo phenyl phenyl ether	<1	<1	<1	<1
BENZENES	1,3-dichlorobenzene	<1	<1	<1	<1
	1,2-dichlorobenzene	<1	<1	<1	<1
	1,4-dichlorobenzene	<1	<1	<1	<1
	nitrobenzene	<1	<1	<1	<1
	1,2,4-trichlorobenzene	<1	<1	<1	<1
	2,6-dinitrotoluene	<1	<1	<1	<1
	2,4-dinitrotoluene	<1	<1	<1	<1
	azobenzene	<1	<1	<1	<1
	hexachlorobenzene	<1	<1	<1	<1
OTHERS	hexachloroethane	<1	<1	<1	<1
	n-nitroso-di-n-propyl-1-propanamine	<1	<1	<1	<1
	isophorone	<1	<1	<1	<1
	bis(2-chloroethoxy)methane	<1	<1	<1	<1
	hexachlorobutadiene	<1	<1	<1	<1
	hexachlorocyclopentadiene	<1	<1	<1	<1
*Denotes analysis outside the scope of our NAMAS accreditation					

Table 3D: Hydrocarbon Oil; all expressed as micrograms/litre

Determinand	BH1	BH2	BH3	BH4
Hydrocarbon Oil	300	500	200	600

Landfill Gas Monitoring Results

Table 3E: Landfill Gas Concentrations (% by volume)

Borehole	Methane	Carbon Dioxide	Oxygen	Atmospheric Pressure (mb)	Flow (l/hr)	Pressure (Pa)
BH1	0.0	2.4	6.3	1005	0.0	0.2
BH2	0.0	0.8	19.0	1005	0.2	0.1
BH3	0.0	1.0	19.2	1005	0.1	0.1
BH4	-	-	-	-	-	-

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Construction and Operational Impacts

Appendix N

Appendix G

Glossary

Adsorption	The process by which substances bond physically or chemically to the surface of solid matter.
Asbestos	A group of naturally occurring mineral fibres that exist in several forms. It is dangerous when its condition begins to deteriorate and when disturbed as the damaged fibres are released into the air and can become lodged in lung tissue. The inhalation of asbestos fibres/dust represents a risk to the health of workers and the public that are exposed.
Attenuation	The processes of dilution, chemical reaction (e.g. adsorption and dispersion) that reduce the concentration of pollutants in the aqueous phase
Biological Oxygen demand	The amount of dissolved oxygen consumed by chemical and microbiological action when a sample is incubated for five days at 20 degrees celcius. It gives a rough indication of the organic matter present in a sample and is often used as a water quality indicator
Groundwater	All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil
Groundwater abstraction	The removal of water from underground strata, known as an aquifer.
Groundwater Source Protection Zone	A zone designated by the Environment Agency with the aim of protecting groundwater in aquifers from over-abstraction and pollution.

Hydrogeology The study of the geological factors relating to the Earth's water.

Integrated Pollution Control A system of control over industrial, environmental emissions.

Landfill A method of waste disposal involving the burial of waste in the ground and frequently in areas where mineral extraction has taken place.

Leachates Water that has become contaminated by passing through materials, commonly those which have been deposited on or in the ground, as landfill sites.

Lithology General descriptions of rock type

Methane A hydrocarbon gas produced as organic compounds break down in waterlogged soils and as a result of digestion in ruminants such as cattle. It is also a constituent of landfill gas.

Putrescible waste Wastes which consist mainly of animal or plant residues and which undergo degradation by bacteriological action.

Remediation The process by which any damage (e.g. pollution) caused is removed, rectified etc.

Volatile organic compounds A class of compounds that are volatile. The compounds include chlorinated solvents and the more volatile components of petrol. Any hydrocarbon, except methane and ethane, with vapour pressure equal to or greater than 0.1 mm of mercury.

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Non-Technical Summary

1.1 Mayer Brown Limited has been appointed by S Grundon (Waste) Ltd to prepare a Traffic Impact Assessment in respect of a redevelopment of the existing water management facility at Lakeside Road, Colnbrook, Berkshire.

1.2 Vehicular access to the site is, and will remain, from the A4 Colnbrook By-pass via Lakeside Road, which is privately owned. A new access will be constructed from Lakeside Road to provide access to the clinical waste incinerator (CWI). The Tanhouse Farm Landfill site will be used as a temporary compound during the construction process.

1.3 The development site currently incinerates 6,986 tonnes of waste per annum as well as processing 150,475 tonnes through the Materials Reclamation Facility per annum. Following the reclamation process, non-recyclable waste is sent to landfill sites and recyclable material is distributed to appropriate centres.

1.4 The site benefits from permission to incinerate 17,500 tonnes of clinical waste per annum and a site licence to process approximately 400,000 tonnes of recovered material per annum. The recovered material and residues are then distributed to various locations by road.

1.5 The proposed operation will incinerate 17,500 tonnes of clinical waste per annum and process 440,000 tonnes of waste material per annum. Recyclable material would still be distributed from the site, however, the waste material that is currently sent to landfill sites would be incinerated on site. An additional 38 parking spaces will also be provided on the site.

1.6 The development will also include the construction of a visitors centre with associated parking for cars, minibuses and bicycles. An existing track, leading from Lakeside Road to Orlitts Lake South, will be improved to accommodate vehicular traffic to the visitors centre.

1.7 Vehicular numbers and movements have been estimated in accordance with traffic figures provided by S Grundon (Waste) Ltd. The Energy from Waste facility will operate 7 days a week, 24 hours a day, with the majority of vehicle movements occurring between 0700-1900 hours. There will be a minimal amount of traffic associated with the proposals occurring between 1900-0700 hours and at the weekend.

1.8 As a result of incinerating the waste material, instead of transporting it from the site to landfill sites, there is a significant saving in the number of heavy goods vehicle (HGV) movements on the adjacent highway network. The proposed development will generate significantly less vehicle movements that the sites consented permission has the potential to generate. In fact, the current operation, consented scheme and proposed scheme will generate 344, 740 and 524 heavy goods vehicle movements respectively between the hours of 0700-1900.

1.9 During the construction period the development site will generate a level of traffic that is less than the number of movements associated with the sites existing operation.

1.10 In terms of highways, the impact of the development proposals have been estimated in accordance with the guidelines set out by the Institution of Highways and Transportation. It has been concluded that the impact of the development on the A4 adjacent to the site will not be significant.

1.11 There are a number of other proposed developments nearby, most notably the London International Freight Exchange. The cumulative impact of the development proposals have been addressed in the Traffic Impact Assessment (TIA) and it has been concluded that following the necessary highway improvements, the adjacent highway network can accommodate the level of traffic that is expected to be generated.

1.12 The east of the site is bounded by a rail line and S Grundon (Waste) Ltd are currently in discussions to utilise a proposed new siding from this line to transport Bottom Ash from the waste incineration process as well as import material for incineration. Being served by rail could significantly reduce the level of heavy goods vehicle movements associated with the proposed development. However, to provide a robust case, the traffic impact assessment makes no allowance for this potential for this site to be served by rail and assumes that all inputs and output will be via the local highway network.

1.0 INTRODUCTION

1.1 Mayer Brown Limited has been appointed by S. Grundon (Waste) Ltd to prepare a Traffic Impact Assessment in respect of a Energy from Waste plant at Lakeside Road, Colnbrook, Berkshire.

1.2 The site is situated approximately 1km north of Poyle and 2km east of Colnbrook. The existing operation involves the incineration of clinical waste material and a Materials Reclamation Facility (MRF). The site in relation to the regional highway network is shown at Figure 1.1.

1.3 The existing site access is from the A4 trunk road via Lakeside Road, which serves predominately industrial units. The A4, locally know as the Colnbrook By-pass, is a major route into London to the east, Slough, Maidenhead and Reading to the west and serves a strategic function in terms of the regional highway infrastructure. The A4 is subject to a de-restricted speed limit.

1.4 Approximately 3km to the west of the site, the A4 links with junction 5 of the M4. The M25 is accessible from the site at junction 14, via the A3044 and A3113, approximately 4 km away.

1.5 The development proposals include the introduction of an energy from waste plant at the existing reclamation site. The site currently incinerates 6,986 tonnes of clinical waste per annum as well as processing 150,475 tonnes through the MRF per annum.

1.6 The site benefits from permission to incinerate 17,500 tonnes of clinical waste per annum and a site licence to process approximately 400,000 tonnes of reclamation material per annum.

1.7 The existing access to the site is from Lakeside Road. This is a wide, traffic calmed road serving a number of major industrial units. It's junction with the A4 is by way of a priority junction. A ghost island is provided on the A4 for right turning traffic into the site.

1.8 During the construction period it is proposed to make use of the Tanhouse Farm Landfill site as a temporary construction compound which will be accessed using the existing A4/Lakeside Road junction.

1.9 There are a number of other traffic generating development proposals in the area, including BAA's Logistics centre, Heathrow Airport's Terminal 5 and the London International Freight Exchange (LIFE). This assessment will appraise the need to take account of these developments when reviewing the impact of traffic of the proposed energy from waste plant on the surrounding highway network on the year of commissioning.

1.10 The purpose of this report is to assess the effects of developing the current site to include a energy from waste plant, in terms of additional traffic movements associated with the proposed development on the surrounding highway network. The report considers the impact of the development with regard to environmental impact in general highway terms. This report will consider three possible scenarios of traffic generation for the site, the existing situation, the consented permission and the proposed energy from waste plant. It will further consider the existing site access as well as the junction of Lakeside Road with the A4 and the proposed changes to this junction which form part of the LIFE scheme.

1.11 The east of the site is bounded by a rail line and S. Grundon (Waste) Ltd are currently in discussions to utilise a proposed new siding from this line to transport Bottom Ash from the waste incineration process as well as import material for incineration. The potential to be served by rail is set out in greater detail in Chapter 3 of the Environmental Statement.

1.12 It has been agreed with the local Highway Authority that this assessment should consider the capacity of junctions at which the proposals may have a material impact in highway terms as set out in the Guidelines for Traffic Impact Assessment published by the Institute of Highways and Transportation and defined later in this report.

1.13 The remainder of this report is divided into 5 Sections. Section 2 provides details of the site and surrounding area while Section 3 describes the proposed energy from waste plant in detail. Section 4 assesses the existing, consented and proposed developments and their traffic generation potential and their impact on the adjacent highway network as well as the impact of the construction traffic. Section 5 provides details of the nearby proposed developments and their cumulative impact with the proposed development. Our summary and conclusions are contained in Section 6.

2.0 SITE AND SURROUNDING AREA

2.1 The site is located on the Lakeside Industrial Estate which lies approximately 1km north of the Village of Poyle, in the borough of Slough. The site is accessed from the A4 via Lakeside Road. To the east of the site, the A4 comes from Central London, passes to the north of Heathrow airport and crosses over the M25 before intersecting with Lakeside Road. Approximately 3km to the west of the site, the A4 meets with junction 5 of the M4 and continues into Slough, Maidenhead and ultimately the west country.

2.2 Lakeside Road has two access points onto the A4 approximately 450 metres apart. The western access is currently utilised by Hellmann traffic only. Lakeside Road is a private road owned by William Boyer and Sons Ltd. All of the properties which front Lakeside Road have rights of way over it, including Grundon. Adjacent to the site, the A4 comprises two 4 metre wide running lanes and a 3 metre wide right turn lane serving Lakeside Road. Approximately 30 metres to the west and 50m to the east there are laybys on the northern side of the carriageway.

2.3 From the west and across the A4/Lakeside Road junction the A4 has a deristricted speed limit, which becomes restricted to 50 mph to the east of the site in the proximity of its junction with the A3044. It is understood that Slough Borough Council and the Highways Agency have plans to extend this 50 mph limit further along the A4 across the existing site access. To the west, in the vicinity of the site, the A4 is predominately fronted by farm land. On the southern side of the carriageway there is a public house and petrol filling station. Another notable development is to the east of the site, accessed from the northern arm of the traffic signal junction of the A4 with the A3044, British Airways has its Waterside Development on Prospect Park. The further east into London the A4 goes, the more built up the adjacent land becomes.

2.4 There is a footway provided on the southern side of the A4, which is typically 1.8 metres wide. Although no formal crossing points for pedestrians exist, they may cross the carriageway in two stages using the traffic islands provided in the centre of the road, close to the junction of the A4 with Lakeside Road. Cyclists currently have no formal facilities in the vicinity of the site, although plans to accommodate them are discussed later in this report.

2.5 Langley Grammar School lies approximately 4 km to the west of the site. A further two schools are situated in the village of Colnbrook and there is Pippins School in Poyle.

2.6 Lakeside Road serves all of the units on the industrial estate, including Safeway, Exel Logistics and DFDS Transport. Lakeside Road also serves the neighbouring gravel pit lakes currently used for recreation and nature conservation.

2.7 Lakeside Road is approximately 6.35 metres wide and is subject to double yellow lines along its length restricting parking.

3.0 PROPOSED DEVELOPMENT

3.1 The proposals for the energy from waste plant involve the redevelopment of the existing clinical waste incinerator and materials reclamation facility (MRF).

3.2 It is proposed that the energy from waste plant will process approximately 440,000 tonnes of waste per annum. The waste will be domestic, commercial and industrial waste. The plant will feed the National Grid with approximately 33 MW of electric power. Although the clinical incinerator will be relocated, it is not proposed to change its current operation.

3.3 The following elements of the proposal will require planning consent:-

- Redevelopment of the existing waste management facility to provide an EfE plant, MRF and replacement CWI;
- Temporary use of Tanhouse Farm Landfill as a construction compound;
- Construction of a Visitor and Environmental Study Centre on Orlitts Lake South.

3.4 The current operation can recover 14% of recyclable material from its input. This material is transported from the site by road in 20, 5 and 3.5 tonne vehicles and generally turn left onto the A4 to access the M25. The remainder of the waste that cannot be reclaimed, some 129,408 tonnes per annum (compared to it's consented permission of 345,000 tonnes per annum), is transported away from the site in 18.5 tonne vehicles and will generally turn right from the site towards the M4. There is also a small amount of ash from the incineration process, some 376 tonnes per annum of APC residues (Fly Ash) and 655 tonnes per annum of Bottom Ash.

3.5 The proposed energy from waste plant will still require the removal of recycled material from site as well as the throughput of clinical waste. As the remainder of the waste will be incinerated, the requirement for removal of this material will be replaced by the need to export two residues from the incineration process, APC residues (Fly Ash) and Bottom Ash.

3.6 The proposed energy from waste plant will produce approximately 12,800 tonnes of APC residues per annum. These residues will be transported from the site in dedicated 25 tonne powder tankers bound for Bishop's Cleeve in Gloucester. The most direct route for the tankers is to turn left onto the A4 Colnbrook Bypass from the site to gain access to the M25 and M40.

3.7 The bottom ash resulting from the incineration of the waste can be used as a secondary aggregate, following a stabilisation period. The site will produce approximately 120,000 tonnes per annum of the bottom ash. As set out in the introduction, there is an opportunity to remove this bottom ash from the site by rail and discussions are taking place with three companies who have expressed an interest in receiving this ash. This would result in the bottom ash not being transported on the public highway. However, to provide a "worst case" assessment, this report assumes that all of the bottom ash will be transported from the site in 20 tonne vehicles and turn right onto the A4 to landfill sites, crossing two streams of traffic resulting in maximum conflicts and delays.

3.8 The amount of input to the site for the consented permission and the proposed energy from waste plant is similar. However the output vehicles used for the energy from waste operation will have a larger capacity than those serving the existing and consented operations. There is a considerable decrease between the 345,000 tonnes the consented permission may output, which would be transported in 18.5 tonne vehicles and the 132,800 tonnes (120,000 tonnes in 20 tonne loads and 12,800 tonnes in 25 tonne loads) that the proposed energy from waste plant is projected to output. It is noteworthy that the energy from waste plant may in fact only require the "*on highway*" transportation of 12,800 tonnes (in 25 tonne vehicles) of output should the bottom ash be transported by rail. This represents a potential reduction of 332,200 tonnes of material on the highway per annum.

3.9 The outputs above do not include recyclable materials and are intended to provide a like for like comparison of the output tonnages which *could* be incinerated for the consented scheme and *would* be incinerated for the proposed scheme. It is anticipated that the proposed energy from waste operation will recover 10% of the input as recyclable material.

3.10 For the purpose of providing a robust assessment, it has been assumed that all of the proposed outputs will be transported on the highway.

3.11 The internal highway layout has been designed to minimise vehicle delay and provide good circulation of the site, which results in the avoidance of vehicles waiting on Lakeside Road to enter the site. All traffic serving the plant will enter the site via the existing access from Lakeside Road, follow a haul road along the northern and eastern perimeters of the site and then ascend the ramp to the tipping hall, passing over an automatic entry weighbridge. Vehicles then leave the facility via the same route, passing over a second weighbridge adjacent to the clinical waste incinerator. Deliveries of clinical waste, lime and other materials used in the energy from waste process and removal of residues will be via a new access onto Lakeside Road. The are currently 76 parking spaces provided on site for use by staff and as part of the development it is proposed to increase the parking by a further 38 spaces.

3.12 We have been advised that 10% of the weekly traffic associated with the proposed development would arrive and depart from the site during the weekend. We have also been advised that 10% of the daily traffic will arrive and depart from the site between the hours of 19:00 and 07:00. The assessment further considers the impact of the traffic associated with the development during the night.

3.13 As part of the development it is proposed to build a visitors centre on land adjacent to the site incorporating 20 parking spaces and coach parking facilities. The centre will generally be visited by organised groups and will be planned in advance. Therefore vehicle trips to the site will be controlled and managed. It is expected that two 20 seater minibuses will visit the site per day. The car parking associated with the visitors centre will provide enhanced facilities for those who currently park in Lakeside Road for leisure purposes.

3.14 As part of the development proposals and in line with current Government policies, S. Grundon (Waste) Ltd will prepare a Green Transport Plan which will encourage staff to travel by non-car modes of transport or to car-share. The development proposals incorporate secure cycle parking facilities as well as shower and changing facilities for those staff who wish to travel to and from work by cycle. In addition, S. Grundon (Waste) Ltd have made a significant financial contribution towards the Colnbrook by-pass section of the national cycle route, which is included as part of the SUSTRANS strategy. In addition, the site is accessible to several bus services linking Slough to Heathrow which run frequently between 0400 and 2400.

4.0 TRAFFIC IMPACT ASSESSMENT

BASE TRAFFIC DATA

4.1 Details of the existing vehicle movements at the existing junction of Lakeside Road/Colnbrook Bypass have been obtained from manual classified turning count and automatic traffic count traffic surveys carried out by QualiDat between 11th and 21st April 1999. The distribution of vehicles turning into Lakeside Road has been established from a Transport Impact Assessment prepared for the London International Freight Exchange (LIFE), for which Count On Us were commissioned to undertake the traffic surveys, which were executed on the 25th May 1998.

4.2 The traffic surveys undertaken established that the critical morning and evening peak hours on the adjacent highway network on weekdays are 08.00-09.00 hours and 17.00-18.00 hours respectively. The assessment therefore considers these peak hours in terms of highway impact. Furthermore, data provided has indicated that the operational peak hour for the existing activities on the site and for the proposed energy from waste plant is 09.30-10.30 hours. The assessment also assesses the impact of the proposed development during this hour for a weekday. It is proposed that the energy from waste plant will be operating 7 days a week, 24 hours a day. The assessment therefore assesses the operational peak hour of the plant for a typical weekend day. The resulting 1999 base flows for these critical peaks are indicated on Figure 4.1 and 4.2.

4.3 Major trunk roads generally have capacity for 1700-2000 vehicles per lane per hour. The capacity of any road is usually restricted by the positioning and type of junctions along that road. It this case, the Stanwell Moor Road traffic signal junction to the east of the Lakeside Road junction determines the capacity of traffic along this section of the A4. The traffic surveys recorded that in the peak flow on a single lane of the A4 past the site is 1165 pcu's. This peak flow is below the capacity of this link of the A4 and site observations indicate that this section of the A4 is operating without link capacity problems.

4.4 In addition, it is possible to calculate the Congestion Reference Flow (CRF) which is an estimate of the Annual Average Daily Traffic (AADT) flow at which the carriageway is likely to be "congested" in peak periods on an average day in accordance with DETR guidelines. For this link of the A4, the CRF has been calculated as 28,112 and the AADT for the road is 21,360. Therefore this calculation indicates that the A4 has significant capacity before congestion can be expected in the peak hours.

4.5 Hourly arrivals and departures for HGV traffic associated with the existing site and proposed energy from waste plant have been have been calculated using a daily profile graph provided by S. Grundon (Waste) Ltd. The waste that is currently collected for input to the site will also form the major input of the energy from waste proposals. The pattern of arrivals and departures for the site will therefore be similar. Hourly traffic has been calculated from daily traffic by multiplying the daily traffic by an hourly weighting factor established from the daily profile graph. The flow profile for the HGV movements is illustrated in graphical format in Appendix A and the weighting factors are summarised in the table below:-

Table 1 : **Daily Flow Profile of Energy from Waste Plant**

Hour Beginning	Percentage of Daily HGV's
0700	5.68
0800	10.02
0900	16.69
1000	16.69
1100	12.77
1200	11.69
1300	11.69
1400	7.51
1500	3.09
1600	2.50
1700	1.67

EXISTING AND CONSENTED GRUNDON TRAFFIC DATA

4.6 The distribution of the heavy goods vehicles have been estimated in accordance with the destination/origin of the vehicle. Vehicles bringing waste to the site, which are generally 6.5 tonnes, have been distributed pro-rata the existing weekday proportion of turning movements for HGV traffic recorded at the Lakeside Road/Colnbrook Bypass junction. We have been advised that the recyclable material leaves the site and turn left from Lakeside Road towards the M25 and will only depart from the site between the hours of 07:00 and 15:00. Also, as a worst case it has been assumed that all of the landfill material leaves the site and turns right towards the M4, having to cross two streams of traffic on exiting Lakeside Road.

4.7 It has further been assumed that HGV's entering the site will normally not stay any longer than one hour, resulting in a 50%/50% Arrivals/Departures split in hourly movements.

4.8 It has previously been stated that the current operation processes 150,475 tonnes through the MRF and incinerates 6,986 tonnes of clinical waste per annum. In comparison, the consented scheme has permission to incinerate 17,500 tonnes of clinical waste and a licence to process 400,000 tonnes of reclamation material per annum.

4.9 During the hours of 0700-1900 the are approximately 120 light vehicle (LV) movements per day associated with office workers, workshop teams and drivers. This number of movements is anticipated to increase to 300 movements should the consented scheme become operational.

4.10 The distribution of light vehicle movements to the site have been estimated from the existing weekday movements of LV's at the junction of Lakeside Road/Colnbrook Bypass. The hourly flows to the site have been apportioned according to the following criteria provided by the Client and are set out below:-

Office workers	30%	Arrive from 8 am onwards (this assessment assumes that they all arrive during the morning peak hour)
Workshop	10%	2 Shift Teams (5 per shift) 1st Shift arrive 6.30 am and depart 2.30 pm 2nd Shift arrive 2.00 pm and depart 10.00 pm
Drivers	60%	10% start at 3.30 am and leave at 1.00 pm 90% start at 5.00 am and leave at 2.00 pm

It is noteworthy that as a result of the energy from waste proposals the workshops will be relocated.

4.11 Set out below are the daily movements associated with the existing and consented schemes:-

Table 2 : **Weekday Current 12 Hour Traffic Flows**

	Existing total Traffic flows	Existing HGV flows	Existing total Grundon traffic	Existing Grundon HGV's	% Impact
A4 East	19182	2195	242	185	1.3%
A4 West	18918	2108	222	159	1.2%
Total			**464**	**344**	

1.26%
1.17%

Table 3: **Weekday Consented 12 Hour Traffic Flows**

	Existing Total Traffic flows	Existing HGV Flows	Total Grundon Traffic Consented Scheme	Grundon HGV's Consented Scheme	% Impact
A4 East	19182	2195	577	410	3.0%
A4 West	18918	2108	463	330	2.4%
Total			**1040**	**740**	

4.12 As discussed, the critical hours on the highway network are the morning peak, operational peak and the evening peak hours. Set out below are the HGV and LV movements associated with the existing and consented scheme:-

Table 4 : **Weekday HGV Movements AM Peak Hour (0800-0900)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	10	6	7	9
Consented Activities	24	16	16	20

Table 5 : **Weekday HGV Movements Operational Peak Hour (0930-1030)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	11	11	11	11
Consented Activities	30	29	23	26

Table 6 : **Weekday HGV Movements PM Peak Hour (1700-1800)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	2	1	2	0
Consented Activities	3	4	5	2

Table 7 : **Weekday LV Movements AM Peak Hour (0800-0900)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	3	17	0	0
Consented Activities	8	42	0	0

Table 8 : **Weekday LV Movements Operational Peak Hour (0930-1030)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	0	0	0	0
Consented Activities	0	0	0	0

Table 9 : **Weekday LV Movements PM Peak Hour (1700-1800)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	0	0	9	11
Consented Activities	0	0	22	28

4.13 There may be a minimal level of LV traffic associated with visitors cars during the operational peak hour, but it is considered insignificant.

4.14 It is clear from the above tables that the consented development has the potential to generate a significant level of traffic over and above that associated with the current operation of the plant.

CONSTRUCTION TRAFFIC AND PROPOSED GRUNDON TRAFFIC DATA

4.15 The site clearance of the existing operation will take approximately 2 months. During this period it is anticipated that there will be approximately 400 HGV movements associated with removal of inert material and 1200 moves associated with removal of other material. This equates to approximately 40 moves per day. In addition, the clinical waste incinerator will be generating a maximum of 61 moves per weekday. The total of 101 movements per day (50 arrivals and 51 departures) is significantly less than is currently generated by the site and therefore will have a negligible effect on the operation of the adjacent highway network.

4.16 The construction period for the new plant from the end of the site clearance to the commissioning of the new plant has been estimated as 29 months. During this period the following vehicles will be associated with the construction:-

Table 10 : **Weekly Moves Associated with Construction Period**

Vehicle Activity	Weekly Moves
Delivery of fill material	2
Deliveries to concrete batching plant	9
Deliveries of steelwork	2
Delivery and removal of tower crane*	2
Delivery and removal of mobile piling rigs and mobile equipment*	2
TOTAL	**17**

*Although there will be only 12 moves in total associated with this item, as a worst case we have assumed that there will be one delivery associated with this activity on a typical week.

4.17 When operating at full capacity of 17,500 tonnes per annum, the clinical waste incinerator has the potential to generate 336 moves per week. The clinical waste incinerator will remain in operational during the construction phase of the new energy from waste plant, resulting in the total of 353 HGV movements.

4.18 It is anticipated during the construction phase that there will be approximately 90 light vehicle movements associated with construction staff per day.

4.19 During the construction period there will be a temporary logistic centre and store positioned on Tanhouse Farm accessed via Lakeside Road. There will be traffic movements associated with the construction between the farm and the site. These movements will not have an effect on the public highway.

4.20 It is necessary to assess the impact of the proposed development in the year 2004, as this is the year in which the energy from waste operation is likely to be commissioned. This assessment assumes that as a worst case that the energy from waste plant will be operating at full capacity from day one. Assessment of similar traffic surveys indicate that, during the peak periods, traffic growth occurs by peak spreading, with zero or relatively low growth occurring during the peak periods. However, to provide a "worst case" assessment this report has allowed for low growth on the base traffic data in accordance with TEMPRO (Trip End Model PROgram) growth rates. TEMPRO is the standard method for predicting traffic growth for specific regions. The growth rate has been established from traffic growth data relating to the Hillingdon district of Greater London. The low growth rate obtained from TEMPRO is 1.025 and the resulting year 2004 base flows for the Weekday morning, operational and evening peak hours and weekend peak are shown on Figure 4.3 and 4.4. The traffic entering and exiting the industrial development has not been growthed up as it is not appropriate to apply general traffic growth to development traffic.

4.21 With regard to the proposed energy from waste operation, the input movements will remain in the same ratio as the existing weekday movements. For the purposes of this assessment it has been assumed that the APC residues will exit and enter the site to and from the east and as a worst case, assuming that the bottom ash is transported on the public highway and not rail, vehicles associated with this bottom ash residue will exit and enter the site from the west.

4.22 The resulting daily HGV movements for the energy from waste plant are set out below as well as the critical peak hours including the existing and consented schemes to provide a comparison.

Table 11 : **Weekday Proposed 12 Hour Traffic Flows**

	Total Traffic flows - 2004	Existing HGV flows	Grundon traffic EfW	Grundon HGV's EfW	% Impact
A4 East	19642	2195	335	291	1.7%
A4 West	19372	2108	269	233	1.4%
Total			**604**	**524**	

Table 12 : **Weekday HGV Movements AM Peak Hour (0800-0900)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	10	6	7	9
Consented Activities	24	16	16	20
Proposed Energy from waste Plant	16	13	15	14

Table 13 : **Weekday HGV Movements Operational Peak Hour (0930-1030)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	11	11	11	11
Consented Activities	30	29	23	26
Proposed Energy from waste Plant	19	27	25	17

Table 14 : **Weekday HGV Movements PM Peak Hour (1700-1800)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	2	1	2	0
Consented Activities	3	4	5	2
Proposed Energy from waste Plant	3	3	2	1

4.23 It is clear from the tables that during the week the proposed development would generate significantly less HGV traffic than the site's current permission has the potential to generate.

Table 15 : **Weekday LV Movements AM Peak Hour (0800-0900)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	3	17	0	0
Consented Activities	8	42	0	0
Proposed Energy from waste Plant	7	33	0	0

Table 16 : **Weekday LV Movements Operational Peak Hour (0930-1030)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	0	0	0	0
Consented Activities	0	0	0	0
Proposed Energy from waste Plant	0	0	0	0

Table 17 : **Weekday LV Movements PM Peak Hour (1700-1800)**

Activity	*Movement respective to Lakeside Road*			
	Left In	*Right In*	*Left Out*	*Right Out*
Existing Activities	0	0	9	11
Consented Activities	0	0	22	28
Proposed Energy from Waste Plant	0	0	24	16

4.24 The above tables clearly indicate that the total level of LV traffic associated with the proposed energy from waste plant during the day is less that that which would be generated by the site operating to its consented permission during the critical peak hours. There may be a minimal level of LV traffic associated with visitors cars during the operational peak hour, but it is considered insignificant.

4.25 The table below outlines the traffic which would be generated by the proposed energy from waste development during the period 19:00 – 07:00, based on 10% of the daily inputs arriving during this period:-

Table 18 : **Traffic Movements Associated with Weekday Night Time Operation (1900-0700)**

Vehicle Generated by	Movements
Inputs	44
Recyclables	0
Bottom Ash	0
LV's	70 (5 Departures)
Other	0
TOTAL	**114**

4.26 It can be seen from the above table that only 22 heavy goods vehicles will arrive at the development, resulting in approximately 44 HGV movements throughout this 12 hour period. The light goods vehicle movements are associated with the drivers of the HGV's, 5 of which would arrive for 6.30am, 5 would depart at 10.00pm, 6 would start at 3.30am and 54 of which would arrive for 5.00 am. These light vehicle movements are comparable to the movements associated with the existing operation. It is clear that this level of traffic would have a negligible impact both in terms of capacity and in terms of environmental impact on the highway network. These figures are based on the plant operating at full capacity, that is processing 440,000 tonnes of material.

4.27 The LV movements that will occur on a typical weekend day are those associated with the drivers arriving early in the morning and leaving in the afternoon. The office will generate little or no traffic over the weekend period for the proposed energy from waste development and as already discussed, the workshops will be relocated.

4.28 The HGV movements associated with a typical weekend day have been estimated on the basis that 10% of the weekly traffic will occur during the weekend. It has been assumed that the daily flow profile of vehicles for a weekday and weekend are similar. The resulting traffic flows during the operation peak of the proposed energy from waste plant is set out in the table below:-

Table 19 : **Weekend Operational Peak (0930-1030)**

Vehicle Generated by	**Movements**
Inputs	19
Recyclables	1
Bottom Ash	2
LV's	0
Other	9
TOTAL	**31**

4.29 It has been set out in Chapter 9 of the Environmental Statement that there would be 188 HGV movements associated with the weekend. The daily profile states that approximately 16.69% of the daily traffic will occur in the operational peak hour, which equates to 31 movements in this peak hour. It is anticipated that staff required for the operation of the plant will not arrive or depart during this peak hour, which is reflected in the above table. There will inevitably be a small number of visitors arriving throughout the day and in this operational peak hour. It is difficult to quantify non-operational light vehicle trips but it is considered that the number will be minimal and will have no material impact on the local highway network. These non-operational trips have therefore been excluded from this assessment.

4.30 The level of traffic generated on a typical weekend night by the proposed energy from waste plant is set out in the table below:-

Table 20 : **Traffic Movements Associated with Weekend Night Time Operation (1900-0700)**

Vehicle Generated by	Movements
Inputs	12
Recyclables	0
Bottom Ash	0
LV's	70
Other	0
TOTAL	**82**

4.31 It can be seen from the above table that the development would generate only 12 heavy goods vehicle movements during this period (approximately 6 arrivals and 6 departures). It is considered that this level of traffic is negligible and would not constitute a detrimental impact on the adjacent highway network. Again the light goods vehicle movements are associated with the drivers of the HGV's.

4.32 The resulting traffic flows associate with the existing, consented and proposed weekday and weekend activities are illustrated on Figures 4.5, 4.6, 4.7 and 4.8 respectively.

INCREASES IN TRAFFIC FLOWS

4.33 The guidelines for Traffic Impact Assessment published by the Institute of Highways and Transportation (IHT) recommend that a traffic impact assessment should include all junctions and links where the proposals would result in an increase in traffic of 5% where congestion occurs and in sensitive locations and 10% where congestion is not expected. On the basis of these guidelines, we have calculated the percentage increase resulting from the proposed energy from waste plant on highway links in the vicinity of Lakeside Road/Colnbrook Bypass and for comparison we have indicated the percentage increase in traffic, based on 2004 base flows, should the consented permission be brought into use. The impacts are indicated in the tables below:-

Impact of Additional Traffic Due To Consented permission Becoming Operational Total Traffic Flows (LV+HGV)

Table 21 : **Weekday AM Peak (0800-0900)**

Link	Existing Traffic	Additional Traffic	% Impact
A4 East	1832	74	4.0%
A4 West	1821	52	2.9%
Lakeside Road	171	126	73.7%

Table 22 : **Weekday Operational Peak (0930-1030)**

Link	Existing Traffic	Additional Traffic	% Impact
A4 East	1092	52	4.7%
A4 West	1056	56	5.3%
Lakeside Road	194	108	55.7%

Table 23 : **Weekday PM Peak (1700-1800)**

Link	Existing Traffic	Additional Traffic	% Impact
A4 East	2147	31	1.5%
A4 West	2114	33	1.6%
Lakeside Road	195	64	67.4%

Impact of Additional Traffic Due To Energy from waste Plant Becoming Operational

Table 24 : **Weekday AM Peak (0800-0900) 2004 Base Flows**

Link	Existing Traffic	Additional Traffic	% Impact
A4 East	1832	61	3.3%
A4 West	1821	37	2.0%
Lakeside Road	171	98	57.3%

Table 25 : **Weekday Operational Peak (0930-1030) 2004 Base Flows**

Link	Existing Traffic	Additional Traffic	% Impact
A4 East	1092	52	4.8%
A4 West	1056	36	3.4%
Lakeside Road	194	88	45.3%

Table 26 : **Weekday PM Peak (1700-1800) 2004 Base Flows**

Link	Existing Traffic	Additional Traffic	% Impact
A4 East	2147	29	1.4%
A4 West	2114	20	0.9%
Lakeside Road	195	49	25.1%

4.34 Table 22 indicated an impact on the A4 beyond the 5% threshold previously set out. However, as set out in paragraph 4.4, it is not anticipated that congestion can be expected in the peak hours and therefore the 10% threshold for assessment is applicable in this case.

4.35 It can be seen from the tables above that the proposed energy from waste plant will have a negligible impact on the A4. In fact, the proposed development will have a smaller impact on the highway than if the consented permission were to be commissioned and could therefore result in a saving of traffic movements on the Colnbrook Bypass.

4.36 It can also been seen that the proposed development would significantly increase traffic flows on the first section of Lakeside Road. However, this road is private and it's purpose is to serve a large industrial estate and has been designed to accommodate frequent heavy goods vehicle movements. Furthermore the proposed development would produce less HGV movements than the consented permission of the site. It is therefore considered that this increase in HGV movements would not have a detrimental impact on the operation of this road.

4.37 On the basis of the tables set out under paragraph 4.33, it can be seen that the impact on the A4 is less than the IHT guidelines set out in paragraph 4.33, bearing in mind the calculation set out in paragraph 4.4 indicating that no congestion would be expected in the peak hours It is therefore not necessary to test the capacity of the junction of Lakeside Road/Colnbrook Bypass. However, in order to provide an indication of how the existing priority junction of Lakeside Road with the A4 would operate, we have assessed its capacity for the year 2004 with the proposed energy from waste plant using the Department of Environment Transport and the Regions PICADY program. The results indicate that this junction would be operating in the morning and evening peak hour with Ratio of Flows to Capacity (RFC) of 0.754 and 0.750 respectively. When an RFC is at the value 1, the flow passing through that junction is equal to the capacity of the junction and it can be considered that there is no further theoretical capacity in the junction. The test output files are included in Appendix B. The results indicate that the junction will operate within capacity in 2004 with the energy from waste development at full operation.

4.38 As part of the development it is proposed to make provision for a visitors centre, for the public to visit and learn about the operation of the site. The centre will be served by a realigned access replacing the existing track to Orlitts Lake South from Lakeside Road and there will be the provision for 20 vehicles to park as well as 12 bicycles and 2 coaches. The majority of visits to the centre will be organised groups which will generally arrive by minibus or coach. Visits will be arranged to avoid the critical peak hours identified and the impact of the movements associated with the visitors centre is expected to be negligible. The parking associated with the visitors centre will provide enhanced facilities for those who currently use lakeside road for parking for leisure purposes such as fresh water fishing.

4.39 It is apparent at this stage that, taking into account that the proposed energy from waste plant would generate less traffic than the consented permission, the proposals would not have a detrimental effect on the local highway network.

4.40 A summary of the existing, consented and proposed traffic flows and impacts is provided in table 27 below:-

Table 27 : **Existing, Consented and Proposed 12 Hour Flows, Morning, Operational and Evening Peak Hours**

	Existing Total Traffic Flows	Current Grundon Traffic	Grundon Traffic As % Total Flows	Grundon Consented Traffic	Consented Traffic as % Total Traffic	2004 Traffic Flows	Grundon EfW Traffic	EfW Traffic as % Total Traffic
Lakeside Rd a.m.	171	52	30.4%	126	73.7%	171	98	57.3%
Lakeside Rd p.m.	195	25	12.8%	64	32.8%	195	49	25.1%
A4 East a.m.	1819	30	1.6%	74	4.1%	1832	61	3.3%
A4 West a.m.	1800	22	1.2%	52	2.8%	1821	37	2.0%
A4 East p.m.	2110	12	0.6%	31	1.5%	2147	29	1.4%
A4 West p.m.	2078	13	0.6%	33	1.6%	2114	20	0.9%

5.0 CUMULATIVE IMPACTS

5.1 The land encompassing the development site has recently had a planning application submitted for the provision of the London International Freight Exchange (LIFE) a detailed plan indicating the extent of the area can be found in Chapter 3 of the Environmental Statement. The development comprises facilities for the transfer of goods from road to rail, distribution units, an internal railway network, estate offices and lorry park as well as providing substantial landscaping.

5.2 It is anticipated that the LIFE project will have no train activity occurring between 06:00 and 09:00 and 16:00 and 20:00. The project is expected to run an efficient "meet the train" policy for arriving HGV's and as such would not generate large amounts of traffic during the critical peak hours on the highway network. The expected distribution of HGV's to the LIFE project are set out below:-

- between 1900-2200 and 0400-0700 there would be 100 HGV's into and out of the site per hour
- between 0730-0930 and 1630-1830 there would be 20 HGV's into and out of the site per hour
- at all other times there would be 50 HGV's per hour into and out of the site

5.3 It is proposed that LIFE will be operational in the year 2011, with major highway improvements to the junction of Lakeside Road with the Colnbrook Bypass taking place in 2004. The TIA produced in support of the application for LIFE provided extensive models of the existing and proposed junctions in the vicinity of the development. The proposed site access junction was tested for 2011 with the LIFE traffic and other traffic associated with the Lakeside Industrial Estate, including the existing Grundon traffic, using OSCADY. The maximum ratio of flow to capacity (RFC) that was obtained for this junction was 0.69 for the critical morning and evening peak hours, meaning that the flow through the junction is approximately 69% of the operational capacity of the junction. These results clearly show that the proposed site access junction would operate well within operational capacity.

5.4 OSCADY is a stage based traffic signal program rather than LINSIG which is a phase based traffic signal program. LINSIG generally provides a more accurate model of a traffic signal junction than OSCADY will and it is therefore our preferred traffic signal modeller. All OSCADY programs use the same basic formula for calculations, the most current version of OSCADY is Version 4, but this practice use OSCADY2 and Peter Bretts were using OSCADY3 at the time of their assessment for the LIFE proposals. We have assessed the proposed junction in 2011 using OSCADY2 with the traffic associated with LIFE and the additional traffic associated with the energy from waste plant for the critical morning and evening peak hours. The results obtained are similar to those in the LIFE assessment, but are indicating a slightly higher RFC than those obtained by LIFE. This is due to an additional function in OSCADY3 (used by Peter Bretts for LIFE) allowing global effective green displacements to be added. The results obtained by our testing do show however that the junction will operate well within capacity with RFC's of 0.729 and 0.713 being obtained in the critical morning and evening peak hours. The test results are included in Appendix C.

5.5 As indicated above, there would only be a small increase in traffic associated with the introduction of the energy from waste plant on Grundon's site in comparison with the base traffic flows on the A4. The impact of this additional traffic would represent a smaller impact on the adjacent highway network in 2011 than it does in 2004, due to the larger base flows in 2011. It is noteworthy that the traffic assessment associated with LIFE did not take into account the consented permission for the Grundon site.

5.6 The other notable developments in the vicinity of the development site being considered are the Heathrow Terminal 5 proposal and the BAA Logistics centre. The Inquiry is now closed for the T5 development and it is impossible to predict the outcome of it. However, it is reasonable to assume that the T5 development would be progressed with the Governments current transport policies being at the forefront of discussion and that alternative modes of transport would probably be a major part of any development proposals. Given the nature and size of this development and taking into account that the Grundon site has consented permission, it is considered that any effect that the T5 and Logistics Centre developments would have following the introduction of the energy from waste development would be a matter that BAA should address. To our knowledge, the T5 proposal did not take account of additional traffic associated with the consented permission held by S. Grundon (Waste) Ltd. However, the traffic generation potential of the Grundon site is such that it will not have a material impact on the highway network and is negligible compared to the traffic which will be generated by the T5 development.

5.7 To the north of the site, Thames Water are proposing a sewage sludge dewatering facility, which will require the improvement of the Lakeside Road junction onto the A4. The proposed improvement includes increasing the right turn ghost island to approximately 10m and incorporates single lane dualling to produce a high capacity and safe junction. The proposals, although not required in terms of capacity by the implementation of Grundon's proposals, would benefit the operation of the Lakeside Road/A4 junction. Should Grundons proposals become operational before the Thames Water Iver South development, Grundons would be prepared to discuss early implementation of the junction improvements. It should be borne in mind that the implementation of the proposed development would result in a reduction of Grundon traffic compared to the extant permission.

5.8 The Thames Water proposals also include widening Lakeside Road to 7.3 metres using land on the western side of the carriageway. A new road will be constructed across the existing dam at Orlitts Lake to provide the link to the southern part of the Iver South site.

5.9 It is understood that the assessments undertaken for the Thames Water development did not take into account the traffic associated with the consented permission held by S. Grundon (Waste) Ltd.

SEVERANCE

5.10 Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The term is used to describe a complex series of factors that separate people from places and other people.

5.11 It is considered that the minimal increase in traffic will result in a negligible effect in severance. The increase in traffic flows would not result in pedestrian movements being affected significantly.

5.12 We are aware that there two schools in the village of Colnbrook and Langley Grammar School on the A4 west of junction 5 of the M4 and it is important to give due consideration to severance at school closing times. The majority of HGV traffic associated with the site use arterial routes, including the A4, M25 and M4. Existing refuse vehicles probably use minor roads through Colnbrook and Poyle on their collection rounds and it is not anticipated that any additional traffic will pass through the villages when the energy from waste plant becomes operational. As previously stated the HGV's are generally trying to reach the M25 or M4, and it is further anticipated that no additional HGV's will pass Langly Grammar as a result of the energy from waste development.

DRIVER DELAY

5.13 It has been demonstrated in this report that the increases in traffic flows will not have a material impact on the adjacent highway network in traffic terms. On this basis, it is reasonable to assume that the additional traffic will not have a material impact on driver delay.

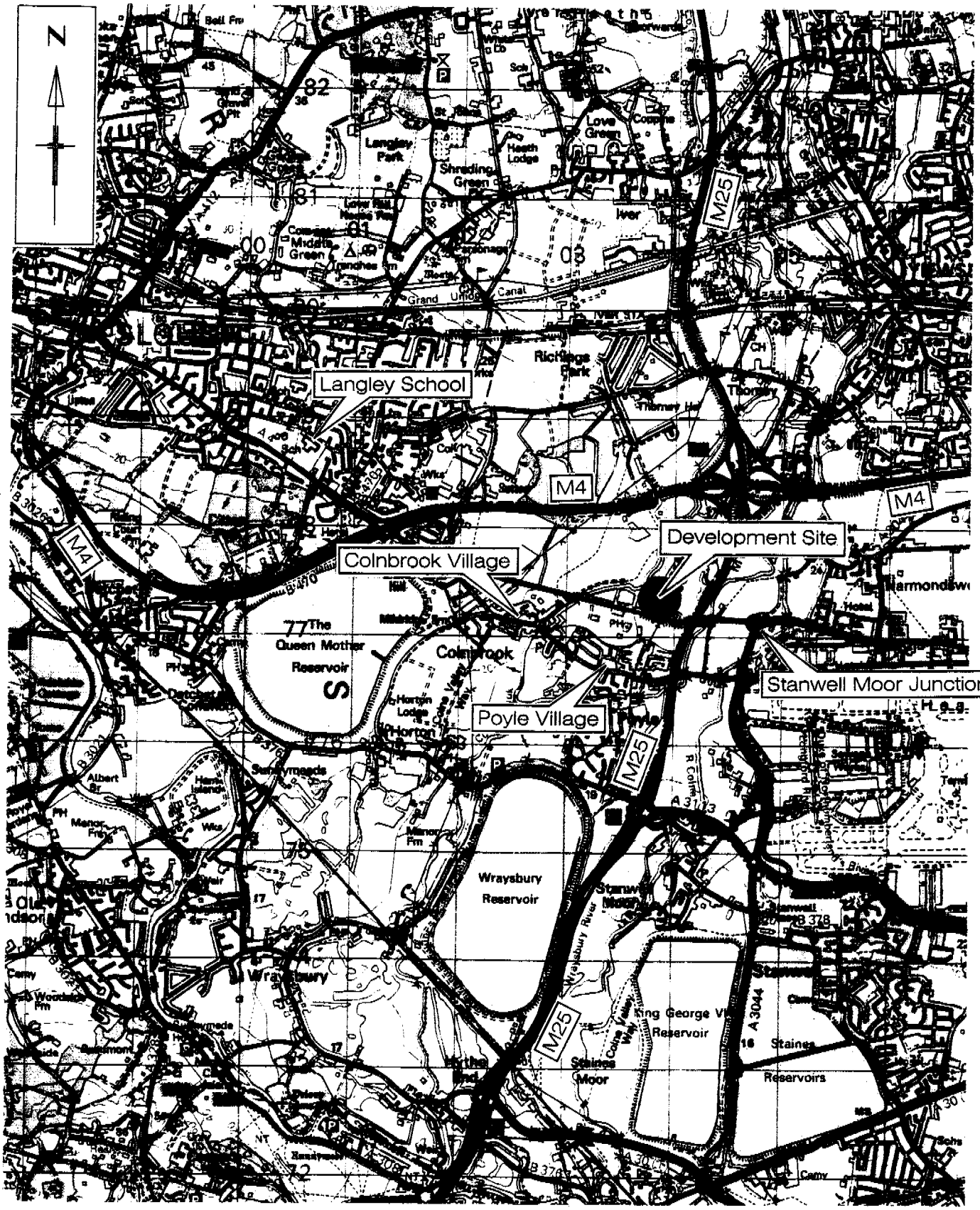
6.0 SUMMARY AND CONCLUSIONS

6.1 This Traffic Impact Assessment has been prepared for a proposed energy from waste facility at S. Grundon (Waste) Ltd's existing waste reclamation facility on the Lakeside Industrial Estate, near Colnbrook. The proposed site will process approximately 440,000 tonnes of material per annum and is programmed to be commissioned in 2004.

6.2 The site has consented permission to process a significantly larger amount of waste than it currently processes. The energy from waste proposals will result in a minimal increase in traffic compared to the existing site use and will result in a saving of vehicle movements compared to the consented permission.

6.3 Due to the impact of the proposed development being lower than the IHT thresholds, it is not necessary to assess the capacity of the adjacent highway network. However, to be robust this assessment has assessed the Lakeside Road/A4 junction and the test results indicate that the junction would operate within capacity with the proposed development in place. There is currently an application submitted for the development of adjacent land into the London International Freight Exchange and associated junction improvements to Lakeside Road/Colnbrook Bypass. Assessments undertaken for this application have shown that the proposed junction will operate well within capacity and it is considered that any additional traffic associated with the energy from waste plant can be accommodated easily by the junction.

6.4 Therefore the proposed energy from waste operation can be accommodated on site without any detriment to vehicular traffic flows or junction capacity, even when considering other local developments. In summary there is no reason why the energy from waste operation should not be considered to be acceptable in highway terms.

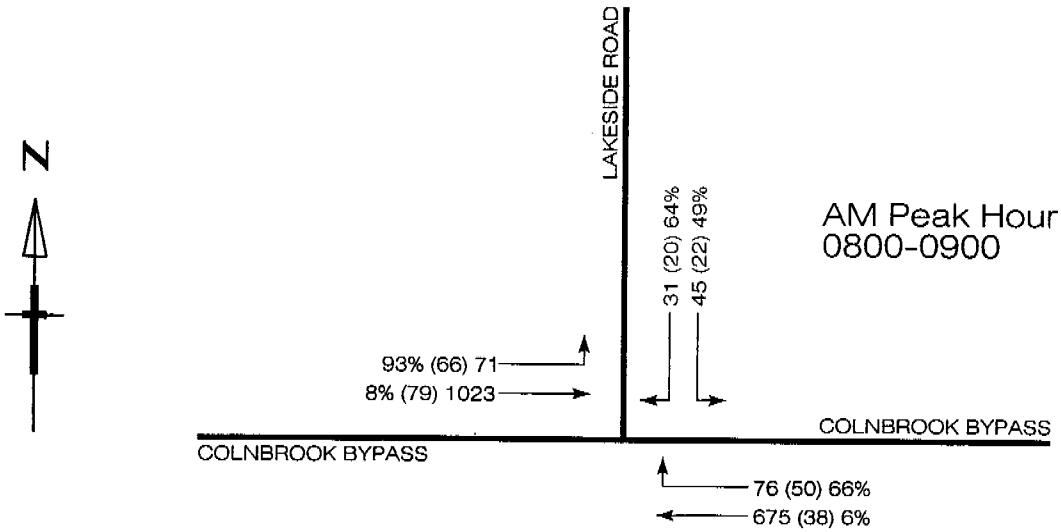


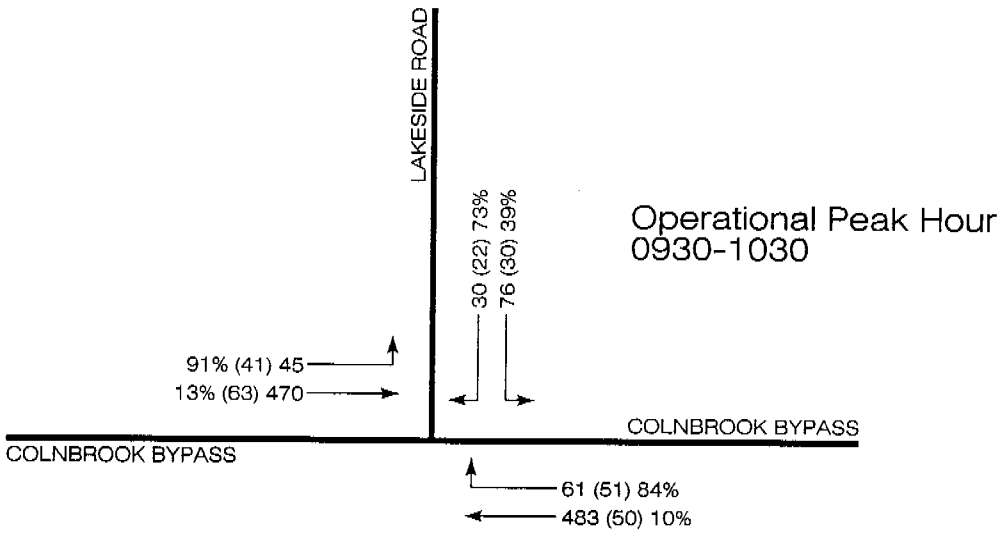
Based upon the Ordnance Survey's 1:50 000 Map of Colnbroook with the permission of the Controller of Her Majesty's Stationery Office, (c) Crown copyright

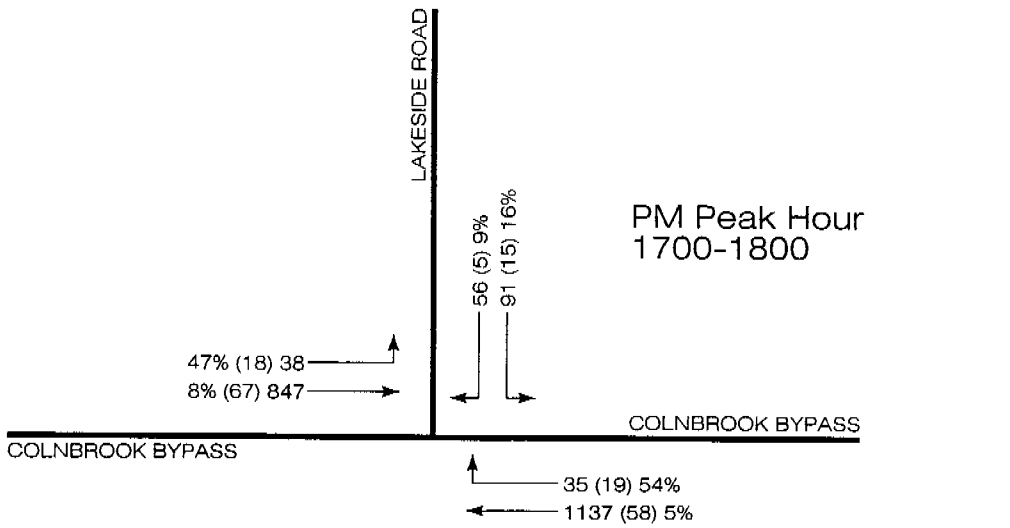
Site in Relation to the Regional Highway Network

Scale 1:50 000

Figure 1.1

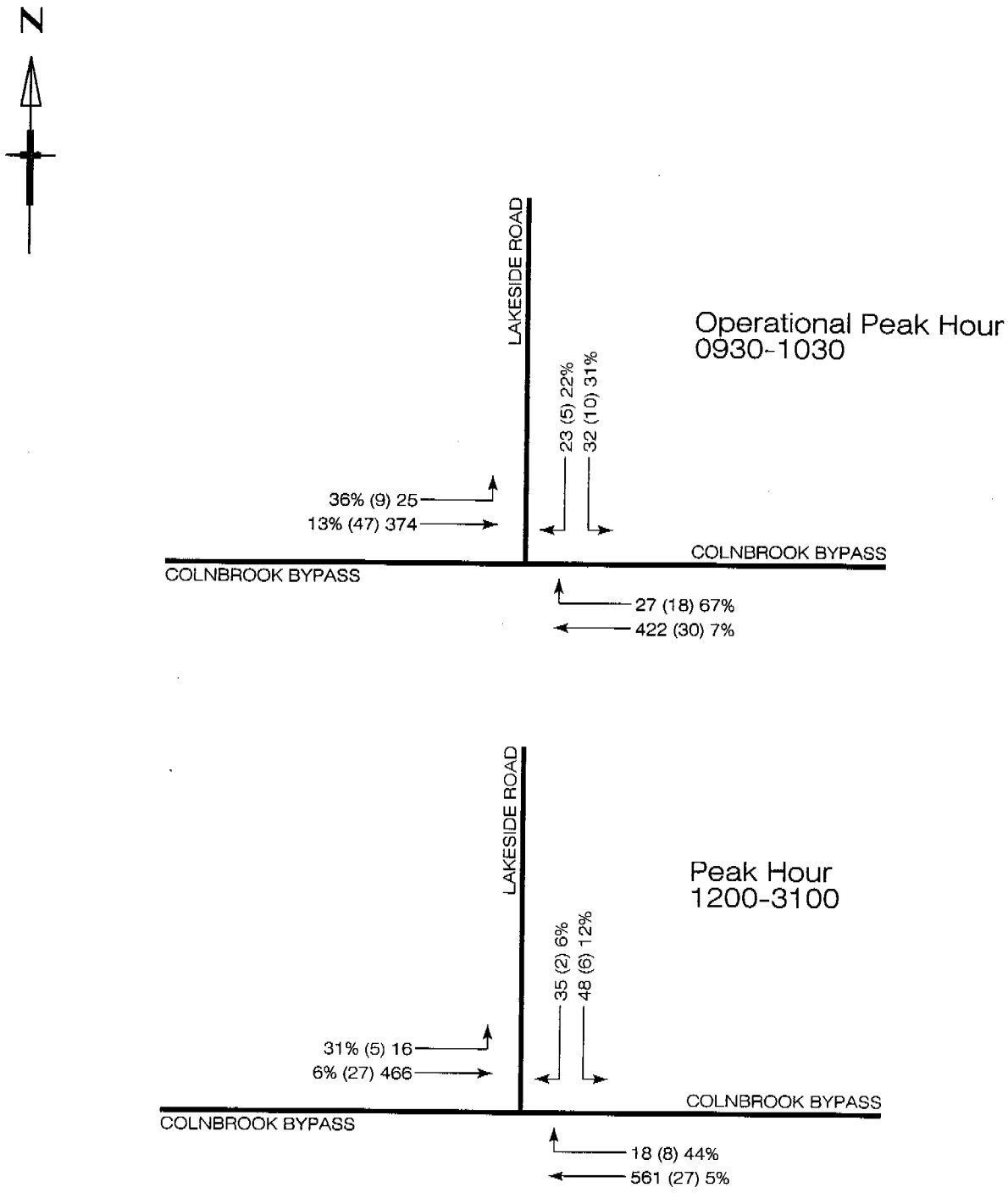






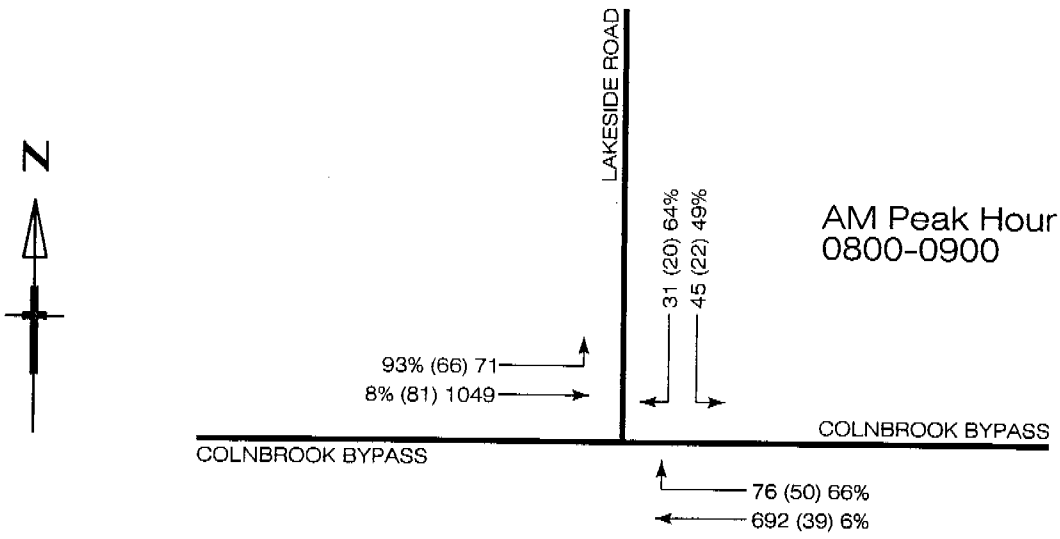
1999 Weekday Base Traffic Flows

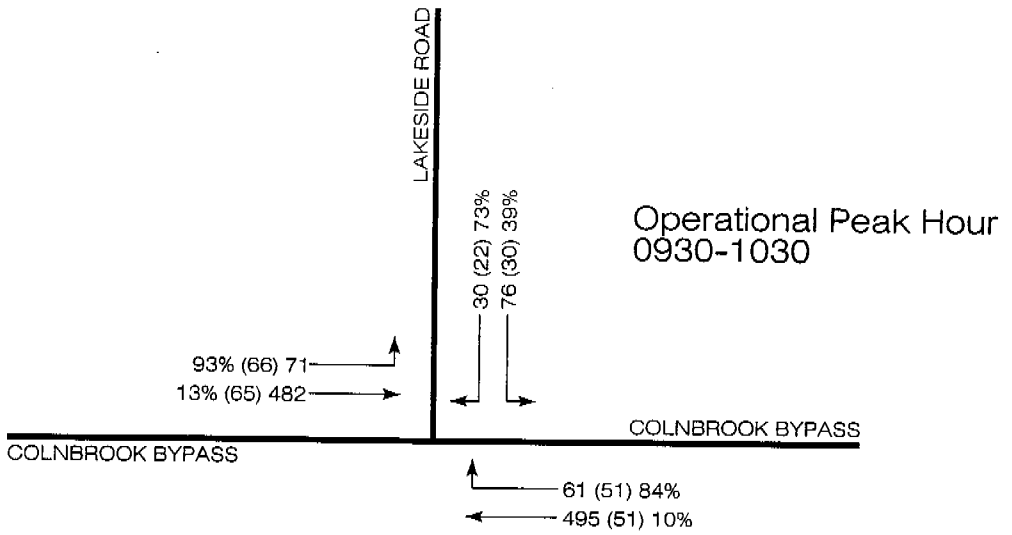
Figure 4.1

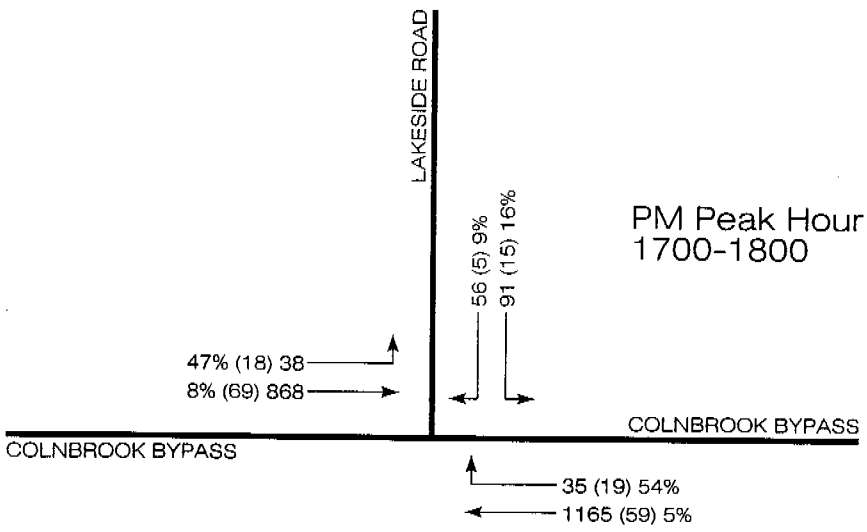


1999 Weekend Base Traffic Flows

Figure 4.2

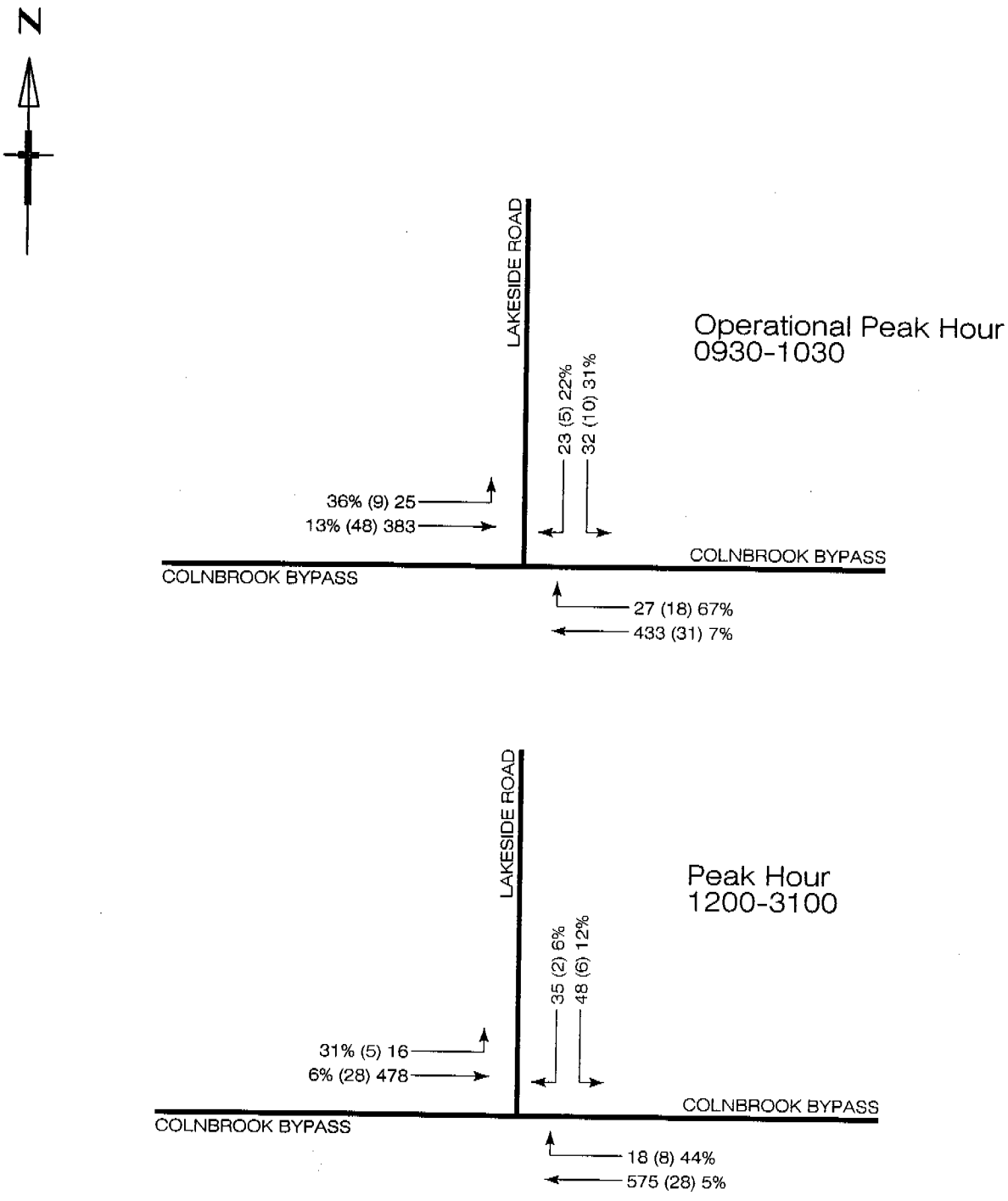






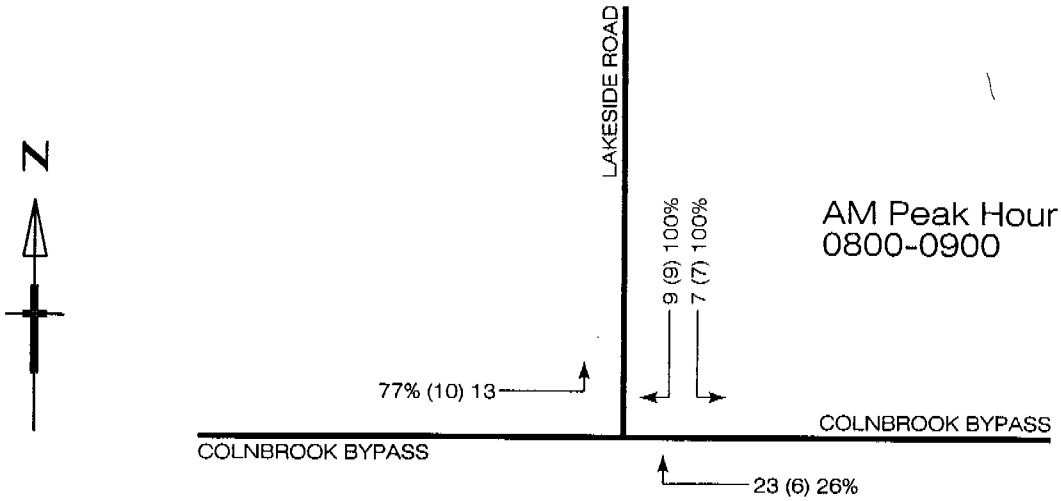
Projected 2004 Weekday Base Traffic Flows

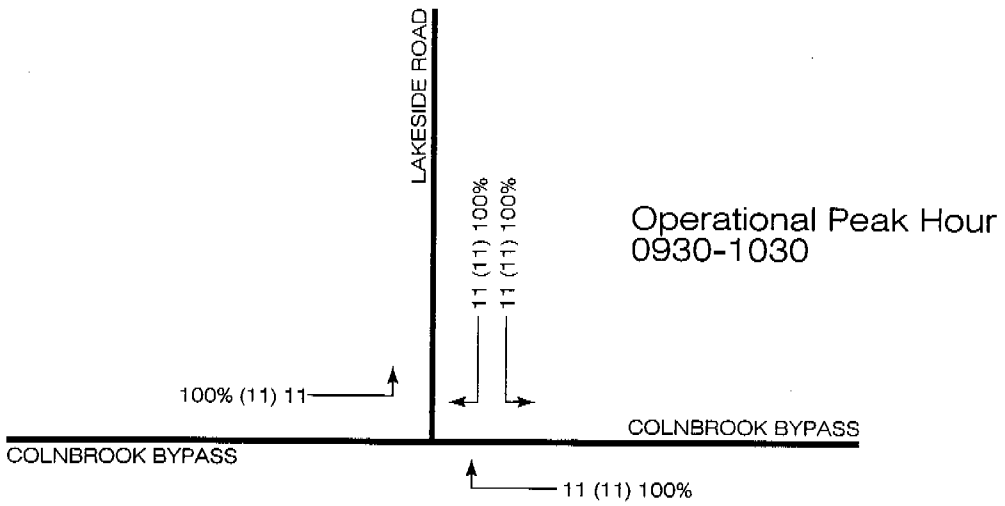
Figure 4.3

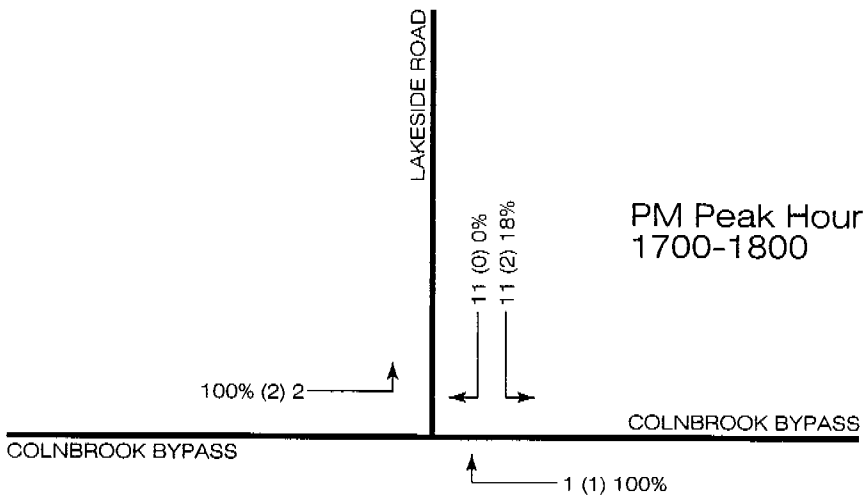


Projected 2004 Weekend Base Traffic Flows

Figure 4.4

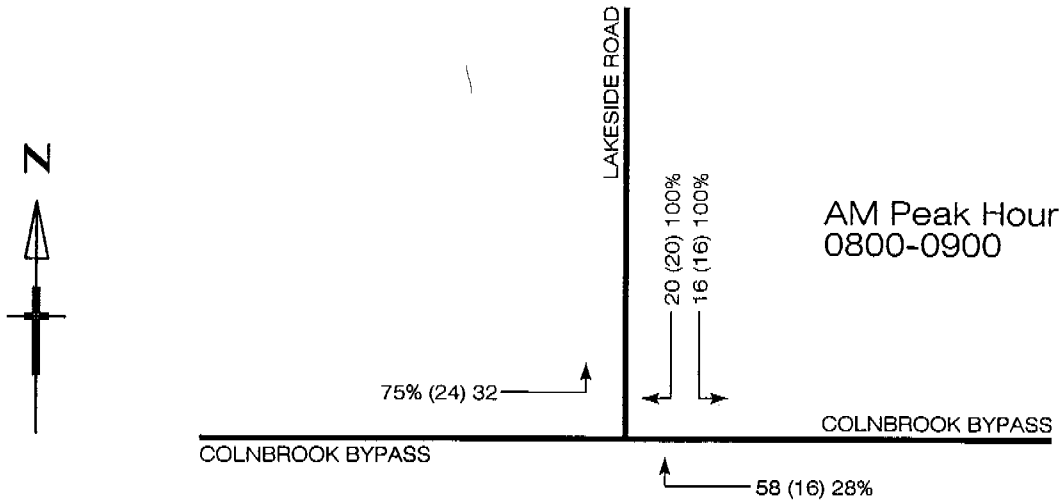




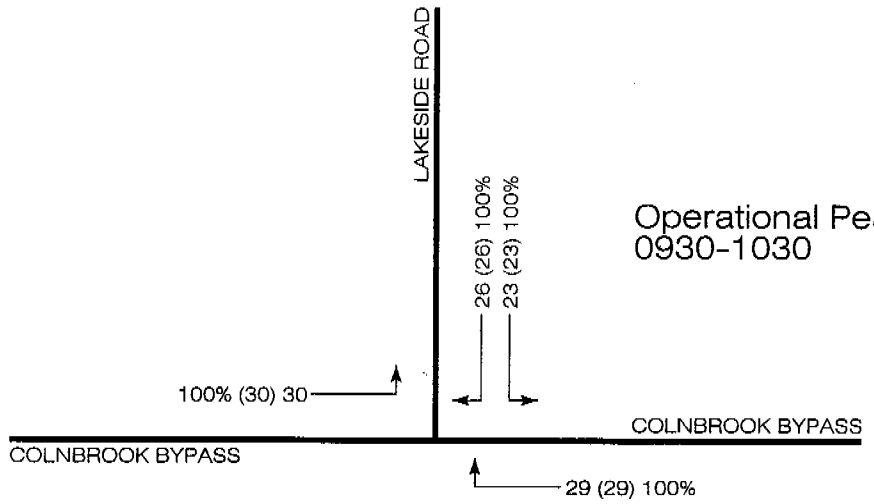


Weekday Traffic Flows Associated with Existing Activities

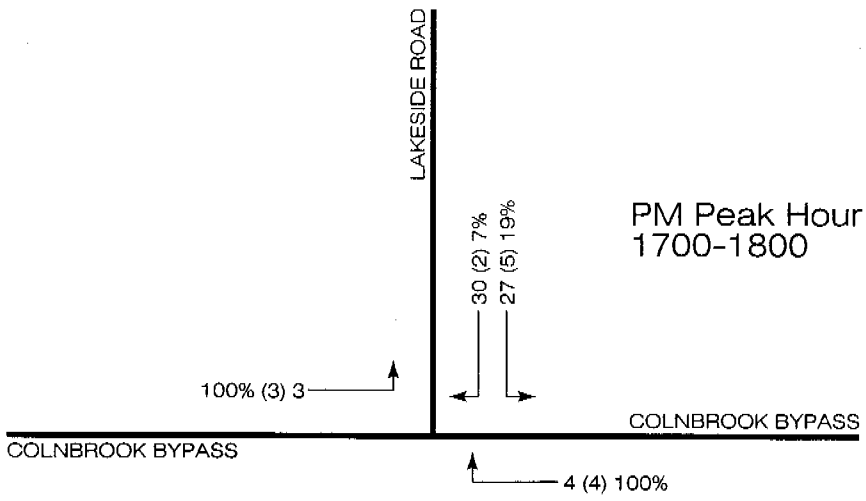
Figure 4.5



AM Peak Hour
0800-0900



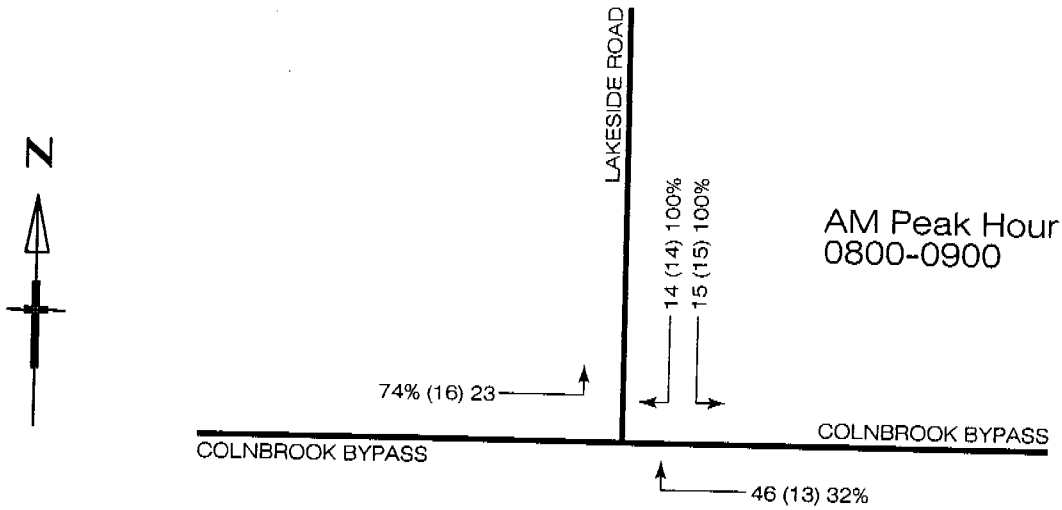
Operational Peak Hour
0930-1030

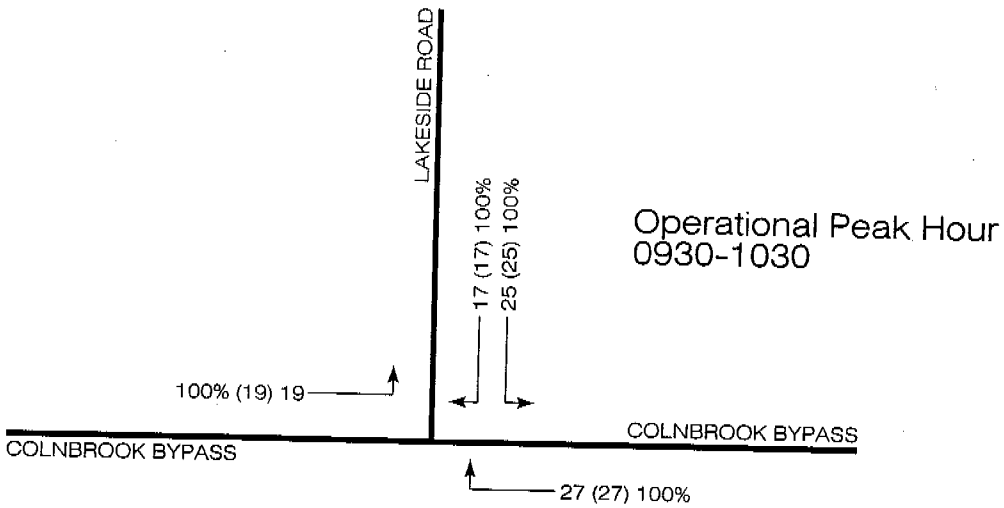


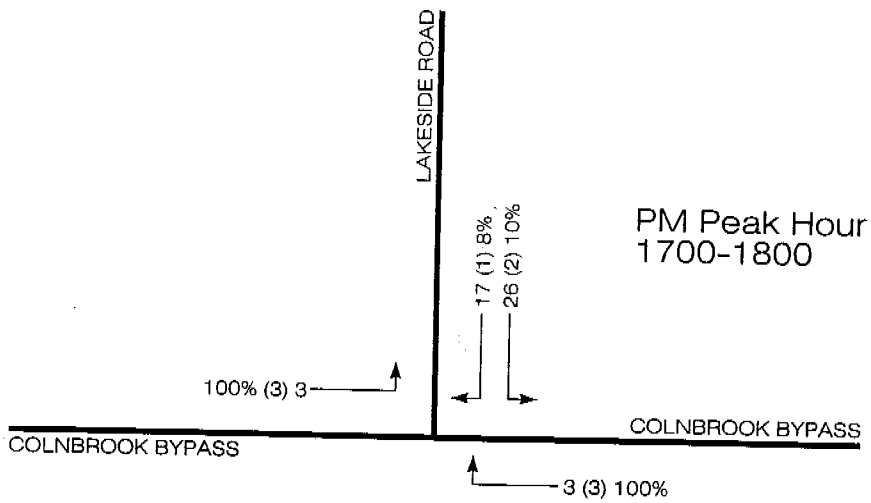
PM Peak Hour
1700-1800

Weekday Traffic Flows Associated with Extant Activities

Figure 4.6

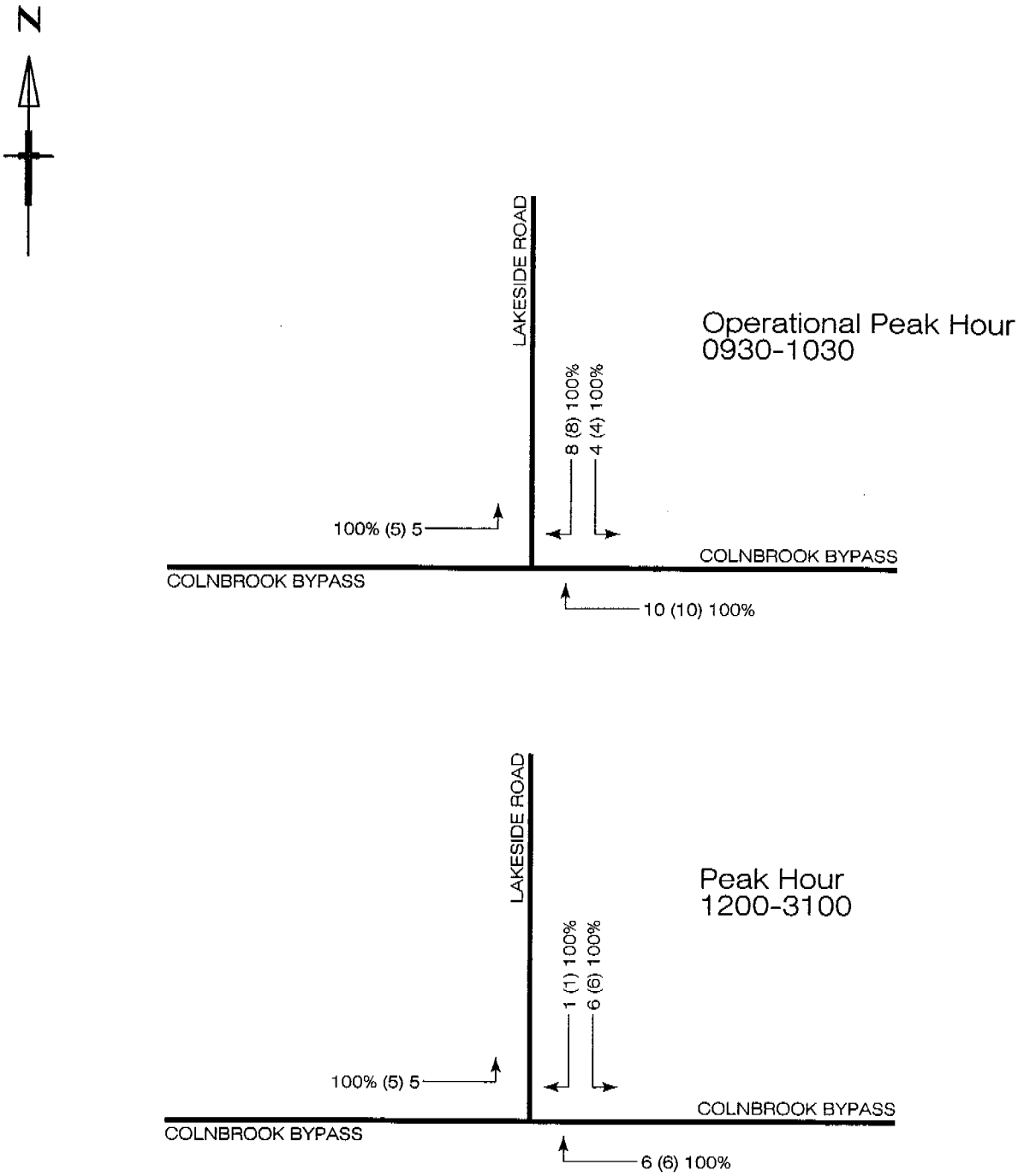






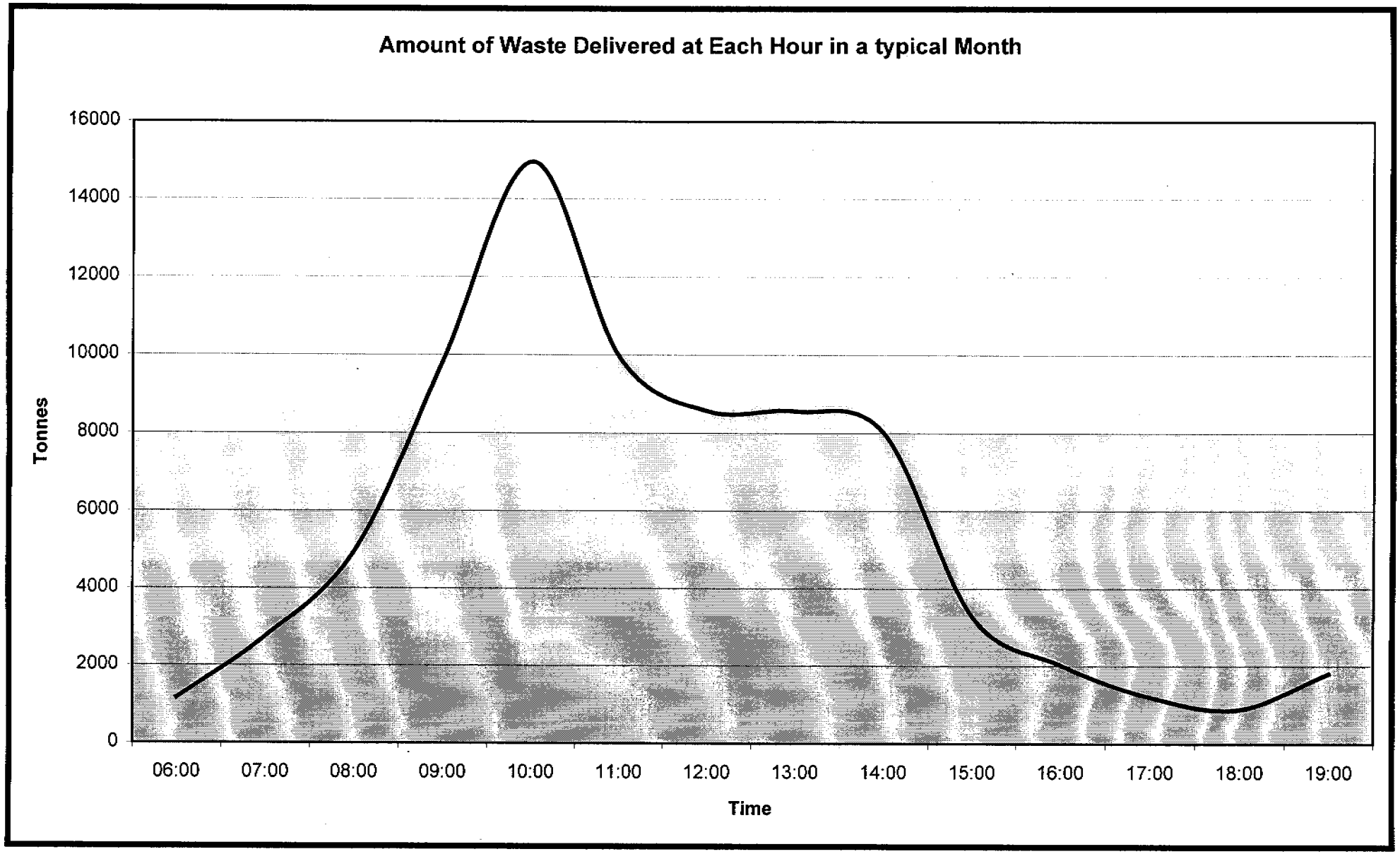
Weekday Traffic Flows Associated with Energy from Waste Activities

Figure 4.7



Weekend Traffic Flows Associated with Energy from Waste Activities

Figure 4.8


Amount of Waste Delivered at Each Hour in a typical Month
16000
14000
12000
10000
8000
6000
4000
2000
0
Tonnes
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
Time

TRL Ltd.

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2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT AM PEAK HOUR

MAJOR/MINOR JUNCTION CAPACITY AND DELAY
****

INPUT DATA

MAJOR ROAD (ARM C) ---------- MAJOR ROAD (ARM A)
I
I
I
I
I
I
MINOR ROAD (ARM B)

ARM A IS A4 WEST
ARM B IS LAKESIDE ROAD
ARM C IS A4 EAST

0
STREAM LABELLING CONVENTION

STREAM A-B CONTAINS TRAFFIC GOING FROM ARM A TO ARM B

STREAM B-AC CONTAINS TRAFFIC GOING FROM ARM B TO ARM A AND TO ARM C

ETC.

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT AM PEAK HOUR

0GEOMETRIC DATA

DATA ITEM	MINOR ROAD B
TOTAL MAJOR ROAD CARRIAGEWAY WIDTH	(W) 8.00 M.
CENTRAL RESERVE WIDTH	(WCR) 0.00 M.
MAJOR ROAD RIGHT TURN - WIDTH	(WC-B) 3.00 M.
- VISIBILITY	(VC-B) 215.0 M.
- BLOCKS TRAFFIC	NO

MINOR ROAD - VISIBILITY TO LEFT	(VB-C)	40.0 M.	
- VISIBILITY TO RIGHT	(VB-A)	35.0 M.	
- LANE 1 WIDTH	(WB-C)	4.36 M.	
- LANE 2 WIDTH	(WB-A)	0.00 M.	

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT AM PEAK HOUR

0TRAFFIC DEMAND DATA

0TIME PERIOD BEGINS 08.00 AND ENDS 09.00
0LENGTH OF TIME PERIOD - 60 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.
0
DEMAND FLOW PROFILES ARE INPUT DIRECTLY.

TIME	FROM/TO	TURNING PROPORTIONS / TURNING COUNTS (PERCENTAGE OF H.V.S) ARM A	ARM B	ARM C
08.00 - 09.00	ARM A	0.000	0.073	0.927
		0.0	83.0	1049.0
		(0.0)	(91.0)	(8.0)
	ARM B	0.415	0.000	0.585
		39.0	0.0	55.0
		(69.0)	(0.0)	(58.0)
	ARM C	0.877	0.123	0.000
		692.0	97.0	0.0
		(6.0)	(62.0)	(0.0)

0TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA
0THE PERCENTAGE OF HEAVY VEHICLES VARIES OVER TURNING MOVEMENTS

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT AM PEAK HOUR

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.00-08.15								
B-AC	1.56	2.09	0.748		0.0	2.1	24.0	
C-A	11.53							
C-B	1.62	4.24	0.381		0.0	0.6	8.1	
A-B	1.38							
A-C	17.48							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.15-08.30								
B-AC	1.56	2.07	0.754		2.1	2.5	34.9	
C-A	11.53							
C-B	1.62	4.24	0.381		0.6	0.6	9.0	
A-B	1.38							
A-C	17.48							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.30-08.45								
B-AC	1.56	2.07	0.754		2.5	2.6	38.5	
C-A	11.53							
C-B	1.62	4.24	0.381		0.6	0.6	9.1	
A-B	1.38							
A-C	17.48							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.45-09.00								
B-AC	1.56	2.07	0.754		2.6	2.7	40.2	
C-A	11.53							
C-B	1.62	4.24	0.381		0.6	0.6	9.1	
A-B	1.38							
A-C	17.48							

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT AM PEAK HOUR

QUEUE FOR STREAM B-AC

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.15	2.1	**
08.30	2.5	**
08.45	2.6	***
09.00	2.7	***

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT AM PEAK HOUR

QUEUE FOR STREAM C-B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.15	0.6	*
08.30	0.6	*
08.45	0.6	*
09.00	0.6	*

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT AM PEAK HOUR

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

STREAM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
B-AC	93.6	93.6	137.6	1.47	139.4	1.49
C-A	692.0	692.0				
C-B	97.0	97.0	35.3	0.36	35.3	0.36
A-B	83.0	83.0				
A-C	1048.6	1048.6				
ALL	2014.2	2014.2	172.9	0.09	174.7	0.09

0

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

TRL Ltd.

(C) TRL Ltd. 1996

CAPACITIES, QUEUES, AND DELAYS AT 3 OR 4-ARM MAJOR/MINOR PRIORITY JUNCTIONS

PROGRAM PICADY/3
RELEASE 1.5 (DECEMBER 1996)

FOR PROGRAM ADVICE AND MAINTENANCE CONTACT:-
MAINTENANCE CONTRACTOR LISTED IN USER GUIDE

FOR SALES AND DISTRIBUTION INFORMATION
CONTACT TRL Ltd., Tel: CROWTHORNE (01344) 770176

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2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT PM PEAK HOUR

MAJOR/MINOR JUNCTION CAPACITY AND DELAY
****

INPUT DATA

MAJOR ROAD (ARM C) ---------- MAJOR ROAD (ARM A)
I
I
I
I
I
I
MINOR ROAD (ARM B)

ARM A IS A4 WEST
ARM B IS LAKESIDE ROAD
ARM C IS A4 EAST

0 STREAM LABELLING CONVENTION

STREAM A-B CONTAINS TRAFFIC GOING FROM ARM A TO ARM B

STREAM B-AC CONTAINS TRAFFIC GOING FROM ARM B TO ARM A AND TO ARM C

ETC.

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT PM PEAK HOUR

0GEOMETRIC DATA

DATA ITEM		MINOR ROAD B	
TOTAL MAJOR ROAD CARRIAGEWAY WIDTH	(W)	8.00 M.	
CENTRAL RESERVE WIDTH	(WCR)	0.00 M.	
MAJOR ROAD RIGHT TURN - WIDTH	(WC-B)	3.00 M.	
- VISIBILITY	(VC-B)	215.0 M.	
- BLOCKS TRAFFIC		NO	

MINOR ROAD - VISIBILITY TO LEFT	(VB-C)	40.0 M.	
- VISIBILITY TO RIGHT	(VB-A)	35.0 M.	
- LANE 1 WIDTH	(WB-C)	4.36 M.	
- LANE 2 WIDTH	(WB-A)	0.00 M.	

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT PM PEAK HOUR

0TRAFFIC DEMAND DATA

0TIME PERIOD BEGINS 08.00 AND ENDS 09.00
0LENGTH OF TIME PERIOD - 60 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.
0
DEMAND FLOW PROFILES ARE INPUT DIRECTLY.

TIME	FROM/TO	TURNING PROPORTIONS / TURNING COUNTS / (PERCENTAGE OF H.V.S) ARM A	ARM B	ARM C
08.00 - 09.00	ARM A	0.000	0.043	0.957
		0.0	39.0	868.0
		(0.0)	(49.0)	(8.0)
	ARM B	0.369	0.000	0.631
		62.0	0.0	106.0
		(10.0)	(0.0)	(17.0)
	ARM C	0.969	0.031	0.000
		1165.0	37.0	0.0
		(5.0)	(56.0)	(0.0)

0TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA
0THE PERCENTAGE OF HEAVY VEHICLES VARIES OVER TURNING MOVEMENTS

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT PM PEAK HOUR

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.00-08.15								
B-AC	2.79	3.73	0.749		0.0	2.4	28.6	
C-A	19.41							
C-B	0.62	5.26	0.117		0.0	0.1	1.9	
A-B	0.65							
A-C	14.46							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.15-08.30								
B-AC	2.79	3.72	0.750		2.4	2.6	38.2	
C-A	19.41							
C-B	0.62	5.26	0.117		0.1	0.1	2.0	
A-B	0.65							
A-C	14.46							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.30-08.45								
B-AC	2.79	3.72	0.750		2.6	2.8	40.6	
C-A	19.41							
C-B	0.62	5.26	0.117		0.1	0.1	2.0	
A-B	0.65							
A-C	14.46							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.45-09.00								
B-AC	2.79	3.72	0.750		2.8	2.8	41.7	
C-A	19.41							
C-B	0.62	5.26	0.117		0.1	0.1	2.0	
A-B	0.65							
A-C	14.46							

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT PM PEAK HOUR

QUEUE FOR STREAM B-AC

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.15	2.4	**
08.30	2.6	***
08.45	2.8	***
09.00	2.8	***

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT PM PEAK HOUR

QUEUE FOR STREAM C-B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.15	0.1
08.30	0.1
08.45	0.1
09.00	0.1

2004 PROJECTED TRAFFIC FLOWS WITH WASTE TO ENERGY DEVELOPMENT PM PEAK HOUR

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

STREAM	TOTAL DEMAND (VEH)	TOTAL DEMAND (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
B-AC	167.4	167.4	149.1	0.89	150.2	0.90
C-A	1164.8	1164.8				
C-B	37.0	37.0	7.8	0.21	7.8	0.21
A-B	39.0	39.0				
A-C	867.6	867.6				
ALL	2275.8	2275.8	156.9	0.07	158.0	0.07

0

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

SITE1.LAN

D E P A R T M E N T O F T R A N S P O R T
TRANSPORT AND ROAD RESEARCH LABORTORY

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OPTIMISED SIGNAL CAPACITY AND DELAY

PROGRAM OSCADY - VERSION 2
RELEASE 2.0 (SEP 1990)

FOR PROGRAM ADVICE AND MAINTENANCE CONTACT:-
MAINTAINANCE CONTRACTOR LISTED IN USER MANUAL

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****

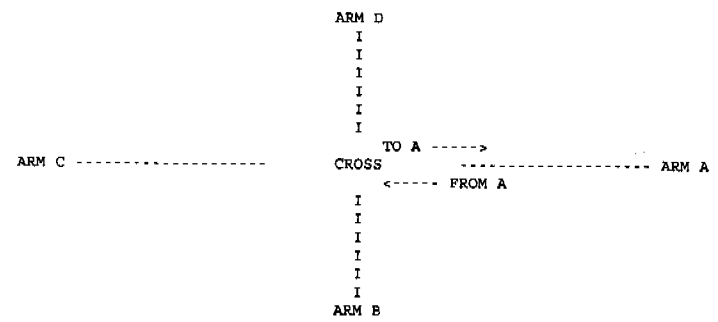
**** ERROR AND WARNING MESSAGES ****

NO ERRORS OR WARNINGS IN THE DATA.

LIFE Data Provided To Mayer Brown Limited For Clonbrook 2011 AM Flows with Dev

TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS A4 WEST
ARM B IS SITE ACCESS
ARM C IS A4 EAST
ARM D IS PFS

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		4	2	3	1
PERMITTED MOVEMENTS	LANE 1	L	LS	LS	LSR
	LANE 2	S	R	S	
	LANE 3	S		R	
	LANE 4	R			
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		7.30 M	9.00 M	7.30 M	7.00 M
LANE WIDTHS	LANE 1	3.50 M	3.50 M	3.50 M	3.50 M
	LANE 2	3.50 M	3.50 M	3.50 M	0.00 M
	LANE 3	3.50 M	0.00 M	3.50 M	0.00 M
	LANE 4	3.50 M	0.00 M	0.00 M	0.00 M
LEFT TURN RADII	LANE 1	15.0 M	15.0 M	7.5 M	7.5 M
RIGHT TURN RADII	LANE 1	N/A	N/A	N/A	25.0 M
	LANE 2	N/A	25.0 M	N/A	N/A
	LANE 3	N/A	N/A	25.0 M	N/A
	LANE 4	20.0 M	N/A	N/A	N/A

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** LEVELS ** OPTION

PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 08.00 TO 09.00

THE FOLLOWING DATA HAS BEEN INPUT

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	08.00	08.30	09.00	23.40	23.50	23.40
	B	08.00	08.30	09.00	4.30	4.40	4.30
	C	08.00	08.30	09.00	16.00	16.10	16.00
	D	08.00	08.30	09.00	0.50	0.60	0.50

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
08.00-09.00	A	1.000	0.000	0.000	0.000	0.000	0.000
	B	1.000	0.000	0.000	0.000	0.000	0.000
	C	1.000	0.000	0.000	0.000	0.000	0.000
	D	1.000	0.000	0.000	0.000	0.000	0.000

TURNING PROPORTIONS

TIME PERIOD	FROM/TO	ARM A	ARM B	ARM C	ARM D
08.00-09.00	ARM A GROUP 1	0.000	0.159	0.833	0.008
	ARM B GROUP 1	0.537	0.000	0.428	0.035
	ARM C GROUP 1	0.807	0.183	0.000	0.010
	ARM D GROUP 1	0.333	0.333	0.333	0.000

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION-	08.00-09.00
MAXIMUM CYCLE TIME-	120.0 SECONDS
OPTIMISED CYCLE TIME-	91.9 SECONDS
OPTIMISED TIMINGS BELOW ARE-	DELAY MINIMIZED (see Note 1)
JUNCTION IS-	WITHIN CAPACITY
MAXIMUM DEGREE OF SATURATION (X'):	72.8 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] :	23.6 PERCENT

DATA ITEM		STAGE 1	STAGE 2	STAGE 3	STAGE 4
LANES ON GREEN	ARM A	1 2 3	4		
	B			1 2	
	C	1 2	3		
	D				1
MINIMUM GREEN AND AMBER TIME (SECS)		7.0	7.0	7.0	7.0
OPTIMISED GREEN AND AMBER TIME (SECS)		40.6	12.7	11.6	7.0
LOST TIME (SECS)		1.5	1.5	1.5	1.5
ALL RED + RED AMBER AFTER STAGE		5.0	5.0	5.0	5.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 91.9 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (72.8 %) and practical reserve capacity of the junction (23.6 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3	4
GREEN+AMBER:	57.8	19.4	15.8	7.0

These timings were calculated for a fixed or maximum cycle time of 120.0 seconds and give a maximum degree of saturation of 59.4 % and practical reserve capacity of the junction of 51.4 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (08.00-09.00) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L	223.9	223.9	1786.4	29.5	205.2
	23	S	1173.0	1173.0	4210.0	65.5	37.3
	4	R	11.3	11.3	1958.1	4.7	*****
B	1	L S	121.4	121.4	1798.7	61.3	46.8
	2	R	140.8	140.8	1985.8	64.4	39.8
C	12	L S	787.7	787.7	4060.1	45.6	97.2
	3	R	176.4	176.4	1985.8	72.8	23.6
D	1	L S R	34.0	34.0	1808.3	31.4	186.2

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

TIME	ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN TIME TRUE (SECS)	EFFECTIVE GREEN TIME NOTIONAL (SECS)	CAPACITY (VEHS/MIN)
08.00-08.15									
	A	1	L	3.73	1786.4	29.77	39.1		12.66
		23	S	19.53	4210.0	70.17	39.1		29.82
		4	R	0.19	1958.1	32.64	11.2		3.98
	B	1	L S	2.01	1798.7	29.98	10.1		3.30
		2	R	2.33	1985.8	33.10	10.1		3.64
	C	12	L S	13.11	4060.1	67.67	39.1		28.76
		3	R	2.94	1985.8	33.10	11.2		4.04
	D	1	L S R	0.54	1808.3	30.14	5.5		1.80
08.15-08.30									
	A	1	L	3.74	1786.4	29.77	39.1		12.66
		23	S	19.57	4210.0	70.17	39.1		29.82
		4	R	0.19	1958.1	32.64	11.2		3.98
	B	1	L S	2.03	1798.7	29.98	10.1		3.30
		2	R	2.36	1985.8	33.10	10.1		3.64
	C	12	L S	13.15	4060.1	67.67	39.1		28.76
		3	R	2.95	1985.8	33.10	11.2		4.04
	D	1	L S R	0.59	1808.3	30.14	5.5		1.80
08.30-08.45									
	A	1	L	3.74	1786.4	29.77	39.1		12.66
		23	S	19.57	4210.0	70.17	39.1		29.82
		4	R	0.19	1958.1	32.64	11.2		3.98
	B	1	L S	2.03	1798.7	29.98	10.1		3.30
		2	R	2.36	1985.8	33.10	10.1		3.64
	C	12	L S	13.15	4060.1	67.67	39.1		28.76
		3	R	2.95	1985.8	33.10	11.2		4.04
	D	1	L S R	0.59	1808.3	30.14	5.5		1.80
08.45-09.00									
	A	1	L	3.73	1786.4	29.77	39.1		12.66
		23	S	19.53	4210.0	70.17	39.1		29.82
		4	R	0.19	1958.1	32.64	11.2		3.98
	B	1	L S	2.01	1798.7	29.98	10.1		3.30
		2	R	2.33	1985.8	33.10	10.1		3.64
	C	12	L S	13.11	4060.1	67.67	39.1		28.76
		3	R	2.94	1985.8	33.10	11.2		4.04
	D	1	L S R	0.54	1808.3	30.14	5.5		1.80

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

TIME	ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEMAND/ CAPACITY (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.00-08.15										
	A	1	L	3.73	12.66	0.295	1.2	3.4	17.3	
		23	S	19.53	29.82	0.655	3.8	9.0	113.7	
		4	R	0.19	3.98	0.047	0.1	0.3	1.7	
	B	1	L S	2.01	3.30	0.609	1.8	3.3	27.2	
		2	R	2.33	3.64	0.640	2.2	3.8	31.8	
	C	12	L S	13.11	28.76	0.456	2.2	5.9	65.1	
		3	R	2.94	4.04	0.727	2.9	5.0	42.8	
	D	1	L S R	0.54	1.80	0.300	0.4	0.9	6.7	
08.15-08.30										
	A	1	L	3.74	12.66	0.295	1.2	3.4	17.3	
		23	S	19.57	29.82	0.656	3.8	9.0	114.3	
		4	R	0.19	3.98	0.047	0.1	0.3	1.7	
	B	1	L S	2.03	3.30	0.617	1.9	3.3	28.7	
		2	R	2.36	3.64	0.648	2.2	3.9	33.7	
	C	12	L S	13.15	28.76	0.457	2.2	5.9	65.4	
		3	R	2.95	4.04	0.729	3.0	5.1	45.9	
	D	1	L S R	0.59	1.80	0.329	0.5	0.9	7.6	
08.30-08.45										
	A	1	L	3.74	12.66	0.295	1.2	3.4	17.3	
		23	S	19.57	29.82	0.656	3.8	9.0	114.3	
		4	R	0.19	3.98	0.047	0.1	0.3	1.7	
	B	1	L S	2.03	3.30	0.617	1.9	3.4	28.7	
		2	R	2.36	3.64	0.648	2.2	3.9	33.8	
	C	12	L S	13.15	28.76	0.457	2.2	5.9	65.4	
		3	R	2.95	4.04	0.729	3.0	5.1	46.1	
	D	1	L S R	0.59	1.80	0.329	0.5	0.9	7.6	
08.45-09.00										
	A	1	L	3.73	12.66	0.295	1.2	3.4	17.3	
		23	S	19.53	29.82	0.655	3.8	9.0	113.9	
		4	R	0.19	3.98	0.047	0.1	0.3	1.7	
	B	1	L S	2.01	3.30	0.609	1.9	3.3	28.2	
		2	R	2.33	3.64	0.640	2.2	3.9	33.1	
	C	12	L S	13.11	28.76	0.456	2.2	5.9	65.2	
		3	R	2.94	4.04	0.727	3.0	5.1	45.8	
	D	1	L S R	0.54	1.80	0.300	0.5	0.9	6.8	

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (08.00-09.00)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	(VEH/H)	* QUEUEING * DELAY * (MIN)	(MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	(MIN/VEH)
A-B	223.9	223.9	69.2	0.31	69.3	0.31
A-C	1173.0	1173.0	456.2	0.39	457.2	0.39
A-D	11.3	11.3	6.8	0.60	6.8	0.60
B-C	112.2	112.2	104.2	0.93	104.7	0.93
B-D	9.2	9.2	8.5	0.93	8.6	0.93
B-A	140.8	140.8	132.4	0.94	133.0	0.95
C-D	9.6	9.6	3.2	0.33	3.2	0.33
C-A	778.0	778.0	257.9	0.33	258.3	0.33
C-B	176.4	176.4	180.6	1.02	181.8	1.03
D-A	11.3	11.3	9.5	0.84	9.6	0.84
D-B	11.3	11.3	9.5	0.84	9.6	0.84
D-C	11.3	11.3	9.5	0.84	9.6	0.84
ALL	2668.4	2668.4	1247.7	0.47	1251.5	0.47

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

**** END OF JOB.

SITE1PM

D E P A R T M E N T O F T R A N S P O R T

TRANSPORT AND ROAD RESEARCH LABORTORY

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OPTIMISED SIGNAL CAPACITY AND DELAY

PROGRAM OSCADY - VERSION 2
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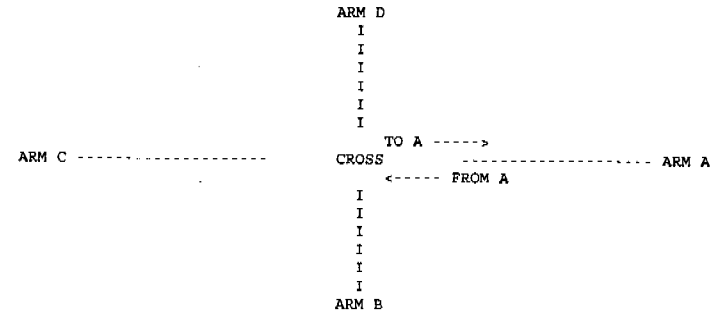
LIFE Data Provided To Mayer Brown Limited For Clonbrook 2011 PM Flows with Dev

TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS A4 WEST
ARM B IS SITE ACCESS
ARM C IS A4 EAST
ARM D IS PFS

GEOMETRIC DATA

DATA ITEM		ARM A	ARM B	ARM C	ARM D
GRADIENT		0.0 %	0.0 %	0.0 %	0.0 %
NUMBER OF LANES		4	2	3	1
PERMITTED MOVEMENTS	LANE 1	L	LS	LS	LSR
	LANE 2	S	R	S	
	LANE 3	S		R	
	LANE 4	R			
TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM		7.30 M	9.00 M	7.30 M	7.00 M
LANE WIDTHS	LANE 1	3.50 M	3.50 M	3.50 M	3.50 M
	LANE 2	3.50 M	3.50 M	3.50 M	0.00 M
	LANE 3	3.50 M	0.00 M	3.50 M	0.00 M
	LANE 4	3.50 M	0.00 M	0.00 M	0.00 M
LEFT TURN RADII	LANE 1	15.0 M	15.0 M	7.5 M	7.5 M
RIGHT TURN RADII	LANE 1	N/A	N/A	N/A	25.0 M
	LANE 2	N/A	25.0 M	N/A	N/A
	LANE 3	N/A	N/A	25.0 M	N/A
	LANE 4	20.0 M	N/A	N/A	N/A

TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** LEVELS ** OPTION

PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 17.00 TO 18.00

THE FOLLOWING DATA HAS BEEN INPUT

ENTRY/EXIT FLOWS	ARM	TIME WHEN FLOW STARTS TO RISE	TIME WHEN TOP OF PEAK IS REACHED	TIME WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ENTRY	A	17.00	17.30	18.00	11.50	11.60	11.50
	B	17.00	17.30	18.00	7.20	7.30	7.20
	C	17.00	17.30	18.00	19.80	19.90	19.80
	D	17.00	17.30	18.00	0.50	0.60	0.50

TIME PERIOD	ARM	VEHICLE TYPE PROPORTIONS CARS AND LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES AND COACHES	MOTOR CYCLES	PEDAL CYCLES
17.00-18.00	A	1.000	0.000	0.000	0.000	0.000	0.000
	B	1.000	0.000	0.000	0.000	0.000	0.000
	C	1.000	0.000	0.000	0.000	0.000	0.000
	D	1.000	0.000	0.000	0.000	0.000	0.000

TIME PERIOD	FROM/TO	TURNING PROPORTIONS ARM A	ARM B	ARM C	ARM D
17.00-18.00	ARM A GROUP 1	0.000	0.212	0.774	0.014
	ARM B GROUP 1	0.583	0.000	0.395	0.022
	ARM C GROUP 1	0.926	0.066	0.000	0.008
	ARM D GROUP 1	0.333	0.333	0.333	0.000

SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- FIXED MODE: TIMINGS TO BE OPTIMISED BY OSCADY

PERIOD FOR OPTIMISATION-	17.00-18.00
MAXIMUM CYCLE TIME-	120.0 SECONDS
OPTIMISED CYCLE TIME-	88.2 SECONDS
OPTIMISED TIMINGS BELOW ARE-	DELAY MINIMIZED (see Note 1)
JUNCTION IS-	WITHIN CAPACITY
MAXIMUM DEGREE OF SATURATION (X'):	71.0 PERCENT
PRACTICAL RESERVE CAPACITY OF JUNCTION [100(90-X')/X'] :	26.7 PERCENT

DATA ITEM		STAGE 1	STAGE 2	STAGE 3	STAGE 4
LANES ON GREEN	ARM A	1 2 3	4		
	B			1 2	
	C	1 2	3		
	D				1
MINIMUM GREEN AND AMBER TIME (SECS)		7.0	7.0	7.0	7.0
OPTIMISED GREEN AND AMBER TIME (SECS)		36.8	7.0	17.4	7.0
LOST TIME (SECS)		1.5	1.5	1.5	1.5
ALL RED + RED AMBER AFTER STAGE		5.0	5.0	5.0	5.0

Note 1: The "delay-minimized" timings above are for an optimised or fixed cycle time of 88.2 seconds and for demand and sat flow values averaged over the specified optimisation period. They are used to calculate the queues and delays over this period and also the quoted maximum degree of saturation (71.0 %) and practical reserve capacity of the junction (26.7 %) values.

CAPACITY MAXIMISED TIMINGS

Optimised "capacity-maximized" timings (seconds) are derived during the first stage of the optimisation process and are as follows:-

STAGE:	1	2	3	4
GREEN+AMBER:	56.4	9.4	27.2	7.0

These timings were calculated for a fixed or maximum cycle time of 120.0 seconds and give a maximum degree of saturation of 59.9 % and practical reserve capacity of the junction of 50.3 % .

DEMAND AND SATURATION FLOW INFORMATION OVER OPTIMISATION PERIOD (17.00-18.00) FOR SIGNAL SET 1

ARM	LANES	MOVEMENT	DEMAND (VEH/HR)	DEMAND (PCU/HR)	SAT FLOW (PCU/HR)	DEGREE OF SAT(%)	RESERVE CAPACITY (%)
A	1	L	147.2	147.2	1786.4	20.6	337.2
	23	S	537.2	537.2	4210.0	31.9	182.2
	4	R	9.7	9.7	1958.1	7.9	*****
B	1	L S	181.9	181.9	1795.0	56.2	60.1
	2	R	254.3	254.3	1985.8	71.0	26.7
C	12	L S	1113.4	1113.4	4063.0	68.5	31.4
	3	R	78.7	78.7	1985.8	63.3	42.1
D	1	L S R	34.0	34.0	1808.3	30.2	198.0

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 17.00 AND 18.00

TIME / ARM	LANES	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE GREEN TIME TRUE (SECS)	EFFECTIVE GREEN TIME NOTIONAL (SECS)	CAPACITY (VEHS/MIN)
17.00-17.15								
A	1	L	2.45	1786.4	29.77	35.3		11.91
	23	S	8.93	4210.0	70.17	35.3		28.08
	4	R	0.16	1958.1	32.64	5.5		2.04
B	1	L S	3.02	1795.0	29.92	15.9		5.39
	2	R	4.22	1985.8	33.10	15.9		5.97
C	12	L S	18.53	4063.0	67.72	35.3		27.10
	3	R	1.31	1985.8	33.10	5.5		2.07
D	1	L S R	0.54	1808.3	30.14	5.5		1.88
17.15-17.30								
A	1	L	2.46	1786.4	29.77	35.3		11.91
	23	S	8.97	4210.0	70.17	35.3		28.08
	4	R	0.16	1958.1	32.64	5.5		2.04
B	1	L S	3.04	1795.0	29.92	15.9		5.39
	2	R	4.25	1985.8	33.10	15.9		5.97
C	12	L S	18.58	4063.0	67.72	35.3		27.10
	3	R	1.31	1985.8	33.10	5.5		2.07
D	1	L S R	0.59	1808.3	30.14	5.5		1.88
17.30-17.45								
A	1	L	2.46	1786.4	29.77	35.3		11.91
	23	S	8.97	4210.0	70.17	35.3		28.08
	4	R	0.16	1958.1	32.64	5.5		2.04
B	1	L S	3.04	1795.0	29.92	15.9		5.39
	2	R	4.25	1985.8	33.10	15.9		5.97
C	12	L S	18.58	4063.0	67.72	35.3		27.10
	3	R	1.31	1985.8	33.10	5.5		2.07
D	1	L S R	0.59	1808.3	30.14	5.5		1.88
17.45-18.00								
A	1	L	2.45	1786.4	29.77	35.3		11.91
	23	S	8.93	4210.0	70.17	35.3		28.08
	4	R	0.16	1958.1	32.64	5.5		2.04
B	1	L S	3.02	1795.0	29.92	15.9		5.39
	2	R	4.22	1985.8	33.10	15.9		5.97
C	12	L S	18.53	4063.0	67.72	35.3		27.10
	3	R	1.31	1985.8	33.10	5.5		2.07
D	1	L S R	0.54	1808.3	30.14	5.5		1.88

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 17.00 AND 18.00

TIME	ARM	LANES	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEMAND/ CAPACITY (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUE AT END OF SEGMENT MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
17.00-17.15										
	A	1	L	2.45	11.91	0.205	0.7	2.2	11.1	
		23	S	8.93	28.08	0.318	1.4	4.0	42.0	
		4	R	0.16	2.04	0.079	0.1	0.2	1.6	
	B	1	L S	3.02	5.39	0.560	2.1	4.1	31.0	
		2	R	4.22	5.97	0.708	3.4	6.1	49.5	
	C	12	L S	18.53	27.10	0.684	3.8	8.6	114.2	
		3	R	1.31	2.07	0.632	1.5	2.4	21.2	
	D	1	L S R	0.54	1.88	0.288	0.4	0.8	6.4	
17.15-17.30										
	A	1	L	2.46	11.91	0.206	0.7	2.2	11.1	
		23	S	8.97	28.08	0.320	1.4	4.0	42.2	
		4	R	0.16	2.04	0.079	0.1	0.2	1.6	
	B	1	L S	3.04	5.39	0.564	2.1	4.1	31.6	
		2	R	4.25	5.97	0.713	3.4	6.1	51.9	
	C	12	L S	18.58	27.10	0.686	3.8	8.6	115.1	
		3	R	1.31	2.07	0.634	1.5	2.4	22.9	
	D	1	L S R	0.59	1.88	0.316	0.5	0.9	7.2	
17.30-17.45										
	A	1	L	2.46	11.91	0.206	0.7	2.2	11.1	
		23	S	8.97	28.08	0.320	1.4	4.0	42.2	
		4	R	0.16	2.04	0.079	0.1	0.2	1.6	
	B	1	L S	3.04	5.39	0.564	2.1	4.1	31.7	
		2	R	4.25	5.97	0.713	3.4	6.2	52.0	
	C	12	L S	18.58	27.10	0.686	3.8	8.6	115.1	
		3	R	1.31	2.07	0.634	1.5	2.4	23.0	
	D	1	L S R	0.59	1.88	0.316	0.5	0.9	7.2	
17.45-18.00										
	A	1	L	2.45	11.91	0.205	0.7	2.2	11.1	
		23	S	8.93	28.08	0.318	1.4	4.0	42.0	
		4	R	0.16	2.04	0.079	0.1	0.2	1.6	
	B	1	L S	3.02	5.39	0.560	2.1	4.1	31.3	
		2	R	4.22	5.97	0.708	3.4	6.1	51.3	
	C	12	L S	18.53	27.10	0.684	3.8	8.6	114.6	
		3	R	1.31	2.07	0.632	1.5	2.4	23.0	
	D	1	L S R	0.54	1.88	0.288	0.4	0.8	6.4	

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (17.00-18.00)

STREAM	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	TOTAL DEMAND (EXCL 2-WHEEL) (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
A-B	147.2	147.2	44.3	0.30	44.4	0.30
A-C	537.2	537.2	168.3	0.31	168.4	0.31
A-D	9.7	9.7	6.6	0.67	6.6	0.67
B-C	172.3	172.3	118.9	0.69	119.3	0.69
B-D	9.6	9.6	6.6	0.69	6.6	0.69
B-A	254.3	254.3	204.7	0.80	205.7	0.81
C-D	9.5	9.5	3.9	0.41	3.9	0.41
C-A	1103.9	1103.9	455.0	0.41	456.1	0.41
C-B	78.7	78.7	90.1	1.15	90.7	1.15
D-A	11.3	11.3	9.0	0.80	9.1	0.80
D-B	11.3	11.3	9.0	0.80	9.1	0.80
D-C	11.3	11.3	9.0	0.80	9.1	0.80
ALL	2356.4	2356.4	1125.6	0.48	1128.9	0.48

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

**** END OF JOB.

LAKESIDE

Energy from Waste

Non-Technical Summary of Environmental Statement

July 1999

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GRUNDON

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ADDENDUM TO THE LAKESIDE ENERGY FROM WASTE NON-TECHNICAL SUMMARY OF ENVIRONMENTAL STATEMENT

'A way with waste'
A DRAFT WASTE STRATEGY FOR ENGLAND AND WALES

1. The Lakeside Energy from Waste Environmental Statement refers to the Government's emerging waste strategy for England and Wales. After the Environmental Statement was finalised for printing, the Government published, under the title of 'A way with waste', its policy on waste management in England and Wales over the next twenty years.

2. 'A way with waste' is an important document which establishes Government policy for energy from waste. This addendum has been prepared by Adams Hendry to supplement the Non-Technical Summary of the Environmental Statement.

3. 'A way with waste' says that the need to curb the growth in the quantity of waste is fundamental to the Government's waste strategy. The Government sees waste reduction, alongside increased recovery of materials and energy, as the key to sustainable waste management.

4. The Landfill Directive creates a binding obligation to restrict the landfilling of municipal waste. There is therefore a pressing need to divert waste from landfill.

5. The Government says that "*modern incinerators have an important role to play in a system of integrated sustainable waste management. Incinerators are tightly regulated, and (the Government) are confident that these controls protect human health and the environment.*" The Government calculates that "*around 8 – 26 million tonnes of incineration capacity might be needed to meet the final target in the Landfill Directive*".

6. The Government emphasises that energy from waste should be linked with other initiatives. Energy from waste plants already form part of the Government's renewable energy strategy.

7. The broad conclusion of the Government's waste strategy is that if its objectives for sustainable waste management are to be achieved and the requirements of the Landfill Directive met, incineration with energy recovery must play a full and integrated part in local and regional solutions. The timescale for compliance with the Landfill Directive requires urgent action by the Government, local authorities, the waste management industry and the community at large.

ADAMS HENDRY
AUGUST 1999

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Non-Technical Summary

of Environmental Statement

Introduction

1. S. Grundon (Waste) Ltd. (referred to in this document as Grundon) is seeking consent to redevelop its existing waste management facility at Lakeside Road Industrial Estate, Colnbrook, Berkshire. The Estate is located between the M4 and the A4, west of the M25. Lakeside Road has direct access to the A4 (see Figure 1).

2. Grundon proposes to construct a new energy from waste (EfW) facility with a capacity to process up to 440,000 tonnes per annum of household, commercial and industrial waste. The facility will serve a catchment area including Slough, other unitary authorities in Berkshire and parts of Buckinghamshire, Surrey and London. A Visitor Centre to serve the EfW facility and provide facilities for environmental studies is proposed on Orlitts Lake South. The EfW facility can be served by rail by a new siding from the Colnbrook Branch Line, which passes alongside the site.

3. A planning application for the new facility has been submitted to Slough Borough Council and an application for Integrated Pollution Control (IPC) Authorisation has been made to the Environment Agency.

4. As required by the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, the planning application is accompanied by an environmental statement (ES). This document summarises the findings and conclusions of the ES in non-technical language.

5. Grundon agreed the scope of the ES with Slough Borough Council following consultation with other statutory bodies, including the Environment Agency and interested groups. The ES is based on the results of studies of potential environmental impacts, which have been carried out by specialist consultants. It sets out the results of an assessment of the likely impact of the proposals on the environment. The ES also explains why the scheme is needed, the consideration given to alternative sites, and describes measures proposed to reduce any environmental impacts.

6. In carrying out the environmental assessment, account has been taken of the potential implications for Grundon's proposal of other major development proposals in the area, including a fifth Heathrow Terminal, the associated proposals for a Logistics Centre and for Iver South Wastewater Treatment Works, and the London International Freight Exchange.

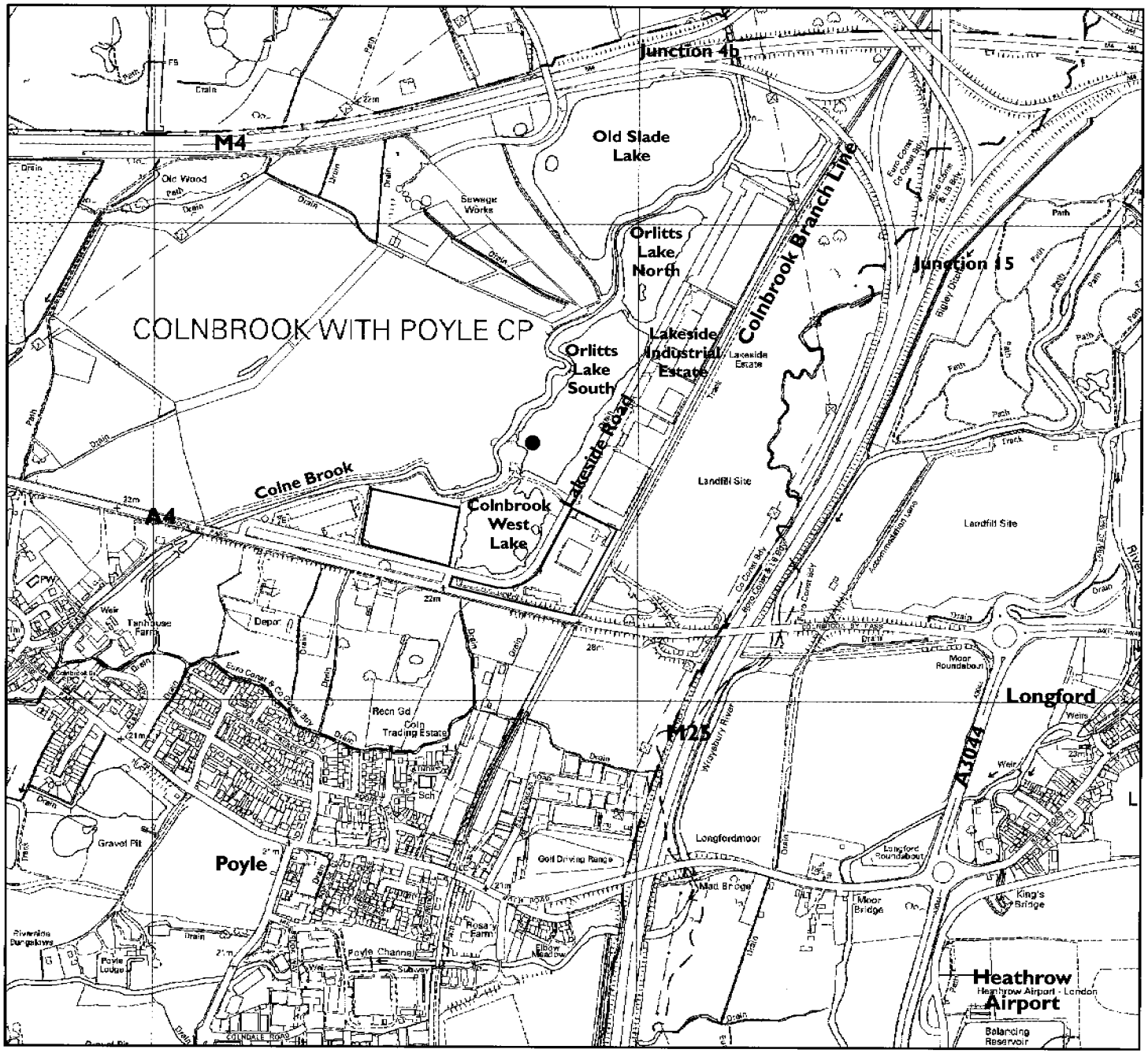

Figure 1 : **Site Location Plan**

Proposed Lakeside Energy from Waste Facility

Proposed Visitor Centre

Proposed Temporary Construction Compound

North

Scale. 1:12 500

500m

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright
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Need for the Scheme

7. Grundon's proposals have been prepared to meet the need for sustainable waste management as part of a strategy of waste minimisation, recycling and energy recovery. Heat and power will be recovered from the waste in an EfW plant and the residue (which will be much smaller than is currently the case without EfW) sent either for further use or to landfill. The proposed EfW facility will produce 30 Megawatts of electrical power, which will be transferred to the National Grid. This is enough electricity for 30,000 households.

8. The Government sees a national role for EfW in the implementation of both sustainable waste and energy strategies. It advises that, "alongside a move to a higher level of recycling, a move to a higher level of incineration with energy recovery is necessary over the next 10-15 years in order to develop a more sustainable waste management system" (Less Waste More Value, 1998).

9. The benefits of EfW are that it:

i. complements the expansion of recycling;
ii. reduces the volumes of unrecyclable waste;
iii. enables landfills to be more easily managed;
iv. recovers energy;
v. is cost-effective;
vi. is safe and reliable, and
vii. provides long-term security.

10. There are at present no EfW plants in the South East outside London. It is inevitable that some will be needed if the Government is to achieve its target of reducing the dependence on landfill. To ensure economic viability, an EfW plant may serve a wider area than a single waste disposal authority.

11. Regional waste planning guidance for London and the South East advocates self sufficiency at county level, a reduction in export of untreated waste from London to zero by 2010 and the landfill of only residues from recycling and non-inert waste after 2010. The strategy relies on the diversion of waste from landfill by providing reduction, treatment and disposal facilities for non-inert wastes allowing landfill to deal with the remaining waste.

12. In common with authorities in the rest of South East England, waste disposal authorities in the former county of Berkshire continue to dispose of most of the community's waste by landfill. Former Berkshire authorities currently export substantial quantities of their communities' waste out of their areas for landfill elsewhere.

13. The Berkshire Waste Local Plan is the statutory plan for the former county. It recognises that recycling and EfW are compatible and aims by 2006 to phase out landfill in Berkshire and the use of landfill outside the county for the disposal of Berkshire's waste.

14. The Local Plan's strategy is based on the availability of adequate landfill capacity and the successful implementation of 'industrial reprocessing' proposals. Approaching half way through the plan period, landfill is in much shorter supply than anticipated and household and other non-inert waste is still exported to other counties in the South East. The 'industrial reprocessing' proposals which were intended to facilitate the reduction in landfill have failed to materialise, placing considerably greater pressure on scarcer landfill resources.

15. No viable alternative could be identified to replace the role of EfW in resolving the waste and energy recovery issues that are faced in the former county of Berkshire and the rest of the South East. Landfill is not an acceptable long term option. The extent of current reliance on landfill, and its growing scarcity, strongly suggests that the Lakeside EfW facility should be of a sufficient size to help meet the needs of an area wider than the former county of Berkshire.

16. With direct access via the A4 to a wide network of principal roads, Grundon's Lakeside Road site already helps serve the waste management needs of waste disposal authorities in the former county of Berkshire, western parts of Surrey, South Bucks and west London. None of these areas has current proposals for EfW plants, although the draft Surrey Waste Local Plan suggests that one or more are required.

17. The environmental assessment therefore concluded that there is an urgent need for the Lakeside EfW facility to be provided as part of sustainable waste management and energy strategies for waste disposal authority areas in the former county of Berkshire and adjoining areas.

Alternatives

18. The only realistic alternative to the proposal is an EfW plant on another site. The Berkshire Waste Local Plan includes a list of criteria which has been used to identify preferred locations for such a plant.

19. The criteria include:

- large catchment area close to major sources of waste
- within or adjacent to industrial type development
- access to the primary road network
- avoidance of sensitive landscapes
- close links to the National Grid and the potential to develop district heating systems.

20. The Government's White Paper on sustainable transport states that sites should also be served by rail.

21. The Lakeside site meets the Local Plan criteria and can be served by rail. The site is already used for waste management and is on an industrial estate with direct access from the primary road network.

22. Before confirming the suitability of the Lakeside site, Grundon considered industrial estates in Slough, Langley, Colnbrook, Poyle, Stockley Park, Hillingdon, Iver and Uxbridge.

23. The Berkshire Waste Local Plan does not identify any sites for EfW in east Berkshire. In central and west Berkshire, it identifies possible sites for EfW at Smallmead, Reading, and Colthrop, Newbury.

24. The potential catchment area of Colthrop is limited. Part of the Smallmead allocation has already been developed and the site is not served by rail. Compared to the Lakeside site, Smallmead is less well located to serve the sub-regional catchment area.

25. The analysis of alternative sites concluded that none could be found which have any advantages over the Lakeside site as a location for an EfW facility.

The Scheme

26. The Grundon site at Lakeside Road currently houses a clinical waste incinerator (CWI) with a single chimney stack, a high density baling plant, a materials recovery facility (MRF), a vehicle workshop and offices.

27. Grundon already has consent to import and process 400,000 tonnes of waste per annum at its Lakeside Road site. To accommodate this volume, the company has consent to extend the existing MRF. Separately, it also has consent to increase the capacity of the existing CWI.

28. The proposed scheme will replace the consented materials recovery and waste reduction facility (a process which is currently followed by landfill) with a waste and energy recovery facility of similar capacity.

29. The CWI will be relocated and rebuilt within the site and clinical waste operations will continue throughout the construction period.

Description of the Proposals

Energy from Waste Facility

30. The EfW plant will be capable of processing approximately 440,000 tonnes of domestic, commercial and industrial waste per annum. Energy from the waste incineration process will be recovered and used to generate electricity. The plant will also be designed to facilitate the supply of heat to third parties as opportunities are identified.

31. An integral MRF within the EfW plant will also process mixed recyclable waste collected from households and commercial premises.

32. The existing CWI at Colnbrook provides a strategically important facility for the disposal of clinical wastes. The new CWI will provide updated facilities to treat the same range of wastes as the company's existing plant thus providing continuity of the current service.

33. The EfW and CWI plants will be designed to meet the latest emission limits as defined by European Directives on the Incineration of Waste and the Environment Agency and will utilise the latest proven technology.

34. Grundon aims to develop a rail link from the EfW plant to enable the Colnbrook Branch Line to be used for the import of wastes to the facility and the removal of residues, mainly ash.

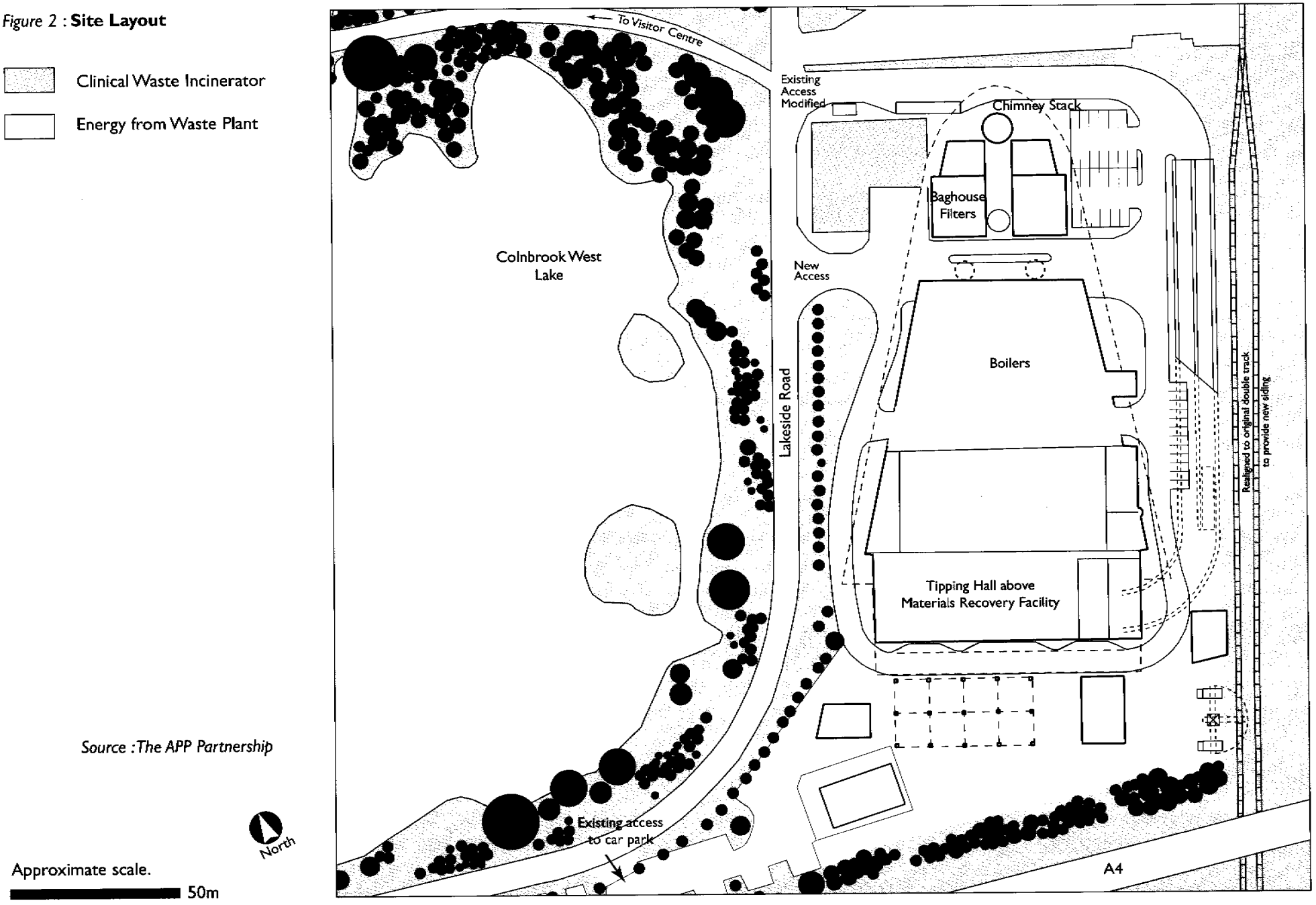
Site Layout and Design

35. The design and location of the facility has been influenced by environmental and physical constraints and air traffic safety considerations. The proposed site layout is indicated in Figure 2.

36. The principal new buildings at the Lakeside site will be the EfW and CWI plants and a new chimney stack 75 metres high, serving both plants. A section through the EfW plant is shown in Figure 3.

37. The height of the building housing the EfW plant will be 42 metres. This is the minimum height required to house the enclosed plant, and complies with advice from the Civil Aviation Authority.

Figure 2 : **Site Layout**



Source : The APP Partnership

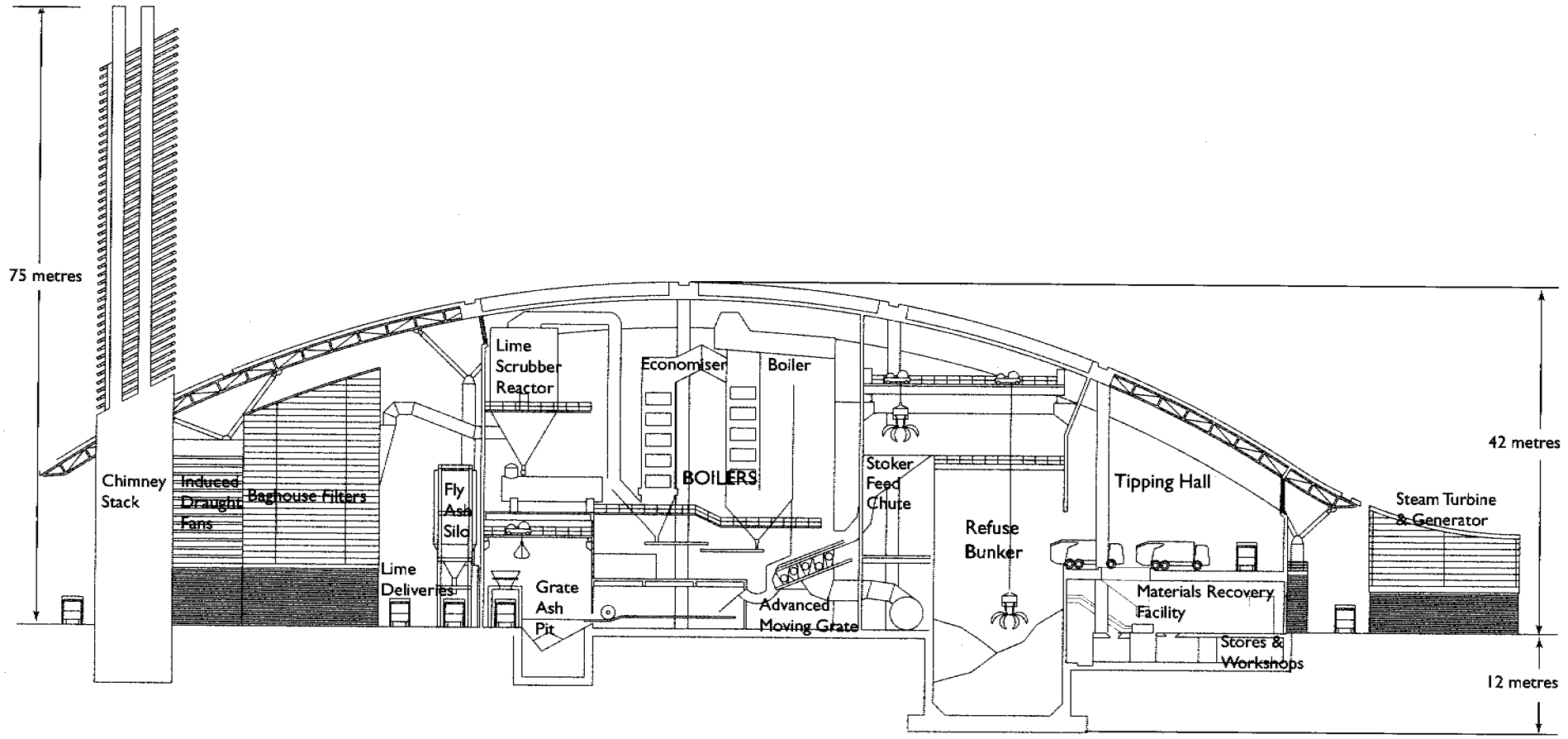


Figure 3 : **Section Through Proposed Energy from Waste Plant**

Source : The APP Partnership

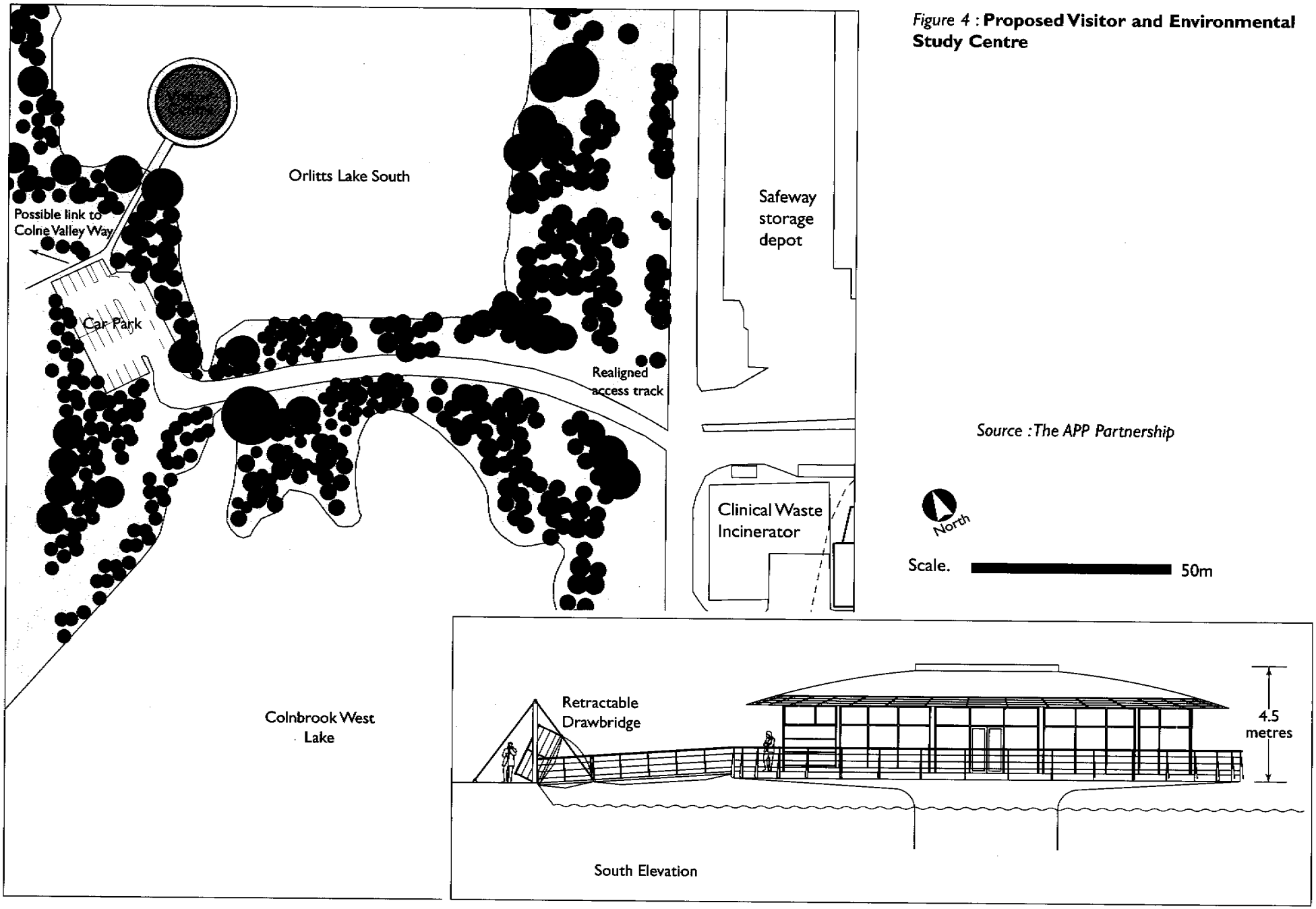


Figure 4 : **Proposed Visitor and Environmental Study Centre**

Source : The APP Partnership

Temporary Construction Compound

38. Part of Tanhouse Farm Landfill, a completed landfill to the west of the site, will be used temporarily for the storage of materials and equipment, contractors parking and offices during construction of the facility.

Visitor Centre

39. The proposals include the development of a Visitor and Environmental Study Centre on the south western edge of Orlitts Lake South. The centre will provide an educational facility for waste management (which is now part of the national curriculum). Because of its setting, the Centre will also be ideally situated to study the value of urban wildlife sites. The location of the Visitor Centre and an elevation of the building are shown in Figure 4.

Liaison Group

40. Grundon will set up a Local Liaison Group as soon as practicable. The purpose of the liaison group will be to provide a forum for discussing construction/operation of the plant and management of the Visitor Centre.

41. The membership of this group will include representatives from Grundon, the Environment Agency, English Nature, Members of local councils and other elected bodies.

Construction Programme

42. Construction of the scheme will take approximately 31 months, with 3 months for commissioning of the EfW plant.

Identifying the Environmental Issues

43. Following an analysis of the local planning policies and environmental constraints (see Figure 5) and consultations with the planning authorities, English Nature and the Environment Agency, it was decided that the environmental assessment should examine the effects of the proposals with respect to the following issues:

- Air quality
- Water Environment
- Ground Contamination
- Landscape
- Traffic
- Noise and Vibration
- Ecology
- Recreation
- Archaeology.

Assessment of Environmental Impacts

Air Quality

44. The air quality impact of the proposed EfW facility has been assessed with reference to current and proposed air quality standards and objectives.

45. Measurements from local monitoring sites show that the air quality in the vicinity of the Lakeside site generally meets air quality standards. However, the stringent air quality standards for nitrogen dioxide and particulate matter (substances present in the air emissions in the form of small particles) are not currently met close to major roads (including the M4 and M25) and Heathrow Airport.

46. The potential impact on air quality of emissions from the proposed EfW facility was assessed using a dispersion model. The results show that, in general, the contribution from the EfW facility to air pollution is not likely to be significant and is unlikely to result in increased risk to human health.

47. The assessment also shows that odorous emissions from the chimney stack and from handling and storage of waste will not be sufficient to cause odour nuisance.

48. Measures will be taken to control dust generation during demolition of the old plant and construction of the new plant. The release of dust from waste and ash handling will be prevented during operation of the plants.

Water Environment

49. The nearest watercourse to the site is the Colne Brook, which is about 200 metres from the EfW site, west of the proposed Visitor Centre. To the east is the Wraysbury River. There are a number of licensed surface water and groundwater abstractions within 2km of the site. However, none of these are used for public or private water supply.

50. The potential impacts on groundwater and surface water resulting from the construction and operation of the proposed EfW facility were assessed. Account was taken of water quality, drainage, water abstraction areas and floodplain areas.

51. Borehole investigations, carried out as part of the assessment, indicate that groundwater quality beneath the site appears to be good and that landfills in the vicinity of the site do not appear to significantly influence groundwater quality.

Figure 5 : **Planning Context**

- Proposed Lakeside Energy from Waste Facility
- Green Belt
- Flood Risk
- Conservation Area
- Business/Industrial Uses
- Wildlife Heritage Site
- Colnbrook Branch Line
- Proposed Visitor Centre
- Proposed Temporary Construction Compound

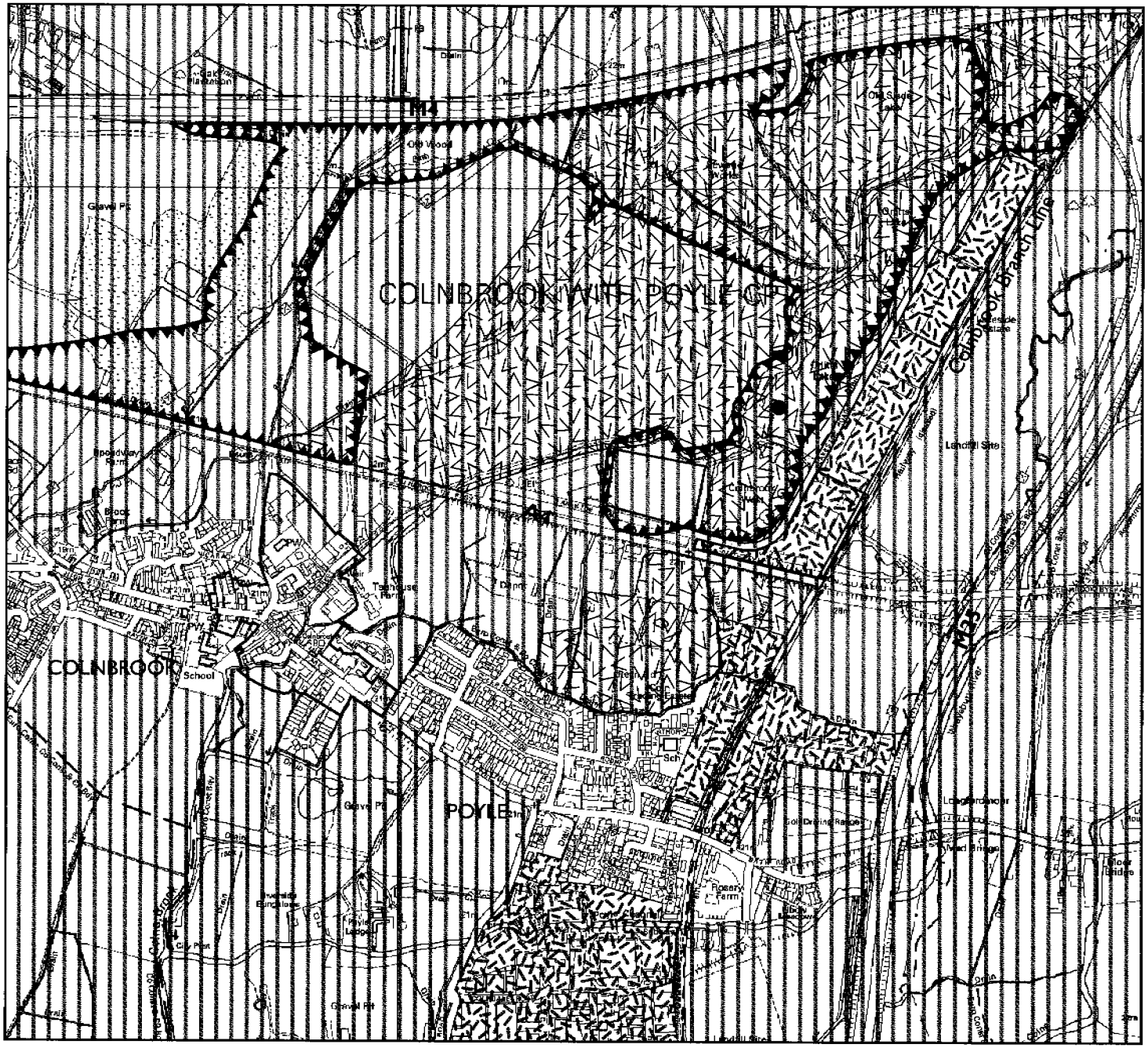
Note. The whole area is within the Colne Valley Regional Park

Source : *Royal Borough of Windsor & Maidenhead Local Plan; Draft for Adoption, 1998*
Hillingdon Unitary Development Plan 1998
The Local Plan for South Bucks 1989
The Review of the Local Plan for Slough; Deposit Draft 1999

North

Scale. 1:12 500

500m



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52. Construction works will affect local groundwater flows and levels during excavation activities and de-watering. However, with mitigation measures in place, the assessment concludes that the quality of the nearby surface water courses, and nearby abstractions will not be significantly affected by construction activities.

53. The operation of the new EfW facility will not result in any discharges of process effluent to sewers or local watercourses. Measures will be implemented to ensure that surface water drainage is of adequate quality prior to discharge and storage areas for oils and chemicals will be fully enclosed to contain any leaks and spills. Therefore, there are not expected to be any changes to the quality of groundwater or surface water resources.

54. Although the development may result in the slight loss of below ground floodplain storage capacity due to excavation works, the development of the site is not expected to affect flood risks.

Ground Contamination

55. Historical records show that the Lakeside site was used for gravel extraction and the construction of pre-cast concrete units prior to the 1970s when Grundon developed their waste reclamation plant. Records do not indicate any former uses which could give rise to potential concern of ground contamination.

56. Information obtained from the Environment Agency indicates that there are a number of commercial, industrial and domestic landfills within 250 metres of the Lakeside site. There is no evidence to suggest that the Lakeside site is influenced by adjacent landfills.

57. In the unlikely event that ground contamination is encountered at the site during construction of the EfW facility, appropriate remedial action will be taken in line with the relevant guidelines.

58. The risk assessment concluded that there are not likely to be any significant effects on the health and safety of site workers, on surface water or groundwater resources, arising from contamination at the site.

Landscape

59. The EfW site is surrounded by but lies outside the Green Belt designation. Tanhouse Farm Landfill, which will accommodate the construction compound, and the site of the Visitor Centre fall within the Green Belt designation.

60. The EfW plant itself does not have a direct impact on the Green Belt. Although visible over a long distance, the careful design of the building and proposed landscaping will provide an attractive feature which in its setting against existing industrial buildings, pylons, motorway and rail infrastructure will not have an adverse impact on the openness of the Green Belt.

61. Once construction is completed, Tanhouse Farm Landfill will be restored and the proposed planting will enhance the landscape of this part of the Green Belt.

62. The small scale of the proposed Visitor Centre means that it will not affect the function of the Green Belt in checking unrestricted growth of large built up areas and safeguarding the countryside from encroachment. Part of its purpose is to provide access to the lake areas and their nature conservation interest fulfilling some of the objectives of the Green Belt. The proposed planting round the lakes will also further enhance the landscape of the Green Belt.

63. The Lakeside site lies within the Colne Valley Regional Park. The redevelopment of the existing waste management site limits the potential impact on the park area. The Visitor Centre will provide public access to the park with the opportunity to observe wildlife on the lakes and in the surrounding area. Landscaping proposed as part of the scheme will also enhance this part of the park area.

64. The EfW building has been designed to produce the minimum size of building required to house the internal plant and to reduce the perceived mass of the building within the landscape. The Visitor Centre has been designed to reflect the appearance of the EfW plant. Landscape planting is proposed around the EfW site, Orlitts Lake South and North and Tanhouse Farm Landfill to assimilate the development into the surrounding environment.

65. The landscape within which the Lakeside EfW site lies reflects evidence of past disturbance, with damaged and degraded land use components. Transportation corridors, utilities and industrial developments are the dominant and intrusive elements along with other urban infrastructure. The proposals will not introduce an entirely new element into the existing landscape but replace the existing waste management plant and chimney stack with a more prominent and larger facility within an existing industrial estate. However, the other existing industrial elements will also remain dominant within the study area.

66. The Lakeside EfW facility will be a substantial structure, visible from a wide area. However, it will frequently be seen in the context of other industrial and urban structures. From most public vantage points it will be a distant feature. Nevertheless, its scale means that it will be more prominent from closer viewpoints. As the facility will be visible from a number of viewpoints, it has been designed to be an attractive landmark building.

67. The overall conclusion of the assessment is that the EfW facility will not have a significant impact on the character or quality of the landscape and in particular will not affect the openness of the adjoining Green Belt.

Traffic

68. During construction, access to the temporary working compound at Tanhouse Farm and the Lakeside EfW site will be from the A4 trunk road via Lakeside Road (i.e. the existing access to the site). This access will also be used once the EfW facility is operational. A further access from Lakeside Road will provide access to the CWI plant. An existing private track off Lakeside Road will be realigned to provide access to the Visitor Centre.

69. The EfW facility will operate 7 days a week, 24 hours a day. Only 10% of the weekly traffic will arrive and depart from the site during the week-end and only 10% of daily traffic will arrive and depart during the night. It is considered that this volume of traffic will not have a significant impact.

70. Existing 12 hour (7a.m. – 7 p.m.) daily traffic flows to the site are 344 heavy goods vehicle (HGV) movements and 120 light vehicle (cars and vans) movements. Grundon has consent to extend the CWI and MRF. There would be an average of 740 HGV movements and 300 light vehicle movements per day if these consents were implemented.

71. During the construction phase for the EfW facility, HGV movements will be significantly less than the current 344 daily HGV movements generated by the site.

72. During the week the operation of the EfW facility would generate 524 daily HGV movements and 80 light vehicle movements. This is less HGV traffic than the site would generate if CWI and MRF were extended in accordance with existing consents and authorisations.

73. Whilst the operation of the EfW facility will result in an increase in traffic using the Lakeside Road/A4 junction, the effects of this increase on the local highway network are not considered to be significant and the junction will be functioning well within capacity.

74. The site can be served by rail from the Colnbrook Branch Line. The predicted volume of road traffic will be significantly reduced if the rail operating companies can provide a rail service to the EfW facility.

Noise and Vibration

75. Noise monitoring was carried out at four locations to represent the residential areas of Poyle and Colnbrook.

76. The assessment shows that noise levels generated during the construction phase will generally be less than the existing day-time noise levels which are dominated by traffic and aircraft movements.

77. The assessment proposes a noise limit from operational plant which will mean that operation of the plant will not have any significant noise impact during normal operation.

78. There may be some noise associated with plant commissioning and testing. Local residents will be notified of any noisy testing via the Liaison Group.

Ecology

79. As the EfW facility could potentially alter air emissions from the site, the effects of the proposal on the ecology of a wide area were assessed.

80. The site of the proposed EfW facility has no ecological value as it is already a developed industrial site.

81. The site for the Visitor Centre car park is characterised by urban wasteland vegetation and is of low ecological value.

82. Four sites of international conservation significance lie within 20km of the proposed development. Windsor Forest and Great Park candidate Special Area of Conservation (cSAC) is 8km to the south west and Burnham Beeches cSAC is 11km to the north west. The proposed Thames Basin Heaths Special Protection Area (SPA) lies 20km to the south-west of the site.

83. The lakes adjacent to Lakeside Road, Colnbrook, are being considered for inclusion in the South West London Waterbodies potential SPA. This designation process is at a very early stage.

84. Four sites of national importance for nature conservation lie within 20km of the site. These are Staines Moor SSSI, Wraysbury and Hythe End Gravel Pits SSSI, Windsor Forest and Great Park SSSI and Burnham Beeches SSSI.

85. Slough Borough Council has identified the lakes off Lakeside Road as a non-statutory Wildlife Heritage Site, particularly for their populations of Kingfisher.

86. The assessment concludes that neither construction nor operation of the EfW facility or Visitor Centre are likely to have a significant effect on designated or potential areas of nature conservation importance.

87. Emissions to air during operation of the EfW plant are not considered likely to have a significant impact on the health of trees and plants.

Recreation

88. The proposed EfW facility is located within the Colne Valley Regional Park which is an important environmental resource for the surrounding urban areas. However, within the immediate surroundings of the proposed development site, recreational facilities are limited to footpaths, bridleways and fishing for members of local angling clubs.

89. There are a number of proposals to improve recreational facilities close to the development site. These include a SUSTRANS cycle route and a Linear Park proposal.

90. During construction of the EfW facility there will be limited impacts on recreational users resulting from noise and traffic. Mitigation measures are proposed to ensure that disturbance is kept to a minimum.

91. As part of the proposals a Visitor and Environmental Study Centre will be provided on Orlitts Lake South. This facility will improve access to the lake and provide information and study facilities on the operation of the EfW facility and on the nature conservation interests in the area.

92. Grundon is also prepared to provide a bridge over the Colne Brook providing a footpath/cycleway link with the proposed Linear Park. This would enable the Visitor Centre to be accessed by foot and cycle. Secure cycle parking will be provided at the Centre.

Archaeology

93. A 1km study area was defined around the Lakeside EfW site. This area is generally of high archaeological interest. The Grundon site and its immediate surroundings have been extensively worked for gravel and filled. Consequently, the site's archaeological potential is negligible and no impact on archaeological sites is likely as a result of the proposed scheme.

94. A number of listed buildings and the Colnbrook Conservation Area lie within the study area. These are located at some distance from the site and it is considered that neither the buildings nor their settings will be adversely affected by the proposals.

Conclusion

95. The establishment of an EfW facility at Lakeside Road would provide a waste treatment and recycling facility for Slough, Berkshire and a wider catchment area extending into Surrey, Buckinghamshire and Greater London.

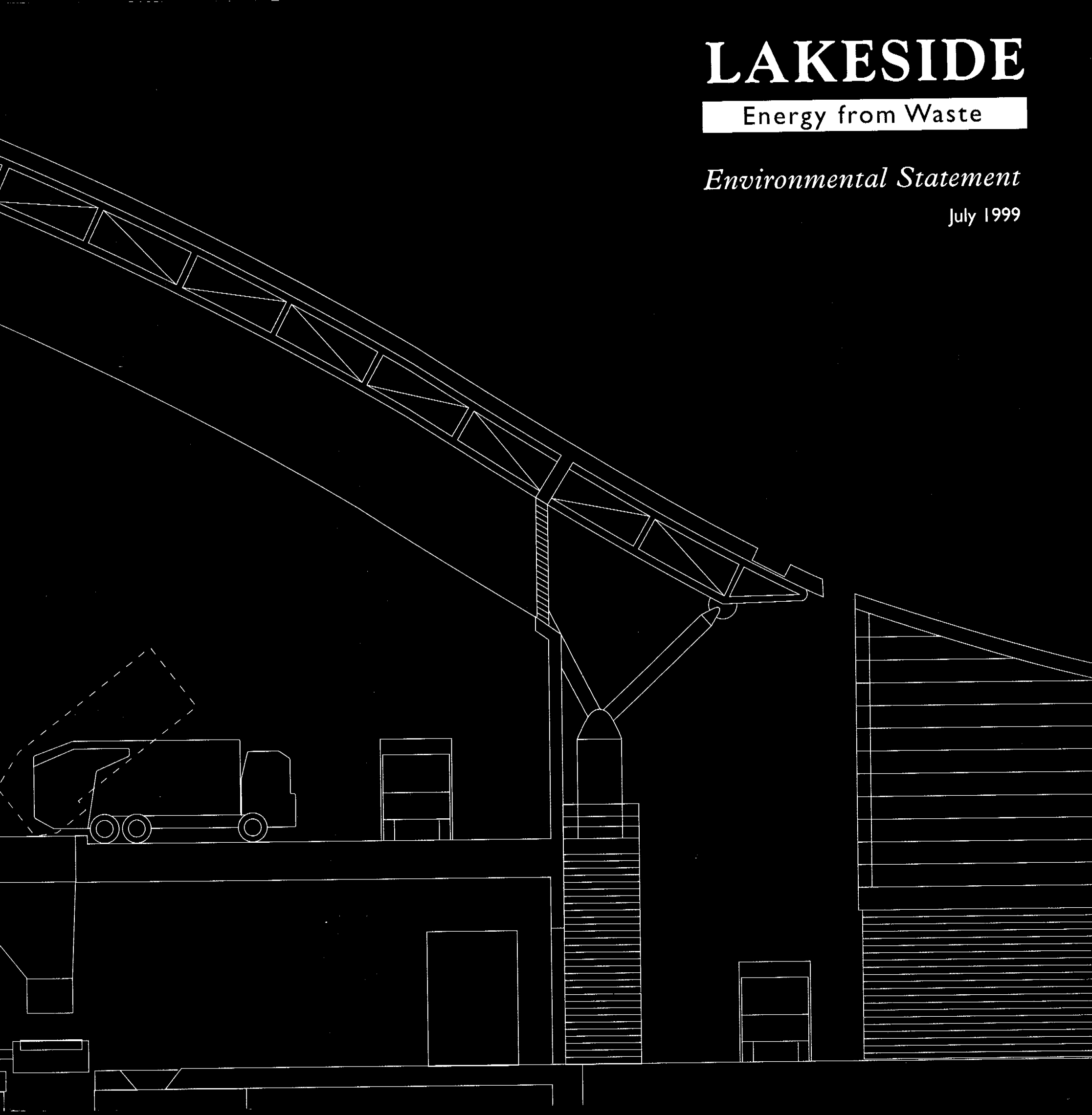
96. The results of the environmental assessment show that, with mitigation measures in place, the proposal can be constructed and operated without any significant environmental effects.

LAKESIDE

Energy from Waste

Environmental Statement

July 1999



Energy from Waste

LAKESIDE
Environmental Statement

July 1999

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ADDENDUM TO THE LAKESIDE ENERGY FROM WASTE ENVIRONMENTAL STATEMENT

'A way with waste'
A DRAFT WASTE STRATEGY FOR ENGLAND AND WALES

1. The Lakeside Energy from Waste Environmental Statement refers to the Government's emerging waste strategy for England and Wales. After the Environmental Statement was finalised for printing, the Government published, under the title of 'A way with waste'[1], its policy on waste management in England and Wales over the next twenty years.

2. 'A way with waste' is a waste management plan under the Waste Framework Directive, the Hazardous Waste Directive and the Packaging Waste Directive, and also sets out the strategy for dealing with waste diverted from landfill as required by Article 5 of the Landfill Directive. It is therefore an important, context-setting document which, alongside its policy for renewable energy[2], establishes Government policy for energy from waste as part of an integrated waste management strategy.

3. This addendum has been prepared by Adams Hendry to supplement paragraphs 2.10-2.14 of the Environmental Statement, to ensure that the policy context described in the statement is up-to-date at the time of submission of the planning application.

4. 'A way with waste' says that the need to curb the growth in the quantity of waste is fundamental to the Government's waste strategy. If household waste continues to grow at current rates (around 3% annually) the Government believes that *"we will need nearly twice as many waste management facilities by 2020." In 1997/98 "the vast majority of municipal waste was landfilled, with just 8% being recycled or composted and a further 6% having energy recovered from it."* The Government sees waste reduction, alongside increased recovery of materials and energy, as the key to sustainable waste management.

5. The Landfill Directive creates a binding obligation to restrict the landfilling of municipal waste. It bans certain types of wastes from landfill entirely and introduces targets for a reduction in the amount of bio-degradable municipal waste to landfill:-

- 75% of 1995 levels by 2010
- 50% of 1995 levels by 2013
- 35% of 1995 levels by 2020

6. There is thus a pressing need to divert waste from landfill. The Government takes an integrated approach that sees the waste management process as a whole, involves all the key players and includes a mixture of options. In the Government's view, *"those planning the management of significant quantities of mixed or diverse waste should avoid over-reliance on a single waste management option. It is unlikely that one approach will represent BPEO (Best Practicable Environmental Option) for all elements of the waste stream)".*

7. 'A way with waste' highlights the Government's conclusion that, notwithstanding the hoped-for success of waste minimisation and recycling campaigns, a substantial number and range of new waste management facilities will need to be developed. It sees an important role for energy from waste. The Government says that *"modern incinerators have an important role to play in a system of integrated sustainable waste management. Incinerators are tightly regulated, and (the Government) are confident that these controls protect human health and the environment."*

8. To meet the requirements of the Landfill Directive and have a truly sustainable system of waste management, the Government intends that, by 2015, 33% of household waste will be recycled (compared with the current 8%). This is a challenging target. Even if this can be achieved, the Government calculates that *"around 8 – 26 million tonnes of incineration capacity might be needed to meet the final target in the Directive".*

9. The Government emphasises that energy from waste should be linked with other initiatives. 'A way with waste' says that *"care must be taken to ensure that incineration contracts are sensitively designed, to avoid 'crowding out' of recycling. In all cases, those developing incinerators should consider the potential for incorporating combined heat and power (CHP) facilities, to use the available heat as efficiently as possible."*

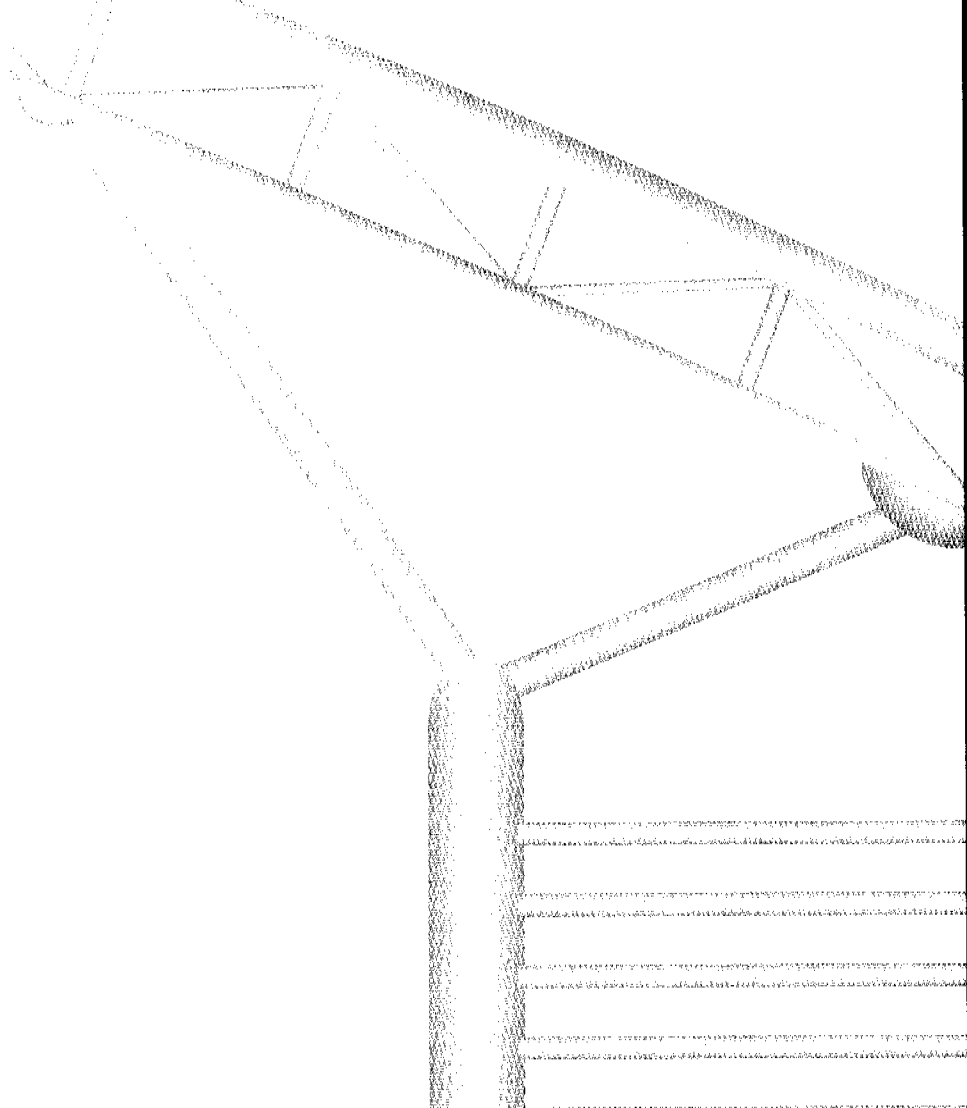
10. Energy from waste plants already form part of the Government's renewable energy strategy. In 'A way with waste', the Government reaffirms its view that such plants can *"displace some electricity generation from fossil fuels" and "displace the need to use more polluting fossil fuels to generate heat".* Consequently, the Government says that it *"will continue to encourage the recovery of energy from waste where this is BPEO ..."*

11. Thus, the broad conclusion of the Government's waste strategy is that if its objectives for sustainable waste management are to be achieved and the requirements of the Landfill Directive met, incineration with energy recovery must play a full and integrated part in local and regional solutions. The timescale for compliance with the Landfill Directive requires urgent action by the Government, local authorities, the waste management industry and the community at large.

12. To help implement its sustainable waste management policy, the Government exhorts the waste management industry to *"grasp the opportunity offered by the shift to more sustainable waste management...by offering a flexible and diverse range of services to business... and to local authorities".* This includes the new incineration capacity identified in 'A way with waste'.

1. Department of the Environment Transport and the Regions. June 1999, 'A way with waste, A Draft Strategy for England and Wales, Part 1'
2. Department of Trade and Industry. March 1999, 'New and Renewable Energy: Prospects for the 21st Century'

ADAMS HENDRY
AUGUST 1999



Chapter One

1 Introduction

Introduction

1.1 S. Grundon (Waste) Ltd. (subsequently referred to as Grundon) is seeking consent to redevelop its existing waste management facility at Lakeside Road Industrial Estate, Colnbrook, Berkshire (see Figures 1 and 2).

1.2 At present the site houses a clinical waste incinerator (CWI) with a single stack, with a capacity of up to 1 tonnes per hour; a materials recovery facility (MRF) and a high density baling plant; a vehicle depot/workshop, and one of the company's administrative offices.

1.3 Grundon currently has authorisation to import and process up to 400,000 tonnes of waste per annum at its Lakeside Road site. To accommodate this volume, the company has planning consent to extend the existing MRF building. Separately, it also has permission (as yet unimplemented) to increase the capacity of the CWI to two 1 tonne per hour incineration units, doubling its existing capacity

1.4 Grundon proposes to redevelop its land to provide a new Energy from Waste (EfW) facility incorporating an EfW plant and a new MRF (which will be integrated with the EfW process). The existing CWI will be relocated and rebuilt within the site. Clinical waste operations will continue throughout the construction period. Grundon's depot and workshop will be re-located to an appropriate employment site elsewhere in the locality. Grundon's Lakeside Road administrative offices, which are the headquarters of its waste management operation, will not be affected. The proposal includes a facility for the reception of waste and dispatch of ash by rail using the Colnbrook Branch Line alongside the site.

1.5 The effect of Grundon's new proposals will be to replace the consented materials recovery facility with an Energy from Waste facility of similar capacity. The proposal will harness and make productive use of the latent energy in the waste and significantly reduce the volume of waste leaving the site requiring landfilling. The CWI capacity and its potential to expand, will not be affected.

1.6 The physical effect of the proposal will be to replace the present structures on the site with a larger, purpose designed EfW plant with a single, higher stack serving both the EfW and CWI processes.

Energy from Waste

1.7 An EfW plant uses modern technology, the operation of which is closely controlled to meet stringent European standards, to harness the heat given off from burning unavoidable waste to generate hot water and electricity. The energy recovered during the EfW process will help conserve fossil fuels. The Lakeside facility will produce 30 MW of electricity for the National Grid, enough for the needs of some 30,000 households and heat which can be supplied to nearby properties. Burning waste reduces its volume. Some of the residue from the process may also be used as an alternative aggregate. Thus the volume of landfill space eventually required is greatly reduced.

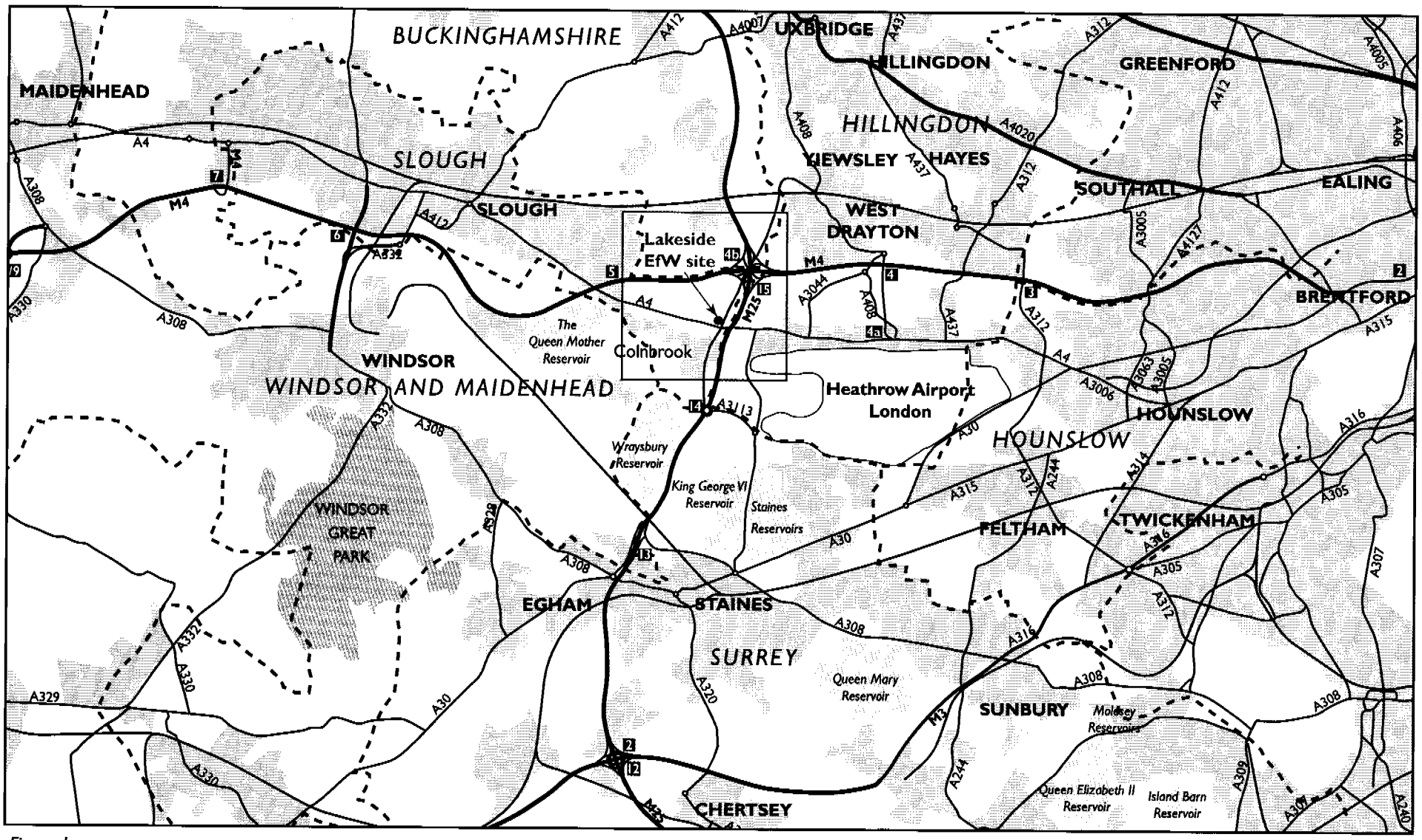


Figure 1 :
Location of Development and Administrative Boundaries

- Lakeside Energy from Waste Site
- Waste Disposal Authority Boundaries
- Roads
- Railways
- Inset see Figure 2

North Scale. 1km

1.8 EfW technology is considered by the Government to be an important feature of its evolving integrated and sustainable waste management strategy. A recent Department for Trade and Industry (DTI) statement, 'Sustainable Energy from Waste', says that *'EfW incineration presents no significant risk - which in everyday language means it is safe - and is a modern, robust waste management technology which helps to protect the environment'*. The Lakeside EfW facility is designed to be part of this strategy, dealing productively with that part of the waste stream that is unavoidable, complementing measures to reduce waste at source and re-use surplus materials to prevent them becoming waste.

1.9 Such is the public interest in waste management facilities, that Grundon proposes to provide educational facilities for visitors on land they own west of the Lakeside site, on Orlitts Lake South. These facilities will also be made available by Grundon to local schools and colleges for the study

of waste management (now part of the national curriculum). The Visitor Centre will also be ideally situated to heighten public awareness of the value of urban wildlife sites.

The Environmental Statement

1.10 This document is the Environmental Statement (ES) which accompanies Grundon's applications for planning consent and for authorisation under Integrated Pollution Control (IPC). A planning application for the redevelopment of the waste management facility has been submitted to Slough Borough Council. An application for IPC authorisation has also been made to the Environment Agency for the EfW plant.

1.11 The ES provides the information required by the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations, 1999. It will assist both the Slough Borough Council and the Environment Agency in reaching their decisions. Technical information regarding the EfW process and pollution control measures is presented in the IPC application.

1.12 The ES has three primary functions:

i. to explain why the EfW scheme is needed and the consideration given to alternatives;

ii. to assess the impact of the proposed scheme on the environment, and

iii. to describe the measures proposed to reduce the environmental impact of the scheme.

1.13 It is sometimes necessary in the ES to use technical language to describe certain items of equipment or processes. Where technical terms are essential, they are either defined in the text or explained in the Glossary. A non-technical summary of the ES is available separately.

The Applicant

1.14 Grundon is the largest privately owned independent waste management group in Britain. The company was established in 1929 as a family business operating in the west of London. The Company's activities now extend from east of London to Gloucestershire and from the Midlands to the south coast. It has developed and managed aggregate, landfill and waste recovery facilities in the Colnbrook area over a period of more than thirty years. Due to its industrial estate location and accessibility from surrounding urban areas, the Lakeside Road site is one of Grundon's main centres, serving London and the western home counties.

1.15 The proposed development of the Lakeside EfW facility will continue a 20 year history of innovative, large scale waste management development at the site. In the late 1970s, Grundon established a high density baling plant at Colnbrook, which was one of the first plants of its scale and type in the world. In 1990, the CWI, one of the largest and most advanced healthcare waste incinerators in the country, was commissioned. In 1995, Grundon commissioned a 150,000 tonne per annum MRF to sort waste materials for recycling. Grundon was granted planning permission in June 1999 by Slough Borough Council to extend the MRF building to increase throughput to 400,000 tonnes of waste per annum.

1.16 Grundon has established a reputation as a competent and professional waste operator. Its clients include many local authorities, commercial companies, hospitals and other healthcare organisations.

1.17 The company recognises the need for waste management activities to be carried out with careful regard to the sensitivities of neighbouring occupiers. During the twenty years that it has conducted waste disposal operations on the Lakeside site Grundon has established and maintained a good relationship with the local community.

Background to the Proposals

1.18 Since Grundon first established a waste disposal operation at Lakeside Road in the late 1970's, wastes and society's needs have changed considerably. The company's reaction has been continuously to improve and update the facilities and services it offers.

1.19 The catchment area of the current waste operations on the site includes parts of Berkshire, Buckinghamshire, Surrey and Greater London. As a specialist facility, and one of the largest of its type, with direct access via the national road network, the CWI has a regional catchment. It also plays a key role in the national management of clinical waste, offering reciprocal facilities to competitors and health authorities during maintenance and down-time of other plants.

1.20 Grundon's proposals for an EfW plant are the outcome of several years study of the need and market for such a facility (see Chapter 2).

1.21 During its investigations, the company actively participated in public consultation on the Berkshire Waste Local Plan. Strategic waste management planning in the Colnbrook area has long been handicapped by its administrative location on the borders of three counties and two London boroughs (Hillingdon and Hounslow). Until 1994, Colnbrook was in Buckinghamshire. It was transferred to Berkshire in 1994 at the same time as Poyle, to the south, was transferred from Surrey. In 1998 six unitary authorities replaced the county of Berkshire. Slough Borough Council is now the local planning authority, highway authority and waste and minerals planning authority for Colnbrook.

1.22 In reaching the decision to proceed with the process of obtaining the necessary consents and committing itself to the substantial investment required to establish an EfW plant, Grundon has been particularly mindful of the following considerations:

M4
A4
A4
M25
A3044
Junction 4b
Junction 15
Old Slade Lake
Orlitts Lake North
Orlitts Lake South
Lakeside Industrial Estate
Colnbrook West Lake
Colnbrook Branch Line
Lakeside Road
Colne Brook
Colnbrook
Poyle
Oil Terminal
Longford
Heathrow Airport
COLNBROOK WITH POYLE CP
Golf Course
Sutton
Sewage Works
Gravel Pit
Landfill Site
Depot
Colnbrook School
Poyle Channel
Mad Bridge
Moor Bridge
Moor Roundabout
Longford Roundabout
Balancing Reservoir
Sewage Works
Colnbrook Trading Estate
Britannia Industrial Estate
Market Trading Estate
Lakeside Estate
Longfordmoor
Golf Driving Range
Disused Railway
Disused Workings
Old Slade Farm
Home Wood
Old Wood
Oak Plantation
Sutton Court Farm
Langley Lodge Farm
Speedway Farm
Brook Farm
Tenthouse Farm
Manor Farm
Poyle Farm
Rosary Farm
Poyle Lodge
Riverside Bungalows
Berkyn Manor Farm
Elbow Meadow
Colnbrook By-Pass
Euro Coast & Co Coast Bdy
River Colne
Wraysbury River
Bigley Ditch
Landfill Site

Figure 2 :
Location Plan

Lakeside Energy from Waste Site

Proposed Visitor Centre

Proposed Temporary Construction Compound

North

Scale. 1:12 500

500m

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A

i. implementation of the Landfill Directive which imposes increasing restrictions on the disposal of biodegradable waste to landfill, such that in the future it can no longer be relied upon as the major waste management option;

ii. increasing scarcity of landfill sites in the South East of England for municipal solid waste, commercial and industrial waste;

iii. the well-established use of the Lakeside Road site for waste management, including incineration, for which purpose it is safeguarded in the Berkshire Waste Local Plan;

iv. existing authorisation for a throughput of 400,000 tonnes of waste per annum to the Lakeside Road site;

v. the importance of retaining a strategic CWI facility on site;

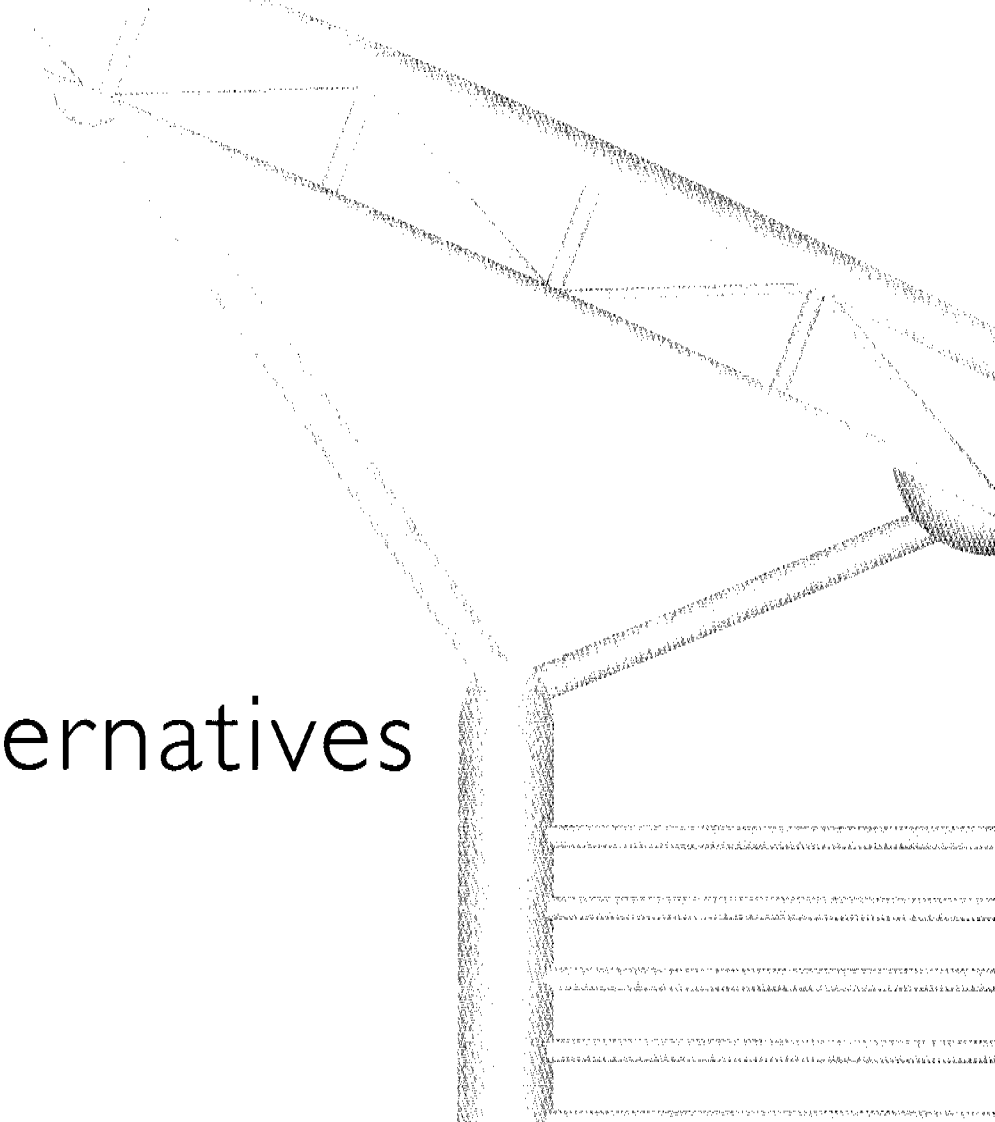
vi. Lakeside Road's direct access to the primary road and rail networks;

vii. the site's relative remoteness from residential areas;

viii. the Government's endorsement of the need for EfW as part of its forthcoming national waste strategy;

ix. proposed major development schemes in the vicinity, which are potential users of the heat output from the plant.

1.23 These considerations have led Grundon to the conclusion that the establishment of an EfW facility at Lakeside Road would be a major contribution to the implementation of an integrated waste management strategy for Slough, Berkshire and a wider catchment extending into Surrey, Buckinghamshire and Greater London.



Chapter Two

2 Need and Alternatives

Introduction

2.1 This chapter explains the need to redevelop the existing waste management facilities at Lakeside Road, Colnbrook. It also describes, in the context of planning and waste management policies for the UK, the South East Region and the local area, the consideration given to alternative courses of action and other possible locations for the plant.

2.2 Grundon's proposals will provide facilities for treating and recycling 440,000 tonnes of waste per annum. They will serve a catchment that will include Slough, other unitary authorities in Berkshire and parts of Buckinghamshire, Surrey and London.

2.3 The main difference between the proposal and the existing consented use of the Lakeside Road waste management site is that the proposal includes provision for heat and power to be recovered from the waste in an EfW plant. There will also be approximately a 90% reduction in the volume of residue sent either for further use (for example, in the production of an alternative aggregate) or to landfill.

2.4 Grundon's proposal has been prepared to meet the need for sustainable waste management as part of an integrated strategy of waste minimisation, recycling and energy recovery. This chapter explains how the proposal reflects European and developing UK waste management policies and local authority strategies for the surrounding area.

European and UK Waste Policy Context

2.5 The European Union has adopted a number of Directives designed to harmonise waste disposal polices. Most waste legislation has concentrated on environmental protection, human health and the prudent use of natural resources.

2.6 'The Community Strategy for Waste Management' (1989 updated 1996) sets out a hierarchy for the management of waste. Minimising the production of waste is considered the most important, followed by recovery and finally, disposal. The strategy notes the importance of recovering energy from waste before disposal, emphasising that incineration without energy recovery should be avoided.

2.7 'The Waste Framework Directive' (1975, amended 1991) has largely been implemented in the UK through Part II of the Environmental Protection Act 1990 and the Waste Management Licensing Regulations 1994. Two key objectives of the Directive are:

1) "*ensuring that waste is recovered or disposed of without danger to human health and without using processes which could harm the environment and, in particular, without*

- *risk to water, air, soil, plants or animals;*
- *causing noise or odour nuisance;*
- *adversely affecting the countryside or places of special interest,* "

2) "*establishing an integrated and adequate network of waste disposal installations, taking account of the best available technology not involving excessive costs.*"

2.8 The 'Framework Directive' also includes a hierarchy for waste management practice, with clean production technologies at the top, followed by waste reduction and minimisation at source, re-use and re-cycling, and maximum recovery of

secondary materials or energy. Landfill is the last option.

2.9 The draft Directive on the Incineration of Waste, June 1998, updates emission limits for the release of pollutants to air, water and land from incineration plants, to ensure that high standards of environmental and human protection are achieved. It also includes a requirement to recover heat.

New Waste Strategy for England and Wales

2.10 UK policies seek to minimise waste at source and encourage greater re-cycling, higher standards for waste disposal and alternatives to landfill. The Government has refined its predecessor's proposals for sustainable waste management, which were set out in 1995 in the White Paper, 'Making Waste Work', and declared its intention to publish its own national waste strategy shortly.

2.11 In the consultation paper, 'Less Waste More Value' (1998), the Government emphasises its commitment "*to sustainable development, in which environmental, economic and social objectives are combined*".

2.12 The consultation paper states that the Government's main objective in developing its new waste strategy will be "*to ensure that waste management in England and Wales plays a full part in the search for greater sustainability*". The Government considers that, fundamental though they are, "*waste minimisation measures can never remove the problem of waste altogether; we have to be realistic about the amounts that will be generated. A failure to deal in an environmentally sound way with waste that does arise would be the worst possible outcome. There will therefore be a continuing need for new waste management facilities.*"

2.13 'Less Waste More Value' supports the theoretical hierarchy of waste reduction followed by recovery of value and only then disposal. However it sees the need for a flexible approach where the Best Practicable Environmental Option may vary according to circumstances.

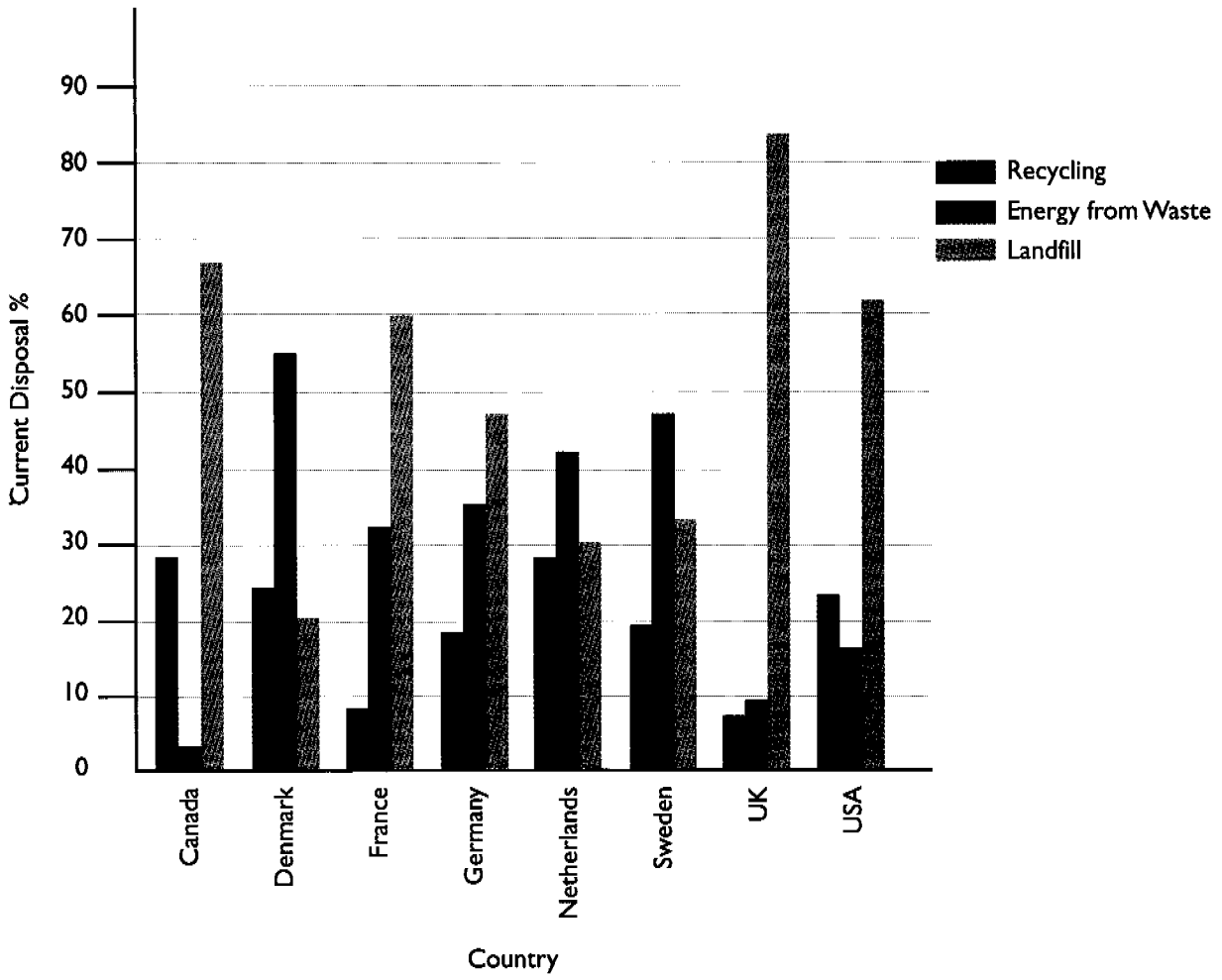


Figure 3 : **International Waste Disposal Methods** *Source : DTI*

2.14 As Figure 3 shows, in contrast with other countries, the UK disposes of very little waste to EFW and over 80% of waste to landfill. In 'Less Waste More Value' the Government says that, "*alongside a move to a higher level of recycling, a move to a higher level of incineration with energy recovery is necessary over the next 10-15 years in order to develop a more sustainable waste management system.*"

UK Renewable Energy Programme

2.15 In a recent publication, 'Sustainable Energy from Waste' (1999), the Department of Trade and Industry (DTI) emphasises the Government's strong support for EfW as a component of a sustainable waste strategy.

2.16 There are at present 10 EfW plants in the UK, processing a total of 2.5 million tonnes of waste per annum. A further three are under construction. London has two plants (see Figure 4). There are none in the rest of South East England.

2.17 In the introduction to 'Sustainable Energy from Waste' the DTI states that

"*There is no single 'right' way to manage waste, and today most people agree that we need to adopt an integrated approach, tailoring our chosen mixture of waste management options to our circumstances and to the wastes we have to deal with. This diversity of solutions matches the diversity of the waste itself. Our*

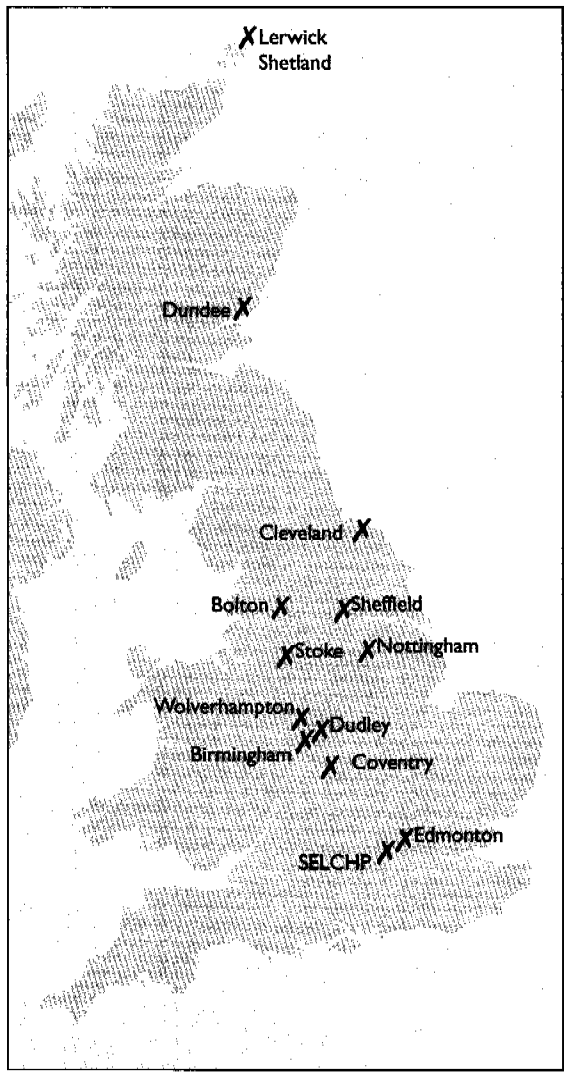


Figure 4 :
Energy from Waste Facilities in the UK - Existing and Under Construction

Source : DTI

aim must be to develop a sustainable way to manage this waste so that we do not burden the next generation with the effects of dealing with the waste of today".

2.18 The statement goes on to emphasise the necessity of recovering energy from waste:

"Local authorities should ensure when letting waste management contracts, that all the options which make up their integrated mix are catered for and that they have treatment and disposal routes for any wastes that are not recycled. That is, they should ensure at the planning stage that flexibility is retained in the way in which the various components of the waste can be recovered for recycling and energy recovery. Failing to harness the latent energy in waste is an unsustainable practice and a big waste of resources."

"EfW incineration is not the whole answer, but, as with recycling and composting – when sensibly applied, it can help ensure that we recover the maximum value for materials which would otherwise be consigned to landfill and wasted".

2.19 'Sustainable Energy from Waste' identifies the following advantages of EfW incineration:

i. EfW complements the expansion of recycling

2.20 EfW incineration deals with the waste that remains for disposal after targetted levels of recycling and composting have been achieved.

2.21 The best rates of dry recycling achieved in this country are similar to those abroad, around 15%-17%. The national average is around 10%. Some of the combustible material in household waste is of too poor quality or too dirty to meet the needs of re-processors, or simply cannot be recycled in an affordable way. In the unlikely event that 50% of waste could be recycled, the remaining 50% would still contain enough heat value to make EfW viable. Many commonly recyclable materials are not combustible, thereby increasing the relative heat value of the remainder.

ii. EfW reduces the volumes of unrecyclable waste

2.22 EfW incineration reduces the volume of waste requiring landfill by some 90% (more if bottom ash is used for secondary aggregates). This greatly reduces pressure on scarce landfill space and also reduces associated lorry traffic.

iii. EfW enables landfills to be more easily managed

2.23 When landfilled in properly engineered sites, the residues from EfW have a reduced potential (compared with untreated waste) for pollution of air, ground and water.

iv. EfW recovers energy

2.24 Energy recovered from waste helps to reduce demands on fossil fuels, which are otherwise the main source of electricity. In 'Sustainable Energy from Waste' the DTI confirms that the Government *"has given its strong support for an expansion of EfW to help meet the EU renewable energy target of 12% by the year 2010."*

v. EfW is cost-effective

2.25 The cost of EfW is competitive with landfill. The effect of landfill tax is often hidden because waste disposal authorities pass the cost on to households through the council tax. Voids suitable for landfill are scarce and will get scarcer. As the volume of waste requiring management grows the pressure on remaining landfill will increase.

vi. EfW is safe and reliable

2.26 The DTI says that *"Modern EfW plant are safe and reliable, and strictly controlled to ensure that emissions are kept within safe limits as defined by European legislation" .... "EfW incineration presents no significant risk – which in everyday language means it is safe – and is a modern, robust waste management technology which helps protect the environment."*

vii EfW provides long-term security

2.27 'Sustainable Energy from Waste' states that "*EfW provides the security of a long-term solution to treating a region's waste unaffected by market variations*". Waste streams vary according to the season and recycling markets are not reliable. Furthermore, it is difficult to find sites suitable for dealing with waste.

2.28 'Sustainable Energy from Waste' concludes that EfW has an important role in a national waste strategy:

"*Recycling, composting and waste minimisation measures must all increase. But many years of worldwide experience have shown that there will still be waste requiring management. If we are to achieve a sustainable approach to managing this waste, we must aim to recover value (energy) prior to disposal. ... The National Waste Strategy, due for introduction by the end of 1999, is expected to call for higher levels of EfW*".

2.29 The DTI's support for EfW is in line with the Government's response to the report of the Royal Commission on Environmental Pollution ('Seventeenth Report: Incineration of Waste', 1993), which gave reassurance about the environmental impacts of incineration and supported the concept on the basis of its use for the generation of power or combined heat and power, and the safeguards provided by EU emission limits, which came into force in 1996.

2.30 In response to the Commission's report, the Government said:

"*We agree with the Royal Commission that incineration of waste in suitably located plants designed to meet these standards is an environmentally acceptable form of waste disposal and should no longer represent a cause for concern to those who work and live close to such plants. We agree also on the desirability of recovering energy from waste as part of a sustainable approach to waste management.*

The best practicable environmental option for wastes will vary according to location and waste stream, but the Government accepts the general thrust of the Commission's argument that incineration, with energy recovery, should play a larger part in waste management in the future..."

2.31 Thus, national and international policies consider EfW to have an important role in implementing sustainable waste management and energy policies. There are at present no EfW plants in the South East outside London. It is inevitable that some will be needed if the Government is to achieve the target of reducing landfill "from 70% to 60% of controlled waste by 2005" ('Less Waste More Value'). Grundon's Lakeside Road site already serves the waste management needs of a wide catchment. Redevelopment of the site to provide EfW facilities would accord with the principle of European and UK policies.

Regional and Local Needs

2.32 It is clear from 'Sustainable Energy from Waste' that EfW facilities should be part of regional and local waste and energy strategies. To ensure economic viability, an EfW plant may serve a wider area than a single waste disposal authority (WDA). As explained in the introduction, Colnbrook is located on the borders of five WDAs and already serves a sub-regional catchment. Since Colnbrook is in the former area of Berkshire, it is appropriate before looking at the regional picture to consider first the needs of the local WDA, Slough Borough.

2.33 Slough Borough Council became a unitary authority, and hence the WDA for the Colnbrook site, following the abolition of Berkshire County Council in April 1998. As WDA, it is responsible for ensuring that a mechanism is in place for the disposal of waste generated in its area. Slough is also the waste planning authority responsible for the identification of sites to meet waste management needs and for planning applications for waste developments. The other unitary authorities created in the former area of Berkshire, which are also WDAs, are Reading, Windsor and Maidenhead, Wokingham, West Berkshire and Bracknell Forest.

2.34 These six authorities are now responsible for dealing with waste arisings in the former Berkshire County. They carry out their task in the context of the Berkshire Waste Local Plan, which was adopted in 1998, through a Joint Strategic Planning Unit, after a preparation period of seven years.

Berkshire Waste Management and Waste Local Plans

2.35 In the Berkshire Waste Management Plan (July 1995) the former County Council set out a hierarchy of technologies it believed to be the best suited to achieve the aims of the waste strategy in terms of feasibility, sustainability and environmental impact. The 'Waste Hierarchy' identified education and waste minimisation as the most desirable options followed by a middle tier of disposal options including reuse, recycling and reduction (which includes EfW), with disposal by landfill and landraising as the least desirable options at the bottom of the hierarchy. EfW schemes were viewed as the least preferable option of the middle order technologies and a 'contingency measure' to meet the possibility of industrial reprocessing being unable to meet the objective of phasing out putrescible landfill by 2006.

2.36 The Waste Management Plan recognises that recycling and EfW are compatible. Policy WM24 of the Waste Management Plan seeks "*to treat as much waste as is practicable via alternative technologies to landfill and to ensure that where energy from waste is generated, as much is recovered as is practicable and economic*".

2.37 The Berkshire Waste Local Plan (1998) also aims by 2006 to phase out landfill and landraising in Berkshire as a method of disposing of putrescible waste and the use of landfill outside the county for the disposal of Berkshire's waste. The Local Plan strategy is based on estimates of waste arisings for the period 1996 – 2006 that will require treatment and disposal. According to figures derived from the Waste Management Plan for Berkshire, in 1995 the average annual total arisings for inert, household,

industrial/commercial and difficult/special; waste was 2,045,000 tonnes.

2.38 The volumes of annual waste arisings requiring treatment and disposal over the Plan period are shown in Table 1. These figures take into account the effect of waste minimisation, re-use and recycling initiatives, the capacity of the existing waste derived fuel plant in Slough (where planning permission has recently been granted for increased capacity) and waste arisings from the parishes of Colnbrook and Poyle (which became part of Berkshire in 1994).

Table 1 : **Volumes of Waste Requiring Treatment**

1995/6 to 2000/1	820,000 cubic metres
2000/1 to 2005/6	810,000 cubic metres
Allowance for Colnbrook & Poyle	12,000 cubic metres

Source: Berkshire Waste Local Plan

2.39 Thus, over the period 1996 to 2006 the Berkshire Waste Management Plan expects that a total of 8.27 million cubic metres of waste will be generated in the area of the former county.

2.40 The treatment strategy set out in the Waste Local Plan for dealing with these arisings considers 'industrial reprocessing' to be the preferred option used in combination with recycling, mixed waste composting, anaerobic digestion, waste derived fuel and landfill. The Plan's glossary defines 'industrial reprocessing as a *'waste treatment process which involves sorting waste into a number of fractions. The treatments involved can vary but could include composting, anaerobic digestion, waste derived fuel and the production of a variety of products from recycled materials'*. EfW is a contingency, to be developed in the event of failure of the other technologies. This approach is now at odds with EU and Government policy which, as described earlier, identifies a key role for EfW as part of its sustainable waste management and renewable energy strategies.

Table 2 : **Estimated Capacity of Existing Landfill Sites in the Former County of Berkshire**

Sites - Existing	Licence (waste type)	Capacity (cubic metres)	Current Situation
Hermitage Farm	Non-inert & domestic	660,000	Expected to be filled by 2005
Field Farm	Non-inert		Closed
Whistley Court Farm	Non-inert	710,000	Expected to be filled by 2003
Stroud Farm	Non-inert		Full
Beenham, Marleys	Non-inert	240,000	Expected to be filled by 2003
Smallmead Farm	Non-inert & domestic	970,000	Expected to be filled by 2005
Kennedy Park	Non-inert		Full
Chavey Down	Non-inert		Full
Knowl Hill	Non-inert	490,000	Limited to 70,000 tonnes per year. Will continue during plan period.
Colnbrook and Poyle	Non-inert	480,000	A further extension is possible. The sites are likely to close by 2002.

Source: Grundon, based on Berkshire Waste Local Plan Inquiry evidence by Babtie on behalf of Berkshire County Council.

2.41 The Local Plan's strategy thus relies on two assumptions. First, the availability of adequate landfill capacity to accept non-inert waste, the residues of recycling and waste left after treatment. Second, the successful implementation of 'industrial reprocessing' proposals, which are unproven on the scale suggested in Berkshire. The Local Plan acknowledges that it will be difficult to find additional landfill capacity if these facilities are not implemented, in which case EfW will be required.

2.42 Approaching half way through the plan period, the reprocessing plant proposed at Smallmead, Reading as part of the Local Plan's preferred disposal/treatment option has failed to materialise. It is understood that there are no current proposals for this site.

2.43 Failure of the 'industrial reprocessing' proposals has therefore placed considerably greater pressure than anticipated on the role of landfill to dispose of Berkshire's waste. This situation is contrary to European and national policy, which seeks to reduce the dependence on landfill and maximise the recovery of energy from waste before disposal.

2.44 Furthermore, since the adoption of the Waste Local Plan, the Joint Strategic Planning Unit has acknowledged a significant reduction in the existing and potential landfill capacity compared with the figures that are relied on in the Plan to meet the county's needs.

2.45 Table 2 shows the capacity (as at mid 1999) of existing landfill sites in Berkshire. Total capacity is estimated to be approximately 3.55 million cubic metres. However, only two sites, Hermitage Farm and Smallmead, are able to accept domestic waste. These two sites are expected to reach capacity by 2005. This current estimate of landfill void available for the disposal of domestic waste is little more than a third of that quoted in the Local Plan.

2.46 The position in respect of potential landfill sites (that is, sites where a void suitable for landfill may be provided by mineral extraction in the future) is similar. Figures supplied by Babtie on behalf of the Joint Strategic Planning Unit (see Table 3) show that current estimated capacity is just over a third of that assumed in the Local Plan.

2.47 The revised figure for Smallmead reflects uncertainty that this site, identified in the Berkshire Minerals Plan as a preferred area for extraction, will come forward. Babtie's revised figures for Riding Court Farm and North of Horton reflect a re-assessment of net non-inert void, taking account of buffer zones to adjoining uses.

2.48 The potential sites shown in Table 3 are dependent on prior mineral extraction before landfill can commence. The 1997 Minerals Monitoring Report calculated that on the basis of recent mineral production the county had in excess of a ten year landbank. It therefore appears unlikely that these potential sites will be in a position to make any significant contribution to Berkshire's waste needs before 2007.

2.49 Reduction in identified landfill capacity and failure of the waste treatment plants suggested in the Local Plan to come forward has thus resulted in a significant shortfall in capacity for dealing with Berkshire's waste, particularly non-inert waste from 2002.

2.50 Due to the current shortage of landfill, household and other non-inert waste is exported from Berkshire to other counties in the South East. In 1996, Berkshire exported 94,496 tonnes of its waste to Bedfordshire, 58,876 tonnes to Buckinghamshire and 9,900 tonnes to Surrey.

2.51 Of the 8.27 million cubic metres of waste likely to be generated in the area of the former county between 1996 and 2006, Berkshire authorities can only provide landfill for 3.55 million cubic metres. If, contrary to national and regional policy, exports were to continue until 2006, it would increase the available capacity to some 6.05 million cubic metres. There would then be a shortfall of 2.22 million cubic metres. Without exports, the shortfall would rise to 4.72 million cubic metres. These figures cast doubt on the achievement of the Berkshire Waste Local Plan aim to phase out the use of landfill and landraising as a means of disposing of putrescible waste by 2006.

2.52 There is therefore strong evidence of a need for EfW facilities to serve the Berkshire WDAs, which will otherwise be reliant on diminishing landfill space. The need is urgent if, as seems to be the case, there is little likelihood of 'industrial reprocessing facilities' coming forward as proposed in the Local Plan. Thus, in addition to the need identified by the Government for more EfW plants to extract energy from waste before disposal and to provide a secure element in an area's waste management strategy, there is local need to include EfW within the facilities available to WDAs within the former county of Berkshire.

Table 3 : **Estimated Capacity of Potential Landfill Sites in the Former County of Berkshire**

Potential Sites	Capacity according to Local Plan Inquiry evidence by Babtie (million cubic metres)	Current capacity estimated by Babtie (million cubic metres)
Smallmead	2.70	0.90
Manor Farm, Slough	0.70	0.70
Riding Court	1.40	0.82
North of Horton	5.40	1.30
TOTAL	10.20	3.72

Source: Babtie

Table 4 : **Existing and Committed Treatment Capacity in South East England (thousand cubic metres)**

County	Capacity at 1996	Volume diverted from landfill 1996-2000	Additional capacity after 2000	Volume diverted per 5 year period after 2000
Berkshire	75	338	579	2942
East Sussex	106	159	0	159
Hampshire	0	0	580	2473
Isle of Wight	50	183	0	183
Kent	50	213	250	1275
London	1150	4888	0	4888
South East	1431	5781	1409	11920

Source: SERPLAN (SERP 160)

The Regional Requirement for EfW Facilities

2.53 It is important to set the Berkshire need for EfW in a regional context. The Lakeside Road waste management facilities are in Slough but close to its boundary with Surrey, Buckinghamshire and Greater London. With direct access via A4 to the rest of the former county of Berkshire and a wide network of other principal roads (see Figure X) Grundon's Lakeside Road site already helps serve the waste management needs of Berkshire, western parts of Surrey, south Bucks and west London. None of these areas have current proposals for EfW plants, although the Draft Surrey Waste Local Plan suggests that one or more are required.

2.54 Regional guidance on waste management and disposal is set out in SERPLAN's 'Regional Strategy for the South East' (SERP 160) which covers the period 1996 to 2010. The guidance sets targets for waste reduction and advocates self sufficiency at county level, a reduction in export of untreated waste from London to zero by 2010 and the landfill of only residues from recycling and non-inert waste after 2010. The strategy relies on the diversion of waste from landfill by shire counties providing reduction, treatment and disposal facilities for non-inert wastes, allowing potential landfill void to deal with the remainder of waste until 2010.

2.55 Table 4 identifies existing waste treatment capacity and additions to it as proposed in local

Table 5 : **Non-inert Waste in South East England, 1996-2010, Assuming Existing and Committed Diversion from Landfill (million cubic metres)**

County	Arisings	Waste Reduction	Waste requiring management	Diversion from Landfill	Void space available	Shortfall or surplus at 2010	Provision for London	Extra provision required
Bedfordshire	13.6	2.5	11.2	0	54.7	43.5	36.5	
Berkshire	13.2	2.4	10.9	6.2	11.8	7.1	6.0	
Buckinghamshire	13.0	2.3	10.6	0	46.2	35.5	29.8	
East Sussex	8.7	1.5	7.2	0.5	6.1	-0.6		0.6
Essex	28.4	5.1	23.3	0	31.9	8.6	7.2	
Hampshire	21.5	3.7	17.7	4.9	9.6	-3.2		3.2
Hertfordshire	18.7	3.4	15.4	0	6.2	-9.1		9.1
Isle of Wight	1.4	0.2	1.2	0.5	1.5	0.8		
Kent	26	4.6	21.4	2.8	6.9	-11.8		11.8
Oxfordshire	11.5	2.1	9.5	0	14.2	4.7	4.0	
Surrey	17.2	3.1	14.2	0	16.3	2.1	1.8	
West Sussex	9.7	1.7	8.0	0	7.6	-0.4		0.4
London	128.2	23.0	105.2	14.7	5.4	-85.2		
SE TOTAL	311.1	55.5	255.7	29.6	218.2	-7.8	85.2	

Source: SERPLAN (SERP 160)

plans. Buckinghamshire, Bedfordshire and Surrey are not included and it is therefore assumed that they have no existing or committed treatment capacity. The figures for Berkshire for the period 1996 – 2000 take account of the waste derived fuel plant at Slough - 60,000 tpa increasing to 123,000 tpa at 2000. After 2000, the figures include assumptions about processing proposals for central Berkshire (Smallmead) (175,000 tpa); west Berkshire (75,000 tpa) and east Berkshire (175,000 tpa).

2.56 The table shows that over a third of the Region's additional waste treatment post 2000 is expected to be provided by Berkshire and that no additional treatment plant is planned by Bedfordshire, Buckinghamshire, Surrey and London. Since, at mid-1999, the industrial re-processing plants proposed in the Berkshire Waste Local Plan have failed to materialise, the volume of waste expected to be diverted from landfill, and hence the resulting additional capacity after 2000 in Berkshire alone, will be significantly less than envisaged by the regional strategy.

2.57 Table 5 quantifies the implications of the additional facilities identified in Table 4 coupled with the waste reduction assumptions for the Region's supply of landfill.

2.58 This table shows that there will be insufficient new waste facilities available to enable landfill to continue until 2010. It indicates that of the 311.1 million cubic metres of waste arising over the regional area between 1996 and 2010, 55.5 million cubic metres (17.8%) will be recycled, 29.6 million cubic metres (9.5%) will be treated and 218.2 million cubic metres (70%) will be landfilled. A shortfall of 7.8 million cubic metres of landfill is thus identified. A reduced contribution of waste treatment facilities for Berkshire will mean that this shortfall will increase to some 13.6 million cubic metres.

2.59 More up to date information from the Environment Agency ('South East England Strategic Waste Management Report on the 1996 Survey') reveals that not all the landfill sites identified in SERP 160 are likely to come forward and that the landfill void space of 218.2 million cubic metres predicted in Table 5 will not in practice all be available.

2.60 The Environment Agency's report estimates that the volume of available landfill void will be 196.52 million cubic metres. Over half (100.32 million cubic metres) consists of potential sites, which do not as yet have planning permission. Experience suggests that not all these potential sites will come forward.

2.61 Thus, the Environment Agency's report suggests that Surrey, Bedfordshire and Buckinghamshire are unlikely to provide sufficient landfill capacity to fulfil the requirements of the regional strategy or to provide for the needs of London. Analysis of the local and regional situation reveal shortfalls in disposal and treatment capacity to deal with waste arisings in the former county of Berkshire and in the SE region as a whole.

2.62 The implications are that waste will continue to be exported from the WDAs within the area of the former county of Berkshire, contrary to regional guidance, and that there will be insufficient capacity to provide for London, threatening the aims of the regional strategy. If waste recycling growth targets do not keep up with forecasts of growth in

the volume of the waste arisings then the position will worsen.

2.63 A difficulty with waste plans prepared by local authorities is that, due to the length of time it takes to prepare them, they are often overtaken by events before they have been adopted. Those which originated in the early and mid 1990s (i.e.,most of the adopted plans in the South East) pre-date a number of advances that significantly affect policy.

2.64 These advances have been described in the early part of this chapter. They include the Government's developing thoughts on a National Waste Strategy, implementation of EU emission limits for incinerators, the Royal Commission's report, the enactment of EU restrictions on landfill, Government confirmation of the importance of EfW in sustainable energy strategies, and acceptance of the mutual compatibility of EfW and recycling.

2.65 The evidence shows a need for EfW facilities to be part of sustainable waste management strategies serving WDAs in the former county of Berkshire and in other parts of the South East, including London. Since the existing Lakeside Road facilities already serve a catchment covering several WDAs, it is reasonable to expect that an EfW plant on the site would serve a similar area.

2.66 The extent of the shortfall identified in the analyses of regional and local strategies also strongly suggests that it would be of greatest value if the EfW plant was of a sufficient size to assist in meeting the needs of an area wider than the former county of Berkshire.

Alternative Sites

2.67 The first part of this chapter has described how the need for the proposals has been established by considering a variety of waste management alternatives in the context of national, regional and local policies. The analysis confirms the Government's conclusion that EfW has an important role in both sustainable waste management and energy policies and is a desirable component of any local strategy. This section explains the results of the consideration given to alternative locations for an EfW plant

2.68 For the reasons already described, it is not considered reasonable to rely on the preferred strategy of the Berkshire Waste Local Plan. Landfill, which is now (contrary to adopted policies) relied upon by unitary authorities in the former Berkshire is not an acceptable long term option. No viable alternative has been identified to replace the role of EfW in resolving the waste and energy recovery issues identified. This is acknowledged in the Berkshire Waste Local Plan which says that EfW will be needed if the 'industrial reprocessing' facilities fail.

2.69 Therefore, the only realistic alternative to the proposal is an EfW plant on another site. The Berkshire Waste Local Plan states that EfW 'would be likely to involve a single plant' and considers the minimum viable throughput to be at least 200,000 tonnes. The Plan includes a checklist of criteria relevant to preferred locations for such an EfW plant:

- a large catchment area and preferably located close to major sources of waste in the County i.e. central and east Berkshire;
- within or adjacent to industrial type development;
- access to the primary road network is essential;
- the visual impact of the plant should be minimised where possible,sensitive landscapes should be avoided;
- sufficiently extensive landscaping should be included as part of proposals;
- potential nuisances including noise impact and emissions should be minimised;
- close links to the national electricity grid and the potential to develop district heating systems;
- suitable arrangements for disposal of residues;
- there is merit in developing sites with opportunities for other facilities.

2.70 Since the Plan was prepared, the Government has published its Sustainable Transport White Paper. Advice in PPG4, paras. 10 -12 and PPG13, para.3.7 already emphasises the importance of accessibility for employment land and the use of more energy efficient modes of transport such as rail. Grundon's consideration of other sites therefore also considered whether the area could be served by rail and whether it was served by an 'A' road as opposed to requiring direct access onto a motorway, in line with advice in PPG13 para. 6.4.

2.71 The Lakeside Road site meets the criteria. The site is already in waste management use on an industrial estate remote from residential areas. It has an extensive potential catchment area, with direct access from the primary road network, including Slough, east Berkshire and adjoining areas. Well-related to the electricity grid, there is potential for heat generated to be used in neighbouring premises. Rail transport can be used to remove ash from the plant. It is well located to serve Slough and a wider area including central Berkshire.

2.72 Grundon considered locations on other industrial sites in Slough, Langley, Colnbrook, Poyle, Stockley Park, Hillingdon, Iver and Uxbridge. None have advantages for EfW over Lakeside Road and most are less well located.

2.73 The largest employment area in Slough is the Slough Trading Estate to the west of the town centre. Access to the Trading Estate is along the main A4 route through the town centre, which is undesirable for an EfW plant fed from an extensive catchment. There is no rail access. The Trading Estate is bounded to the north and east by residential areas. The smaller trading estate to the north of the town centre at Stoke Road is close to residential areas.

2.74 Employment areas at Langley have undergone redevelopment in recent years and the area is not served by a primary road. Similarly, access to the main Poyle Industrial Estate is through residential areas or the A3113 from the east. There is a smaller industrial area to the north of the main Industrial Estate and south of the A4, although there is no access from the A4 at present. Land outside the existing industrial areas in the Colnbrook area lies within the Green Belt. Other industrial sites in Colnbrook and Poyle are within or close to residential areas and are not served by a primary road. All land outside the existing industrial areas is within Green Belt.

2.75 Hillingdon sites investigated included the modern Stockley Park and older industrial areas within the Borough, which are generally close to residential areas, and are not considered suitable for EfW. Those allocated industrial areas to the south west of Uxbridge are not served by a primary road and are not accessible by rail.

2.76 Planning policies in South Bucks restrain employment generating development and protect Green Belt. No new allocations of employment land are made. There are two existing industrial areas south of Iver both adjacent to the Grand Union Canal and one adjacent to a railway. Neither site has access onto the primary road network. A further industrial site at Willowbank, north of Uxbridge has poor access and is not considered suitable.

2.77 Within the remaining local authority areas, no existing industrial areas for EfW could be identified and no new employment allocations are made in local plans.

2.78 The character of the settlement pattern and the nature of planning policies in the area is such that outside built up areas there are few significant areas of land which are not covered by environmental constraints or close to residential areas.

2.79 To the south and north west of the Lakeside Road site, apart from Green Belt other constraints apply. These include SSSIs and local nature conservation designations such as Wildlife Heritage Sites, Local Sites of Nature Conservation Interest/Importance and, within the London Boroughs, Nature Conservation Areas of Metropolitan Importance and Borough Grade I Importance. The large open area of land south of the M4 motorway, in addition to being within Green Belt, is designated as an Area of Environmental Opportunity, to be protected and upgraded where possible.

2.80 At the Berkshire Waste Local Plan Inquiry, Grundon promoted the possibility of establishing an EfW plant on part of Orlitts Lake, adjoining Lakeside Road. This site is in the Metropolitan Green Belt and the Local Plan Inspector did not consider that Grundon had *'produced the sort of compelling and conclusive evidence of need which is required to justify inappropriate development in the Green Belt.'* His conclusion illustrates the difficulty of finding suitable locations for EfW in this part of the South East other than in established industrial areas.

2.81 An earlier draft of the Surrey Waste Local Plan (1966) identified a preferred area for a EfW plant to the south east of the Queen Mary Reservoir on land at Charlton Lane, Shepperton. The site was a civic amenity and transfer station and had been used for waste incineration in the past. The surrounding area has been worked for minerals. The site is within Green Belt and a Landscape Improvement Area. The area is flat and open, and nearby residential properties would also be likely to be subject to a high level of disturbance with the increase in traffic and likely visual impact.

2.82 A large number of objections were received to this proposal during public consultation. Surrey County Council withdrew the draft plan and has, as already described, recently published a new draft, identifying a need for EfW without proposed sites.

2.83 The Berkshire Waste Local Plan does not identify any site for EfW in east Berkshire. In west and central Berkshire it identifies possible sites at Smallmead and Colthrop respectively.

2.84 The potential catchment area of Colthrop is limited and it is not well placed to serve the more densely populated central and east Berkshire. Part of the Smallmead allocation has already been developed and the unitary authority's intentions for the remainder are as yet unclear. Smallmead is not served by rail. Compared with Lakeside Road, Smallmead is not well located to serve Slough and east Berkshire or a wider sub-regional catchment.

2.84 The Local Plan states that, subject to consideration of environmental impacts, waste management proposals will be permitted on sites within existing, permanent waste management facilities or within existing or proposed industrial areas. It further states that appropriate proposals in industrial type locations will stand *'an equal chance'* of securing planning permission as proposals in preferred areas.

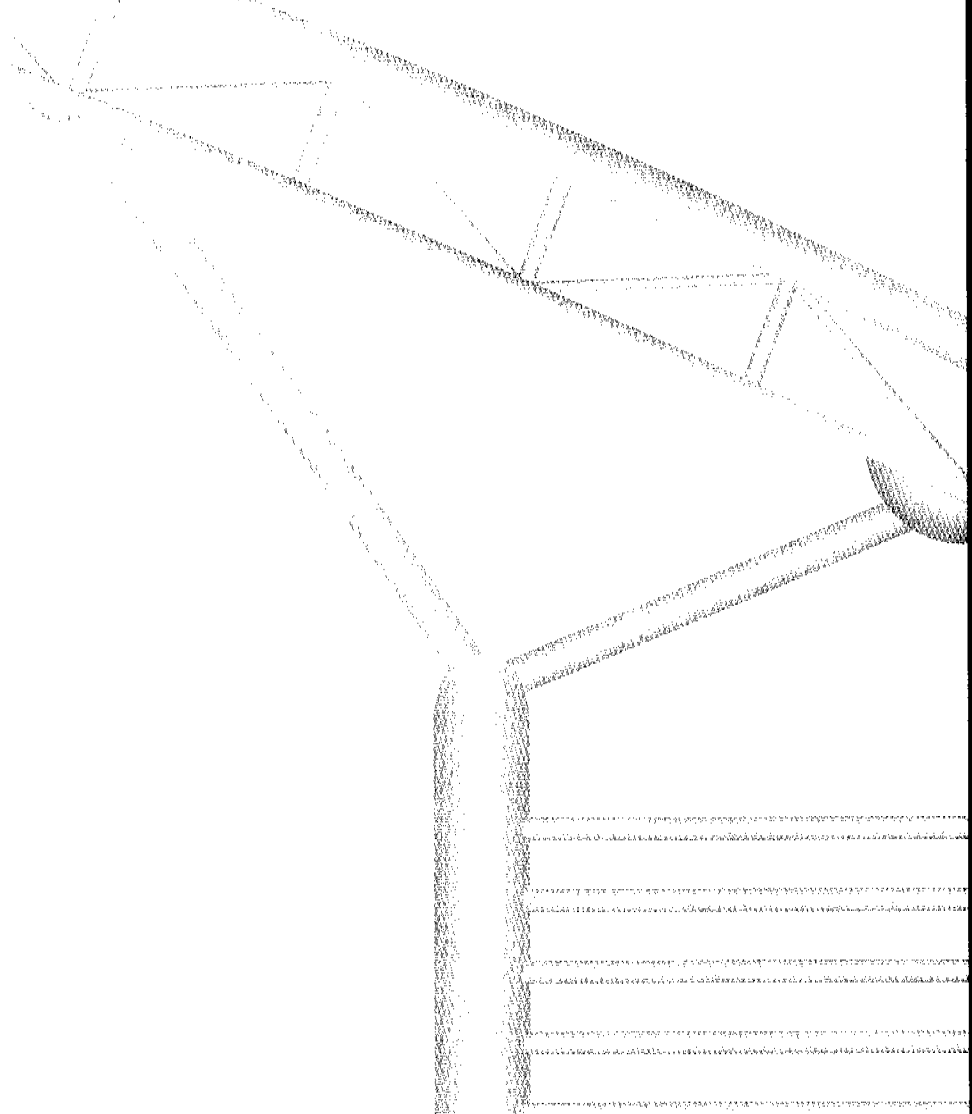
2.85 It was concluded there were no more suitable locations than Lakeside Road Industrial Estate for an EfW plant to serve Slough and a wider catchment area. With the capacity to process 400,000 tonnes of waste per annum, the proposed facility will provide EfW capacity for Slough and contribute significantly to the needs of Berkshire and a wider sub-region. The proposal will reduce the amount of waste required to be exported out of Berkshire and will divert waste from landfill, increasing the volume of landfill available to accept non-inert waste and the residues from recycling.

Summary of Need and the Consideration Given to Alternatives

- European and UK policies make it clear that landfill is the least desirable method of waste disposal.
- Policies for the area covered by the former county of Berkshire aim to phase out landfill and landraising in Berkshire and the use of landfill outside the county for the disposal of Berkshire's waste by 2006. This strategy is based on the successful implementation of 'industrial reprocessing' proposals. These proposals have not been implemented. Greater pressure is therefore now being placed on landfill resources, which are in short supply.
- A recent DTI publication states that *'alongside a move to a higher level of recycling, a move to a higher level of incineration with energy recovery is necessary over the next 10-15 years in order to develop a more sustainable waste management system'*.
- The benefits of EfW are that it:

  - complements the expansion of recycling;
  - reduces the volumes of unrecyclable waste;
  - enables landfills to be more easily managed;
  - recovers energy;
  - is cost-effective;
  - is safe and reliable; and
  - provides long-term security.

- There are no EfW plants in the south east, outside London. New plants are needed if the potential contribution of EfW to a sustainable energy policy is to be realised and if the Government is to achieve its aim of reducing the UK's dependence on landfill.
- To ensure economic viability, EfW plants may serve a wider area than a single waste disposal authority.
- Grundon's proposals conform to the Government's wish to see EfW play a role as part of a strategy of waste minimisation, recycling and energy recovery.
- The only realistic alternative to the proposal is an EfW plant on another site. The Berkshire Waste Local Plan includes a checklist of criteria which has been used to identify preferred locations for such a plant.
- The Lakeside Road site meets the Local Plan criteria and can be served by rail. The site is already used for waste management and is on an industrial estate with direct access from the primary road network.
- The Lakeside Road site is reasonably near a National Grid collection point and also near potential heat users, especially if proposals for the LIFE scheme and/or Heathrow Terminal 5 proceed.
- Before confirming the suitability of the Lakeside site, Grundon considered industrial estates in Slough, Langley, Colnbrook, Poyle, Stockley Park, Hillingdon, Iver and Uxbridge.
- The Berkshire Waste Local Plan does not identify any sites for EfW in east Berkshire. In central and west Berkshire, it identifies possible sites for EfW at Smallmead and Colthrop.
- The potential catchment area of Colthrop is limited. Part of the Smallmead allocation has already been developed and the site is not served by rail. Compared to the Lakeside site, Smallmead is less well located to serve as a sub-regional catchment.
- The analysis of alternative sites concluded that none could be found which have any advantages over the Lakeside Road site as a location for an EfW facility.



Chapter Three

3 The Proposals

Introduction

3.1 Grundon proposes to redevelop its existing waste management facilities at Lakeside Road Industrial Estate to provide an EfW plant, a MRF, and a CWI. This chapter describes the proposals in detail.

3.2 The EfW plant will be capable of processing approximately 440,000 tonnes per annum of municipal solid waste (MSW), commercial and industrial waste. An integral MRF within the plant will also process mixed recyclable waste. Energy from the waste incineration process will be recovered and used to generate some 30 MW of electrical power which will be sold to the National Grid. The plant will also be designed to facilitate the supply of heat to third parties as opportunities are identified.

3.3 A new CWI plant will be developed to provide updated facilities to treat the range of wastes currently processed at the company's existing plant, thus providing continuity of the clinical waste service.

3.4 In addition to its proposals for Lakeside Road, Grundon aims to develop complementary waste management facilities at other locations, thus providing the company and the community with an advanced integrated waste management network. The company has planning consent for a new MRF at their depot at Beenham, West Berkshire, and has recently applied for permission for a new plastics reprocessing plant and green waste composting facilities at the same site. Grundon's site at Knowl Hill is also identified for future recycling development in the Berkshire Waste Local Plan.

3.5 The Lakeside Road proposals include the development of a Visitor and Environmental Study Centre on the south western edge of Orlitts Lake, to the west of Lakeside Road. This will provide an interpretation facility for visitors to the EfW plant, and a study centre for nature conservation interests in the area.

3.6 Part of the completed Tanhouse Farm Landfill, to the west of the site, will be used temporarily for the storage of materials and equipment, contractors parking and accommodation during construction of the facility.

The Proposals

3.7 The following elements of the proposal will require planning consent:

i. Redevelopment of the existing waste management facility to provide a EfW plant, MRF and replacement CWI;

iii. Temporary use of Tanhouse Farm Landfill as a construction compound;

iii. Construction of a Visitor and Environmental Study Centre on Orlitts Lake South.

3.8 These elements have been included within one planning application which has been submitted to Slough Borough Council.

3.9 An Authorisation under Integrated Pollution Control (IPC), is also required from the Environment Agency for the new EfW plant. An application for Authorisation has been submitted to the Environment Agency. Variations of the existing IPC Authorisation for the CWI plant and the Waste

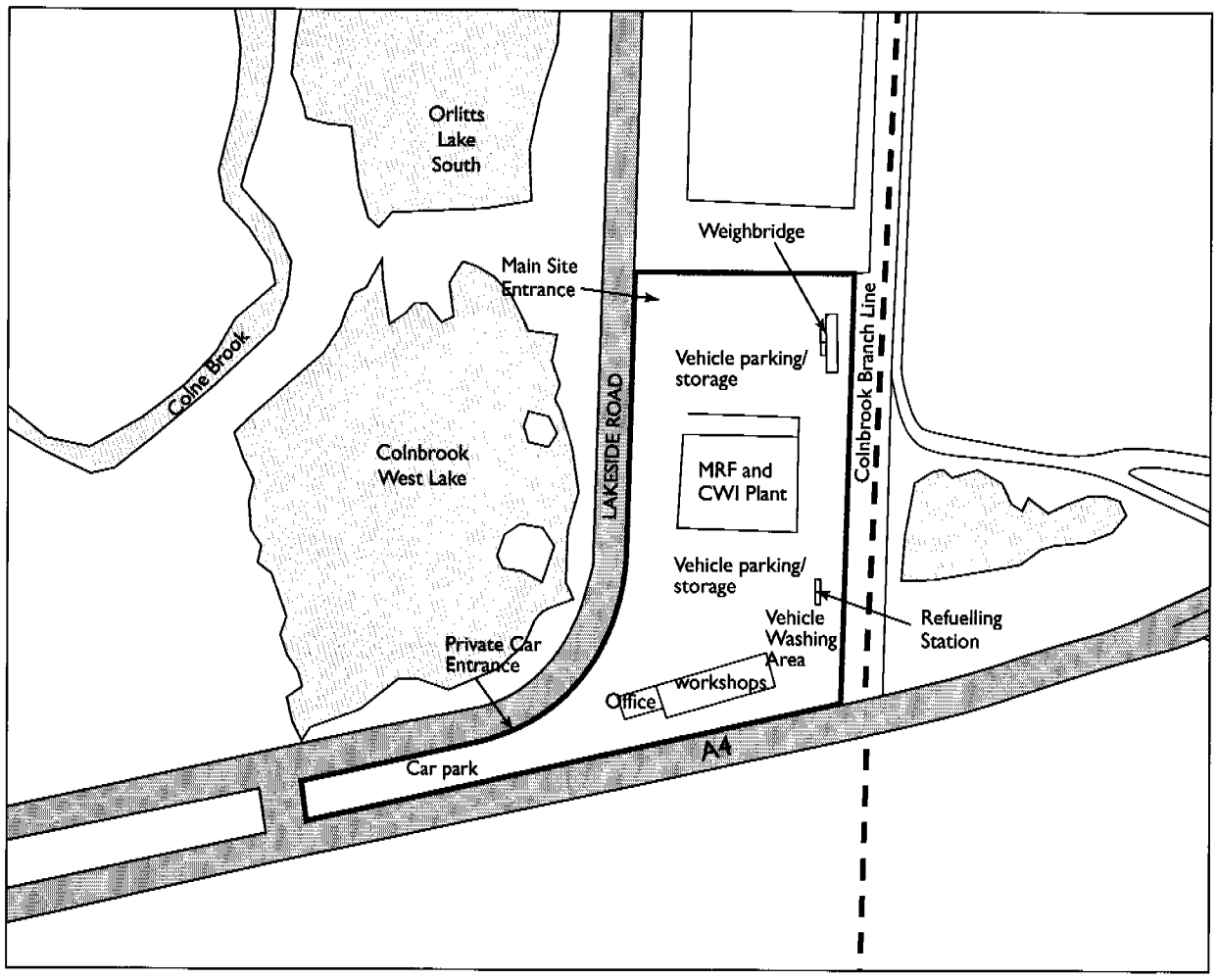


Figure 5 : **Existing Site Layout**

Source: Grundon

North

Diagrammatic Only Not to Scale

Management Licence for the MRF will also be sought.

3.10 It is intended that plant procurement will be through a turnkey contract awarded on a competitive basis to a major supplier of proven equipment. The contract will require guarantees of compliance with performance criteria to be set out in a Performance Specification. The Performance Specification will reflect the criteria set down in the conditions of the IPC Authorisation and planning consent.

Lakeside Energy from Waste Facility

3.11 The facility will be located on a 2.7 hectare site owned by Grundon, within the Lakeside Industrial Estate. The site is currently occupied by Grundon's administrative offices, a large building housing the MRF and CWI plant, transport depot, workshops, and vehicle parking areas.

3.12 The site lies adjacent to the Colnbrook Branch Line, and to the south west of M4/M25 interchange. It is approximately 5.5 km to the south east of Slough and 1km to the north west of Heathrow Airport. Immediately to the east of the site are a restored landfill and the M25 motorway. To the west are Orlitts Lake and Colnbrook West Lake, flooded gravel pits that have been retained for recreation and nature conservation. Directly to the north of the site are industrial premises, including a refrigerated food store and warehouse units. The nearest residential properties are to the south, in Poyle village, 350 metres from the boundary of the site.

3.13 The site has been used for waste management since the late 1970s when Grundon was granted planning consent for a waste reduction and reclamation centre. The facility has been subsequently upgraded and extended, and currently comprises a MRF and high density baling plant housed within a building 13.5 metres in height. The plant processes mixed dry, non hazardous commercial and industrial waste, together with some pre-sorted mixed recyclables (MRW) from household waste collections. The existing site layout is shown in Figure 5.

3.14 Slough Borough Council granted planning consent in June 1999 for an extension of the MRF building to allow the processing capacity to increase to 400,000 tonnes per annum. This reflects the waste throughput permitted by the Environment Agency under the current Waste Management Licence for the facility. The consented extension would increase total floorspace by a further 3,150 square metres and the height of the building to 18.6 metres.

3.15 Planning consent was granted in 1987 for a CWI and heat reclamation plant on the site. The consent permits Grundon to develop two incineration units, each with an operating capacity of

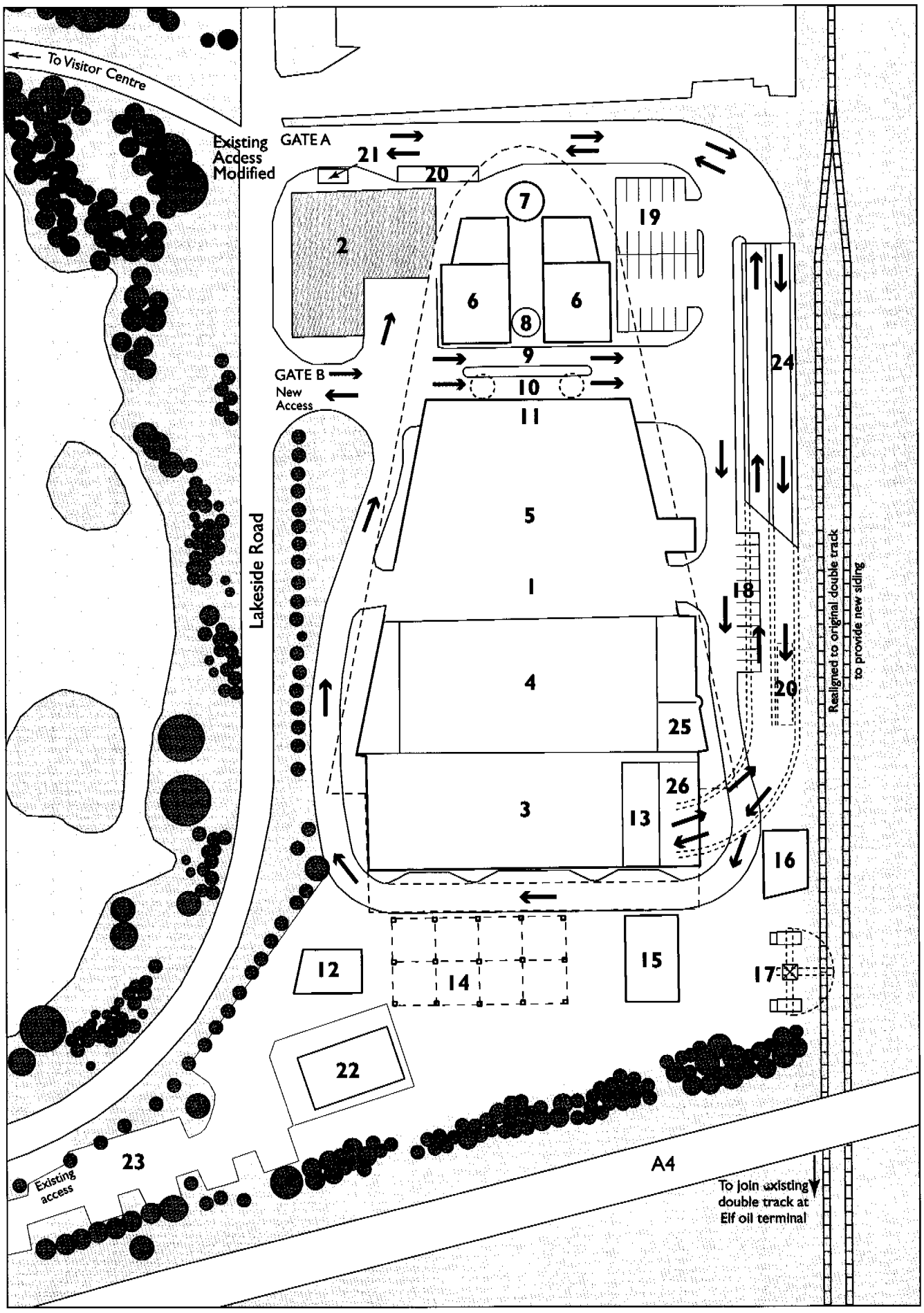


Figure 6 : **Proposed EfW Facility Site Layout**

EfW Plant

CWI

1. Advanced moving grate
2. Clinical waste incineration plant
3. Tipping hall over MRF
4. Bunker
5. Boilers
6. Baghouse filters
7. Stack
8. Lime silo
9. Lime deliveries
10. Fly ash collection
11. Grate ash collection
12. Wastewater treatment
13. Water treatment plant
14. Condensers
15. Steam turbine and generator
16. Transformers and switchgear
17. Rail loading facility
18. Staff/visitor parking
19. Car park
20. Weighbridge
21. Gatehouse
22. Existing offices
23. Existing car park
24. Ramp
25. Control room
26. Workshops

Traffic Circulation:

Gate A Deliveries of waste to EFW plant and MRF

Gate B Deliveries to CWI, chemicals and removal of ash residue

Source :The APP Partnership

North

Diagrammatic Only Not to Scale

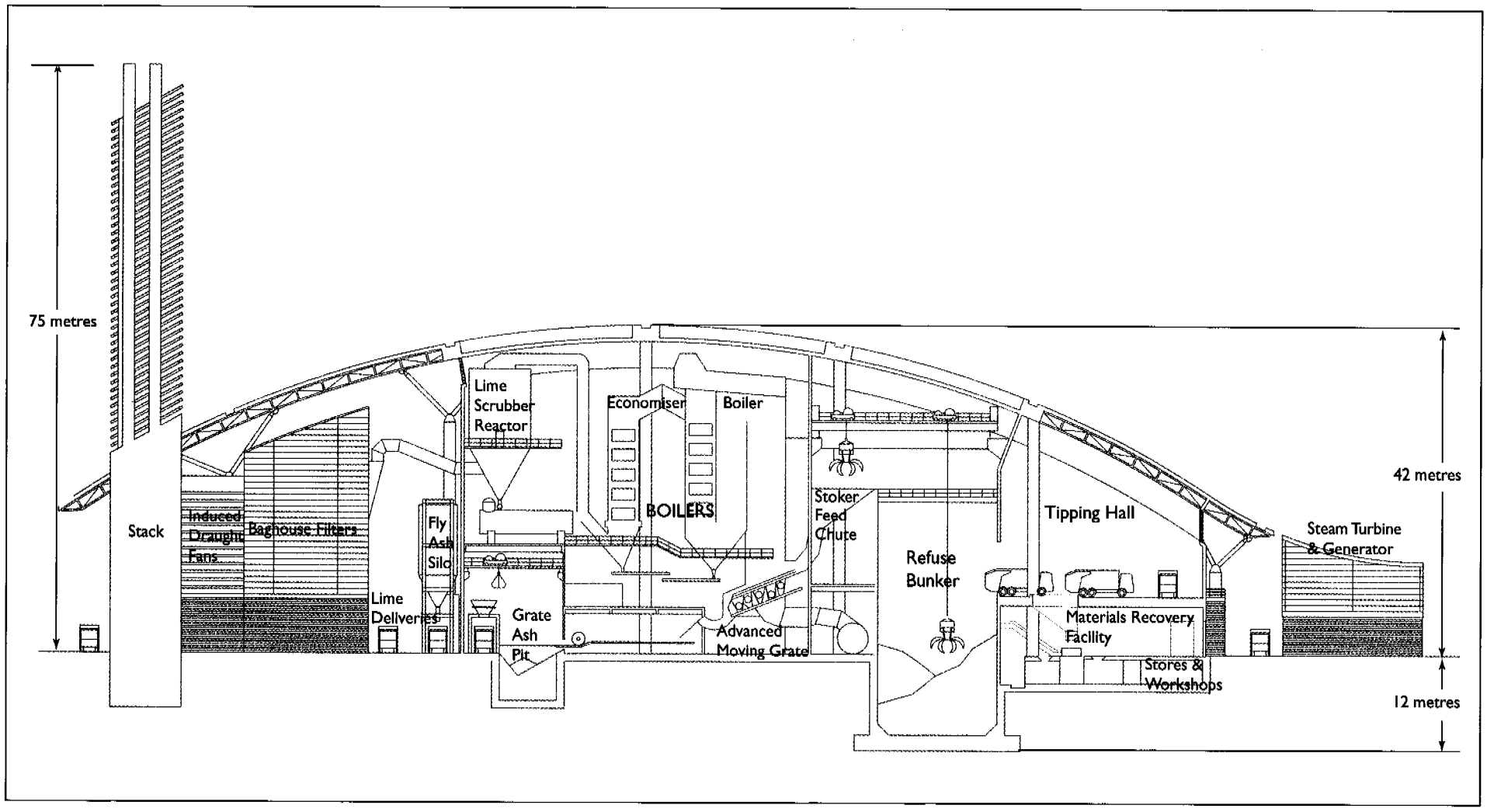


Figure 7 : **Section through Energy from Waste Plant**

Source : The APP Partnership

one tonne per hour, and to store clinical waste in refrigerated containers outside the building. Currently, one incineration unit has been installed. Since its installation, improvements have been made to the plant, including an extension of the stack to 38 metres, to facilitate better emissions dispersion. Upgraded emission control equipment has also been installed which is able to accommodate the second incineration unit.

3.16 The CWI process is currently authorised by the Environment Agency for the incineration of up to one tonne per hour of clinical waste, pharmaceutical waste, customs confiscated materials and specified radioactive waste e.g. medical laboratory waste. The second incineration unit may be constructed at a future date to increase the plant capacity should it be required.

Tanhouse Farm Landfill

3.17 Tanhouse Farm Landfill is located approximately 200 metres to the west of the Lakeside site. The landfill covers about 3 hectares. To the west are industrial units, to the east is Colnbrook West Lake, and to the north is the Colne Brook and agricultural land.

3.18 The site was granted consent in 1983 for sand and gravel extraction followed by infilling with wastes. About 2.5 hectares at the centre of the site was infilled with commercial and industrial waste. The remaining void around the perimeter of the site was filled with soils.

Visitor and Environmental Study Centre

3.19 A Visitor Centre is proposed on the south western edge of Orlitts Lake South, approximately 150 metres to the north west of the Lakeside site. Access to the site will be gained via a realigned private track off Lakeside Road.

Detailed Description of the Proposals

Design of EfW Facility

3.20 The proposed layout of the Lakeside EfW facility is shown diagrammatically on Figure 6.

3.21 The principal new buildings at the Lakeside site will be the EfW and CWI plants, and a new stack 75 metres in height, housing four flues, serving both plants. The main building housing the EfW and MRF plants will be 42 metres high. This is the minimum required to house the enclosed plant, and complies with the limit imposed by the Civil Aviation Authority. The building form will be a

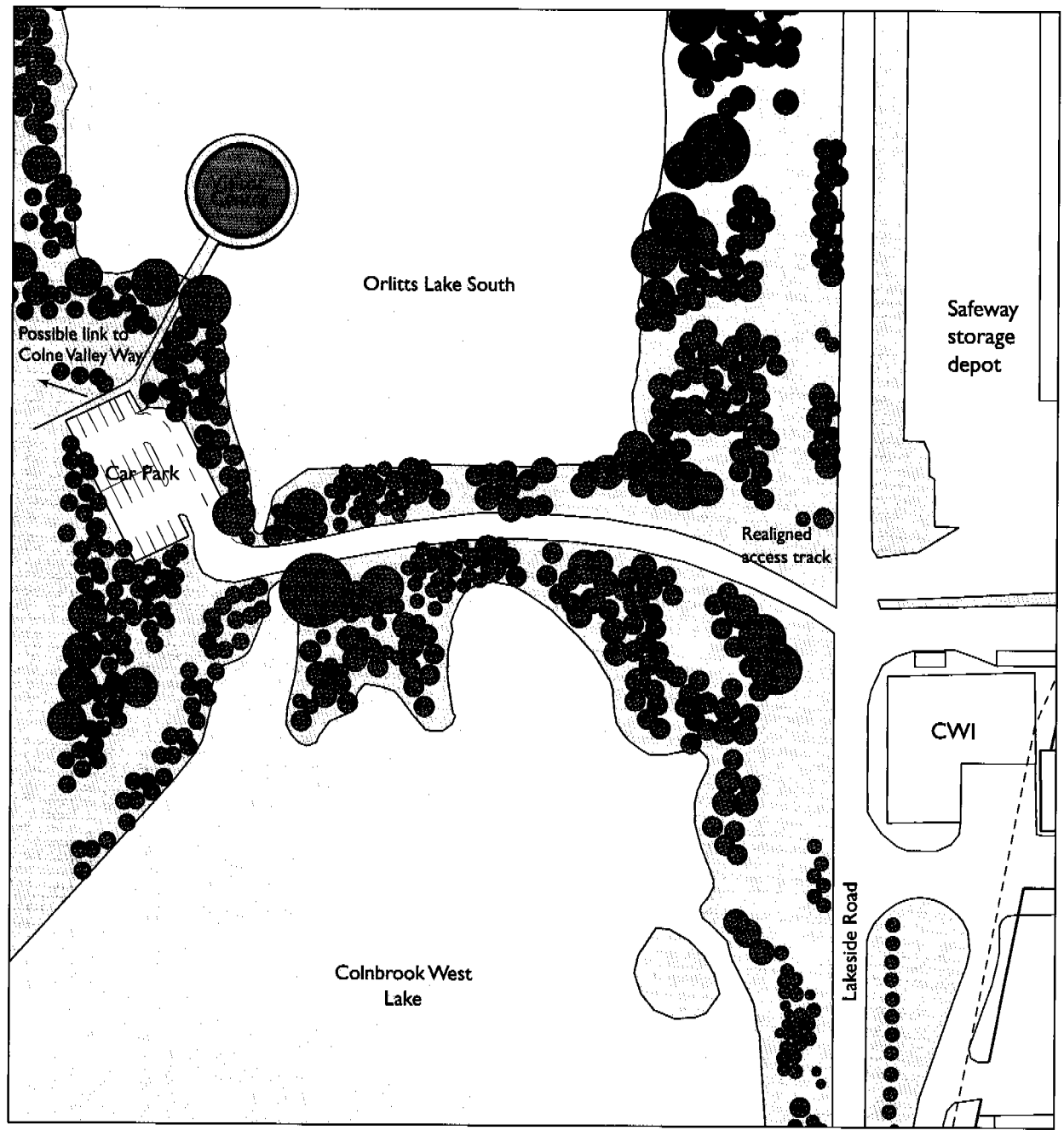
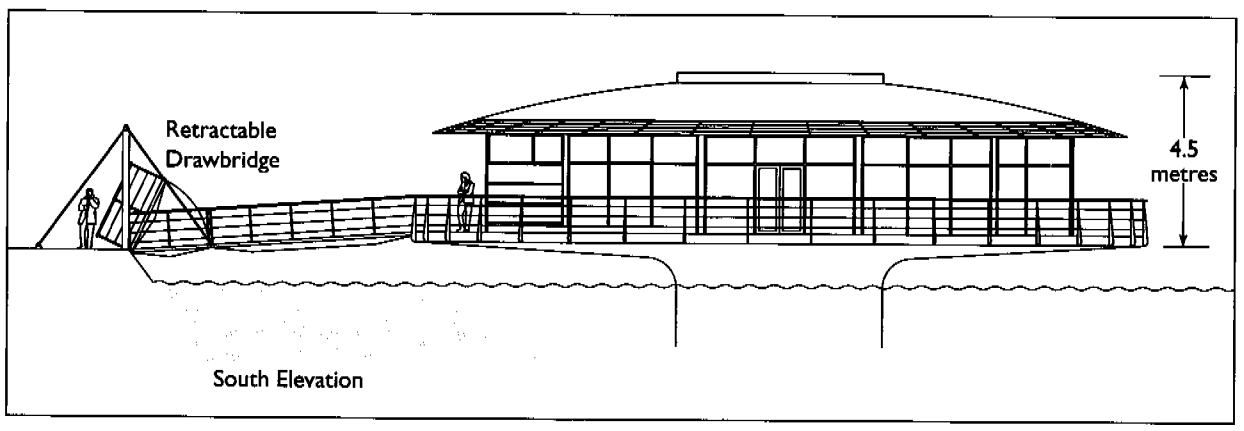


Figure 8 : **Location and Section of Visitor Centre**

Diagrammatic Only Not to Scale

Source :The APP Partnership



curved metallic shell. The profile of the building has been designed to reduce the possibility of wind vortices towards the airport, following advice from the Building Research Establishment. A section through the building is shown in Figure 7.

Design of Visitor Centre

3.22 The proposed location of the Visitor Centre on Orlitts Lake South is shown on Figure 8. The centre's design is intended to complement that of the main plant. It is located to provide visitors with an ideal viewing platform for both the EfW plant and the local natural environment. An elevation of the Visitor Centre is also shown in Figure 8. Pedestrian access to the Centre from the car park will be via a drawbridge, which will be drawn up when the Centre is not in use to prevent unauthorised access.

Vehicular Access

3.23 Traffic associated with the construction and operation of the new EfW facility will use the existing Lakeside Road access to the site via the A4. Vehicle access to the EfW plant and MRF will be via the existing northern site entrance off Lakeside Road (Gate A). A new access will also be constructed into the site from Lakeside Road serving the CWI plant (Gate B). The existing site access to the car park to the south of the site will be retained. Access to the Visitor Centre will be via a realigned track off Lakeside Road. Access to the construction compound at Tanhouse Farm Landfill will be via Lakeside Road.

Traffic Circulation

3.24 The traffic circulation arrangements within the facility are shown on Figure 6. All traffic serving the plant will enter the site via the existing access from Lakeside Road (Gate A), follow a haul road along the northern and eastern perimeters of the site and then ascend the ramp to the tipping hall, passing over an automatic entry weighbridge. Vehicles will then leave the facility via the same route, passing over a second weighbridge adjacent

to the CWI. Deliveries of clinical waste, lime and other materials used in EfW process, and removal of residues will be via the new access (Gate B) off Lakeside Road.

Vehicle Parking

3.25 38 parking spaces for operations and office staff will be provided adjacent to the EfW plant. A further 20 parking spaces will be provided at the Visitor Centre.

Rail Access

3.26 The Colnbrook Branch Line adjacent to the Lakeside site has an existing single track centred on a former double track bed running under the A4 Colnbrook bypass, and M4/M25 interchange and connecting to the London-Bristol main line at West Drayton. Grundon's proposals include a link from the Lakeside EfW facility to the branch line to enable train operating companies to compete for the importation of wastes to the facility and the removal of residues, mainly bottom ash.

3.27 In consultation with both Railtrack and English, Welsh and Scottish Railways Ltd (EWSR), Grundon has developed a design for the rail facility. A rail connection could be constructed by Grundon in association with EWSR, on land owned by Railtrack, (see Figure 6). This would involve extending double track alongside the EfW plant and as far south as the Poyle Oil Terminal, beyond the A4 overbridge. The western track would function as a siding and would allow waste and ash containers to be loaded and unloaded. Wagons would be moved by shunter or towline past the loading point.

3.28 Grundon has also considered alternative options for rail transfer if any or all of the proposed developments in the area (described in paras 3.108-3.112) go ahead. The proposals for the LIFE scheme, Colnbrook Logistics Centre and Foster Yeoman Aggregates Depot all include new rail sidings adjacent to the Colnbrook Branch Line to the east of the EfW facility. Should these schemes proceed, agreement would be sought with the operator to transfer waste and ash in containers to and from these sidings.

Description of Plant and Process

Energy from Waste Plant

3.29 The EfW plant will be designed to comply with the stringent emission controls set out in the European Directive on the Prevention of Air Pollution from New Municipal Waste Incineration Plants (89/369/EEC), and the EC Draft Directive on the Incineration of Wastes (June 1998). The existing and proposed emission limits under these Directives are detailed in Chapter 5, Air Quality.

Types of Waste

3.30 The following types of wastes will be processed at the EfW Plant:

i. municipal solid waste (MSW): this is mixed combustible household refuse;

ii. residual MSW arising from civic amenity sites and transfer stations;

iii. non-hazardous commercial and industrial waste: these are combustible materials arising from commercial or industrial premises containing similar materials to household refuse; and

iv. recycling residues: these are residues remaining from the recovery of recyclable household wastes at other MRFs.

3.31 The incineration capacity of the proposed EfW plant will be 400,000 tonnes per annum. This figure is based upon a total facility throughput of 54 tonnes per hour, allowing for plant shutdowns and other planned maintenance. The plant will consist of 2 streams each capable of burning some 27 tonnes per hour. The latest proven combustion processes, energy recovery and pollution abatement technologies will be utilised. A schematic of the EfW process is shown in Figure 9.

Operating Hours

3.32 As with the existing CWI plant and MRF, the plant will receive and process waste on a 24-hour basis, 7 days a week. The plant will be shut down for routine, and occasionally unscheduled maintenance. There will typically be two planned shutdowns of each stream per annum for maintenance, each of approximately 7 days duration.

Waste Reception and Handling

3.33 Incoming refuse collection and bulk transport vehicles will enter the site at Gate A (Figure 6), or in the case of rail containers, from the loading facility adjoining the site. Vehicles will then proceed to the ramp and onto an automatic weighbridge where the quantity and nature of incoming wastes will be checked and recorded. Vehicle loads will be inspected at random to confirm the character of the waste being delivered. The operator will only permit loads through to the tipping hall containing those waste types that the facility is authorised to receive.

3.34 After weighing, the waste vehicles will drive into the enclosed tipping hall, where they will be directed to a vacant tipping bay to discharge their load into the storage bunker. On completion of the tipping operation, the vehicles will leave the tipping hall via the ramp. A second automatic weighbridge will be located on the exit route, adjacent to the gatehouse.

3.35 The doors to the tipping hall will be equipped with vertical folding doors, which will be kept closed when delivery of waste is not taking place. The hall will be about 68 metres by 23.5 metres and will incorporate 11 tipping bays, each about 3.5 metres wide. The refuse storage bunker will be of concrete construction and will be enclosed within the main building. The bunker will be able to accommodate up to 4.9 days supply of refuse at full waste burning capacity.

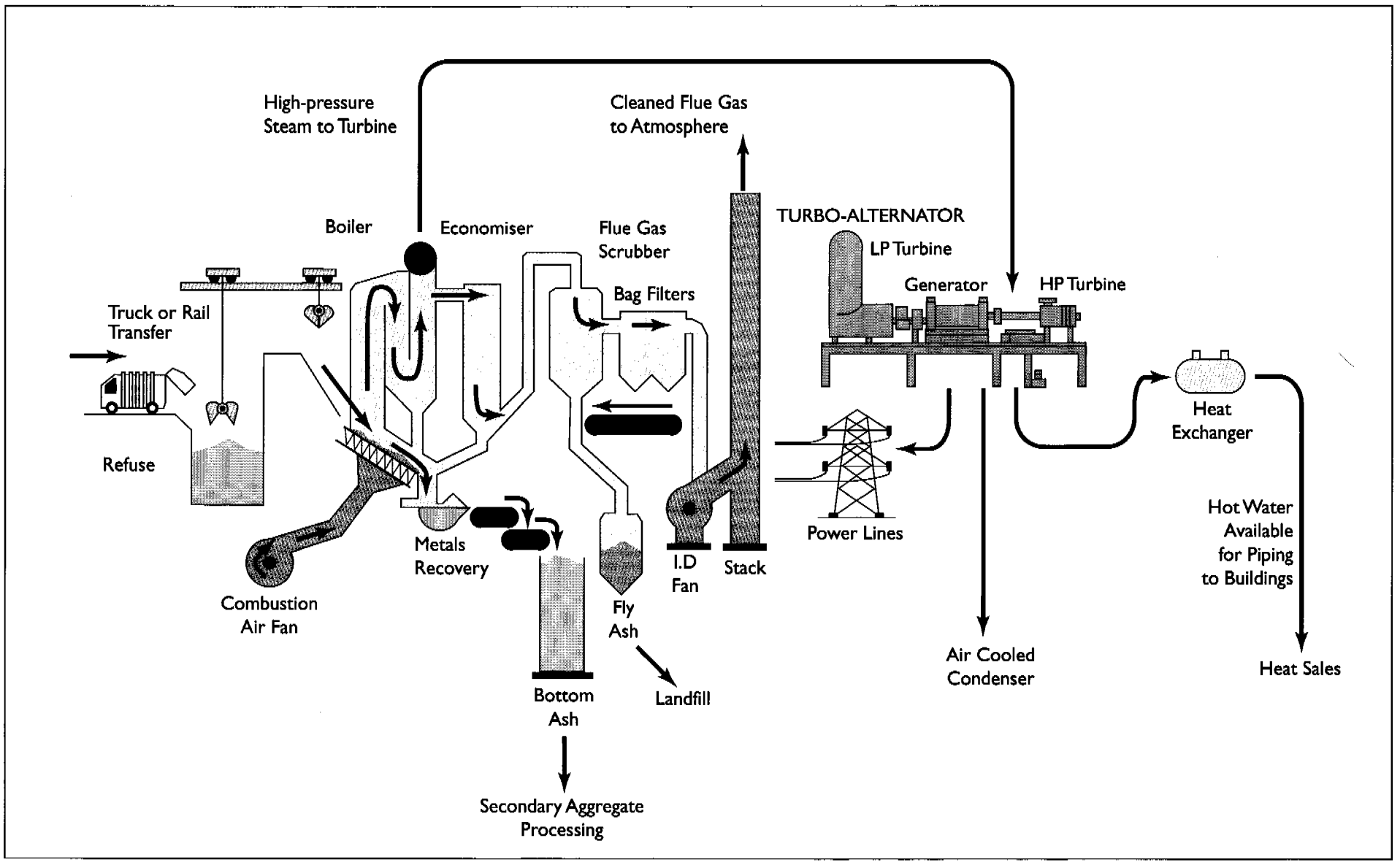


Figure 9 : **Schematic of Proposed Energy from Waste Process**

Source : ETSU

3.36 Above the storage bunker, two overhead travelling cranes, equipped with petal grabs each of some 7 tonnes capacity, will facilitate the mixing of the refuse to ensure a feedstock of consistent calorific value, and load the refuse into the feed chutes of each refuse stream. One crane will have sufficient capacity to feed both streams operating at full capacity.

3.37 Under normal operating conditions, odour and dust in the tipping hall and refuse storage bunker will be withdrawn by forced draught fans, located above the bunker. These will draw air from the bunker hall into the furnace to feed the combustion process. The operation of one fan will be sufficient to remove any dust or odour arising from the tipping, mixing and furnace loading operations.

3.38 Anaerobic conditions in the bunker which could cause odour will be prevented by regular mixing of the waste by the cranes. As a routine operation, each section of the bunker will be periodically emptied on a rotational basis, in addition to the waste levels being decreased at weekends when refuse deliveries will reduce.

3.39 Material from the storage bunker will be fed by the grab into a feeding hopper and feeding chute and onto the grate, by hydraulically powered feeding units. During waste charging the backward flow of combustion gases, or the ignition of waste before entering, will be prevented by keeping the chute constantly full of wastes and by keeping the furnace under negative pressure. A level detector will monitor the waste in the feed chute and set off an alarm if the level of the waste falls below a safe minimum level. Secondary air will be injected from nozzles in the walls of the furnace to control flame height and the direction of the air flow and flame.

3.40 The feed rate to the furnaces will be controlled by a state of the art computerised computer based combustion control system. Electro-mechanical interlocks will ensure that waste cannot be admitted to the furnace, until a minimum temperature of 850°C has been achieved.

Combustion Grate

3.41 The grate will be a current version of proven advanced moving grate technology. The grate will consist of inclined fixed and moving bars which move the waste from the feed inlet to the residue discharge. The grate movement turns and mixes the waste along the surface of the grate so ensuring that all waste is exposed to the combustion process.

3.42 Primary air for combustion will be fed to the underside of the grates by the forced draught fans. Secondary air will also be admitted above the grate to create turbulence and ensure complete combustion with minimum levels of oxides of nitrogen (NO_x). The volume of both the primary and secondary air will be regulated by a combustion control system.

3.43 Conditions within the furnace and boiler will be controlled to ensure the efficient combustion of wastes. To meet the requirements of the Draft Directive on the Incineration of Wastes (June 1998), the plant will be equipped and operated to ensure that the temperature of combustion gas is raised to 850°C, after the last injection of air, for at least 2 seconds in the presence of at least 6% v/v (by volume) of oxygen. Dioxins and furans are destroyed by combustion at these high temperatures.

3.44 The combustion control system will regulate combustion conditions (and thereby minimise the levels of pollutants and particulates in the flue gas before flue gas treatment), and control the boilers. The incinerator will also be fitted with two standby oil burners per stream (burning gas oil) which will automatically switch on to maintain the temperature above 850°C. Combustion chambers, casings and ducts and ancillary equipment will be maintained under slight negative pressure to prevent the release of gases.

Waste Heat Recovery

3.45 One of the major benefits of the proposed facility will be the capability to recover energy to generate electricity. Hot gases from the combustion chamber will pass to a boiler which converts the energy from the hot gases into superheated steam. A multi-pass conventional water-tube boiler of proven design will be located above each grate. Each boiler will have a steam capacity of approximately 72.6 t/h.

3.46 The steam will be fed to a single condensing steam turbine coupled to a generator delivering some 30MW of electricity at 11kV. The generator will be connected to the National Grid via a transformer and an underground cable. A sub station will be located adjacent to the turbine/generator building. electricity to the site. Exhaust steam from the turbine will be condensed by an air cooled condenser located adjacent to the turbine hall.

3.47 The EfW plant will also be designed to facilitate future supply of district heating in the form of hot water or steam for existing properties or new development in the locality.

Water Treatment

3.48 Water for the boilers will be produced by treating mains water in a demineralisation plant using an ion exchange process. The plant will include two streams, one operating with the other being regenerated or on standby. The plant will produce some 12.53 m^3/hr of demineralised water. A 100 m^3 reserve feed water tank will be provided. Effluent from the water treatment plant will be pumped to the on-site wastewater treatment plant. There will be no discharges of process effluent to controlled waters.

Flue Gas Cleaning

3.49 Combustion gases from the furnace will be cleaned before being released to the atmosphere. The abatement plant will consist of a NOx reduction system, activated carbon injection, lime scrubbing, and bag filters, and will be designed to ensure that the plant operates well within the emission limits set out in the Draft Directive on the Incineration of Wastes. The final configuration and design of the plant will be agreed with the Environment Agency.

NO_x Reduction

3.50 To achieve the NOx limit of 200 mg/Nm^3 proposed in the Draft Directive on the Incineration of Waste, careful control of combustion air, flue gas recirculation (FGR) and selective non-catalytic NOx reduction (SNCR) will be employed. FGR involves recirculating the flue gases in the furnace to reduce the amount of oxygen available to react with nitrogen, leading to a reduced emission of NOx. SNCR involves the injection of ammonia or urea which converts both nitrogen oxide (NO) and nitrogen dioxide (NO_2), to nitrogen and water, also reducing NOx levels.

Gas Scrubbing

3.51 Acid gases produced by the waste burning process including hydrogen fluoride, hydrogen chloride and sulphur dioxide, will be neutralised by

a semi-dry lime injection system within a scrubber vessel. Neutralisation of the acid gases takes place as they react with a suspension of slaked lime (calcium hydroxide). Water will be evaporated and the dry residual material recovered at the outlet of the flue-gas scrubbing system.

3.52 An activated carbon injection system will also be installed on each scrubber vessel to minimise the flue gas emissions of dioxins, mercury and other heavy metals. The carbon will be injected into the flue gases in the duct upstream of the scrubber.

Baghouse Filter

3.53 After flowing through the gas scrubber, the gases will be drawn through a baghouse filter to remove particulates, including lime and activated carbon particles (Air Pollution Control Residues - APC). The treated flue gases will then pass through an induced draught fan into the stack for release into the atmosphere, at a height of 75 metres to ensure efficient plume dispersion.

3.54 Bag filter cleaning will be performed on-line by pulsing compressed air within the bags in sequence. The APC residues will be collected in fully enclosed hoppers beneath the filters to prevent the release of dust to the atmosphere.

Stack

3.55 Following cleaning, the combustion gases will be released to the atmosphere via two separate flues within the 75 metres high stack. The height has been determined using the methods defined by the Environment Agency Technical Guidance Note (D1). This has been followed by computer modelling of the dispersion of emissions from the stack and evaluation of the resulting dispersion plumes, to ensure that ground level concentrations of key pollutants are kept within statutory air quality levels under all operating conditions. The air quality impact assessment and the results of dispersion modelling are presented in Chapter 5 Air Quality. The precise stack height will be finalised with the Environment Agency as part of the IPC application. However, it will be no higher than 75 metres.

3.56 The stack will contain four exhaust flues (two for the EfW plant and two for the CWI plant), housed within a steel outer sleeve to protect against the wind. Inspection platforms and monitoring systems will be located with the structure.

Ash Handling & Disposal

3.57 Two types of solid residue will be generated by the combustion process; furnace bottom ash from the grates and boilers, and air pollution control residues (APC), which will have separate storage and disposal arrangements.

Bottom Ash

3.58 Approximately 16,000 kg per hour of burnt out residue from the grate (bottom ash) will be produced at full load (both streams). The ash will fall into a quench bath to cool the ash and reduce dust emissions. A discharger will then push the ash onto a conveyor system where oversize material will be separated and ferrous material will be removed by overband magnetic separators for recycling. The bottom ash and ferrous metals will be discharged to separate storage pits with sufficient capacity to store the arisings from four days plant operation at full capacity.

3.59 The ash will be removed from site either by rail, or in covered lorries, and taken to an approved facility for further extraction of remaining metals and processing into secondary aggregates. It is possible that conveyors could be used to reach the sidings. Subject to meeting the necessary quality standards, secondary aggregates will be produced from the ash for use in macadam and concrete blocks. Recovered metals will be recycled.

Air Pollution Control Residues

3.60 APC residues consisting of fine particles of ash from the combustion of refuse, and residues from the air pollution control process, including unreacted lime and activated carbon, will be collected in the bag filters and transferred to silos. The hoppers will be insulated and heated to maintain the temperature above 110°C to prevent any moisture which can lead to blockages. The ash will be conveyed from the hoppers via a sealed system into two silos each of approximately 100 tonnes capacity, where it will be stored for a maximum of three days before removal by sealed tankers.

3.61 To prevent fugitive emissions of ash, the storage silos will be positioned over an enclosed roadway, contained within roller shutter doors. Air vents from the storage silos will be fitted with filters to prevent dust releases during filling and emptying of silos.

3.62 The APC residues which contain pollutants removed from the gas stream, will be classified and consigned as a special waste and transferred in purpose designed sealed tankers to Grundon's ash conditioning facility at Bishops Cleeve in Gloucestershire.

Materials Recovery Facility (MRF)

3.63 The proposals also include the development of a new MRF within the EfW plant building (see Figure7). The MRF will process mixed recyclable materials from commercial and industrial premises together with pre-sorted recyclables from household waste collections, (MRW).

3.64 The MRF will perform the following functions:

i. segregation of imported MRW into a number of different homogenous waste streams;

ii separation of recyclable paper, cardboard and plastics;

iii. separation of recoverable ferrous and non ferrous metals; and

iv. bulking up of the separated materials for transport to reprocessing facilities.

3.65 The MRF will occupy an enclosed hall beneath the main tipping hall and will be designed to process wastes on a 24 hour, 7 days a week basis.

Handling and Reception

3.66 Collection vehicles delivering MRW will enter the site via Gate A (Figure 6) and following inspection at the weighbridge, proceed to the ramp and tipping hall within the EfW plant. The vehicles will discharge their loads on to the floor of the tipping hall. The materials will be loaded into the plant, via a hopper. The materials will fall onto a feed conveyor and be fed through a bag splitter to release materials. Materials will then be transported along a conveyor, through 12 picking stations where plastics, paper and cardboard will be manually separated and discharged into bunkers below the sorting platform. Steel and aluminium cans will be removed at the end of the conveyor by a magnet and eddy current separator. The sorting platform will be enclosed within a separate sealed structure to allow control of dust and odour within the picking areas. The contents of each bunker will be transferred by conveyor to the baling machine. Baled recycled materials will then be transferred to a storage area and loaded onto bulk carriers. Residues remaining from the recycling process will be transported by conveyor into the bunker and processed in the EfW plant.

3.67 In the event of plant breakdown or failure, deliveries of materials will be diverted to Grundon's MRF at Beenham. Any residual wastes remaining in the plant will be fed into the main bunker and processed through the EfW plant.

Clinical Waste Incinerator (CWI)

3.68 The existing CWI plant operated by Grundon is authorised by the Environment Agency to incinerate up to one tonne per hour of waste. The new facility will be designed to meet the latest emission limits as defined by the European Hazardous Waste Incineration Directive (94/67/EC) and the EC Draft Directive on the Incineration of Wastes (June 1998).

Types of Waste

3.69 The new CWI plant will continue to process the range of wastes currently authorised by the Environment Agency for the existing plant including:

i. Clinical waste categories A-E, as defined by the Health and Safety Commission / Health Services Advisory Committee (HSC/HSAC1992);

ii. Confidential paper wastes

iii. Wastes seized by HM Customs and Excise; and

iv. Specified radioactive wastes e.g. medical laboratory waste.

3.70 The expected incineration capacity of the proposed CWI will be 17,000 tonnes per annum. This figure is based upon a total facility throughput of 2 tonnes per hour, allowing for plant shutdowns. Subject to authorisation by the EA, the proposed plant will consist of 2 streams each capable of burning 1 tonne per hour and will utilise the latest proven combustion and pollution abatement technologies. A schematic of the proposed CWI process is shown in Figure 10.

Operating Hours

3.71 The plant will receive and process waste on a 24-hour continuous basis, 7 days a week. The plant will be shut down for routine, and occasionally unscheduled maintenance. There will typically be a shutdown of each waste stream every 12 weeks for maintenance, each of 4 to 6 days duration.

Waste Handling and Reception

3.72 The waste received for incineration will be packaged in various types of container depending on its origin and nature. The majority of wastes will be delivered either in sealed yellow bags within wheeled bins or in 'one way burn' containers. Sharps and pharmaceuticals will be delivered either one burn containers or sealed boxes. Collection vehicles will arrive at the site at Gate B (see Figure 6) and then proceed to the plant where documents will be checked and instructions given for discharging the load. A computerised tracking system will be used for each bin. Containers will then be unloaded and individually weighed prior to storage. Normally, all clinical wastes will be incinerated within 48 hours of delivery.

3.73 The wheeled containers will be weighed prior to being loaded onto a hydraulic lifting platform and the contents emptied on to a conveyor. After discharge of the contents, the empty wheeled containers will be washed and disinfected. The clean, wheeled containers will be moved to a clean storage area ready for collection for reuse. One way burn bins, plus other unusual packaged/security items will be hand loaded onto the conveyor.

3.74 The conveyor movement will be co-ordinated with the readiness of the charging system to accept a load. Waste charging will be interlocked with furnace conditions so that charging cannot take place when the temperatures and air flows are inadequate or when any flue gas cleaning by-passes are open.

Primary Chamber

3.75 When the charge box has received a load, the waste will be pushed forward into the primary chamber (Figure 10). The primary chamber will consist of stepped hearths, each fitted with a ram at floor level. Each hearth will be approximately 1 metre below its predecessor. The primary chambers will have underfloor ducts where the air can be adequately controlled to maintain pyrolysing (starved air) conditions.

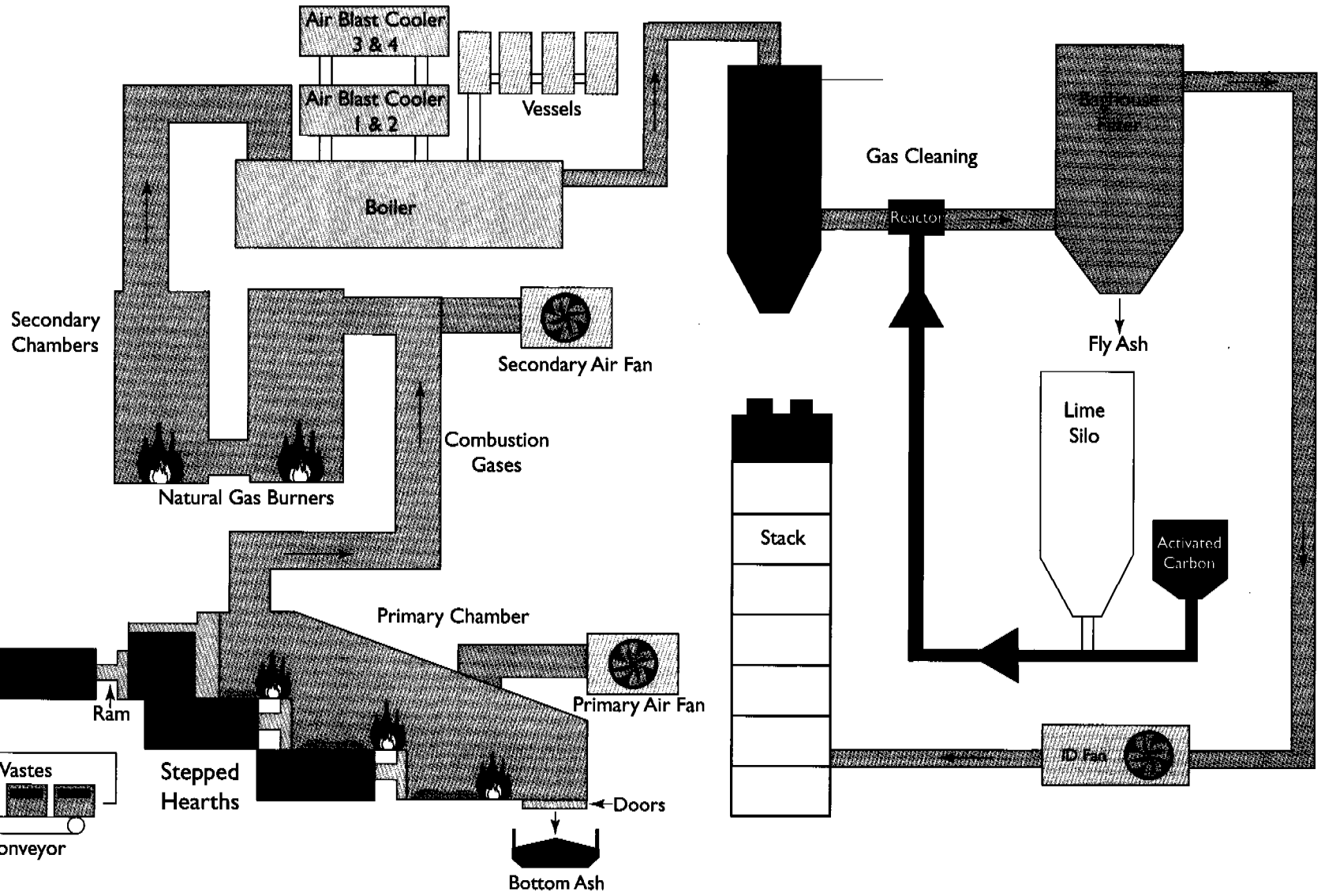


Figure 10 : **Schematic of Clinical Waste Incineration Process**

Source: Grundon

3.76 The waste ignites in the limited air supply and as each load is charged onto the first hearth, the waste from the last charge is pushed forward and the burning mass falls over into the next hearth. The rams move the waste forward on the hearths according to a predetermined sequence and the bottom ash eventually arrives at the last hearth some 8 hours after beginning the process. The ash will collect at doors at the end, and will be discharged into a sealed container.

Secondary Chamber

3.77 On leaving the primary chamber, air will be blown into the gas stream by the secondary air fan thus changing the pyrolysis conditions to oxidising conditions and raising the gas temperature in excess of 1100°C. This temperature will be maintained by 2 natural gas burners to ensure destruction of dioxins and furans. The chambers will be designed to ensure a residence time in excess of 2 seconds to meet conditions prescribed by the Hazardous Waste Incineration Directive. Hot gases from the secondary chamber will pass to a boiler in which the energy from the hot gases will be removed and the flue gas temperatures will be reduced from 1100°C to 300°C.

Flue Gas Cleaning Equipment

3.78 Combustion gases from the boiler will next be passed through a cooling tower prior to transfer to the flue gas cleaning plant. The waste gases will be cooled by using atomising water spray lances fitted at the top of the tower rapidly reducing the temperature of the gases from 300 °C to 150 °C, preventing the reformation of dioxins and furans. Reagents consisting of hydrated lime and activated carbon will be injected into reactor vessel, up stream of a bag filter system of a similar design used in the EfW plant. The treated gases will then be removed from the bag filters by an induced draught (ID) fan, and released to atmosphere via two separate flues within the 75 metre stack.

Ash handling and Disposal

Bottom Ash

3.79 Burnt out residue from the primary chamber (bottom ash) will be discharged through doors at the end of the hearth, through a quenching system to cool the ash, and into a sealed container. The containers will be transferred to a suitably licensed landfill facility for disposal.

Air Pollution Control Residues

3.80 APC residues will be conveyed by compressed air to a silo and transferred to a sealed tanker for disposal at Grundon's ash conditioning facility at Bishops Cleeve, Gloucestershire.

Plant Operations

Process Control

3.81 The EfW and CWI plants will be designed with facilities for dealing safely and efficiently with all foreseeable operational circumstances. Each plant will be monitored by an integrated computer control system to ensure uniform and complete combustion, and a steady flow of consistent flue gases. These will be used to control the refuse feed rate, grate action, primary and secondary air volume and distribution, furnace temperature and steam flow.

Monitoring

Flue Gases

3.82 A continuous emissions monitoring system (CEMS) will be installed at each plant to monitor the concentrations of key components of the flue gases, including hydrogen chloride (HCl), carbon monoxide (CO), oxides of nitrogen (NOx), sulphur dioxide (SO_2) and dust particles, and process operation parameters including oxygen (O_2), pressure, temperature and water vapour. Continuous monitoring of VOCs (volatile organic compounds) will also take place at the CWI. The CEMS will comprise a sample handling system, analytical devices and logging/reporting equipment. This will provide continuous records of emissions and events for inspection by the Environment Agency.

3.83 Monitoring will also be carried out at regular intervals, as agreed with the Environment Agency for other pollutants including hydrogen fluoride (HF), dioxins, heavy metals and volatile organic compounds (VOCs) at a sampling position to be built into each flue. Periodic measurements of key pollutants will also be carried out by an analytical laboratory certified by a third party accreditation scheme, to confirm the results of the routine monitoring.

Residual Ash

3.84 Samples of the furnace bottom ashes and APC residues will be analysed on a regular basis to determine the composition of the residues. This will ensure that the wastes are acceptable under the terms of the Waste Management Licence for the disposal facility and fulfil the waste description requirements of the Duty of Care. Routine analysis will also be carried out to confirm effective burn-out of the ash.

Plant Management and Staff

3.85 The EfW plant will be run by a team of 42 persons comprising five shift teams, to provide 24 hour 7 day cover. This will include a plant manager, operations manager, engineering manager, operations and maintenance staff, an environmental chemist, and administration staff. The CWI plant will be operated by a team of 12 operatives, a supervisor and a plant manager. Additional specialist and non-specialist resources will be called in on a contract basis as required, to deal with breakdown maintenance, shutdowns and periods of exceptional workload at both plants. Routine maintenance contracts will be taken out with manufacturers of environmental and other essential equipment.

Start Up and Maintenance of Plant

3.86 Procedures for checking the efficiency and safety of the plants will be applied during commissioning of the plants and following routine shut-down for maintenance. During start-up of the boiler a refuse feed interlock and bag filter bypass will come into operation whilst the auxiliary burners bring the furnace temperature slowly up to the required temperature (850°C for EfW plant, 1100°C for CWI plant). Admission of waste to the grate will commence only when the automatic controls have established that the furnace temperature is at the required temperature and the bag filter bypass is closed.

3.87 Regular maintenance will ensure high performance from each of the plants. A comprehensive programme of plant condition monitoring will be implemented. An efficient computerised defect recording system will be introduced and defects will be assessed and remedial work scheduled with appropriate priority, on a daily basis. In addition routine shutdown periods will be implemented every six months for certain sections of the plant. This will involve only one waste stream at a time to ensure continuity of service.

Abnormal Operating Conditions

Bag Filter failure

3.88 Should a bag fail, this will be indicated by an increase in dust content recorded at the outlet of the filter. The operator will immediately take steps to identify which filter cell contains the failed bag. Should timely detection not be possible, the plant will be shut down until the problem has been resolved.

Electrical Failure

3.89 In the event of disconnection from the high voltage electricity distribution system , the plant will be equipped with standby systems which will maintain essential operational supplies, whilst a controlled plant shut-down is initiated.

Wastewater Treatment and Disposal

3.90 At the present time, the Lakeside site does not have a connection to mains sewer. It is possible that a connection may be available, prior to commissioning of both plants, depending on approval of other major developments in the area such as the LIFE scheme, Heathrow Terminal 5 Logistics Centre or the redevelopment of the Iver South Wastewater Treatment Works by Thames Water Utilities.

3.91 The drainage and effluent disposal systems will therefore be designed on the assumption that no mains drainage will be available.

3.92 During normal operation of the facility there will be no discharges of process effluents to watercourse or foul sewer from either the EfW or CWI plants. Surface water drainage from the Lakeside EfW site will be similar to the existing arrangements. Roof drainage and drainage from landscaped areas will discharge to soakaway. Drainage from the parking areas, roadways, and ramps, will be collected via impervious paved surfaces and directed to a wastewater treatment plant via oil interceptors. Areas used for the storage and handling of wastes, ash residues and chemicals will drain via impervious paved surfaces to the wastewater treatment plant. Foul water from the office accommodation will be treated in a proprietary bio-filter system and the treated effluent discharged to soakaway, in accordance with a consent from the Environment Agency.

Energy from Waste Plant

3.93 Process water from the EfW plant including boiler draining and blowdown, demineralisation plant effluent, washdown water and ash discharger overflow will be treated as contaminated and routed to the wastewater treatment plant. The wastewater treatment plant will clarify the effluent in a precipitation tank with oil separation and pH neutralisation. Treated wastewater will normally be re-used on site. Any surplus water will be removed from site in tankers to approved safe disposal points.

Clinical Waste Plant

3.94 Any surplus wash water from the container washing system will be recycled and reused, within a self contained system. The washings will be retained in holding tanks and after filtration will be used within the plant process. Any excess will be disposed of via tankers to a wastewater treatment plant.

Prevention of Hazards and Nuisance

Fire

3.95 Fire protection and detection systems will be installed. Water cannons connected to a fire main fed by a diesel pump will enable a prompt response in the event of fire in the main refuse pit. The nearby Orlitts Lake will provide an emergency source of water for fire fighting purposes.

Accidental Discharges of Process Effluent

3.96 The Lakeside EfW facility has been designed to ensure there are no routine discharges of process effluent to controlled water. In the unlikely event of a spillage, this would be contained by the surface water drainage system and following testing be transferred either to the wastewater treatment plant or to a suitably licensed disposal facility.

Spillage of Chemicals

3.97 Chemicals including aqueous ammonia, lime, acids and caustic soda will be delivered in purpose built tankers which will pump the materials directly into appropriate sealed vessels, thereby minimising the risk of accidental spillage. All sealed tanks will be located within bunded storage areas. Any spillages of material into the bunded area will be contained, cleared by tanker, and removed to a suitably licensed disposal facility.

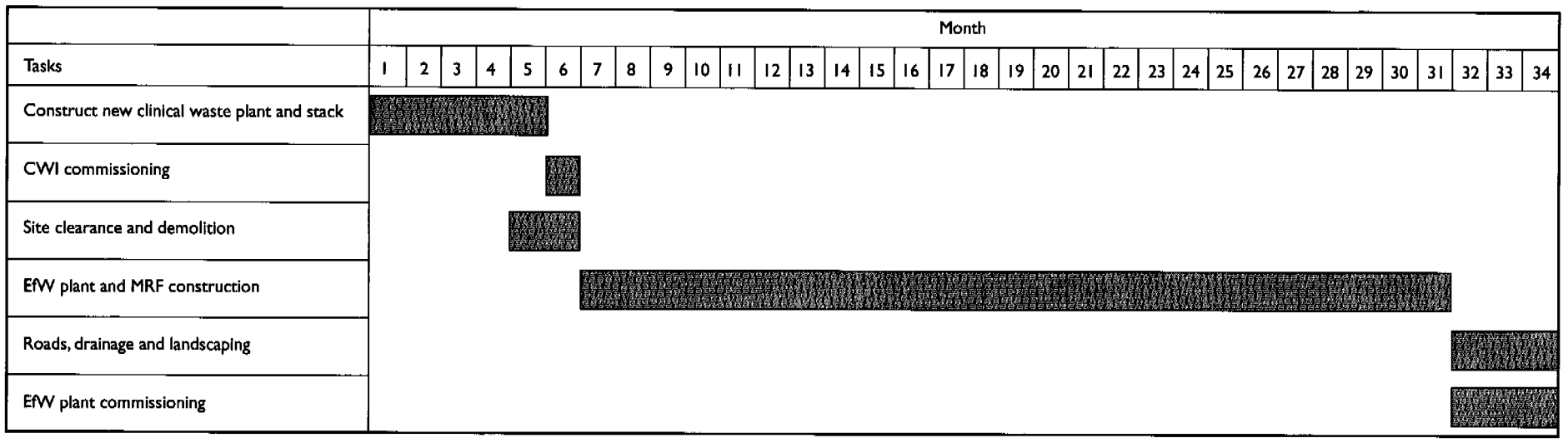
Odour and Noise

3.98 Odour and noise emissions will be contained at source. The containment provided by the building will significantly limit both odour and noise. Measures and procedures to control fugitive odour emissions during normal operation of the plant are described in detail in Chapter 5, Air Quality. The spread of internal noise will also be further limited by enclosing the most significant sources of plant noise as described in Chapter 10, Noise and Vibration.

Vermin Control

3.99 No problems are anticipated with rodents on site, but a precautionary contract will be let to a specialist rodent control company. Flies are also not expected to be a problem, however sprays will be made available if required.

Figure 11 : **Construction Programme**



Construction Programme

3.100 Construction of the CWI and EfW plants is expected to commence in January 2001 and take approximately 31 months with a further 3 months for commissioning of the EfW plant. The clearance of the site and construction of the new facility will follow the programme showed in Figure 11.

3.101 It is proposed that the existing CWI plant will continue operating whilst the new clinical waste facility is constructed, together with the new stack serving both plants. Grundon will initially install a new, one tonne per hour, incineration unit within the new plant. Following commissioning, the existing plant will be shut down and the abatement plant will be moved to the new plant and connected to the new stack. When the new CWI plant is operational, the remaining plant will then be dismantled, and the site will be cleared. Subject to EA authorisation, the redundant incineration unit will be refurbished and installed at the new plant when demand is evident.

3.102 The main structures to be demolished will be the stack, workshops, and the MRF and CWI buildings. Prior to demolition, the CWI will be cleaned to remove all dry deposits, dust and ash residues by vacuuming. A scaffold will be erected, which will be totally sheeted and the stack will be dismantled by hand in sections. The debris will be carefully loaded onto lorries which will be sheeted, and transported to suitably licensed landfill sites for disposal.

3.103 The main building will be demolished using a combination of muncher, excavator and crane to remove component parts. Large concrete slabs will be broken up by means of jackhammers, and JCBs. The concrete will be crushed and used for fill during reconstruction where possible, with the remaining material transported off-site in sheeted lorries.

3.104 Once the site has been cleared, the waste bunker and ash pits for the EFW plant will be excavated. The foundations for the plant will be piled and the main slabs formed primarily with mass concrete. The structural steel for the main and ancillary plant will then be erected. The furnaces, boilers, flue gas treatment plant and support structures will be erected. The steel framework for the building will then be erected followed by cladding and the roof, together with ancillary accommodation such as offices, turbine hall, mess rooms. The final phase will involve completion of the site roads, drainage controls, installation of weighbridges, plant controls and instrumentation, landscaping and commissioning and testing of the new EfW plant.

3.105 The Visitor Centre will be built towards the end of the plant construction period. It will be constructed during the summer months, to minimise the impact on breeding waterfowl (see Chapter 11, Ecology).

Local Liaison Group

3.106 Grundon will facilitate the formation of a Local Liaison Group as soon as practicable. The Liaison Group will provide a forum for discussing implementation of the planning permission, the construction and operation of the plant, the management of the Visitor Centre and any environmental improvements considered necessary.

3.107 The membership of this group will include representatives from Grundon, statutory organisations (the Environment Agency and English Nature), Members of local councils and other

elected bodies. Interest groups will be invited to attend Liaison Group meetings from time to time.

Other Development Proposals

3.108 Consideration has also been given to the future land requirements and new access arrangements of other proposed developments in the vicinity of the site. These major developments are shown in Figure 12. The proposed layout ensures that the EfW facility could operate with any or all of these proposals in place. Only the LIFE proposal would physically affect the Lakeside site.

London International Freight Exchange (LIFE)

3.109 An application has been submitted by Argent LIFE Plc to develop an international rail freight distribution facility serving the western side of the South East Region, including London. The freight exchange would be developed around new road and rail connections across the Colne Brook and along the northern and southern edges of the lakes. The scheme would require a strip of land owned by Grundon along the southern boundary of the Lakeside site and the removal of the existing offices, workshops and car parking areas to accommodate rail sidings. The existing junction of Lakeside Road with the A4 would be closed and a new traffic light controlled junction created to the south of Tanhouse Farm landfill. An access road to the EfW facility and Lakeside Industrial Estate would be created off the main LIFE site access.

Heathrow Terminal 5 Construction Logistics Centre

3.110 BAA has applied for planning permission to use part of the area between the existing Colnbrook Branch Line and the M25 for a temporary construction logistics facility, to facilitate the construction of Heathrow Terminal 5. If approved, a new access would be constructed from the A4 to the east of the Lakeside site and improvements made to the A4. New rail sidings would also be provided between the Colnbrook Branch Line and the Lakeside Industrial Estate.

Iver South Sewage Treatment Works

3.111 Thames Water Utilities has submitted proposals to construct a sludge dewatering works at Iver South, to replace the sludge treatment works at Heathrow Airport which would be displaced by the development of Terminal 5. Vehicular access to the works from the A4 would be via an improved junction onto Lakeside Road which would be used by Grundon's traffic.

Foster Yeoman Aggregates Depot

3.112 Foster Yeoman has planning consent for a rail aggregates depot on land to the north east of the Lakeside site that will include the development of a rail terminal, aggregate storage area, asphalt coating plant and ready mixed concrete plant, on land between the M25 and the Lakeside Industrial Estate.

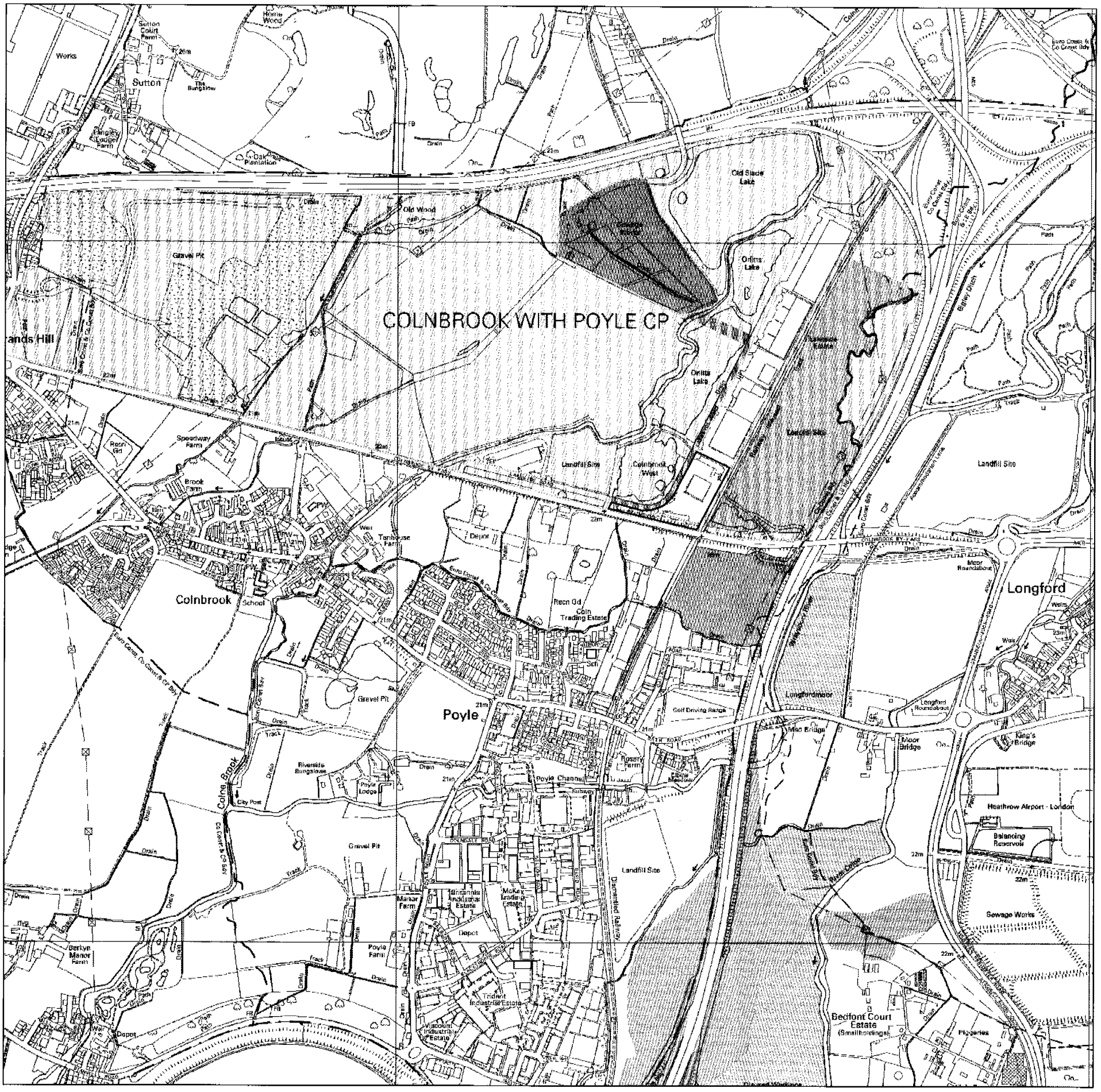

COLNBROOK WITH POYLE CP
Colnbrook
Poyle
Longford
Sutton
Works
Sutton Court Farm
The Bungalow
Hernie Wood
Oak Tree Plantation
Langley Lodge Farm
Old Slade Lake
Old Wood
Gravel Pit
Orlits Lake
Landfill Site
Colnbrook West
Speedway Farm
Brook Farm
Tenthouse Farm
Depot
Recn Gd
Colnbrook School
Coln Trading Estate
Golf Driving Range
Longfordmoor
Moor Roundabout
Longford Roundabout
Moor Bridge
King's Bridge
Riverside Bungalows
Poyle Lodge
City Post
Poyle Channel
Rosary Farm
Elbow Meadows
Heathrow Airport - London
Balancing Reservoir
Sewage Works
Manor Farm
Poyle Farm
Berkyn Manor Farm
Britannia Industrial Estate
McKay Trading Estate
Trident Industrial Estate
Viscount Industrial Estate
Bedfont Court Estate (Smallholdings)
Piggeries
Dismantled Railway
Colne Brook
Wraysbury River
Bigley Ditch

Figure 12 : **Nearby Major Development Proposals**

- London International Freight Exchange (LIFE)
- Heathrow Terminal 5
- Iver South Wastewater Treatment Works
- Heathrow Terminal 5 Construction Logistics Centre
- Terminal 5 Spur Road
- Terminal 5 Landscaping
- Lakeside Energy from Waste Site

Source: RPS Group plc.

North

Scale. 1:12 500

500m

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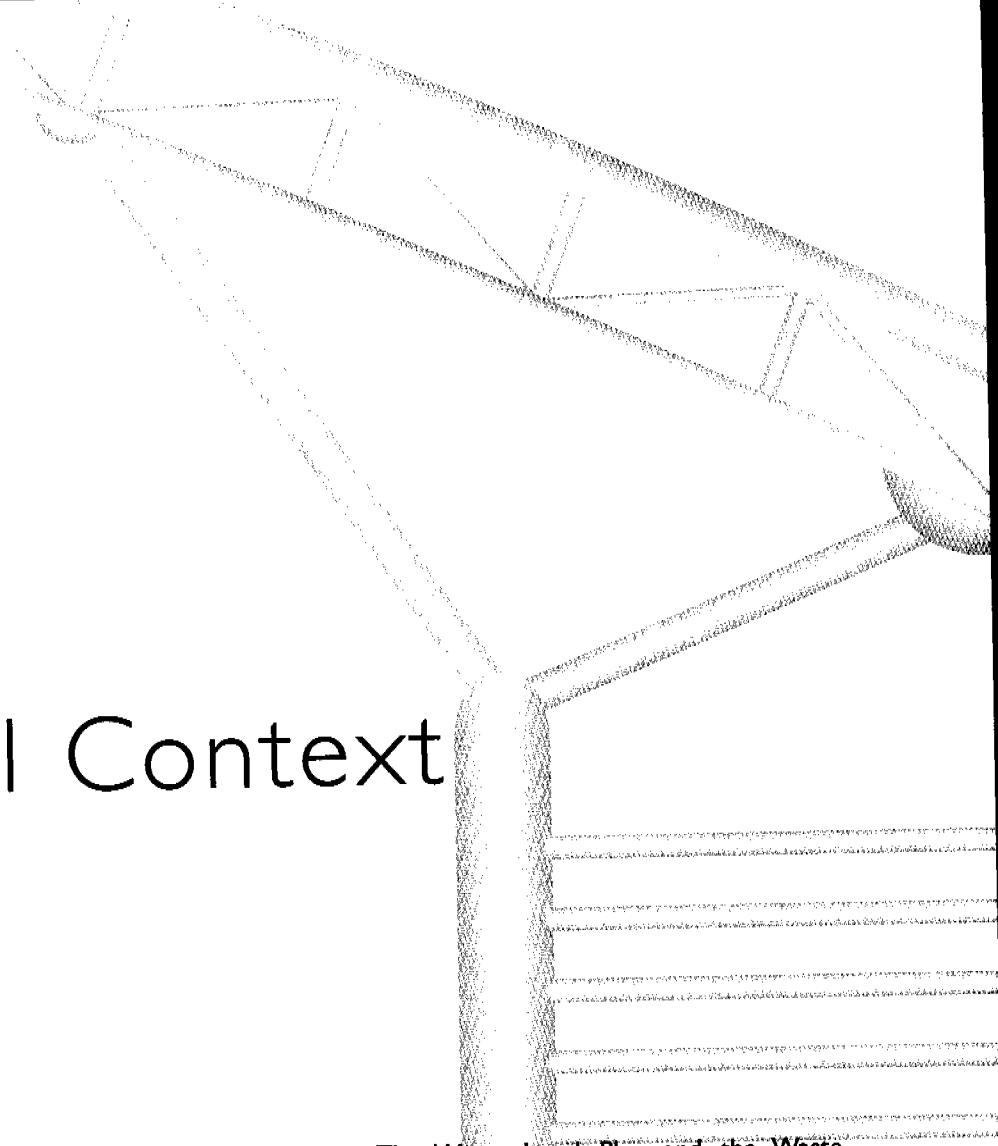
Summary of Proposals

- Grundon proposes to upgrade its existing waste management facilities at Lakeside Road Industrial Estate by constructing a new MRF and EfW plant, capable of processing approximately 440,000 tonnes of waste per annum. Energy from the waste incineration process will be recovered and used to generate some 30 Megawatts of electrical power which will be transferred to the National Grid. The plant will also be designed to facilitate the supply of heat to third parties as opportunities are identified.
- An integral MRF within the EfW plant will process mixed recyclable waste collected from households and commercial premises.
- A new CWI will provide updated facilities to treat the same range of wastes as Grundon's existing plant, thus providing continuity of the current clinical waste service.
- The EfW and CWI plants will be designed to meet the latest emission limits as defined by European Directives on the Incineration of Wastes and by the Environment Agency and will utilise the latest version of proven technology.
- Train operating companies will be encourages to work with Grundon to develop a rail link enabling the Colnbrook Branch Line to be used for the import of wastes to the facility and the removal of bottom ash.
- Part of Tanhouse Farm Landfill will be used temporarily for the storage of materials during construction of the facility.
- The proposals also include the development of a Visitor and Environmental Study Centre on the south western edge of Orlitts Lake. This will provide an interpretation facility for visitors to the plant, and a study centre for nature conservation interests in the area.
- Construction of the scheme will take approximately 31 months, with 3 months for commissioning of the EfW plant.
- Grundon will facilitate the formation of a Local Liaison Group to provide a forum to discuss the implementation and operation of the proposals.
- Grundon's proposals have been designed to operate with or without the implementation of other nearby development proposals by Argent LIFE, BAA, Thames Water and Foster Yeoman.



Chapter Four

Environmental Context

Introduction

4.1 This chapter describes the main planning and environmental policies and designations that relate to the Colnbrook area. They were identified from a study of available environmental data and of published local and structure plans and policies and from consultations with the Local Planning Authority, the Environment Agency and other bodies. The consultation process facilitated definition of the scope of the environmental assessment.

Development Plans

4.2 Policies and proposals in statutory development plans provide a comprehensive land use and environmental context. The Lakeside Road site is in the parish of Colnbrook with Poyle. Its complex administrative history has already been recorded. As at June 1999, the statutory development plans for the Lakeside EfW site consist of the Berkshire Structure Plan 1991-2006, incorporating alterations to the Structure Plan 1997, the South Bucks Local Plan 1989 and the Berkshire Waste Local Plan 1998.

4.3 Since the boundary changes, South Bucks District Council has adopted a new Local Plan which excludes Colnbrook and Slough Borough Council have begun the process of preparing a new Plan, which incorporates the Colnbrook area. The current deposit draft Review of the Local Plan for Slough (which will replace the South Bucks Local Plan when it is adopted) is the first plan to be prepared from the outset on the basis of the present boundaries and administrative responsibilities.

Waste Planning Polices for the Former County of Berkshire

4.4 These have largely been described and analysed in Chapter 2, Need and Alternatives. It is important to note here that the adopted Berkshire Waste Local Plan safeguards the site of Grundon's existing waste facility (MRF and CWI) at Lakeside Road for appropriate waste management purposes (Policy WLP21).

4.5 The Waste Local Plan and the Waste Management Plan have the stated aim of reducing the amount of waste requiring disposal and ensuring that the handling, treatment and disposal of the remaining waste is carried out with the minimum effect upon the environment and within the overall principles of sustainability.

4.6 The Waste Local Plan also sets out general criteria for the development of waste facilities which have been carefully considered in drawing up the EfW proposals.

4.7 Policy WLP1 ensures that waste management proposals are within the overall strategy of sustainability, while Policy WLP2 says that proposals for waste management development will be judged against the extent to which they contribute to the overall waste management strategy and waste hierarchy. Policy WLP27 states that the need for the development must be shown, wider environmental benefits which outweigh any adverse environmental and other effects must be demonstrated, and satisfactory arrangements made to secure infrastructure, services and amenities should be achieved.

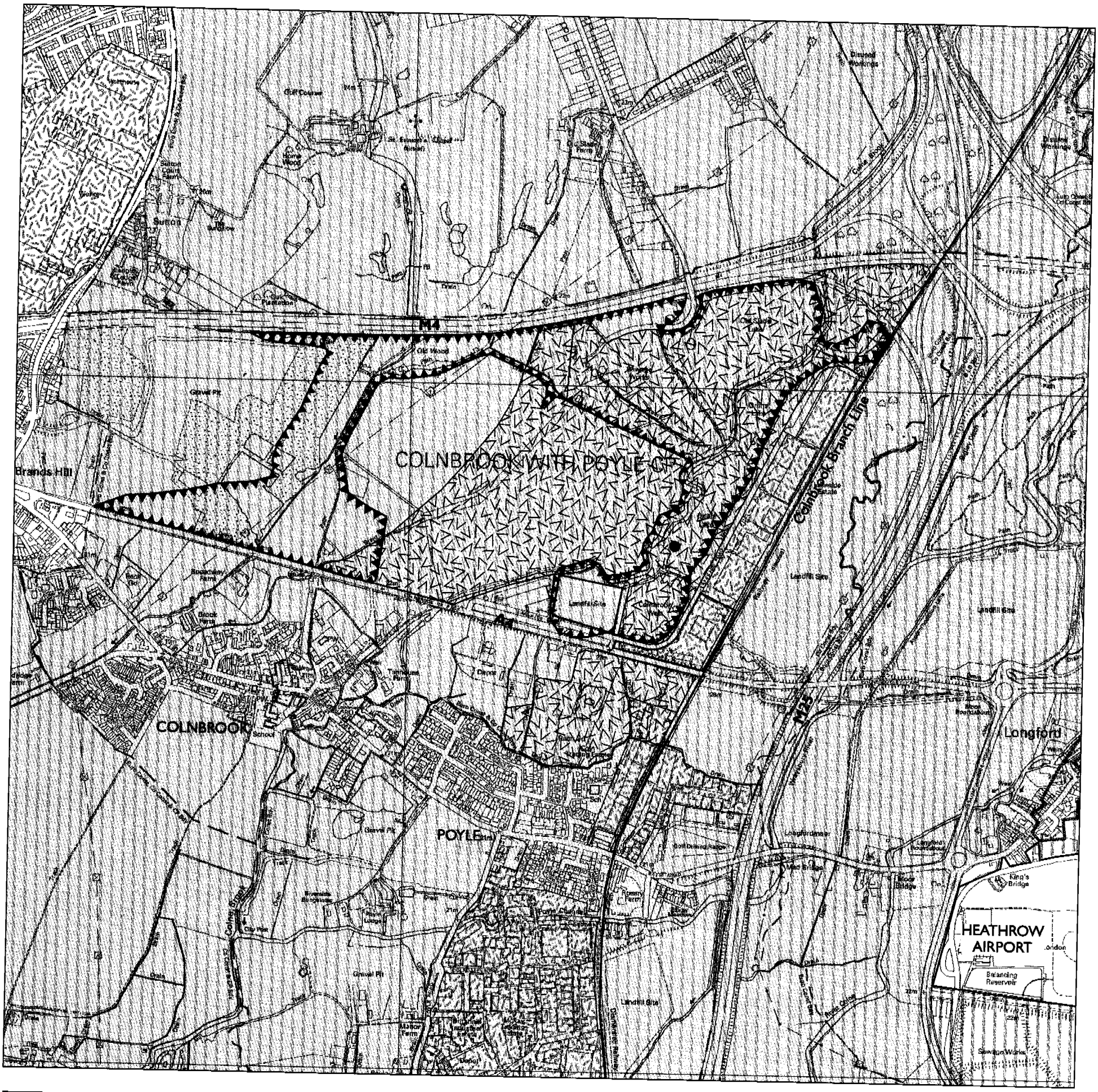

M4
COLNBROOK WITH POYLE CP
Brands Hill
COLNBROOK
POYLE
Longford
HEATHROW AIRPORT
M25
Colnbrook Branch Line
Golf Course
Landfill Site
Gravel Pit
Old Wood
Disused Workings
Sewage Works
Balancing Reservoir
King's Bridge

Figure 13 :
Planning Context

- Lakeside Energy from Waste Site
- Colne Valley Regional Park
- Green Belt
- Flood Risk
- Conservation Area
- Industrial/ Business Uses
- Wildlife Heritage Site
- Heathrow Airport
- Colnbrook Branch Line
- Proposed Visitor Centre
- Proposed Temporary Construction Compound

Source. *Royal Borough of Windsor & Maidenhead Local Plan; Draft for Adoption, 1998*
Hillingdon Unitary Development Plan 1998
The Local Plan for South Bucks 1989
The Review of the Local Plan for Slough; Deposit Draft 1999

North

Scale. 1:12 500

500m

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4.8 Policy WLP12 seeks to ensure maximum practicable re-use, recovery and recycling takes place in appropriate circumstances and locations. Policy WLP13 encourages proposals that provide source separation and storage facilities for both household and industrial and commercial wastes.

Berkshire Structure Plan (1998)

4.9 The adopted Berkshire Structure Plan (1998) has broad strategic polices for controlling and guiding development for the management and disposal of waste and seeks to minimise the environmental impact of waste disposal. Policy W4 outlines the considerations to be taken into account when dealing with proposals for waste management, which include the need for the development, and the need to minimise any adverse environmental impacts without a decline in environmental quality.

4.10 Policy W1 says that the need for waste disposal will be balanced with the need to protect living conditions and the environment generally. Other policies include a commitment to minimising waste production and recycling waste (Policy W2) and phasing out the use of landfill and landraising as a means of disposing of putrescible waste (Policy W3). In addition, Policy RE1 supports development proposals that utilise renewable energy sources.

Waste Planning Policies for the Slough Unitary Authority

4.11 The deposit draft Review Slough Local Plan is the Borough Council's first statement of planning policy since its establishment as a unitary authority. The draft recognises the environmental benefits of renewable energy technologies and says that studies undertaken in the 1990's highlight the contribution of renewable energy resources to energy provision in the local area. There are no specific draft local plan policies relating to renewable energy schemes as the Borough Council consider they are more appropriately addressed in the Waste Local Plan.

4.12 Draft Local Plan objective (f) promotes the recycling of waste materials and aims to ensure that all new development includes appropriate measures to deal with problems caused by its own waste generation and previous waste disposal activities.

Strategic Waste Management Plans

4.13 The statutory requirement to produce a waste strategy for an area has been transferred from local authorities to the Environment Agency (EA). The EA have produced a strategy for preparing such plans but a plan for the Colnbrook area has not yet been published. Whilst the 1995 Berkshire Waste Management Plan meanwhile remains in force, it does not cover the Colnbrook area.

Planning Policy Designations

4.14 Policies refer to several designations and constraints that have influenced the proposed location and design of the scheme. These are shown in Figure 13.

4.15 General planning policies relating to limiting the environmental impact of development are addressed in Berkshire Structure Plan Policy LD3, Policy ENV1 of the adopted South Bucks Local Plan and within the overall objectives of the draft Slough Local Plan. The implication of policies relating to individual sections of the ES are addressed in the relevant chapters.

Existing Business Areas

4.16 The Lakeside site is in an "Existing Business Area" in the deposit Draft Review of the Local Plan for Slough. Policy EMP3 guards against the loss of employment land in such designated areas.

4.17 The draft Local Plan notes that the Lakeside Road Estate is an ideal location for distribution/storage and freight transport and that also general industrial uses would be acceptable. The draft Local Plan says that any redevelopment should improve vehicular access, overcome road safety problems and may require additional parking provision. Policy EMP10 states that research and development of products and processes and any industrial processes will also be permitted here.

4.18 Grundon intends to create a second access to their site for CWI deliveries which will allow more efficient vehicular segregation within the plant and will avoid the need for queuing on Lakeside Road.

4.19 Policy EMP4 of the draft deposit plan says that expansion of existing firms or the intensification of use within existing business areas will normally be permitted unless:

- the site is too restricted to accommodate the proposed development;
- it would harm the amenities of adjoining properties;
- the proposed development would harm the appearance or environment of the site or the surroundings;
- traffic could not be accommodated on the road network.

4.20 Grundon has been careful to consider these factors in the redevelopment proposals for the Lakeside site and these are addressed in later chapters of the ES.

4.21 The Adopted South Bucks Local Plan seeks to protect the Green Belt from commercial development and the policies channel all new commercial development towards existing commercial areas. The Lakeside Industrial Estate is protected from development other than industry, business, storage and distribution in Policy E2.

Colne Valley Regional Park

4.22 The Lakeside site lies within the Colne Valley Regional Park. The importance and the sub-regional role of this designation is recognised in the proposal of the Visitor Centre at Orlitts Lake South.

4.23 A"*Strategy for the Colne Valley Regional Park*" was adopted in 1995 by the eight constituent authorities and provides a framework for future programme of improvements in this area. One of the key aims of this strategy is "*to provide accessible facilities and opportunities for countryside recreation*". This key aim is repeated in Policy GC1 of the draft local plan, which gives support for projects which realise the aims and objectives of the Strategy. Slough Borough Council recognise in particular the need to improve and extend opportunities for people to enjoy the park.

4.24 Berkshire Structure Plan Policy C9 says that the character and quality of the park landscape and features important to its character and history will be protected and enhanced. Strategic Policy R2 also supports measures to improve informal outdoor recreation and access to the countryside. In particular Policy R2(iv) encourages the provision of schemes for car parking and interpretation at recreation sites.

4.25 Other aims of the Strategy and draft local plan policy include the protection of the landscape, safeguarding existing countryside from encroachment and preservation of wildlife.

Metropolitan Green Belt

4.26 The Lakeside Road Industrial Estate is outside the Green Belt but the site of the proposed Visitor Centre and the temporary construction compound at the completed landfill at Tanhouse Farm both lie within it.

4.27 Draft Local Plan policy CG5 is in line with national guidance in PPG2 (Green Belt), existing strategic Policy C4 and adopted South Bucks Local Plan Policy GB1 in allowing only appropriate uses, which includes outdoor recreation in the Green Belt. Grundon's proposals for the Visitor Centre in this area will offer the opportunity to enhance the environmental quality of this Green Belt area.

4.28 Draft Local Plan Policy CG5 notes the presumption against inappropriate development in the Green Belt. This includes engineering and other operations unless the openness of the Green Belt is maintained and the use does not conflict with the purposes of including the land in the Green Belt. The draft local plan notes that inappropriate development that is justified in special circumstances can offer opportunities to improve derelict and damaged land. Also opportunities for enhancing environmental quality and visual amenity of the Green Belt will be sought.

Strategic Gap

4.29 Adopted Structure Plan Policy C6 introduces the definition of "gaps" and "green wedges" separating built up areas and maintaining open areas of land between settlements. This applies to both areas inside and outside the Green Belt. The draft local plan in Policy CG6 notes the importance of maintaining a Strategic Gap in the open area between the eastern edge of Slough, Colnbrook and Poyle and Greater London and restricts development which could affect the openness of the Green Belt in this area. However the boundary of this proposed Strategic Gap is not shown on the local plan proposals.

4.30 Careful consideration has been given to the design of the proposals to ensure that they will minimise the potential effect on the integrity of the Strategic Gap between the eastern edge of Slough and Greater London. The issue of both the openness of the Green Belt and the Strategic Gap are considered further in Chapter 8, Landscape.

Area Liable to Flooding

4.31 The emerging Local Plan identifies the area adjacent to the Lakeside site as lying within an area liable to flood. The proposed Visitor Centre and temporary construction compound lie within this designation. Policy CG8 of the draft local plan and adopted strategic policy EN3 restrict new development in this area. An evaluation of the risks of flooding together with details of appropriate flood protection measures to be taken should accompany all development proposals.

Wildlife Heritage Site

4.32 Slough Borough Council has identified the complex of lakes at Colnbrook, which includes Old Slade Lake, Orlitts Lake South and North and

Colnbrook West Lake as a Wildlife Heritage site. The vegetation and waterfowl populations of these lakes are said to be of at least district importance. This includes the site of the proposed Visitor Centre.

4.33 Draft Policy EN24 gives protection to sites with nature conservation importance which may be subject to the detrimental effects of development proposals. The policy says that any proposed development which would have a detrimental effect will be refused unless appropriate measures are taken to conserve the site's wildlife interest as far as possible. Ecological appraisals will be required for proposals that threaten any nature conservation interests.

4.34 Old Slade Lake to the north of Orlitts Lake is proposed as a non-statutory informal nature reserve under Policy EN25. The policy says that sympathetic habitat and access management will be sought.

4.35 Grundon's proposals for this area support the overall aim of this designation and ensure that they do not have an adverse effect on the wildlife interests and nature conservation interest of this area. Further consideration to this issue is given in Chapter 11, Ecology.

Potential Special Protection Area

4.36 The lakes off Lakeside Road are within an area under consideration by English Nature for inclusion within the South West London Water Bodies potential Special Protection Area (pSPA) under the EC Directive on the Conservation of Wild Birds (79/409/EEC). The area is also designated as a potential Ramsar site, as a Wetland of International Importance. The designation process is at an early stage and a boundary has been defined.

4.37 Policy EN23 of the draft Slough Local Plan and policies EN8 and EN9 of the adopted Berkshire Structure Plan protect designated nature conservation sites from harmful development. Structure plan polices also encourage public access to such sites where appropriate.

Linear Park

4.38 An area along the northern boundary of Tanhouse Farm Landfill site and the western boundary of Orlitts Lake South and North and Old Slade Lake is proposed for a Linear Park in the draft Slough Local Plan, Policy CG2. Development proposals which would prejudice the proposed cycleway/footpath or would detract from user's enjoyment of this route will not be permitted. This designation is shown on Figure 37 in Chapter 12, Recreation.

Footpath/Rights of Way

4.39 There are no public rights of way on the Lakeside site. A public right of way runs along the eastern boundary of the proposed Linear Park. There are informal paths used by anglers around the lakes. Draft Local Plan Policy T7 considers the maintenance and safeguarding of rights of way in line with strategic Policy R2 of the Berkshire Structure Plan.

Archaeology

4.40 The archaeological assessment revealed 13 sites of archaeological interest within a defined 1km study area of the Grundon site at Lakeside Road. These sites are included on Figure 38 in Chapter 13, Archaelogy.

4.41 Conservation of areas of archaeological interest is included in Policy C4 of the South Bucks Local Plan (1989). This notes that development proposals should not have an unacceptable impact on historic landscapes, scheduled ancient monuments or other features of natural history. Draft Policies EN21 and EN22 of the Slough Local Plan say that development will not be permitted where it fails to preserve archaeological remains in their setting (Policy EN21) and includes the requirement of a field evaluation in areas of archaeological potential prior to planning decision (Policy EN22). The importance of any archaeological remains discovered will dictate the preservation required, whether preservation in situ, modification to the development proposals or the recording of evidence before destruction. Policy EN6 of the adopted Berkshire Structure Plan gives protection to archaeological heritage and notes conflicts between preservation and proposals will be resolved by management agreements.

Conservation Areas / Listed Buildings

4.42 The nearest Conservation Area is in Colnbrook, south west of the Lakeside Road Estate The draft Slough Local Plan (Policy EN14) and Policy EN5 of the adopted Berkshire Structure Plan say that development which would harm the character or appearance of the Conservation Area will not normally be permitted.

4.43 Other conservation areas in the surrounding area include Longford Village 1km to the east and Harmondsworth Village 1.5km to the north east. Conservation Areas in the surrounding area to the Lakeside site are shown on Figure 13.

4.44 There are no listed buildings on the site or within the immediate vicinity. The nearest listed buildings to the site are located in the Colnbrook Conservation Area. Policy EN18 of the draft Slough Local Plan in line with advice in PPG15 (Planning and the Historic Environment), says that development which would adversely affect the setting of a listed building will not be permitted.

Heathrow Airport

4.45 Policy CG9 of the draft Local Plan identifies the public safety zone for Heathrow Airport in line from official safeguarded area maps published by DETR. This area which defines the approach to Heathrow Airport is 0.65km south of the Lakeside site.

Residential Areas

4.46 The closest houses are about 400 metres from the Lakeside site. The potential impact on

residential areas in terms of air quality, noise and vibration, recreation and visual issues are considered in the relevant chapters of the ES.

Traffic and Access

4.47 The proposals include the provision of an additional access from Lakeside Road for deliveries to the CWI, to facilitate vehicular movements within the site and to improve road safety in line with draft local plan polices.

4.48 Additional car parking will be provided at the Visitor Centre for visitors to the plant in line with paragraph 3.90 of the draft local plan, to alleviate localised operational or road safety problems.

4.49 In line with Policy T11 of the draft Local Plan, Grundon's proposals provide for access to the Colnbrook Branch Line which can be used for the transport of waste to the EfW plant and the removal of bottom ash residues thereby reducing lorry movements.

4.50 The Berkshire Waste Local Plan also supports the use of rail for waste management facilities in line with national and regional planning guidance on sustainable transport in PPG13 (Transport) and the White Paper on the 'Future of Transport' (1998).

Cycleways

4.51 The line of the proposed Sustrans national cycle route runs along the A4 Colnbrook bypass.

M25 Widening

4.52 The Government has announced plans to widen the M25 motorway between junctions 12 and 15, although it is understood that this will take place within the existing motorway boundary. Plans for widening the M4 motorway between junctions 3 and 4B and the M25 Terminal 5 spur road will be progressed if the proposed fifth terminal for Heathrow Airport is constructed.

Landscape

4.53 Policy ENV7 of the adopted South Bucks Local Plan and Policy EN3 of the draft Slough Local Plan requires all new development to include comprehensive landscape proposals.

Protection of Watercourses

4.54 Policy EN26 of the draft Sough Local Plan requires developers to submit a statement indicating how potential damage to watercourses has been overcome and to provide conditions to replace features if necessary. Draft Policy EN34 in line with national advice considers the need to protect water quality and groundwater resources from contamination. Paragraph 5.143 says that "*particular attention should be paid to development which would cause disturbance to contaminated land*".

Contaminated Land

4.55 Policy EN30 of the draft Slough Local Plan, in line with guidance in PPG23 (Planning and Pollution Control), requires development proposals which on land thought to be contaminated to provide a full assessment of ground conditions and details of measures to remedy potential adverse effects.

Noise

4.56 Planning policies provide safeguards for residential and other noise sensitive land uses from potential noise from development. Draft Policies EN27 and EN28 of the Slough Local Plan impose controls on noise levels from road and rail traffic and commercial developments in line with Government advice in PPG24 (Planning and Noise) and their powers under the Environment Protection Act 1990. The potential adverse affect of noise pollution during construction is controlled through the provisions of the Control of Pollution Act 1974 and British Standard 5228 (1984).

Pollution

4.57 Policy EN31 of the draft Slough Local Plan says that development proposals which would result in a significant deterioration of air quality (including cumulative deterioration) will not be permitted unless mitigation measures are demonstrated and achieved. This is covered by the general strategic Policy LD1 on sustainable development and Policy EN2, protection from environmental nuisance in the Berkshire Structure Plan.

Government Advice

4.58 Government guidance on waste management is discussed in Chapter 3, Need. This section considers other land use planning guidance and advice relating to Grundon's proposals. A key theme underlying recent government advice and guidance is the promotion of sustainable development while taking account of reducing or minimising adverse impact on the environment.

PPG1 - General Policy and Principles (February 1997)

4.59 PPG1 outlines the framework for sustainable development including the need to provide for the nation's industrial and commercial needs while respecting environmental objectives; using developed areas in the most efficient way; conservation of cultural heritage and natural resources (including wildlife, landscape, water, soil and air quality); and encourage alternative means of travel which have less environmental impact.

PPG2 - Green Belt

4.60 In PPG2 there is a presumption against inappropriate development within the Green Belt, or development that would be conspicuous from the Green Belt and be visually inappropriate (paragraph 3.15). Special circumstances need to be shown as to why development should be allowed in the Green Belt. Paragraph 3.2 states that "very

special circumstances will not exist unless the harm by reason of inappropriateness, and any other harm, is clearly outweighed by other considerations".

PPG9 - Nature Conservation

4.61 PPG9 includes the Government's objectives for nature conservation and considers those of international importance through to those of local importance.

4.62 The advice emphasises in paragraph 7 that local planning authorities should not refuse planning permission if development can be subject to conditions which will prevent damaging impacts on areas of nature conservation value, or if material factors override conservation considerations.

4.63 Paragraph 13 of PPG9 states that proposed Special Protection Areas (SPAs) should be treated in the same way as classified SPAs, at least for the purpose of considering development proposals affecting them. In the case of the West London Water Bodies SPA, this approach is complicated by the lack of a firm boundary. English Nature cannot be sure that Orlitts Lake South and North and Old Slade Gravel Pits will be included in the SPA when it is finally proposed. If the area is proposed to be included in the SPA, Orlitts Lake and the Old Slade Gravel Pits would first be designated as an SSSI, a pre-requisite for SPA designation in the UK.

4.64 PPG9 also recognises the importance of local sites designated by local authorities, although it says that care should be taken to avoid unnecessary constraints on development (paragraph 18).

Draft PPG10 - Waste Disposal and Management

4.65 This draft guidance reflects the advice given in "Less Waste, More Value" considering the benefits of an integrated approach to waste management. The draft advice notes that careful attention needs to be paid to the location and potential environmental implications of proposed incinerators incorporating energy recovery (paragraph A51). With regard to visual impact, careful landscape treatment and high quality design are important.

4.66 The draft advice goes on to say that appropriate locations for EfW facilities could include sites which were formerly occupied by incinerators or other waste management facilities, industrial areas, and extensive areas of despoiled, contaminated or previously developed derelict land (paragraph A52).

4.67 This advice will replace guidance in PPG23 relating to waste management issues and will support the new waste strategy for England and Wales.

PPG13 - Transport and 'A New Deal for Transport'

4.68 Sustainable transport is the underlying theme of PPG13. Alternative means of travel which have less environmental impact and encouraging the use of rail for freight movements are stressed. This theme is continued in the Government's White Paper on integrated transport policy issued in July 1998. Local authorities should identify and protect opportunities for rail connections to existing manufacturing, distribution and warehousing sites adjacent or close to the rail network.

PPG16 - Archaeology and Planning

4.69 Planning Policy Guidance Note 16: Archaeology and Planning, gives advice to Planning Authorities on the safeguarding of archaeology within the planning process. In the course of determining planning applications, the guidance sets out a presumption in favour of the physical preservation of nationally important archaeological remains and their settings, whether they are scheduled or not. It further advises that where preservation in situ is not justified planning authorities may reasonably require developers to make appropriate and satisfactory provision for excavating and recording archaeological remains.

PPG22 Renewable Energy

4.70 The environmental implications of EfW are considered in the Annex to PPG22 published in October 1994. Paragraph 2 notes that waste represents a significant fuel resource for renewable energy production).

4.71 PPG22 says that EfW proposals will be influenced by the source of the waste, the economic implications of transporting the waste, site access and proposed energy use and ease of connection to the electricity distribution network.

4.72 Other factors to be considered include visual effects (paragraphs 23 and 24), air quality and odour (paragraphs 25 and 26), dust (paragraph 27), water protection (paragraph 28) and proximity to airports, which requires consultation with the appropriate airport authority (paragraph 35 Wind Annex).

New and Renewable Energy - Prospects for the 21st century (Consultation Document March 1999)

4.73 The Renewables Review Paper includes the Government's manifesto commitment to "*a new and strong drive to develop renewable sources of energy*". It identifies the potential for renewables as making an increasing contribution to the UK energy supply and the Government is working towards a target of 10% of UK electricity supplies from this source by 2010, achieving 5% by 2003.

4.74 The Paper also considers issues to be tackled to ensure that renewables contribute to sustainable energy supplies. Reference is made to the emerging guidance in PPG10 on waste which will consider issues faced by EfW proposals .

PPG 23 - Planning and Pollution Control (1994)

4.75 PPG23 is concerned with the relationship between land use planning and pollution control

legislation with specific reference to industrial developments likely to produce a pollution risk. It advises that local planning authorities should not seek to duplicate controls that are the statutory responsibility of other bodies. In determining planning applications, however, planning authorities may take account of any potential pollution to the extent that it may affect the future use of land.

4.76 Potential pollution risks include land contamination, the impact of effluent or discharge which may pose a threat to water resources, the risk of toxic releases and the waste generated by the development.

PPG24 - Planning and Noise (September 1994)

4.77 PPG24 aims to minimise the adverse impacts of noise without placing unreasonable restriction on development or adding unduly to costs and administration of businesses. It says that noisy activities should be located away from noise sensitive land uses and local authorities are required to ensure that development does not cause an unacceptable level of disturbance. A number of noise control measures are designed to control noise at source or limit exposure to noise.

RPG 9 Regional Planning Guidance for the South East

4.78 Published in March 1994 this document gives guidance on Government policy to help shape the region's environment and guide its development. Amongst other matters it gives advice on waste management. Paragraph 4.52 states that the provision of adequate facilities to meet the disposal needs of the South East is a regional consideration as sites are not evenly spread. The regional guidance also encourages the use of rail transport.

A Sustainable Development Strategy for the South East (December 1998)

4.79 This document has been submitted by SERPLAN as a draft revised RPG9 and has recently been subject to a public examination. The principle of sustainability while improving prosperity and promoting a high quality environment development runs through the strategy.

4.80 Policy EE6 aims towards self sufficiency for the management and disposal for waste in the south east. In line with other national and regional advice, the need to develop alternatives to landfill and minimising waste arisings are stressed. The use of rail to transport waste is encouraged consistent with Policy EE5 - conservation of resources and Policy ST3 - encouraging the use of rail for freight.

4.81 In considering increasing local self sufficiency in Policy EE5, the need to effectively manage finite resources in a sustainable way and consider the impact on the environment is stressed. Opportunities to meet sustainable demand from sustainable sources should be maximised, including the use of renewable energy sources, and recycled waste materials. The issue of sustainable design specifically includes the "*design to facilitate recycling systems, including energy from waste*".

Local Environment Agency Plan for Colne

4.82 The Environment Agency (EA) have produced a Local Environment Agency Plan for Colne (LEAP) (September 1998) aimed at improving the local environment of the Colne area through a variety of measures which are within the influence of the EA, including pollution control and river basin management, managing water resources and land contamination. The LEAP aims to improve standards of waste disposal and to reduce the amount of waste by encouraging people to re-use and recycle their waste.

4.83 The EA notes that the Colne Plan Area is under increasing pressure to find new ways of dealing with its own waste arisings in a sustainable way, as well as pressure to deal with waste from London. A series of 'Actions' are promoted to support the waste hierarchy, and to work with local industries and businesses to reduce waste production and promote best practice.

Consultations

4.84 During the process of confirming the suitability of the Lakeside Road site and scoping the environmental assessment, Grundon consulted the following bodies:

Statutory Organisations:
Slough Borough Council (Planning, Highways and Environmental Health)
Buckinghamshire County Council
Surrey County Council
London Borough of Hillingdon
London Borough of Hounslow
Spelthorne Borough Council
The Royal Borough of Windsor and Maidenhead
Runnymede Borough Council
South Bucks District Council
Colnbrook with Poyle Parish Council
Department of Transport, Environment and the Regions
English Nature
Environment Agency
Civil Aviation Authority
London Planning Advisory Council (LPAC)
Babtie Minerals and Waste Team
Government Office for the South East (GOSE)

Interest Groups:
Colne Valley Park Standing Conference
Berkshire, Buckinghamshire and Oxfordshire Naturalists Trust Ltd.
English Welsh & Scottish Railway Ltd.

Landowners:
British Airports Authority Plc
Thames Water Utilities Ltd.
National Mutual Life Assurance Society
Royal and Sun Alliance
St Martin's Property Corporation
William Boyer and Sons
British Airways Plc
Railtrack Plc

4.85 Presentations were given to members of Slough Borough Council and Colnbrook with Poyle Parish Council.

The Environmental Issues Defined

4.86 From an analysis of the environmental context and views and information gained from consultations it was possible to identify the potentially significant impacts associated with the scheme. A scoping document setting out the impacts to be assessed by the environmental statement was prepared and sent to various statutory consultees for comment. The final scoping document was revised to take account of comments received. In summary the scoping document identified the following potential issues which have been assessed in this statement: the likely impact of Grundon's proposals on;

- local and regional waste strategies (Chapter 2)
- air quality and dust levels (Chapter 5)
- water quality and contamination (Chapters 6 and 7)
- landscape and the Green Belt (Chapter 8)
- traffic and the local rail network (Chapter 9)
- noise levels (Chapter 10)
- ecological interests (Chapter 11)
- recreation and the impact on Colne Valley Regional Park (Chapter 12)
- potential cultural heritage interests in the area (Chapter 13)

4.87 An evaluation of alternatives was carried out as described in Chapter 2. In addition, cumulative impacts of the proposal taking account of existing and proposed development in the local area, including the proposed T5 at Heathrow Airport have also been considered. The potential human impact, including emergency/accident procedures is considered in relevant chapters.

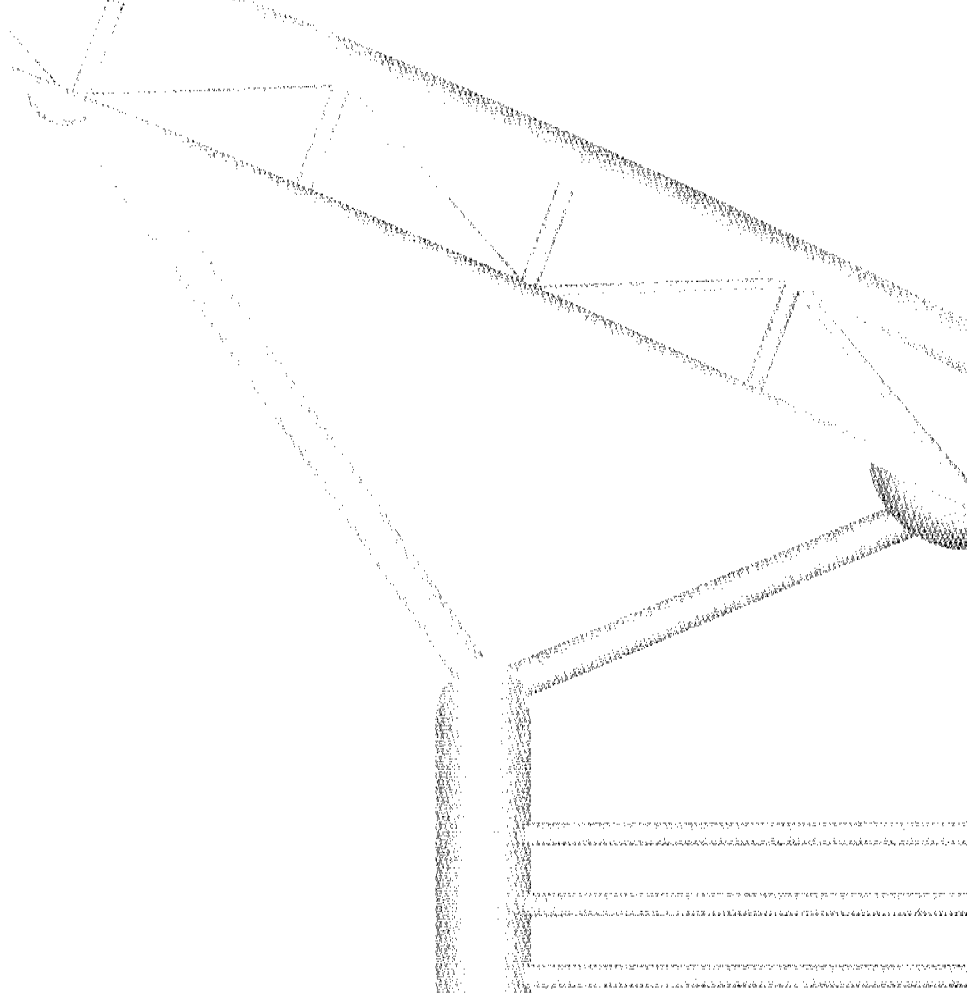
Making the Assessment

4.88 The general issues and environmental impacts were assessed by a team of specialist consultants:

Adams Hendry	*Planning* *Recreation* *Environmental statement* *Archaeology (based on work carried out by RPS Group plc)* *Need and alternatives (with Grundon)*
The APP Partnership	*Design and architecture*
Project Development Services	*Project development*
AEA Technology	*Air quality*
Ecological Planning & Research	*Ecology and nature conservation*
Derek Lovejoy Partnership	*Landscape*
Mayer Brown	*Traffic*
EAG Environ	*Water environment & contamination*
ATL Consulting	*Noise and vibration*

Summary of the Environmental Context

- In common with national and regional planning guidance, Local Plans for the Colnbrook area confirm the role of EfW in sustainable waste and energy policies.
- The site is relatively remote from residential areas and close to major roads and a freight railway line. The Green Belt designation in the area is complemented by other protective designations which also seek to improve the local environment.
- Grundon's existing waste management facilities site at Lakeside Road is safeguarded for that purpose. It is within a designated business area where B1/B2/B8 uses will be encouraged.
- The proposed EfW facilities are outside but adjoin the Metropolitan Green Belt. Orlitts Lake South, the site of the proposed Visitor Centre is within the Green Belt and an area which English Nature are considering identifying as a potential SPA. Grundon's proposals have been carefully designed to minimise adverse impact on the Green Belt and nature conservation designations.
- From the analysis of the environmental context it was concluded that the environmental assessment should examine whether the proposal might have an impact individually or cumulatively on:
  - air quality,
  - water environment,
  - contamination,
  - landscape,
  - traffic,
  - noise and vibration,
  - ecology,
  - recreation,
  - archaeology.;
- These matters were assessed by a team of specialist consultants. An analysis of the need and alternatives to the proposal was also carried out.



Chapter Five

5 Air Quality

Introduction

5.1 This chapter assesses the potential impacts of emissions to air from the proposed Lakeside EfW facility on air quality and human health. The assessment includes the following components:

- a review of ambient air quality in the vicinity of the proposed EfW facility based on measured data from local monitoring networks;
- computer modelling of the contribution of emissions from the plant to ground level concentrations, and comparison with air quality standards and guidelines;
- prediction of concentrations of pollutants with the facility in operation, taking account of background concentrations obtained at monitoring sites in the area and the expected changes in background concentrations as a result of planned developments in the area;
- assessment of the risks to human health from pollutants;
- assessment of the potential impacts of emissions from traffic using the facility, and fugitive dust and odour emissions.

Existing Air Quality

Air Quality Standards & Guidelines

5.2 The air quality in a particular area may be assessed by reference to a framework of standards and guidelines. Measurements of air pollutant concentrations at monitoring stations in the area may be compared to standards and guideline values.

5.3 The main pollutants considered in this assessment are those that are likely to arise as the result of the combustion of the waste and associated material handling operations. These include:

- Nitrogen dioxide (NO_2)
- Sulphur dioxide (SO_2)
- Particulate matter(PM_{10})
- Carbon monoxide (CO)
- Hydrogen chloride (HCl)
- Hydrogen fluoride (HF)
- Dioxins and furans(PCDD/Fs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Lead and heavy metals

5.4 Some of these pollutants are covered by statutory regulations that set air quality standards or objectives for air pollutant concentrations which are derived using a health effects based approach. For materials for which there are no statutory regulations, reference is made to the guidelines from the World Health Organisation (WHO) and Environmental Assessment Levels (EALs) published by the Environment Agency. The relevant air quality standards and objectives considered in this assessment are shown in Tables 6a and 6b.

Air Quality Monitoring Data

5.5 The concentrations of air pollutants are routinely monitored at a number of locations in the vicinity of the proposed facility. In addition a number of short-term monitoring studies have been carried out with reference to specific proposed developments in the area, most notably Heathrow

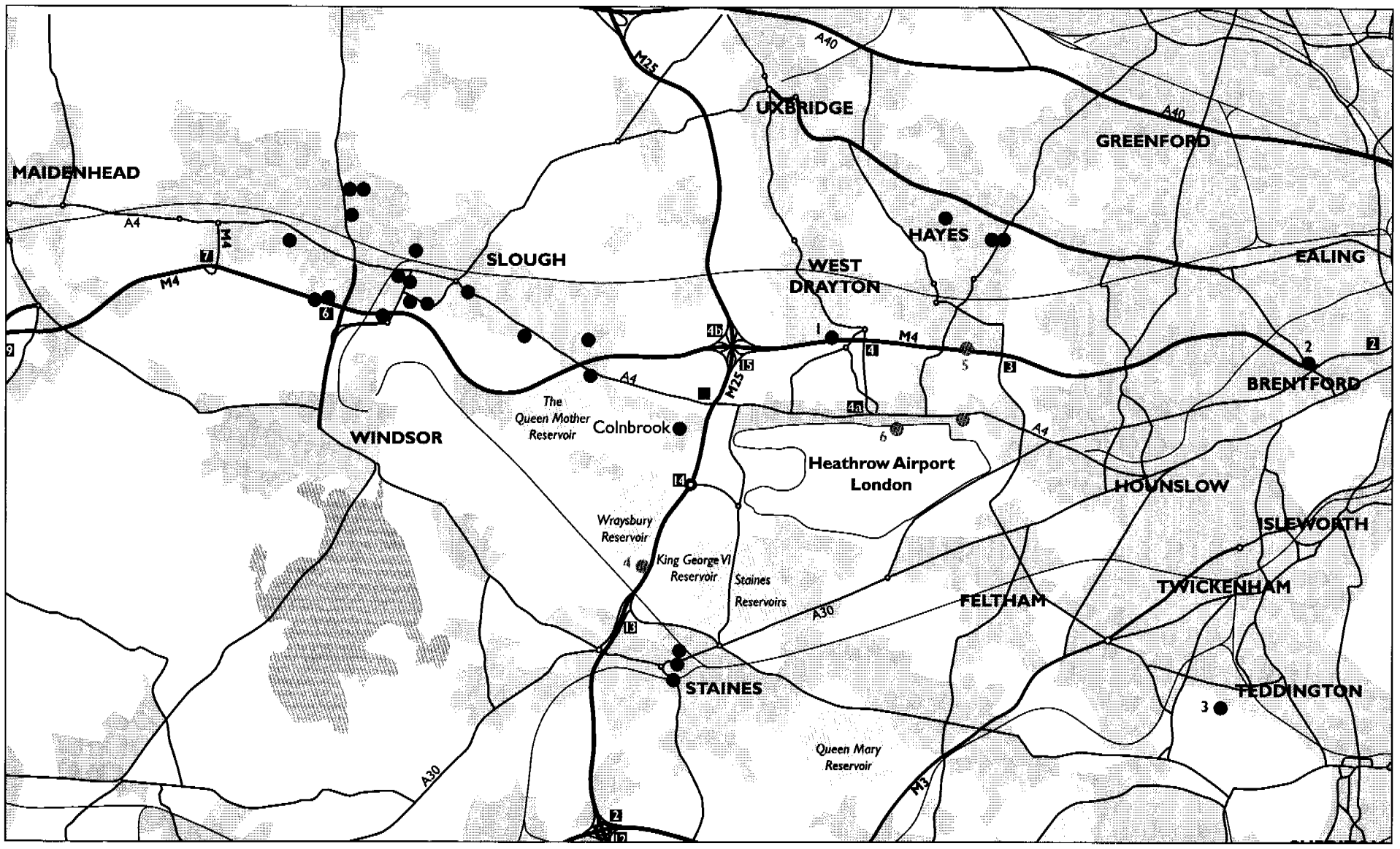


Figure 14 :
Location of Air Quality Monitoring Sites

- ■ Lakeside Energy from Waste Site
- ● DETR AUN Continuous Monitoring Sites
  1. Hillingdon
  2. Hounslow
  3. Teddington
- ● Other Continuous Monitoring Sites
  4. Staines
  5. Cranford Park School
  6. Heathrow Airport
- ● Diffusion tubes (NO_2)

Source. AEA Technology

Scale. ▬ 1km

North

Airport Terminal 5. Monitoring data reviewed for the Lakeside EfW assessment was derived from the following sources:

- DETR Automatic Monitoring Network continuous monitoring sites at London Hillingdon, London Teddington and Hounslow Roadside;
- Highways Agency monitoring sites on the M25 at Staines and at Cranford Park School,north of the M4 ;
- BAA's continuous monitoring sites on London Heathrow Airport at the Old Apron (LHR2) and Lapwing Sports Ground;
- Diffusion tube measurements carried out by Slough Borough Council (NO_2);
- Diffusion tube measurements from the National Diffusion Tube Network.

5.6 The locations of the monitoring sites are shown in Figure 14. The results have been compared to current standards and guidelines. Concentrations at other locations and for future years have then been inferred on the basis of the measurements and other modelling studies.

5.7 The monitoring results for the three DETR network sites at Hillingdon, Hounslow Roadside and Teddington show that pollutants are in most cases already below the amended National Air Quality Standard (NAQS) objective limits set by the Government appointed Expert Panel on Air Quality Standards (EPAQS). However the hourly mean objective for nitrogen dioxide (NO_2) was exceeded slightly at Hillingdon during 1997. The indicative provisional annual average objective of 21 parts per billion (ppb) for NO_2 was exceeded at Hillingdon and at Hounslow Roadside during 1998.

5.8 Particulate matter (PM_{10}) concentrations at London Hillingdon met the new annual objective for 2004 during 1997 and 1998. However, the measured concentrations exceeded the new indicative annual level for 2009 of 20 microgrammes per cubic metre ($\mu g\ m^{-3}$). Few locations in England can currently meet the indicative level for PM_{10} because of long distance transport of the pollutant. Concentrations at the site also met the new 24 hour objective of 50 $\mu g\ m^{-3}$ during 1998, although this value may have been exceeded in 1997. The indicative objectives of 50 $\mu g\ m^{-3}$ for the 99th percentile of daily maximum running 24 hour means were not achieved at the London Hillingdon site during 1997 or 1998.

5.9 The monitoring results for the Highways Agency show that the concentration of NO_2 exceeded the NAQS provisional annual average objective of 21 ppb (40 $\mu g\ m^{-3}$) at both the Cranford Park School during 1993/4 and the Staines M25 site during 1996/97. Carbon monoxide (CO) concentrations at the Staines M25 site exceeded the objective value of 10 parts per million (ppm) as an 8-hour average during 1996, but not during 1997. The annual average PM_{10} concentration at the Staines M25 site achieved the objective of 40 $\mu g\ m^{-3}$ during 1997, but just failed to meet the objective in 1996. The provisional objective of 50 $\mu g\ m^{-3}$ as 99th percentile of daily maximum running 24 hours means was not achieved in either 1996 or 1997. It is expected that concentrations of all these pollutants will decrease substantially in future years as a result of reductions in emissions from motor vehicles.

5.10 The monitoring results for Heathrow Airport indicate that the annual average concentrations of NO_2 at the Old Apron site exceeded the NAQS provisional 40 $\mu g\ m^{-3}$ objective between 1993 - 1996. Maximum hourly concentrations also exceeded the one hour average objective of 150 ppb during 1994, 1995 and 1996. CO concentrations at the Old Apron site were less than the objective of 10 ppm as an 8 hour average.

5.11 The NO_2 diffusion tube monitoring undertaken at a number of kerbside, intermediate and background sites, by Slough Borough Council, during 1995 - 1997, shows that the provisional annual average objective of 21 ppb (40 $\mu g\ m^{-3}$) was met at all background and intermediate sites in Slough, except Cooper Way. However concentrations at the kerbside sites on Farnham Road and Windsor Road (Slough) exceeded the objective. At Daventry Close (Poyle), a residential site 600 metres from the proposed EfW facility, annual average NO_2 concentrations were 4.7 ppb less than the objective limit.

5.12 The concentrations of a number of metals are measured at sites in Central London and Brent. The annual average concentrations of trace elements for the years 1990/1 to 1994/5 indicate that current background levels are trivial in comparison with the Environment Agency guidance limits, with the exception of cadmium. The background levels for cadmium are approximately 20% of the guidance limit.

Environmental Change Without the Proposals

Modelling and Forecasting Studies

5.13 DETR forecasts for estimated concentrations of NO_2 and PM_{10} in future years indicate that NO_2 concentrations are expected to slightly exceed the indicative annual level of 21 ppb at Hillingdon in 2005, but will meet the objective by 2009. At Teddington, NO_2 concentrations will already meet the indicative objective and further reductions in concentrations are expected in future years. PM_{10} concentrations at Hillingdon are expected to meet the objectives for 2004, but not the stricter objectives for 2009. The indicative level for PM_{10} 2005 of 50 $\mu g\ m^{-3}$ as the 99th percentile 24 hour rolling means is also unlikely to be met.

Impact of Other Proposed Developments

Heathrow Terminal 5

5.14 Extensive modelling of air quality has also been undertaken by BAA in the vicinity of the EfW plant in connection with the proposed development of Heathrow Airport Terminal 5 (T5). The model results show a general pattern of concentrations with the highest concentrations on the airport itself and alongside the M4 and M25 motorways. The contribution of airport sources to modelled concentrations decreases with distance from the airport.

5.15 The Heathrow Airport models have been used to predict concentrations of pollutants at a number of locations around the perimeter of the airport for 1993 and 2016, both with and without T5. Airport sources will contribute less than 20% to concentrations of oxides of nitrogen (NOx) in areas to the west of the M25 in 2016 if T5 is built. The results show that NOx concentrations at locations at the perimeter of the airport are expected to decrease in future years if T5 is not built. The concentrations at perimeter locations are expected to remain about the same in future years if T5 is built.

LIFE proposals

5.16 Argent are proposing to develop an inter-modal rail facility on land adjacent to the proposed Lakeside EfW site. The London International Freight Exchange (LIFE) scheme will generate significant additional traffic, particularly on the A4 Colnbrook Bypass (see Chapter 8, Traffic). It is estimated that this will result in an increase in annual average NO_2 concentration at roadside locations near the A4 at Brands Hill, of 1.2 ppb compared to the no LIFE scheme case. Similarly it has been estimated that the 99th percentile 24 hour mean PM_{10} concentration will increase by 0.5 $mg\ m^{-3}$, compared to the no LIFE scheme case.

Stack Dispersion Modelling

5.17 The principal source of emissions discharged to atmosphere from the normal operation of the proposed Lakeside facility will be from the stack serving the EfW and CWI plants. The concentrations of pollutants will be dispersed

Table 6a: **Air Quality Standards and Guidelines Applied in the Assessment**

Pollutant	Limit value	Averaging time	Frequency of exceedance	To be achieved by	Source
Nitrogen dioxide	200 µg m^{-3}	One hour average	18 times per year	31 December 2004	A
	40 µg m^{-3}	Annual average		31 December 2005 (provisional)	A,B
	150 ppb	One hour average	Maximum	31 December 2005	B
Sulphur dioxide	100 ppb	15 minute average	99.9 th percentile	31 December 2005	B
	350 µg m^{-3}	1 hour average	24 times per year	31 December 2004	C
	125 µg m^{-3}	24 hour average	3 times per year	31 December 2004	C
	7ppb (20µg m^{-3})	Annual + winter average			C
Particulate matter	40 µg m^{-3}	Annual average	35 times per year	31 December 2004	A
	50 µg m^{-3}	24 hour average		31 December 2004	A
	50 µg m^{-3}	Maximum running 24 hour means	99 th percentile	31 December 2004 (indicative value)	A,B
	20 µg m^{-3}	Annual average		31 December 2009 (indicative value)	A
	50 µg m^{-3}	24 hour average	7 times per year	31 December 2009 (indicative value)	A
Carbon monoxide	10 ppm	Running 8 hour mean	Maximum	31 December 2003	A,B
Lead	0.5 µg m^{-3}	Annual average		31 December 2004	A
	0.25 µg m^{-3}	Annual average		31 December 2008	A

in the atmosphere by atmospheric turbulence, so that ground level concentrations will be generally several orders of magnitude lower than the emission concentrations at source. These processes have been modelled using a dispersion model.

5.18 Estimates of the rate of emission from each of the plants have been used to predict ground level concentrations from the proposed EfW and CWI plants with meteorological conditions least favourable to dispersion. The predicted ground level concentrations have then been compared with air quality standards and guidelines.

5.19 Emissions of prescribed pollutants to air, water or land from waste incinerators with a capacity of greater than one tonne per hour are controlled by the Environment Agency (EA), under the system of Integrated Pollution Control (IPC) implemented by the Environmental Protection Act 1990, Part 1. Incinerator operators proposing to release pollutants to the environment require authorisation from the EA. The Authorisation will contain specific emission limits for the release of pollutants. These are set on the basis of environmental standards relevant to the process, and benchmark release levels, taking account of the principles of Best Available Techniques Not Entailing Excessive Costs (BATNEEC) and having regard to the Best Practicable Environmental Option (BPEO).

5.20 New municipal waste incinerators with capacity greater than 3 tonnes per hour are subject to the requirements of European Directive on Air Pollution from New Municipal Waste Incinerators (EC89/369, (Table 7). The Hazardous Waste Incineration Directive, 94/67/EC, also applies to most clinical waste incinerators (Tables 8 and 10). The European Community has also recently produced a Draft Directive on the Incineration of Wastes (June 1998), which will replace both these Directives. Although the Directive has no legal status and its future is uncertain, most new waste incineration plans are currently designed to achieve the proposed emission limits. In practice however, the pollution abatement technologies applied at the Lakeside EfW and CWI plants, will limit the emission concentrations to levels below the limit values set in the Draft Directive. The emissions limits for the Draft Directive are shown in Tables 8 - 10.

5.21 For the purposes of the stack dispersion modelling it has been assumed that the IPC Authorisation limits for the EfW and CWI plants will be set at around the EC Draft Waste Incineration Directive limits. The specified waste throughput for the EfW plant is 400,000 tonnes per annum through two incineration streams each with a capacity of 27 tonnes per hour. Each of the incineration streams will discharge through a separate flue into the same chimney stack. The maximum rates of emission per incineration stream

Table 6b: **Air Quality Standards and Guidelines Applied in the Assessment Environmental Assessment Levels**

Pollutant	Limit value	Averaging time	Source
Hydrogen chloride	7 µg m^{-3}	Annual average	D
	700 µg m^{-3}	Hourly average	D
Hydrogen fluoride	250 µg m^{-3}	Hourly average	D
Benzo (a) pyrene	0.25 ng m^{-3}	Annual average	E
Arsenic	3. 10^{-3} (µg m^{-3})$^{-1}$	Lifetime risk	F
	0.2 µg m^{-3}	Annual average	D
	6 µg m^{-3}	Hourly average	D
	0.2 mg m^{-2} day^{-1}	Average deposition rate	D
Antimony	5 µg m^{-3}	Annual average	D
	150 µg m^{-3}	Hourly average	D
Cadmium	0.005 µg m^{-3}	Annual average	D
	1.5 µg m^{-3}	Hourly average	D
	0.009 mg m^{-2} day^{-1}	Average deposition rate	D
Chromium (VI)	4. 10^{-2} (µg m^{-3})$^{-1}$	Lifetime risk	F
Chromium (VI)	0.1 µg m^{-3}	Annual average	D
Chromium (VI)	3 µg m^{-3}	Hourly average	D
Chromium (II, III)	5 µg m^{-3}	Annual average	D
Chromium (II, III)	150 µg m^{-3}	Hourly average	D
Chromium	1.5 mg m^{-2} day^{-1}	Average deposition rate	D
Cobalt	0.2 µg m^{-3}	Annual average	D
	6 µg m^{-3}	Hourly average	D
	0.49 ng m^{-2} day^{-1}	Average deposition rate	D
Copper	10 µg m^{-3}	Annual average	D
	200 µg m^{-3}	Hourly average	D
	0.25 mg m^{-2} day^{-1}	Average deposition rate	D
Manganese	1 µg m^{-3}	Annual average	D
	1500 µg m^{-3}	Hourly average	D
Mercury	1 µg m^{-3}	Annual average	D
	15 µg m^{-3}	Hourly average	D
	0.004 mg m^{-2} day^{-1}	Average deposition rate	D
Nickel	4. 10^{-4} (µg m^{-3})$^{-1}$	Lifetime risk	F
	0.2 µg m^{-3}	Annual average	D
	6 µg m^{-3}	Hourly average	D
	0.11 mg m^{-2} day^{-1}	Average deposition rate	D
Thallium	1 µg m^{-3}	Annual average	D
	30 µg m^{-3}	Hourly average	D
Vanadium	1 µg m^{-3}	Hourly average	D

KEY

A Review of UK National Air Quality Strategy, 1999
B Air Quality Regulations, 1997
C EC Air Quality Daughter Directive , 1998
D Environment Agency Technical Guidance Note E1
E EPAQS Draft Recommendation
F WHO Guidelines for Europe

calculated for the EfW based on the proposed Draft Waste Incineration Directive limits are detailed in Table 6.

5.22 The waste throughput for the CWI plant will be 2 tonnes per hour. The CWI will discharge through two separate flues into the chimney stack used by the EfW plant. Calculated rates of emission per incineration stream for the CWI based on the Draft Waste Incineration Directive are shown in Table 7.

The Dispersion Model

5.23 Ground level concentrations of pollutants and rates of deposition with the EfW facility have been modelled using the UK Atmospheric Dispersion Modelling System (ADMS-2). ADMS was preferred over other models (such as the US EPA model ISCST and AERMOD) because it provides a better representation of the physical processes of dispersion and has an established track record of use in similar studies and greater flexibility of operation. The model also allows for the effects of plume rise and the presence of buildings. Estimates of the likely concentration of pollutants emitted from the stack from both the EfW and CWI have been used for the model (see Tables 6 and 7).

5.24 The dispersion of pollutants is affected by meteorological conditions such as the speed and direction of the wind, boundary layer height and surface heat flux. For this study, statistically analysed meteorological data for Heathrow Airport, immediately to the east of the site, for the period 1988-97, was used to represent meteorological conditions. The prevailing wind direction is from the south/south west.

5.25 The nature of the surface of the terrain in the vicinity of the proposed site can also have a significant influence on dispersion. The land around the plant is generally flat and therefore has not been taken into account in the modelling. The land surface roughness was assumed in the modelling to be 0.2 metres, which is characteristic of rough agricultural land.

Table 7: **Municipal Waste Incineration Directive (89/369 EEC) Maximum plant emission limits**

Pollutant	Concentration limit mg m^{-3}	Conditions
Total dust	30 39	7 day rolling average Daily average
Hydrogen Chloride (HCl)	50 65	7 day rolling average Daily average
Carbon Monoxide (CO) #	100	Hourly average. 90% of measurements taken in any 24 hours must be less than 150 mg m^{-3}
Hydrogen Fluoride (HF)	2	Periodic sample
Sulphur Dioxide ($S0_2$)	300	Periodic sample
Heavy metals Lead (Pb)+Chromium (Cr) +Copper (Cu)+ Manganese (Mn)	5	Periodic sample. Applies to metals and their compounds expressed as metal.
Nickel and Arsenic (Ni + As)	1	Periodic sample. Applies to metals and their compounds expressed as metal.
Cadmium and Mercury (Cd + Hg)	0.2	Periodic sample. Applies to metals and their compounds expressed as metal.
Volatile Organic Compounds VOCs #	20	Periodic sample. As total carbon.

 # CO and VOC limits apply to combustion gases prior to gas cleaning as a measure of combustion performance.

Table 8: **Hazardous Waste Incineration Directive (94/76/EC) and Draft Directive on the Incineration of Wastes (June 1998) Maximum plant emission limits daily average values**

Pollutant	Limit
Total dust [a]	10 mg m^{-3}
Gaseous and vapourous organic substances (total organic carbon)	10 mg m^{-3}
Hydrogen fluoride	1 mg m^{-3}
Hydrogen chloride	10 mg m^{-3}
Sulphur dioxide	50 mg m^{-3}
Nitric oxide and nitrogen dioxide (as nitrogen dioxide) (Draft Directive only)	200 mg m^{-3}
Carbon monoxide	50 mg m^{-3}
Dioxins and furans (ITEQ - Toxic Equivalent Quotient)	0.1 ng m^{-3}

a. 95% hourly averages for each 24 hour period
Concentration reference conditions are 273 K, 101.3 kPa; dry; 11% v/v O_2

5.26 The presence of large buildings near to the emission source may also affect the dispersion of pollutants from the stack. The effects of buildings are generally insignificant if the building height is less than 40% of the stack height. The EfW facility will be housed in a large building, 42 metres high, 180 metres long and 90 metres wide, aligned at 15° with respect to north. This has therefore been considered in the modelling.

Model Scenarios

5.27 The model was used to examine a number of possible plant operating scenarios as shown in Table 13. The range of scenarios investigated allows the effect of stack height and operation at full and reduced load to be considered. It shows both the separate and combined effects of operation of the CWI and the EfW plant with a stack height of 65, 70 and 75 metres.

Results of Modelling

5.28 The annual average concentrations of pollutants for a 1g/s (gramme per second) emission rate are shown in Figures 15 and 16. These show isopleths ("contours") of concentration superimposed on a map of the area which have been interpolated from the model results using a contour plotting package. For example in Figure 15 the annual average ground level concentration is predicted to exceed 0.18 mg m^{-3} (milligrammes per cubic metre) for a 1 g/s emission rate within the area bounded by the 0.18 contour. Similarly the annual average ground level concentration is predicted to exceed 0.03 mg m^{-3} for a 1 g/s emission rate within the area bounded by the 0.03 contour. For other rates of emission, the predicted increment to ground level concentration may be calculated by multiplying the predicted ground level concentrations in mg m^{-3} shown on the figure, by the rate of emission of the pollutant in g/s set out in Tables 11 and 12.

5.29 Annual average concentrations of pollutants approach the highest levels in the area to

Table 9: **Hazardous Waste Incineration Directive and the Draft Directive on the Incineration of Waste (June 1998) Maximum plant emission limits (half hourly average values)**

Pollutant	Limit
Total dust [a]	30 mg m^{-3}
Gaseous and vapourous organic substances (total organic carbon)	20 mgm^{-3}
Hydrogen fluoride	4 mg m^{-3}
Hydrogen chloride	60 mg m^{-3}
Sulphur dioxide	200 mg m^{-3}
Carbon monoxide	100 mg m^{-3}
Nitric oxide and nitrogen dioxide (as nitrogen dioxide) (applies to Draft Directive only)	400 mg m^{-3}

a. Concentration reference conditions are 273 K, 101.3 kPa; dry; 11% v/v O_2

Table 10: **Hazardous Waste Incineration Directive and the Draft Directive on the Incineration of Waste (June 1998) Maximum plant emission limits average values over the sample period of a minimum of 30 minutes and maximum of 8 hours**

Pollutant	Limit
Cadmium Thallium	Total 0.05 mg m^{-3}
Mercury	0.05 mg m^{-3}
Antimony Arsenic Lead Chromium Cobalt Copper Manganese Nickel Vanadium	Total 0.5 mg m^{-3}

Concentration reference conditions are 273 K, 101.3 kPa; dry; 11% v/v O_2

the north/north east of the facility, between the disused railway and the M25 (Figures 15 and 16). However, the contribution to concentrations decreases rapidly with distance from the stack, so that the contribution from the discharge at the M4/M25 interchange, is approximately half of the highest value. The stack contribution to pollutant concentrations is rather less to the south and west of the stack because prevailing winds are from the south west. For example the annual average contributions to pollutant concentrations at Colnbrook, Poyle and Longford and at The Greyhound Public House on the A4 (GR034773) are less than 20% of the maximum contribution. Predicted annual average concentrations of relevant pollutants based on the maximum daily mean rates of emission given in Tables 11 and 12, are shown in Table 14.

5.30 Maximum modelled hourly ground level concentrations of pollutants are shown in Figures 17 and 18. The highest modelled hourly concentrations are approximately 200 metres north east and north west of the stack. The modelled maximum hourly concentrations on the M25 and at The Greyhound Public House on the A4 are approximately half this maximum modelled value. The highest modelled hourly concentrations at Colnbrook, Poyle, Longford and Harmondsworth and at the M4/M25 interchange are approximately one third of the maximum at the location of greatest impact. Table 15 shows predicted maximum hourly contributions to concentrations.

5.31 Figure 19 shows the predicted rates of deposition (wet plus dry) of heavy metals for a 1 g/s emission rate and for a 75 metre stack. It also shows the highest rate of deposition close to the stack with deposition rates falling by a factor of 5 within 500 metres of the stack.

Impact Assessment

Stack Emissions

5.32 An assessment has been made of the potential impact on local air quality of the modelled concentrations of pollutants associated with emissions from the stack compared with relevant air quality standards and guidelines. For those pollutants where air quality objectives are set as part of the UK NAQS, the assessment identifies locations, if any, where exceedance of the objectives is predicted. For most other pollutants, including metals, following Environment Agency guidance, the effects of exposure to concentrations is considered to be insignificant if:

- the predicted maximum annual average ground level concentration from the stack is less than 0.2% of the long term Environmental Assessment Level (EAL);
- the predicted deposition rate on land is less than 0.2% of the maximum deposition rate for land;
- the predicted maximum hourly average ground level concentration is less than 0.2% of the short term EAL.

5.33 For the purposes of the assessment, it has been conservatively assumed that:

Table 11 : **Maximum rates of emission per stream from Energy from Waste Plant**

	Emission rate, g/s		
	Daily mean	**Half hour average**	**30 minute - 8 hour average**
Particulate matter	0.4	1.44	
VOC	0.4	0.96	
Hydrogen fluoride	0.04	0.19	
Hydrogen chloride	0.4	2.89	
Sulphur dioxide	2.0	9.62	
Oxides of nitrogen	8.0	19.25	
Carbon monoxide	2.0	4.81	
Dioxins and furans	$4.0.10^{-9}$		
Cadmium and Thallium			TOTAL $2.0.10^{-3}$
Mercury			$2.0.10^{-3}$
Antimony Arsenic Lead Chromium Cobalt Copper Manganese Nickel Vanadium			TOTAL $2.0.10^{-2}$

Source. AEA Technology

Table 12 : **Maximum Rates of Emission from Clinical Waste Incineration Plant**

	Emission rate, g/s		
	Daily mean	**Half hour average**	**30 minute - 8 hour average**
Particulate matter	00.028	1.44	
VOC	0.028	0.96	
Hydrogen fluoride	0.003	0.19	
Hydrogen chloride	0.028	2.89	
Sulphur dioxide	0.139	9.62	
Oxides of nitrogen	0.556	19.25	
Carbon monoxide	0.139	0.278	
Dioxins and furans	$2.78.10^{-10}$		
Cadmium and Thallium			TOTAL $1.39.10^{-4}$
Mercury			$1.39.10^{-4}$
Antimony Arsenic Lead Chromium Cobalt Copper Manganese Nickel Vanadium			TOTAL $1.39.10^{-3}$

Source. AEA Technology

- both plants operate at capacity;
- both plants operate at their emission limits at all times; and
- the calculations have been based on the modelled concentrations at the location of greatest impact.

Nitrogen Dioxide

5.34 For NO_2 the annual average concentrations have been estimated following DETR guidance (*Review and Assessment : Pollutant - specific guidance :Part IV of the Environment Act 1995, Local Air Quality Management, 1998*) which recommends that it can be assumed that 20% of nitrogen oxides from the stack at the point of maximum impact is converted to NO_2. The total annual average NO_2 was calculated as the sum of 20% of the annual average oxides of nitrogen concentrations at the location of greatest impact and the appropriate background concentration. The contribution of emissions from the EfW facility to annual average NO_2 concentrations, are predicted to be small even under the worst operating conditions (Figure14).

5.35 The calculations show that the indicative NO_2 limit of 21 ppb (40 $\mu g\ m^{-3}$) for 2005 included within the NAQS will be exceeded at many near road sites and on Heathrow Airport, irrespective of whether the EfW facility is in operation. It is recognised by DETR that there will be widespread exceedances of this indicative limit at many near road locations in the London area. Therefore this objective is likely to remain only as a provisional objective until a further review is undertaken by the DETR. The contribution from the EfW facility, to annual average NO_2 concentrations at the location of greatest impact is predicted to be less than 2% of the 40 $\mu g\ m^{-3}$ objective for 2005.

5.36 Modelled concentrations during the hour of maximum impact, have been calculated assuming that oxides of nitrogen in the discharge are at the higher 400 $mg\ m^{-3}$ limit (as specified in the EC Draft Directive, half hourly average values), and hourly background concentrations are twice the annual

average background concentration (Figure 16). The results show that stack emissions on this very conservative basis are not sufficient to cause exceedance of the one hour average NAQS objective of 150 pbb during the hour of maximum impact.

5.37 The 99.8th percentile hourly concentrations for NO_2 calculated on the same conservative basis meet the proposed revised NAQS objective of 100 ppb for NO_2 at roadside locations close to the M25 for the 75 m stack. The objective would be exceeded for a 65 m stack in the industrial area close to the stack and close to the M25 roadside. However, it is unlikely that the discharge concentrations would remain at the half-hour average limit value for sufficient periods. In practice, emission concentrations of oxides of nitrogen are also expected to be typically 80-300 mg m^{-3} as a result of the abatement measures to be employed. Reducing the emission concentrations to these levels will result in predicted concentrations markedly less than the revised NAQS objective.

Sulphur Dioxide

5.38 The predicted 99.9th percentile of 15 minute average concentrations for SO_2 are considerably less than the 100 ppb NAQS objective, for both 65 metre and 75 metre high stacks. Comparison with the EC Air Quality Daughter Directive 1 hour and 24 hour objectives (Table 6a) shows that the predicted concentrations are also considerably less than the objectives. The predicted annual average concentration at the location of maximum impact is estimated to be 5.5 ppb for a 65 metres stack and 5.3 ppb for a 75 metres stack. It is therefore concluded that SO_2 emissions from the plant are also unlikely to result in the exceedance of the annual average objectives of 7 ppb for the protection of ecosystems set by the Air Quality Daughter Directive.

Particulate Matter

5.39 Comparing the predicted concentrations of particulate material (PM_{10}) with the NAQS objectives, shows that the contribution from the stack would be small compared to the objective limits and to contributions from other sources. The proposed NAQS objective for annual average PM_{10} concentrations (40 µg m^{-3}) is likely to be met. The indicative value of 50 µg m^{-3} as the 99th percentile of 24 hour running averages by 2005 will not be achieved as background.

Carbon Monoxide

5.40 The maximum hourly carbon monoxide (CO) concentrations are small (approximately 5% or less) compared with the NAQS 8 hour average objective of 10ppm. Maximum 8 hour average concentrations are typically less than 70% of the maximum hourly concentration. It is therefore unlikely that CO concentrations resulting from the stack emissions will result in the exceedance of the NAQS objectives.

Hydrogen Chloride and Hydrogen Fluoride

5.41 Modelled annual average concentrations of hydrogen chloride are approximately 2% of the long term EAL for a 75 metre stack and 3% of the EAL for a 65 metre stack. The modelled maximum hourly average concentrations is approximately 4% of the short- term EAL for a 75 metre stack and 5% of the EAL for a 65 metre stack. There is no long term EAL for hydrogen fluoride. The modelled concentration of hydrogen fluoride is less than 1% of the short-term EAL. These values are based on the maximum predicted rates of emissions shown in Tables 11 and 12 and will in practice overestimate the concentrations.

Cadmium and Thallium

5.42 The modelled annual average concentrations of total cadmium and thallium at the location of maximum impact, with the plant operating to its emission limits are predicted to be less than 35% of the long term EAL value for cadmium of 5 ng m^{-3} for the 75 metre stack. The maximum hourly concentrations of cadmium and thallium at the location of maximum impact, are predicted to be less than 2% of the short- term EAL. In practice, emission concentrations of cadmium at the EfW plant will be typically much less than the maximum emission values specified in Tables 11 and 12. It is therefore unlikely that emissions of cadmium and thallium from the plant will lead to exceedances of the EALs.

Mercury

5.43 Modelled annual average and maximum hourly concentrations of mercury are predicted to be less than 0.2% of the EAL of both the long term and short term EALs, thus it is concluded that the risk of exceeding the EALs for mercury is negligible.

Table 13 : **Model Scenarios**

Scenario	Stack height	Effective stack diameter, m	Discharge velocity ms^{-1}	Notes
A	75	2.52	15	EfWI, 1 stream
B	75	3.56	15	EfWI, 2 streams
C	65	3.56	15	EfWI, 2 streams
D	65	2.52	15	EfWI, 1 stream
E	75	2.52	10	EfWI, 1 stream reduced load
F	75	0.74	15	CWI
G	70	3.56	15	EfWI, 2 streams
H	75	3.62	15	EfWI, 2 streams + CWI

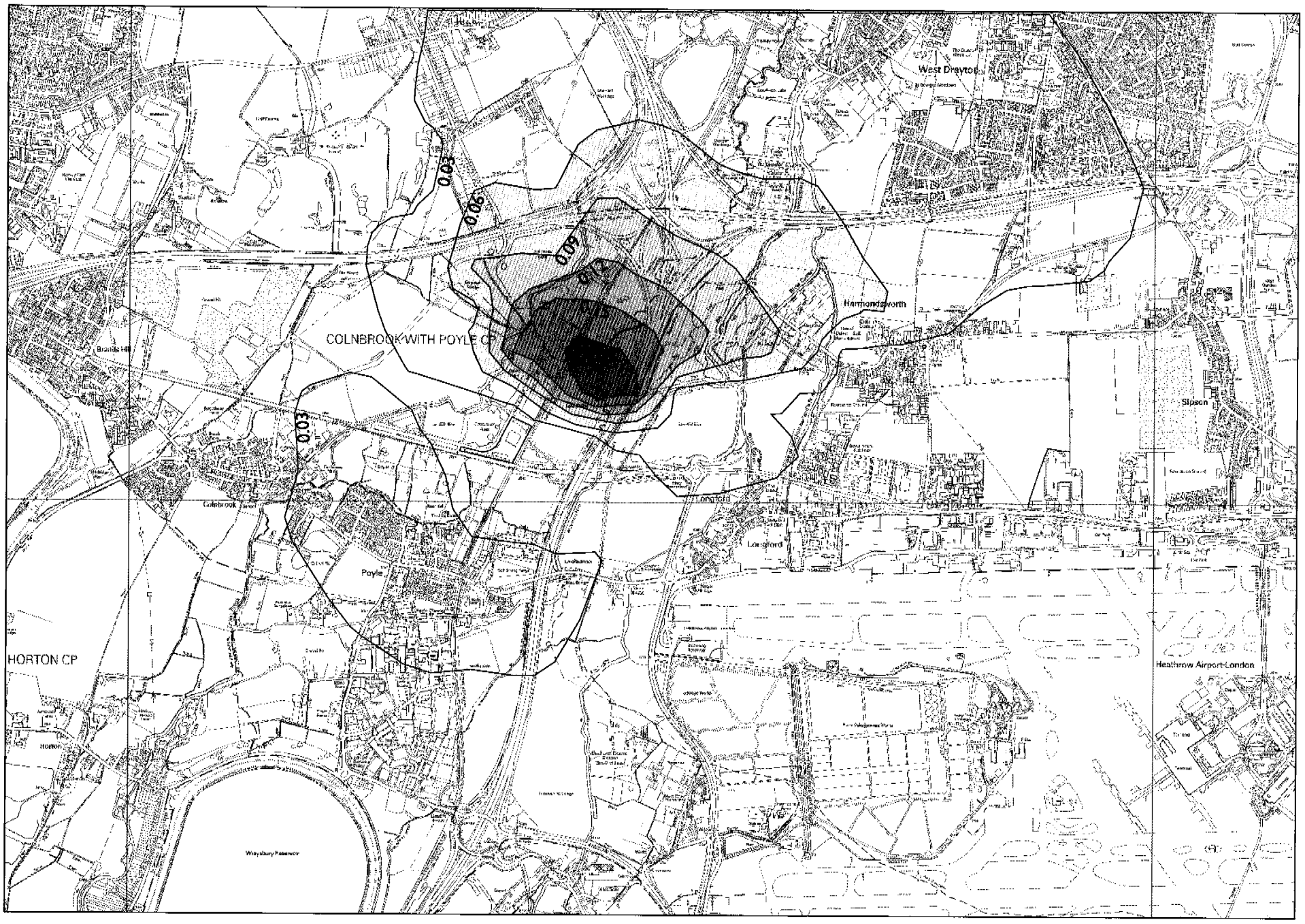


Figure 15 : **Annual average ground level concentrations 75m stack, 1 stream operation**

Isopleths show concentrations in microgrammes per cubic metre for 1 g/s emission

Source. AEA Technology

Scale. 1:25 000

North

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A

Figure 16 : **Annual average ground level concentrations 75m stack, 2 stream operation**

Isopleths show concentrations in microgrammes per cubic metre for 1 g/s emission

0.03
0.06
0.09
0.12
0.15
0.18

Source. AEA Technology

Scale. 1:25 000

North

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A

Figure 17 : **Maximum hourly ground level concentrations 75m stack, 1 stream operation**

Isopleths show concentrations in microgrammes per cubic metre for 1 g/s emission

Source. AEA Technology

Scale. 1:25 000

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A

Figure 18: **Maximum hourly ground level concentrations 75m stack, 2 stream operation**

Isopleths show concentrations in microgrammes per cubic metre for 1 g/s emission

1
2
3
4
5

Source. AEA Technology

Scale. 1:25 000

North

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A

Figure 19 : **Annual average deposition rate 75m stack, 2 stream operation**

Isopleths show concentrations in microgrammes per square metre for 1 g/s emission

- 0.0002
- 0.0004
- 0.0006
- 0.0008
- 0.0010

Source. AEA Technology

Scale. 1:25 000

North

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Other Metals

5.44 The predicted concentrations of other metals at the location of maximum impact are calculated to be less than 20% of their EALs. In practice, the emission of other metals is predominantly made up of lead and zinc, with other metals being present in municipal wastes at concentrations less than typically found in coal. Ambient environmental concentrations are small, therefore it is unlikely that process emissions of these metals will lead to environmental concentrations in the atmosphere exceeding the EALs. The maximum hourly concentrations of other metals at the location of maximum impact, with the plant operating at capacity and to its emission limits for metals, are predicted to be less than 30% of the most stringent short term EAL (1µg m^{-3} for vanadium).

Health Risk Assessment

5.45 The health effects from the proposed EfW facility have been assessed by comparison with established air quality standards and guidelines where they exist. For those species for which standards are not defined, a further health risk assessment has been undertaken. These include:

- Cadmium;
- Thallium;
- Arsenic;
- Nickel;
- Lead;
- Mercury;
- Tin;
- Antimony;
- Copper;
- Manganese;
- Vanadium;
- Dioxins and furans (PCDD/Fs)

Metals

5.46 There is currently no legislation in the UK controlling the concentrations of metals, other than lead, in the ambient air. The World Health Organisation (WHO) have established guideline values for metallic substances emitted from waste incinerators. The guidelines provide data on the uptake by inhalation, ingestion from water and food and dermal contact where relevant. Data is then presented on the lowest concentrations at which adverse effects are observed in humans, animals and plants.

5.47 Occupational Exposure Limits (OELs) are also published annually by the Health and Safety Executive. These provide an assessment of the toxicological effects of a pollutant. The limits are based on an assessment and review of the available evidence relating to the health effects of exposure to heavy metals.

5.48 The Environment Agency has published EALs for releases of these substances based on the World Health Organisation Air Quality Guidelines (for cadmium, manganese, mercury, vanadium) or Health and Safety occupational exposure limits. Protection factors have been applied to the limits to allow for the different sensitivity of other receptor populations, for example, children, the elderly or those with diseases such as asthma, and for different patterns of exposure. The protection factor applied to long term exposure to metals in deriving long-term EALs is typically 100. The Environment Agency Guidance recommends that the effects of exposure at concentrations less than 0.2% of the EAL be considered insignificant. More detailed assessment of substances considered insignificant is not warranted.

5.49 The Environment Agency also provides Maximum Deposition Rate limits for deposition of metals (arsenic, cadmium, chromium, cobalt copper, lead, mercury and nickel) from air into soil and vegetation. The Maximum Deposition Rate is the quantity of pollutant which can be added to the soil over 50 years before selected soil quality criteria are exceeded.

5.50 The possible routes of exposure (via inhalation, ingestion of food and water and dermal contact) of the population in the vicinity of the proposed EfW facility were considered in the light of the WHO Guidelines. No special circumstances were identified that would render the WHO Guidelines inapplicable.

5.51 The WHO Guideline values for the non-carcinogenic substances were then compared with the EALs. The EALs for these substances were generally at least as stringent as the WHO Guidelines. The predicted concentrations derived from the dispersion modelling have therefore been compared for these substances with the EALs. The lifetime cancer risk has been calculated for carcinogenic substances (arsenic, chromium, and nickel) following the WHO Guidelines (Table 16). The incremental risk based on WHO risk factors and the modelled concentrations of pollutants at the location of greatest impact approximately 300 m north east of the EfW facility (Orlitts Lake South) have also been assessed.

Interpretation of Risk

5.52 There is considerable debate with respect to the level of risk that is considered to be acceptable. For this study a target annual risk of 1 in 1,000,000 as stated by the Royal Commission on Environmental Pollution (RCEP, 1993), equivalent to a 1 in 14,300 lifetime risk has been adopted (assuming a lifetime of 70 years). Table 16 shows the additional risks that the local population might face as a result of heavy metal emissions from the plant.

5.53 In the absence of the facility, the risk of contracting a fatal cancer is 1 in 5. For comparison the lifetime fatal risk from road accidents, accidents in the private home and fire are 1 in 143, 1 in 154 and 1 in 952 respectively.

5.54 There are no residential properties in the location of greatest impact. At locations further from the stack and towards the south west where there are significant numbers of residential dwellings, the predicted concentrations and hence the risk is significantly less. The annual average

Table 14 : **Annual average concentrations of pollutants at the location of greatest impact (μgm^{-3})**

Model scenarios *	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**Guideline**
Pollutant									
Particulate matter	0.10	0.13	0.22	0.17	0.10	0.019	0.17	0.13	40 (PM_{10})
VOC	0.10	0.13	0.22	0.17	0.10	0.019	0.17	0.13	
Hydrogen fluoride	0.01	0.01	0.02	0.02	0.01	0.002	0.02	0.01	
Hydrogen chloride	0.10	0.13	0.22	0.17	0.10	0.0197	0.17	0.13	
Sulphur dioxide	0.49	0.63	1.10	0.87	0.49	0.097	0.83	0.63	
Oxides of nitrogen	1.95	2.51	4.40	3.46	1.97	0.39	3.31	2.52	40 (NO_2)
Dioxins and furans	$0.98.10^{-9}$	$1.26.10^{-9}$	$2.20.10^{-9}$	$1.73.10^{-9}$	$0.99.10^{-9}$	$1.94.10^{-10}$	$1.7.10^{-9}$	$1.26.10^{-9}$	
Cadmium	$4.88.10^{-4}$	$6.28.10^{-4}$	$1.10.10^{-3}$	$8.66.10^{-4}$	$4.93.10^{-4}$	$9.7.10^{-5}$	$8.28.10^{-4}$	$6.29.10^{-4}$	0.005
Thallium	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	1
Mercury	$4.88.10^{-4}$	$6.28.10^{-4}$	$1.10.10^{-3}$	$8.66.10^{-4}$	$4.93.10^{-4}$	$9.7.10^{-5}$	$8.28.10^{-4}$	$6.29.10^{-4}$	1
Antimony	$4.88.10^{-3}$	$6.28.10^{-3}$	$1.10.10^{-2}$	$8.66.10^{-3}$	$4.93.10^{-3}$	$9.7.10^{-4}$	$8.28.10^{-3}$	$6.29.10^{-3}$	5
Arsenic	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	0.2
Lead									0.25
Chromium									0.1 (VI)
									5 (II or III)
Cobalt									0.2
Copper									10
Manganese									1
Nickel									0.2
Vanadium									-

Table 15 : **Predicted maximum hourly contributions to concentrations (μgm^{-3})**

Model scenarios *	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**Guideline**
Pollutant									
Particulate matter	6.53	11.23	15.82	9.28	5.49	0.85	13.34	11.58	
VOC	4.35	7.49	10.54	6.18	3.66	0.57	8.90	7.92	
Hydrogen fluoride	0.87	1.50	2.11	1.24	0.73	0.11	1.78	1.54	250
Hydrogen chloride	13.06	22.46	31.63	18.55	10.98	1.7	26.69	23.15	700
Sulphur dioxide	43.52	74.88	105.44	61.84	36.68	1.9	88.96	77.17	350
NOx (400 mg m^{-3})	87.04	149.76	210.88	123.68	73.21	11.33	177.92	154.34	287(NO_2)
NOx (200 mg m^{-3})	43.52	74.88	105.44	61.84	36.6	5.67	88.96	77.17	287(NO_2)
CO	21.76	37.44	52.72	30.92	18.3	2.83	44.48	38.58	
Cadmium	0.011	0.019	0.026	0.015	0.009	0.001	0.022	0.019	1.5
Thallium	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	30
Mercury	0.011	0.019	0.026	0.015	0.009	0.001	0.022	0.019	15
Antimony	0.109	0.187	0.264	0.155	0.092	0.014	0.222	0193	150
Arsenic	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL			6
Lead									-
Chromium									3 (VI)
									150 (II or III)
Cobalt									6
Copper									200
Manganese									1500
Nickel									6
Vanadium									1

* see *Table 13*

contributions to pollutant concentrations at Colnbrook, Poyle and Longford and at the Public House on the A4 are less than 20% of the contribution at the location of greatest impact (north/north east of the site) and it is therefore estimated that the risk is thus 20% of the value at the location of greatest impact. Thus a person living at these locations during 50 years of plant operation would be exposed to an incremental risk of 1:1,100,000. On this basis it is concluded that emissions of metals from the facility are not predicted to produce an unacceptable risk to health for the local residents.

Dioxins and Furans

5.55 Dioxins and furans (PCDDs and PCDFs) are known to be carcinogenic and are taken up largely by ingestion with food and water. The UK's Committee on the Toxicity of Chemicals in Food, Consumer Products and the Environment has recommended the adoption of a TDI for PCDDs and PCDFs of 10 pg kg^{-1} body weight per day.

5.56 The dispersion of PCDDs and PCDFs released from the stack into the atmosphere has been modelled to predict the maximum ground level concentrations. At ground level the PCDDs and PCDFs will then impact on other environmental media such as air, soil and surface water. From the various environmental media, uptake will occur into the local ecosystems and so finally to foodstuffs which are consumed by humans. The exposure routes assessed included intake of soil, water and food including breast milk and inhalation. As PCDD and PCDF effects are thought to be long term in consequence, annual average values of concentration have been used. The methodology calculated the soil concentration resulting from deposition at the point of greatest annual average PCDD and PCDF concentration. The calculated exposure was then compared to the WHO TDI value.

5.57 The exposure assumptions and study methodology followed that given in HMIP 1996. Assumptions were made about the average dietary behaviour and the behaviour of people exposed to

Table 16 : **Incremental risk of cancer from EfW metal emissions**

Metal	**Incremental lifetime cancer risk ($\mu g\ m^{-3}$) $^{-1}$**	**Estimated maximum annual concentration[a] $\mu g\ m^{-3}$**	**Incremental lifetime cancer risk**
Arsenic	0.003	0.0006	1:560000
Chromium VI	0.04	0.00006[b]	1:420000
Nickel	0.0004	0.0006	1:420000
Total risk			1:220000

[a] *Assuming arsenic, chromium and nickel each comprise 10% of other metal emissions*
[b] *Assuming 10% of chromium is present as hexavalent chromium*

Table 17a : **Exposure to PCDDs and PCDFs for various types of people (exposures as pg TEQ per kg body weight per day)**

Model scenarios	**A**	**B**	**C**	**D**	**E**
Case					
Max ground level concentration (pg TEQ/m^3)	0.84	1.10	1.95	1.58	0.91
Local adult resident	0.02	0.03	0.05	0.04	0.03
Local school child aged 11 to 16	0.03	0.03	0.06	0.05	0.03
Local school child aged 5 to 11	0.04	0.06	0.10	0.08	0.05
Local child aged 1 to 6	0.04	0.06	0.10	0.08	0.05
Local breast feeding baby	0.14	0.18	0.33	0.27	0.16
Local farmer	0.07	0.09	0.16	0.13	0.07
Local child of a farmer	0.13	0.17	0.31	0.25	0.14
Local farmers baby	0.22	0.28	0.50	0.40	0.23
Hypothetically Maximally Exposed Adult	0.18	0.24	0.42	0.34	0.20

Table 17b : **Possible exposure to PCDDs and PCDFs as a percentage of the tolerable daily intake (10 pg per kg body weight per day)**

Model scenarios	**A**	**B**	**C**	**D**	**E**
Case					
Local adult resident	0.23	0.31	0.54	0.44	0.25
Local school child aged 11 to 16	0.26	0.34	0.61	0.49	0.28
Local school child aged 5 to 11	0.44	0.57	1.00	0.82	0.47
Local child aged 1 to 6	0.44	0.57	1.00	0.82	0.48
Local breast feeding baby	1.41	1.83	3.33	2.66	1.58
Local farmer	0.69	0.91	1.58	1.33	0.75
Local child of a farmer	1.33	1.75	3.08	2.49	1.41
Local farmers baby	2.16	2.83	4.99	3.99	2.33
Hypothetically Maximally Exposed Adult	1.83	2.41	4.24	3.41	2.00

emissions to ensure that under prediction of the exposure did not occur. In consequence, the results will tend to provide a worst case for the possible exposure arising from the operation of the plant.

5.58 Tables 17a show the predicted exposure to PCDDs and PCDFs for various types of people (exposures as pg TEQ per kg body weight per day) for each of the model scenarios A - E. Table 17b shows the possible exposure as a percentage of the TDI (10 pg per kg body weight per day).

5.59 The conclusion of the risk assessment is that the exposure arising from the EfW facility is likely to be a small fraction, at most 6% (for a 65 metre stack) or 2.4 % (for a 75 metre stack), of the TDI for PCDDs and PCDFs recommended by the UK Committee on the Toxicity of Chemicals in Food, Consumer Products and the Environment. The assessment has been based on the hypothetically most exposed adult and on the worst case ground level concentrations. It is therefore concluded that the risk to human health from the emissions of dioxins and furans is negligible.

Traffic Emissions

5.60 The impacts of traffic emissions to air for the existing Colnbrook facility operating at planned capacity and the new EfW facility have been assessed using data from the Traffic Impact Assessment study (see Chapter 9 Traffic) and the Highways Agency draft Design Manual for Roads and Bridges. The impact from traffic during peak hours has been assessed as representing the worst case. Traffic flows during the construction period will be significantly lower than during operation of the facility and thus have not been considered in the assessment.

5.61 Based on monitoring data and DETR Pollutant Specific Guidance to Local Authorities the predicted background concentrations of NO_x, CO and PM_{10} are expected to decrease markedly between now and 2005 at roadside locations along the A4. The changes in traffic on the A4 resulting from the operation of the EfW facility will have little effect on roadside concentrations of these pollutants. The reduction in traffic resulting from operation of the EfW facility, compared to the existing consented operations will result in a slight improvement in the air quality at roadside locations.

Odours

Construction and Demolition Impacts

5.62 The potential for odour emissions during the demolition of the old plant will be minimised by removing all deposits and residues by vacuuming prior to any work taking place following by a complete washdown of the plant.

Operational Impacts

5.63 Odours may arise during operation of the EfW facility from a number of sources including:

- handling and storage of wastes and raw materials;
- stack flue gas where there is poor combustion control or poor dispersion;
- ash handling.

5.64 One of the potential sources of odour will be the handling and storage of putrescible wastes at the facility prior to incineration. The main odorous areas are potentially:

- The tipping hall
- The materials reclamation facility
- The refuse storage bunkers
- The stoker feed chutes
- The ash pit
- Clinical waste storage areas

5.65 Effective control of the odours at the EfW plant will depend on the enclosure of odorous areas, drawing air from the area at a rate at which the odour is produced, and prevention of anaerobic conditions within the waste bunker. A useful rule of thumb is that extracting air at a rate to provide one air change per hour will limit fugitive release of odours from a well-sealed industrial building. The total volume of the waste handling and storage areas is estimated to be 150,000 m^3. Thus an extraction air flow of 42 $m^3 s^{-1}$ (cubic metres per second) will be sufficient to limit fugitive release of odours from the building. The design gas flow for the EfW plant is approximately 40 $m^3 s^{-1}$ per stream. The air requirements for one incinerator stream extracted from the odorous areas of the building should therefore limit fugitive odour release. The availability of two incinerator streams at the plant will thus provide back-up capacity for odour treatment during periodic shutdown of one of the streams.

5.66 The existing CWI has not caused any reported odour impact. Measures such as keeping the waste in sealed containers until incineration, disposal of the wastes within 48 hours, and the washing of containers, has been effective in containing odour and the washing of containers. These measures will continue to be applied in the new clinical waste facility and it is therefore unlikely that it will have any odour impact.

5.67 During plant maintenance or breakdown of the EfW plant, there may be short periods when neither incinerator stream is in operation and both extraction fans are out of operation. Under these circumstances, if large quantities of waste are being stored, fugitive emissions of odour from the facility may occur. It is estimated that the rate of fugitive loss under most meteorological conditions will be approximately 42 $m^3 s^{-1}$ equivalent to one air change per hour. The odour concentration will depend on the amount of putrescible waste being stored and the time of storage. Typical odour concentrations would be in the range 100-1500 ou m^{-3}. Rates of odour concentrations based on the rate of fugitive loss, are thus likely to be in the range 4,200- 63,000 ou/s with a typical value of 21,000 ou/s.

5.68 The potential for odour complaints for such releases has been estimated assuming stable low wind speed atmospheric conditions. The

estimated maximum distance from the plant at which odour complaint might be experienced in these circumstances is 700 metres. In practice, it is unlikely that such a combination of conditions will occur except on rare occasions. Also the waste will be carefully managed to prevent odour nuisance, therefore it is unlikely that the predicted odour emission rates and hence complaints will arise.

Stack odour

5.69 Incineration of odorous air will result in the destruction of most odorous substances. However, in practice, some residual odour may remain so that the gases discharged from the stack may have an odour concentration, estimated to be approximately 1000 ou m^{-3}. With two incinerator streams in operation, there is thus the potential for an odour emission of around 100,000 ou/s from the stack. The contribution from the CWI is negligible. It is therefore very much less than the uncertainty in the estimate of odour emissions.

5.70 The results of the dispersion modelling using ADMS-2 shown in Figures 15 - 19 have been used to estimate ground level odour concentrations during meteorological conditions least favourable to dispersion. These show that short-term peak odour concentrations may be approximately 3 - 5 ou m^{-3} approximately 300 metres north of the facility, but are predicted to be half this value at the nearest residential properties in Poyle. It is therefore concluded that a 65 metre or 75 metre high stack will be sufficient to prevent odour nuisance from incinerator discharges at any location.

Dust

Construction and Demolition Impacts

5.71 The demolition and construction works associated with the development of the EfW facility will have the potential to generate dust. One of the first tasks will involve removal of the existing CWI, MRF workshop buildings and chimney and breaking up of the floor slab. During construction of the new plants, dust may also be generated during handling of aggregates, foundation piling and by site traffic on unpaved roads.

5.72 Demolition and construction debris consists primarily of large particles with a relatively small proportion of fine material. Fine particles may become airborne and transported from their initial source when the wind speeds are above approximately 3 m s^{-1}. However, particles greater than approximately 100 µm will settle out within a few metres of the source. Smaller particles in the 30-100 µm will settle within approximately 100 m of the source. The smallest particles, particularly those less than 10 µm, may be prevented from settling by atmospheric turbulence and will be transported further from their source. The nearest residential properties are 350 metres away from the site, to the south. At this distance, most of the larger particle dust generated by operations at the site will have settled out. Careful control of activities on site will minimise the risk from smaller particles.

Operational Impacts

5.73 The handling and storage of refuse, chemicals and ash residues resulting from the combustion process have the potential to generate fugitive dust emissions. Most of the particles would be in the 30 - 100 µm range, however a significant proportion of the lime and fly ash would be less than 10 µm. A number of mitigation measures will be put in place to minimise the possibility of fugitive dust losses from the plant during handling and storage of these materials.

Mitigation Measures

Demolition and Construction

Odour

5.74 The potential for odour emissions during the demolition of the old plant will be minimised by removing dry deposits, dust and ash residues by vacuuming prior to any work taking place, followed by a complete washdown of the plant. During washdown all drainage will be collected and promptly tankered away following testing.

Dust

5.75 In order to prevent dust migration, the following Code of Practice will be implemented during demolition and construction of the plant:

- Large components of plant will be carefully dismantled;
- Demolition debris will be quickly removed;
- Lorries will be sheeted during transportation of debris materials;
- Materials will be wetted particularly during crushing and windy conditions;
- Aggregates will be wetted during handling;
- Site foundations will be piled using continuous flight augers which are cleaner and quieter;
- Paved roads around the site will be swept regularly to prevent build up of dusty materials; and
- Unpaved roads on site will be wetted to prevent dust generation during dry weather periods.

Operation

Stack Emissions

5.76 Details of the proposed systems to control the combustion process, the pollution abatement technology to be employed and the arrangements for continuous monitoring of emissions to air, are described in detail in Chapter 3, Proposals. The detailed design and specification of the plant will be agreed with the Environment Agency as part of the IPC Authorisation. The air quality and health risk assessments indicate that the impact of predicted emissions resulting from operation of the EfW plant will not introduce an unacceptable risk to the health of local residents. Therefore no additional mitigation measures are proposed.

Odours

5.77 To prevent odour nuisance, as routine operational procedure, each section of the bunker will be periodically emptied on a rotational basis, in addition to the waste levels being naturally decreased at weekends when refuse deliveries are reduced.

5.78 During plant breakdown or maintenance, the main tipping hall doors will be closed and deodorant will be sprayed on the floor outside of waste tipping hours. During waste tipping hours, fresh waste will be deposited on older waste already in the bunker to cover it completely if necessary. Deodorant will be sprayed over all exposed waste surfaces and the tipping floor.

Dust

5.79 The following measures will be implemented to prevent fugitive emissions of dust during operations:

- Lorries delivering waste materials to the site will be totally enclosed or covered by tarpaulins/nets;
- The unloading of municipal waste from lorries will take place under cover in the tipping hall.
- Air will be extracted from the main tipping area and incinerated, filtered and discharged through the elevated stack. The extraction of air will minimise the possibility of fugitive dust losses from the tipping area.
- Lime and activated carbon will be delivered to the site in enclosed tankers. The tankers will discharge via a pneumatic conveyor to the lime silo. Air extracted from the top of the silo will pass through a bag filter prior to discharge.
- Any material spilled during transfer operations will be promptly cleared up by vacuuming.
- Grate ash from the furnace grate will be cooled in a water bath prior to magnetic separation of ferrous metals. The wet ash will be stored in pits before being removed from the site in covered vehicles. The wet ash material has little potential for dust generation. Spilled material will be cleared up promptly.
- Fly ash will be transferred to dedicated sealed tankers for removal from the site. The transfer operation will take place via an enclosed connection, with displaced air extracted and passed through a bag filter prior to discharge.

Summary of Impacts on Air Quality

- The impact of the proposed Lakeside EfW facility on air quality has been assessed with reference to air quality standards and guidelines for the pollutants released.
- The air quality in the region of the proposed facility has been assessed on the basis of measurements from continuous and static monitoring sites in the vicinity of the proposed facility. These measurements show that the air quality at background locations in the region generally meets the air quality standards prescribed by the UK National Air Quality Strategy, the EC Air Quality Daughter Directive, the Expert Panel on Air Quality Assessment and the World Health Organisation . However, the most stringent air quality standards for nitrogen dioxide and particulate matter are not currently met close to major roads e.g. M4 and M25, or on Heathrow Airport.
- DETR forecasts of the air quality at the London Hillingdon monitoring site, 30 metres from the M4, suggest that the concentrations of nitrogen dioxide and particulate matter will continue to exceed the most stringent standards for these pollutants in 2005. However, these most stringent objectives will be exceeded at locations throughout the United Kingdom. The extent of this exceedance is such that the DETR intends to replace these objectives with less stringent alternatives.
- The impact on air quality of emissions from the proposed EfW facility has been assessed using the dispersion model ADMS Version 2.2. Model results for 20 pollutants show that in general, the contribution from the EfW facility to pollutant concentrations will be small. However, total concentrations of nitrogen dioxide and particulate matter, taking account of background concentrations are predicted to exceed the most stringent air quality objectives. These objectives would not be met irrespective of the operation of the EfW facility. It is therefore concluded that predicted emissions from the facility are unlikely to cause a risk to human health.
- The incremental risk to human health from exposure to metals, dioxins and furans arising from the EfW facility have also been assessed and found to be negligible.
- The impact on air quality of the traffic generated on the A4 Colnbrook Bypass by operation of the EfW facility has been compared with that of the existing waste management operations on the site at consented capacity, for the year 2005. The predictions show that the air quality at roadside locations is expected to improve markedly in future years irrespective of the operations on the site. The proposed EfW facility will improve air quality slightly compared with the currently authorised recovery operations.
- Odours from the site will be controlled by means of a number of measures. These include the incineration of ventilation air. During normal operation the extraction of air from the plant through the burners will be sufficient to limit fugitive releases of odour. Modelling studies based on estimated rates of odour emission show that the impact of odorous discharges from the stack will not be sufficient to cause odour nuisance.
- A number of activities at the site have the potential to release fugitive dust emissions during operations. The escape of dust from the site from most of these activities will be limited by enclosure of operations. Measures to control dust generation during the demolition of the old plant and the construction of the new plant have also been developed.

Chapter Six

6 Water Environment

Introduction

6.1 This chapter assesses the potential impacts on groundwater and surface water resulting from the construction and operation of the proposed Lakeside EfW facility. The assessment examines the following:

- the influence of foundations on groundwater movement;
- the effect of the site layout on surface water run-off and the resulting impact on groundwater recharge and flood risk; and
- the impacts on groundwater and surface water quality.

Existing Environment

6.2 Information has been obtained from the Environment Agency, Slough Borough Council, Thames Water Utilities and other published sources to establish the existing surface and groundwater regime at the site. Supplementary information was obtained from OS maps and the collection of field data.

Geology

6.3 The geological succession within the area of the site consists of Recent and Pleistocene Drift Deposits which lie unconformably on Eocene London Clay and Reading Beds and the Cretaceous Upper Chalk. The Drift Deposits consist of two main components, either Terrace Deposits or Flood Plain Deposits. The lithologies of all the Drift Deposits are similar, comprising largely gravels, sands and silts which are highly permeable and porous. Gravel thickness to the west of the River Colne ranges from 1 – 11 metres.

6.4 The gravel and sand deposits in the immediate vicinity of the proposed EfW facility have been extensively extracted, and the superficial deposits have been substantially altered by the extraction and subsequent landfilling. The landfilling has had significant effects on the local groundwater regime.

6.5 The London Clay consists of blue, fissured clays, and is of considerable thickness. It forms a largely impermeable barrier, isolating the surface Drift Deposits from the underlying Reading Beds and Upper Chalk, which is a regionally important aquifer. The Old Slade Lake which is north of the site, was created by extraction of clay deposits. The London Clay is more than 50 metres thick in the vicinity of the site, and becomes thicker to the south west of the site.

Hydrogeology and Groundwater

6.6 Groundwater flows within the surface Drift Deposits of the Colne Valley from north to south towards the River Thames (5.5 km to the south of the Lakeside site), following the gradient of the bed of the River Colne and the topography of the underlying London Clay. From the M4 the average groundwater level varies from approximately 23 metres AODN (Above Ordnance Datum, Newlyn) to about 13.5 metres AODN at the River Thames.

6.7 The Environment Agency characterises the River Terrace Deposits as a Major Aquifer with soils of high leaching potential. The groundwater is therefore vulnerable to pollution and the potential for rapid transmission of pollutants through the deposits is high. The thick layer of London Clay generally protects the Upper Chalk aquifer, although

a gravel filled scour hole along the eastern edge of the Iver South Wastewater Treatment Works may result in a localised direct connection between the surface gravels and the chalk. The potential connection formed by the scour hole should not result in a pollution risk, since the movement of water is vertically upwards under artesian pressure.

6.8 The regional groundwater flow regime is disrupted by obstructions to flow. These include clay lined reservoirs to the south of Colnbrook (Wraysbury, King George VI and Staines Reservoirs), the clay bunds around the Perry Oaks Wastewater Treatment Works (Heathrow Airport), the various lined landfills and the Central Terminal Area at Heathrow. These structures tend to cause an upgradient increase in groundwater level, with a corresponding down gradient decrease. The effects appear to be restricted to a distance of approximately 0.5km radially from the obstructions. The groundwater regime in the vicinity of the proposed EfW facility is influenced by the lined and effectively impermeable Tanhouse Farm landfill to the north west, the semi-permeable Larbourne Farm landfill to the north, discharge from Old Slade Lake, and recharge from the Colne Brook and the gravel pits.

Groundwater Quality

6.9 The Environment Agency holds no information on groundwater quality at the site or in the vicinity, or any records of past incidents of groundwater contamination at the site.

6.10 Borehole investigations of the local groundwater at the site were carried out as part of the contamination assessment (see Chapter 7, Contamination). Samples of groundwater were tested for trace metals, phenols, volatile and semi-volatile organic substances, and total petroleum hydrocarbons. In addition tests were carried out of Biological Oxygen Demand (BOD), ammonia, nitrate and nitrite, and phosphate concentrations, in order to assess the particular influence of landfill leachates on groundwater quality. The results of the sampling indicate that groundwater quality beneath the site is good. Levels of trace metals and volatile organic substances were below the respective analytical detection limits. Concentrations of phenols reported were in the range 1.2 –1.6 µg/l, which are low. Nitrate, ammonia and phosphate were not found at levels in excess of the analytical detection limit which suggests that the landfills in the vicinity of the site do not significantly influence groundwater quality.

6.11 The groundwater is hard, with alkalinity and calcium content comparable to chalk, although the major ion content tends to increase towards Colne Brook. This could be due to the discharge of mineralised chalk groundwater from the scour hole at Iver South, or discharge from inert landfills or recharge from the lakes.

Licensed Abstractions

6.12 There are a number of licensed surface water and groundwater abstractions within a 2km radius of the site (see Figure 20). These include two licensed abstractions from the River Colne which are private abstractions used to maintain the water levels of lakes.

6.13 There are a further 7 licensed abstractions from the River Terrace Deposits groundwater which are principally used for gravel washing and other industrial or agricultural uses. The closest of these is 1.2km from the site. There are no public or private water supplies within 2 km of the site.

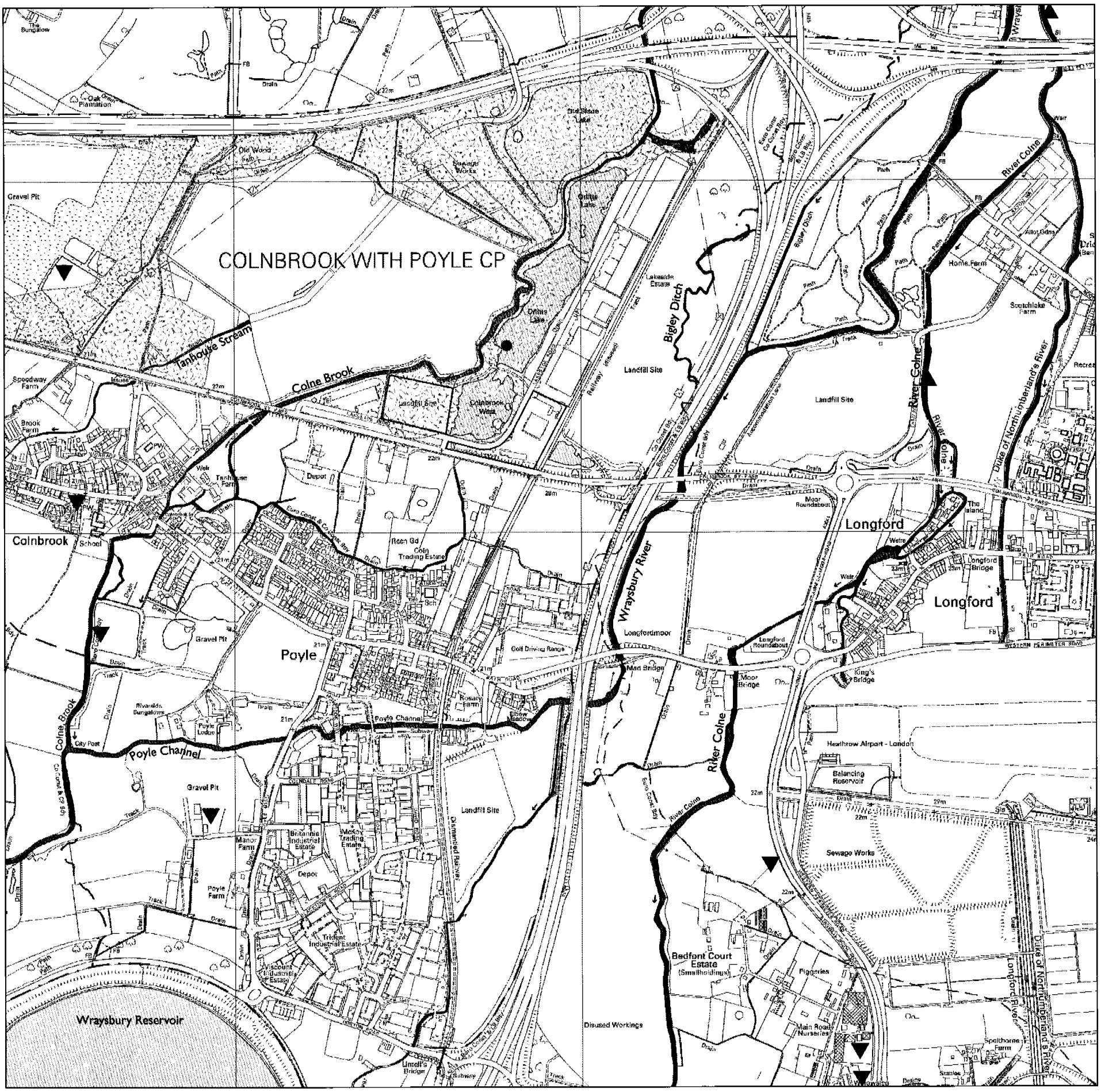
Surface Waters

6.14 The nearest watercourse to the site is the Colne Brook, which at its closest point, is about 200 metres distant and flows in a south westerly direction. Some 400 metres east of the site and the M25 is the Wraysbury River which flows directly south (see Figure 20). Environment Agency data suggests that the flows for the Colne Brook and Wraysbury River are less than 1.25m^3/s and 0.62m^3/s respectively. Other minor drainage features include the Bigley Ditch which is a minor tributary of the Wraysbury River and the Tanhouse Stream, an intermittent watercourse which flows adjacent to the Tanhouse Farm Landfill.

Figure 20 :
Surface Water Features & Licensed Abstractions

Source : EAG Environ

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A


COLNBROOK WITH POYLE CP
Colnbrook
Poyle
Longford
Tanhouse Stream
Colne Brook
Poyle Channel
Bigley Ditch
River Colne
Wraysbury River
Wraysbury Reservoir
Landfill Site
Gravel Pit
Sewage Works
Depot
Golf Driving Range
Longford Roundabout
Mad Bridge
Moor Bridge
King's Bridge
Heathrow Airport - London
Balancing Reservoir
Bedfont Court Estate (Smallholdings)
Piggeries
Disused Workings
Duke of Northumberland's River
Longford River
Western Perimeter Road
Colnbrook School
Colnbrook Trading Estate
Poyle Trading Estate
Britannia Industrial Estate
Trident Industrial Estate
Viscount Industrial Estate
Lakeside Estate
Scotchlake Farm
Home Farm
Longford Bridge
Spelthorne Farm
Main Road Nurseries
Old Slade Lake
Ortins Lake
Colnbrook Weir
Poyle Farm
Manor Farm
Tanhouse Farm
Speedway Farm
Brook Farm
Rosary Farm
Elbow Meadows
Riverside Bungalows
Poyle Lodge
Oak Plantation
Old Wood Path
The Bungalow
Gravel Pit
Landfill Site
Sewage Works
Allot Gdns
Recreation Ground
Railway (disused)
Drain
Track
Path
Weir
Culvert
Subway
Slip Road
Roundabout
Bridge
Stables
Pylons
Reen Gd
Colnbrook By-Pass
Staines Bridge
Littell's Bridge
Poyle Channel Subway
Colnbrook By-Pass Accommodation Bridge
Colnbrook By-Pass Accommodation Subway
Datchet Road Accommodation Subway
Eton Road Accommodation Subway
Eton Road Subway
Staines Reservoirs
Wraysbury Reservoir
Longford Bridge
Longford Roundabout
Mear Roundabout
Longford Trading Estate
Longford Industrial Estate
Longford Gravel Pit
Longford Sewage Works
Longford Landfill Site
Longford Golf Driving Range
Longford Mad Bridge
Longford Moor Bridge
Longford King's Bridge
Longford Heathrow Airport - London
Longford Balancing Reservoir
Longford Bedfont Court Estate (Smallholdings)
Longford Piggeries
Longford Disused Workings
Longford Duke of Northumberland's River
Longford Longford River
Longford Western Perimeter Road
Longford Spelthorne Farm
Longford Main Road Nurseries
Longford Scotchlake Farm
Longford Home Farm
Longford Allot Gdns
Longford Recreation Ground
Longford Lakeside Estate
Longford Old Slade Lake
Longford Ortins Lake
Longford Colnbrook Weir
Longford Poyle Farm
Longford Manor Farm
Longford Tanhouse Farm
Longford Speedway Farm
Longford Brook Farm
Longford Rosary Farm
Longford Elbow Meadows
Longford Riverside Bungalows
Longford Poyle Lodge
Longford Oak Plantation
Longford The Bungalow
Longford Gravel Pit
Longford Landfill Site
Longford Sewage Works
Longford Allot Gdns
Longford Recreation Ground
Longford Railway (disused)
Longford Drain
Longford Track
Longford Path
Longford Weir
Longford Culvert
Longford Subway
Longford Slip Road
Longford Roundabout
Longford Bridge
Longford Pylons
Longford Stables
Longford Reen Gd
Longford Colnbrook By-Pass
Longford Staines Bridge
Longford Littell's Bridge
Longford Poyle Channel Subway
Longford Colnbrook By-Pass Accommodation Bridge
Longford Colnbrook By-Pass Accommodation Subway
Longford Datchet Road Accommodation Subway
Longford Eton Road Accommodation Subway
Longford Eton Road Subway
Longford Staines Reservoirs
Longford Wraysbury Reservoir
Longford Longford Bridge
Longford Longford Roundabout
Longford Mear Roundabout
Longford Longford Trading Estate
Longford Longford Industrial Estate
Longford Longford Gravel Pit
Longford Longford Sewage Works
Longford Longford Landfill Site
Longford Longford Golf Driving Range
Longford Longford Mad Bridge
Longford Longford Moor Bridge
Longford Longford King's Bridge
Longford Longford Heathrow Airport - London
Longford Longford Balancing Reservoir
Longford Longford Bedfont Court Estate (Smallholdings)
Longford Longford Piggeries
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Longford Longford Culvert
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Longford Longford Colnbrook By-Pass Accommodation Bridge
Longford Longford Colnbrook By-Pass Accommodation Subway
Longford Longford Datchet Road Accommodation Subway
Longford Longford Eton Road Accommodation Subway
Longford Longford Eton Road Subway
Longford Longford Staines Reservoirs
Longford Longford Wraysbury Reservoir

6.15 Between the Colne Brook and the Wraysbury River is a complex of lakes formed as a result of the extraction of gravel and clay pits. The river and lakes form part of the wider River Colne system, which includes a complex network of streams to the west of Heathrow Airport. The entire network of streams is closely inter-linked with the groundwater of the gravel. The lakes closest to the site are, from north to south, Old Slade Lake, Orlitt's Lake North, Orlitt's Lake South and Colnbrook West Lake. These lakes are, to varying extents, in hydraulic continuity with the groundwater and river systems.

6.16 The floodplain to the east and west of the Lakeside Industrial Estate provides important additional flood capacity for the River Colne system during major flood events. Large scale changes in the characteristics of the catchment due particularly to the construction of reservoirs, landfilling and road , rail and airport developments within the area over the last century, has reduced the storage capacity of the floodplain. The Environment Agency has recently undertaken extensive improvements to the Lower River Colne to increase floodplain capacity.

Surface Water Quality

6.17 Water quality data for the Colne Brook and Wraysbury River indicate that both rivers are Class C/B (fair/good quality) according to the Environment Agency's General Quality Assessment(GQA) characterisation. The 90th percentile dissolved oxygen concentrations exceeds 6mg/l, and the rivers are able to support good coarse fisheries, insofar as the physical conditions can support these. Biological surveys by the Environment Agency indicate that the Colne Brook is of good to very good biological quality.

6.18 Data for the upstream and downstream of the Iver South Wastewater Treatment Works suggests that the discharge from the works does not adversely affect water quality in the Colne Brook. Ammonia levels are highest further downstream which may be due to the influence of leachate discharges from landfills. The Tanhouse Stream which is often dry, has poorer quality and is thus not important for fish.

6.19 Data for the Old Slade Lake and Colnbrook West Lake indicate that the quality of the water is good with no indication of influence from the adjacent landfills. All the lakes are stocked with fish, including carp, tench, roach, rudd and 'skimmer' bream. There are coarse fisheries on Colnbrook West, Old Slade and Orlitts Lakes.

Implication of Policies

6.20 Many of the impacts assessed in this chapter are within the control of the Environment Agency, who will advise the local planning authority about any risks to ground or surface water associated with this scheme and will set conditions for any consents to discharge to controlled waters.

6.21 The Lakeside site and Tanhouse Farm Landfill are not within a Groundwater Protection Zone and there are no Environment Agency groundwater protection policies which might affect the development.

6.22 The Lakeside site falls outside the area defined as liable to flooding by Slough Borough Council in the Review of the Local Plan for Slough, Deposit Draft (October 1998), (see Figure 20).

Environmental Change without the Proposal

6.23 Future groundwater levels in the vicinity of the site could be affected by proposed developments elsewhere, including the Iver South sludge dewatering plant to the north west, and the LIFE scheme.

6.24 Substantial earthworks required to level the LIFE construction site would also be expected to alter the spatial distribution of the areas liable to flood (essentially those areas flooded by a 1:00 year event). However, this is unlikely to result in the inclusion of the Lakeside Road Industrial Estate within the altered area liable to flood.

Impact of the Proposal

Demolition and Construction Impacts

Surface Water

6.25 During demolition and construction of the EfW facility, the quality of surface water run-off may potentially be influenced by the following:

- high loads of suspended solids from surface earthworks, comprising soils, cement particles, etc;
- spilled oils, lubricants, sealants; and
- discharges of contaminated groundwater from dewatering of excavations, which would only be made subject to consent under the Water Resources Act 1991. Compliance with such consents will by definition prevent significant effects.

6.26 If uncontrolled, surface run-off containing contaminants would be likely to discharge directly to surface water soakaways, which themselves will discharge ultimately to groundwater. These impacts can be controlled through the implementation of adequate control and mitigation measures.

6.27 A residual risk of possible oil release from fuel tanks to nearby watercourses would be of greater significance, but good site management practice would ensure that such releases are contained within the boundaries of the construction site (see para 6.40).

6.28 There are no surface water or groundwater abstractions in the immediate vicinity of the main construction sites. Tanhouse Stream could be affected by drainage from the Tanhouse Farm construction compound however, it is more likely that drainage from the site will discharge to the Colne Brook, which is the closest stream.

6.29 To avoid the disturbance of sediment from the bed of Orlitts Lake during construction of the

Visitor Centre, the working area will be isolated to reduce the potential for wider dispersion of sediment across the lake.

Groundwater

6.30 During construction of the EfW facility, there will be a need to excavate an area 12 metres deep for the refuse bunker. Excavations of lesser depth (5 - 7 metres) will also be required to accommodate the base of the stack, bottom ash pit and MRF. All of these structures would be expected to extend into the London Clay, thus providing an impediment to groundwater flow over the entire depth of the gravel aquifer. However, the cross-section affected would be substantially less than the total cross-sectional area available for groundwater flow between Colnbrook West Lake and Wraysbury River to the east

6.31 During construction, the excavation is likely to require substantial de-watering, causing localised draw down of groundwater levels. The degree to which de-watering will be required will depend on the construction technique. Possible methods would be to create *insitu* diaphragm walls or segmental piled walls to form the bunker, prior to excavation of the gravels. Formation of impermeable walls of this type would lead to minimal ingress of groundwater.

6.32 The scale of the excavation required is expected to be in the order of 20,000 cubic metres (m^3). The degree of dewatering and potential extent of the groundwater drawdown has been estimated using a simplified relationship assuming no attempt to control inflows of water. The zone of drawdown is estimated to be 380 m, while the rate of inflow of groundwater into the excavation is estimated at 30 m^3 per hour. With the formation of an impermeable barrier, the extent of draw down would be reduced to 19 m, and the rate of inflow to less than 0.1 m^3 per hour.

6.33 The dewatering effluent would require disposal off-site. Currently there are no sewers in the area, thus the likely discharge points would be surface water bodies, soakaways or drainage ditches. Prior to discharge the groundwater would be routed to a settling tank and oil interceptor to remove solids and free oil. Current data for groundwater suggests that the chemical quality is good, and thus it is anticipated that disposal to surface water would be acceptable to the Environment Agency.

6.34 The impact of construction of the bunker on groundwater flows is likely to be significant only within 250 metres. The flow regime would be disturbed, with flows directed to the south west and south east of the bunker, with a slight depression of groundwater immediately downstream of the structure.

6.35 None of the groundwater abstractions currently made from the gravel are considered to be sensitive to impacts on quality, and none are considered to be within the likely zone of disturbance of the groundwater regime expected from the construction of the bunker. Thus, no significant impact on groundwater resources is predicted.

Operational Impacts

6.36 The operation of the proposed EfW facility may have implications in terms of the flood potential and risk both at the site and in the wider area. The EfW site is not located within the floodplain, and the basic run-off characteristics of the site will not be significantly altered as it is intended that the current arrangement of discharging run-off to soakaway will be maintained. The slight loss of below ground storage capacity due to underground structures is not expected to affect flood risks.

6.37 The proposed development will not substantially alter the total area of hard surface to be drained, since most of the site is already extensively developed and urban in character. Any changes in the quantity and quality of surface drainage are therefore likely to be small.

6.38 During normal operation there will be no discharges of process effluent to watercourses or the foul sewer from the EfW facility or the Visitor Centre. The proposed arrangements for treatment and disposal of effluent from the EfW and CWI plants are described in detail in Chapter 3, Proposals.

6.39 Potentially contaminated surface water drainage from areas used for the handling and storage of wastes and ash residues will be collected separately and directed to the wastewater treatment plant. Thus no impacts on groundwater or surface water quality are anticipated.

6.40 Water will be taken from the mains supply and treated by demineralisation using a water treatment and conditioning plant before use in the boilers. Drain down water from the boilers will be recycled and any excess will be taken off site by tanker.

Mitigation Measures

Demolition and Construction

6.41 The demolition and construction site drainage systems will be designed and managed to comply with BS6031:198 'The British Standard Code of Practice for Earthworks' which details methods that should be considered for the general control of drainage on construction sites. Further advice is also contained within the British Standard Code of Practice for Foundations (BS8004,1986). A Code of Construction Practice (COCP) forming part of the contract for the construction works will also require the contractors to take full account of Environment Agency guidance on the prevention of pollution of controlled waters, the layout of the construction site and surface water drainage systems.

6.42 Drainage systems at the EfW construction site and the construction compound at Tanhouse Farm Landfill will make provision for the interception of oil and suspended solids. Any groundwater de-watering effluent will undergo treatment prior to discharge.

6.43 During construction of the Visitor Centre the working area will be isolated to reduce the potential for wider dispersion of any sediment across Orlitts Lake which may be disturbed from the lake bed.

6.44 Construction techniques will be adopted which will minimise the need to de-water excavations. This may include the installation of in-situ piles to form the walls of the bunker prior to excavation of the gravels.

Operation

6.45 Measures will be taken to ensure that drainage from each of the sites is of adequate quality prior to disposal, in order to comply with Environment Agency guidance on the prevention of pollution of controlled waters.

6.46 Drainage from car parks and areas serving refuse trucks will be collected via impervious paved surfaces and appropriately sized oil interceptors and directed to a wastewater treatment plant. Drainage from areas used for the storage and handling of ash residues and wastes will be collected in catchpits and directed to a wastewater treatment plant. Uncontaminated drainage from the roof and landscaped areas will be discharged directly to soakaway.

6.47 All areas for oil and chemical storage tanks on site will be fully bunded, providing a sealed drainage system capable of containing a minimum volume of 110% capacity of the largest tank in the bund. Refuse and ash handling and storage areas will be enclosed and roofed and no drainage will be provided.

Significance of the Impacts

6.48 With implementation of the above mitigation measures, within the framework of the Code of Construction Practice, it is anticipated that the proposed Lakeside EfW facility can be constructed without significant impacts on either surface or groundwater resources or quality. The predicted impact on groundwater flows and levels resulting from the construction of underground structures is expected to be localised and relatively insignificant.

6.49 There will be no discharge of aqueous effluent from the EfW facility to controlled waters or foul sewer. The proposed on-site effluent treatment arrangements and the implementation of the proposed site drainage protection measures will ensure there are no significant impacts on the water environment from the operation of the plant.

Summary of the Impact on the Water Environment

- The potential impacts of the construction and operation of the proposed EfW facility have been considered taking into account water quality, drainage, water abstraction areas and floodplain areas.
- Borehole investigations at the development site indicate that groundwater quality beneath the site is good. Landfills in the vicinity of the site also do not appear to significantly influence groundwater quality.
- Construction works will affect local groundwater flows and levels during excavation activities and dewatering. However, none of the groundwater abstractions in the area is considered to be within the likely zone of disturbance of groundwater flows and levels.
- Measures to control potentially contaminated run-off from the construction site will be implemented through a Code of Construction Practice. With such measures in place, it is not expected that the quality of the nearby surface water courses, and therefore nearby abstractions will be significantly affected by construction activities.
- The operation of the new EfW facility will not result in any discharges of process effluent to either watercourses or foul sewer. Measures will also be implemented to ensure that drainage is of adequate quality prior to discharge. Storage areas for oils and chemicals will be fully bunded to contain any leaks and spills. Therefore, there are not expected to be any changes to the quality of groundwater or surface water resources.
- Although the development may result in the slight loss of below ground floodplain storage capacity due to excavation works, the development of the site is not expected to affect flood risks.

Chapter Seven

7 Ground Contamination

Introduction

7.1 This chapter assesses the presence and nature of ground contamination at the development site and potential risks to the environment and human health from the proposed development of the Lakeside EfW facility. The following issues are considered in the assessment:

- ground contaminants both on and off site which may affect building materials and could cause constraints to engineering works;
- hazardous components of soils and materials on-site which may have to be removed from the site during construction and may need to go to other disposal facilities;
- risks to on and off-site receptors as a result of contaminants (including landfill gas) being released or disturbed during demolition and construction including groundwater resources, air quality, ecology and site workers; and
- the potential for build up of soil gases, principally landfill gas, which could migrate into buildings or enclosed spaces causing a hazard to occupants in terms of ashphyxiation or explosion.

Existing Environment

7.2 This section describes the historic and current uses of the land on and adjacent to the proposed Lakeside EfW facility with particular reference to the potential for contamination from past uses. The geology and hydrogeology of the development site are also relevant to understanding the significance of any contamination in relation to groundwater resources. The geology and hydrogeology of the local area are described in more detail in Chapter 6, Water Environment.

7.3 A desk study review was carried out using historical and geological maps and records from the Environment Agency, Slough Borough Council and other published sources, to establish the character and historical use of the development site and neighbouring areas. An intrusive soil investigation was also undertaken at the proposed site, to investigate the nature of the underlying soils, the groundwater regime, soil gases and the possible presence of ground contaminants.

History of Site

7.4 Historical maps show the first major development in the area commenced with the construction of the Great Western Railway (Colnbrook Branch) along the eastern boundary of the Lakeside site in the late 19th Century. In 1925, the northern area of the site was occupied by a gravel pit served by rail sidings along the eastern boundary of the site. By 1932, the site formed part of a sand and ballast works which expanded considerably off site to the north west. A raised road had also been developed on the southern area of the site enabling vehicle access from the A4. Gravel extraction areas were extended on the site and adjacent areas until the early 1970s. These areas had been infilled by the late 1970s.

7.5 Planning records held by Slough Borough Council indicate that, prior to the 1970s, when

Figure 21 :
Landfill Sites

North

Lakeside Energy from Waste Site

Landfill sites

Proposed Visitor Centre

Source. EAG Environ

Scale. 1:10 000

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A

Grundon developed their waste reclamation and baling plant, the site was used for the construction of pre-cast concrete units. Records do not indicate any former uses which could give concern with respect to ground contamination.

7.6 Additional information on the location and nature of landfills (post 1974) in the vicinity of the site obtained from the Environment Agency, indicate that there are a number of commercial, industrial and domestic landfills within 250 metres of the Lakeside site (Figure 21). Colnbrook Bypass Landfills 1,2 and 4, to the east and south east of the site were infilled between 1977 and 1993. Tanhouse Farm Landfills areas 1 and 22, to the west of the site were operational between 1972 and 1995. Records indicate that two of the landfills Colnbrook Bypass (1) and Tanhouse Farm (22) are generating landfill gas.

7.7 The site of the proposed Visitor and Environmental Study Centre was partially worked for gravel in the 1930/40s leaving a shallow water area known as Orlitts Lake. The northern part of the lake was further deepened in the early 1990s and separated from the southern lake by an earth bund.

Existing Operations

7.8 Since the late 1970s Grundon has operated a waste management facility at the Lakeside site. The facility currently comprises offices, a vehicle workshop, MRF, high density baling plant, and CWI plant, together with associated areas for lorry parking, The current site layout is shown in Figure 22 which also shows the location of the site investigation boreholes. A waste management licence was granted to Grundon for a waste reduction and reclamation plant (MRF) at the site in 1980. A further licence was granted to the company in 1989, to operate a 1 tonne per hour clinical waste incineration plant. The CWI operations are now authorised by the Environment Agency under IPC.

Significance of Geology and Hydrogeology

7.9 Borehole records for the site in 1978, prior to construction of the current facility, generally confirm the expected geological sequence (see Chapter 6, Water Environment) and show that some of the alluvial deposits may have been removed and replaced with fill materials in some places. Groundwater was encountered within the three boreholes at depths between 0.75 metres and 2.60 metres.

7.10 These Alluvial deposits are permeable and would allow the migration of pollutants (if present) both laterally into the nearby watercourse (Colne Brook) and downwards to the major aquifer (Flood Plain Gravels). Groundwater resources within the gravels are abstracted at several locations within 2 km of the site (Chapter 6, Figure 20). The presence of London Clay and Reading Beds would prevent the further downward movement of any mobile contaminants (if present) into the major Chalk aquifer (a sensitive receptor), thereby reducing its sensitivity. The level of sensitivity of the Chalk in the site area is also reduced as the site does not lie within a groundwater protection zone (GPZ) and there are no public water supply abstractions within a 2km radius of the site.

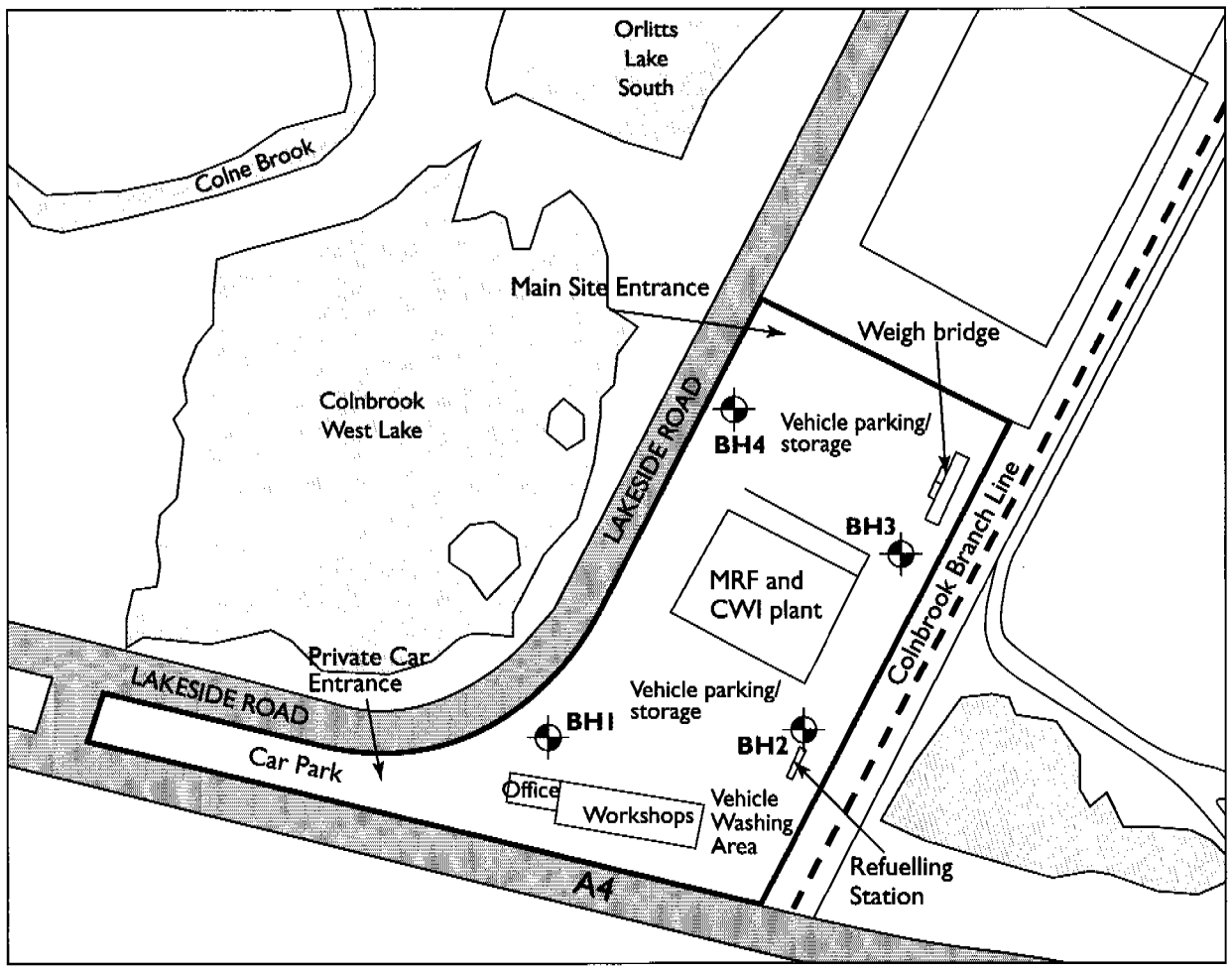


Figure 22 : **Location of Site Investigation Boreholes**
Diagrammatic Only Not to Scale

Source. EAG Environ

Site Investigation

Methodology

7.11 An intrusive soil investigation was carried out at the Lakeside site during February 1999. The number and location of boreholes were limited by the extent of current operations at the site. Four boreholes were excavated to a maximum depth of 8 metres below ground level to confirm current soil and groundwater conditions at the site (see Figure 22). Soil arisings from the boreholes were recorded and selected samples sent for analysis for a range of chemical parameters. Samples of groundwater were also collected and analysed.

7.12 The site history review indicated the presence of two gassing landfills within 250 metres of the site. Thus the boreholes were designed also to facilitate the future monitoring of soil gases, particularly landfill gas. Readings of methane, carbon dioxide and oxygen, the principle components of landfill gas, were taken from three of the monitoring wells in March 1999. Flow rate and gas pressure were also monitored.

Results

7.13 Beneath a concrete/hardstanding layer, deposits of made ground were encountered at each borehole location. These ranged in thickness between 0.2 metres and 1.5 metres below ground level (bgl) and comprised sandy, gravelly hardcore fill with brick and concrete. In all the boreholes, apart from BH4, the natural strata was found to consist of silty, gravelly clay underlain by sand and gravels. These in turn were underlain by the London Clay at depths of between 4.7 metres and 7.4 metres bgl. Groundwater was encountered in all boreholes at depths of between 0.75 metres and 2.6 metres bgl.

7.14 No physical evidence was found of hydrocarbon contamination or landfilling in the borehole excavations or groundwater. A thin

horizon of clinker material was noted at shallow depths in boreholes 1 and 2 ranging between 0.8 metres bgl (BH2) and 1.3 metres bgl (BH1). Samples of this material were collected for analysis

.

7.15 None of the soil samples collected contained elevated concentrations of the contaminants tested. Although the ground underlying the site has been impacted by historical landfilling, the analytical results suggest the material used for backfilling was uncontaminated and is unlikely to include putrescible or chemical waste capable of generating significant quantities of landfill gas or leachate. The data suggests that widespread contamination at the site from both past and current activities does not exist. This is also apparent from the results of the groundwater analysis which show that the groundwater beneath the site is of reasonable quality. Concentrations of phenol (an indicator of hydrocarbon contamination) are in the range 1.2 – 1.6 ug/l which is low. The reasonable quality of the groundwater beneath the site suggests that the landfill activity in the surrounding area does not significantly influence groundwater quality. It is possible that these preliminary investigations may not have picked up all possible contamination from industrial landfilling operations.

7.16 Levels of methane were found to be below the detection limit of the instrument (0.1% v/v - by volume). Carbon dioxide was detected at an elevated concentration (2.4% v/v) in borehole BH1, slightly above the 1.5% v/v threshold limit set by the Building Regulations 1991 and Waste Management Paper 27. The gas monitoring results indicate that the ground underlying the site is not generating significant volumes of landfill gas and it is unlikely that such gases are migrating onto site from the two gassing landfills in the vicinity. It is considered that the slightly elevated carbon dioxide concentration is likely to be attributable to the natural microbial processes that occur in the silty deposits underlying the site.

Implication of Policies

7.17 Planning Policy Guidance Note 23: *Planning and Pollution Control* (Department of Environment 1994), gives guidance on the relevance of pollution controls in the exercise of planning functions. The guidance states that when determining a planning application for land which might be contaminated, the local planning authority will need to consider whether the proposal takes proper account of contamination. Where contamination is suspected, the developers should investigate the land to determine what remedial measures are necessary to ensure its safety and suitability for the purpose proposed.

7.18 The Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL 1982) has produced guidance on the assessment and redevelopment of contaminated land and gives advisory limits or 'values' for concentrations at which specific contaminants would make a site unsuitable (without remedial action) for particular purposes.

7.19 Under the Control of Substances Hazardous to Health Regulations (1994) (COSHH) and the more recent Construction and Design Management (CDM) Regulations, where a developer knows or suspects the presence of contaminated soil, provisions should be made to ensure that risks to site workers and the general public are minimised.

7.20 The Environmental Protection Act 1990, Part II, also places a Duty of Care on all producers of wastes to ensure that sufficient information about the nature of the wastes is available when the material is transferred and waste materials are disposed of at appropriately licensed sites.

7.21 Waste Management Paper No: 27; Landfill Gas published by the Department of the Environment (1994) and the Building Regulations 1991, Approved Document C, also give advice on the need to consider possible measures to prevent landfill gas ingress into buildings where concentrations of gas are detected above certain guideline levels.

Impact of the Proposal

7.22 The significance of any contamination discovered at the site will depend on two factors:

- the intended after-use of the site, since stricter standards are normally appropriate for sensitive end uses, such as houses, gardens and allotments, than for industrial developments or railway uses; and
- the potential sensitivity of surrounding resources and receptors to exposure to contamination or releases of contaminants from the site.

7.23 The EfW scheme does not constitute change in use of the land, therefore this issue is considered to be of less significance in this assessment. The sensitivity of the surrounding resources and receptors is dealt with in the following risk assessment which examines the potential risks relating to the presence of hydrocarbons in groundwater at the site.

Risk Assessment

7.24 A qualitative risk assessment has been carried out using a conceptual source-pathway-receptor model to predict the scale of potential risks from contaminants identified by the study.

7.25 The site investigation results suggest that there is only one contaminant source present at the site. A slightly elevated concentration of hydrocarbon (phenol) was detected in one of the groundwater samples taken at the site, although the concentration is not considered to be significant.

7.26 The main pathways through which the hydrocarbons can travel are via the groundwater,

within the permeable river gravels underlying the site, or via direct ingestion of groundwater or soil.

7.27 The following resource/receptors have also been identified as being significant for this site:

- groundwater resources present in the underlying gravels. This is presently abstracted and susceptible to pollution;
- nearby surface water bodies, including the Colne Brook and Colnbrook West Lake, where the water quality is susceptible to pollution; and
- site workers and the general public in the immediate area in terms of health issues.

Risk Characterisation

Groundwater Resources

7.28 Groundwater present in the River Gravels is abstracted for sand and gravel washing and agricultural purposes in the surrounding area. Due to the considerable distance of these abstractions from the site (the nearest being 1.2 km), and their current uses, the groundwater resources within the river gravels are not considered to be at risk from the hydrocarbons detected at the site during the site investigation.

Surface Water Bodies

7.29 It is considered likely that the groundwater beneath the site is in hydraulic continuity with the Colne Brook and the River Colne system. Therefore, hydrocarbons present within groundwater beneath the site could migrate laterally into these surrounding receptors. The concentration of hydrocarbons detected in the groundwater at the site is not considered to be significant. On entering the Colne Brook and other watercourses in the surrounding area, the concentration of hydrocarbons will be significantly diluted, further reducing their concentration. Such concentrations are therefore unlikely to affect the surface water quality of the surrounding water bodies.

Site Workers and the General Public

7.30 Site construction workers are liable to exposure to potential soil contamination during construction works. The principle exposure pathways for site workers are inhalation of dust during excavation of materials in dry conditions and direct ingestion of contaminated soil through eating, drinking or smoking on site, due to lack of properly controlled hygiene procedures. Field observations and on-site testing did not record any elevated concentrations of contaminants in the soil. Thus if soil were to be ingested there is considered to be negligible risk to health.

Other Considerations

7.31 Some areas of the site could not be sampled since working plant currently occupies a large part of the site. Thus there is a possibility that pockets of contamination may be present in these areas. Consideration will therefore need to be given to the potential impacts and management of contamination should pockets of contaminated soil or groundwater become evident during construction works.

Spoil Use and Disposal

7.32 Spoil will be generated by excavation of the bunker pit, bottom ash collection pit, stack and foundations, and by the levelling of the site. The site investigation findings and supplementary information from previous works at the site suggest that the bulk of the material excavated at the site will be inert, uncontaminated material. Thus, it is likely that the material excavated will be acceptable for disposal at most landfill sites or could be reused for other end uses within the scheme such as general cover, fill material and landscaping works. Where excavated soil requires off site disposal, appropriate chemical testing will be carried out to ensure that all spoil is disposed at appropriately licensed sites.

Water Resources

7.33 If contaminants are encountered during construction works, there is the potential for these mobile contaminants to enter groundwater beneath the site and migrate both laterally and vertically. As a precaution, further pollution control measures to prevent effects from any potential historic contamination at the site in areas not covered by the investigations will be drawn up in agreement with the Environment Agency.

Air Quality

7.34 The potential impact of dust emissions during construction is dealt with in detail in Chapter 5, Air Quality.

Mitigation Measures

7.35 The potential for the presence of contamination derived from historical landfilling operations (if they were undertaken at the site) in areas not covered by the site investigations will be addressed through the implementation of a Code of Construction Practice (COCP). The COCP will form part of the environmental management control measures to be implemented during construction. Contractors will be required to provide an Environmental Method Statement at the point of tendering for the construction work associated with this development project. The statement will set out the measures by which the contractor proposes to minimise the risks to offsite resources and sensitive receptors from potential contamination.

7.36 A system of monitoring will be developed to ensure that the environmental requirements for construction are met and commitments entered into with the relevant local and statutory authorities are complied with. The intrusive soil investigations will also be extended to cover central areas of the site currently occupied by Grundon's waste management operations.

7.37 The risks to site workers and the general public due to exposure to contaminated soil and the release of contaminants to controlled waters, will be minimised by the implementation of appropriate site practices. This will include the implementation of comprehensive health and safety plans. This will specify the measures to be adopted at the site, including methods for limiting dust emissions from the sites; preventing leakages or spillages migrating off-site, and ensuring that vehicles transporting contaminated soil are covered. The method statement and plan will comply with the requirements of the Control of Substances Hazardous to Health Regulations 1994 (COSHH), the more recent Construction and Design Management (CDM) Regulations and Environment Agency guidance on the prevention of pollution of controlled waters.

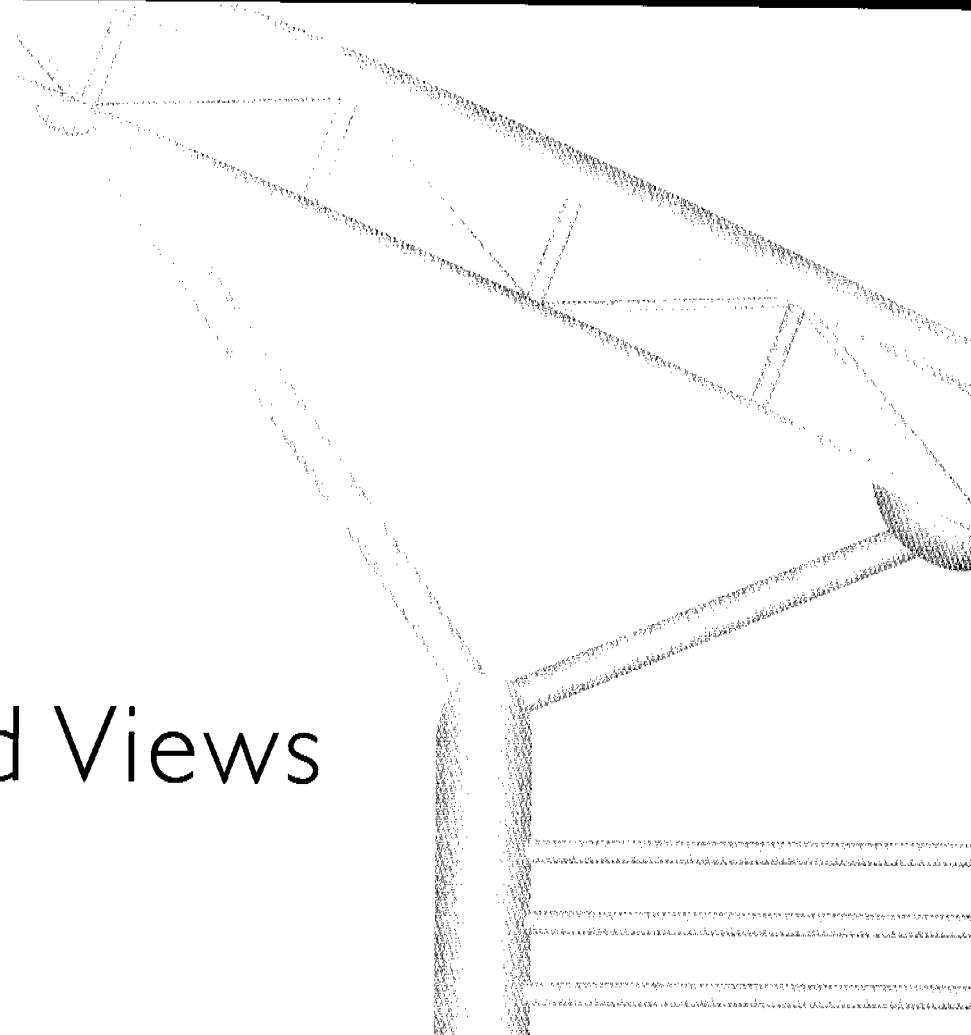
7.38 In the event of isolated pockets of contaminated soil being found during construction works in areas not covered by the site investigation, remediation works may be necessary. This could involve either the removal of contaminated soil for disposal to landfill or isolation of the contamination by covering or capping.

Significance of Impacts

7.39 Based on the results of the site investigation, widespread or significant contamination at the site is not expected to be encountered during demolition and construction of the new EfW facility. Only one groundwater sample showed a slightly elevated level of hydrocarbon, however, the risks to sensitive resources or receptors from this contamination source have been assessed and were not found to be significant. The implementation of the above site management and control measures will further minimise these risks and provide additional precautions should any pockets of contaminated soil or groundwater become evident during construction works. Once the EfW facility is operational, the potential for hazards to arise from contaminated materials or groundwater is expected to be insignificant.

Summary of Impacts from Contamination

- Historical records indicate that the Lakeside site was formerly used for gravel extraction and the construction of pre-cast concrete units. The gravel pits on the site were infilled prior to the development of the current waste facility, which was first operational in 1980. Orlitts Lake, the site of the proposed Visitor Centre was worked for sand and gravel during the 1930s and retained as a shallow water feature. Tanhouse Farm landfill (Area 22), a former extraction area, was infilled with industrial and commercial wastes in the early 1990s.
- The potential impacts of this scheme, in terms of contamination, relate primarily to construction of the EfW facility as this will involve the excavation of large quantities of earth from the site.
- An intrusive ground investigation was carried out to determine the nature of the underlying soils and groundwater at the Lakeside site. The results indicate that the material used to infill the former gravel pits at the site was uncontaminated and the groundwater beneath the site is of reasonable quality and is also not significantly influenced by landfills in the vicinity of the site. There is also no evidence to suggest that landfill gas generated by surrounding landfills is migrating onto the site.
- The risk assessment has concluded that no significant impacts on surface water or groundwater quality or resources, or the health and safety of site workers, are likely to result from construction works.
- However, the potential for the presence of pockets of contamination derived from historical activities on the site being found in areas not covered by the site investigations cannot be discounted at this time. Appropriate control measures will be put in place during construction of the facility to prevent pollution occurring.
- In the unlikely event that ground contamination is encountered at the site, appropriate remedial action will be taken in line with the relevant guidelines and current practices.



Chapter Eight

Landscape and Views

Impacts Assessed

8.1 A study was carried out of the landscape and visual impact of the construction and operation of the EfW plant, and any mitigation measures required to reduce the impact. For the purposes of this assessment, landscape impacts are defined as those which have an effect on the physical substance of the landscape. Visual impacts are defined as those which affect the viewer and the view.

8.2 The likely cumulative impacts from the other proposed major developments in the area including the Colnbrook Logistics Centre associated with the construction of Terminal 5 at Heathrow, the LIFE scheme and Thames Water's proposals at Iver South were also considered.

8.3 The methodology was based on good practice guidance published by the Institute of Environmental Assessment and Landscape Institute ("Landscape and Visual Impact Assessment", 1996) and the Countryside Commission and Countryside Council for Wales ("Environmental Assessment" CCP326 1991).

Existing Environment

8.4 A study area (Figure 23) was defined based on the Zone of Visual Influence (ZVI) of the proposed 75m stack. The ZVI extends to approximately 3km around the proposed stack. Beyond the ZVI, distance and intervening development and vegetation reduce any visual impact to an insignificant level.

8.5 The ZVI extends as far as the Great Western Railway line, the western edge of West Drayton, the M4, the A30 (including Heathrow Airport), Staines Reservoirs, King George VI Reservoir and Wraysbury Reservoir (including Stanwell), the northern edge of Horton and the eastern edges of Brands Hill and Langley.

8.6 Photographic panoramas were used to record the character and condition of the landscape in the study area and the visibility of the current structures on the site. The photographs cover a representative selection of distances and receptors (Figure 24).

8.7 A desk top study supplemented by field surveys was used to assess the landscape and visual context.

Physical Context

8.8 The physical characteristics of the sites of the EfW facility, the Visitor Centre and Tanhouse Farm Landfill have already been generally described in earlier chapters.

8.9 The study area is predominantly flat, being largely within the valley of the River Colne. The ground level of the site and its immediate surroundings and land to the south including Horton, Poyle, Stanwell Moor, Stanwell and Heathrow Airport is about 20m Above Ordnance Datum (AOD). The land rises slightly to the north, to 25m AOD at Harmondsworth, West Drayton and Langley, and to 30m AOD at Richings Park and West Drayton.

8.10 Within the flat landscape are several significant man-made features. These include a number of substantial reservoir embankments and the embankments supporting the M25 and M4 and

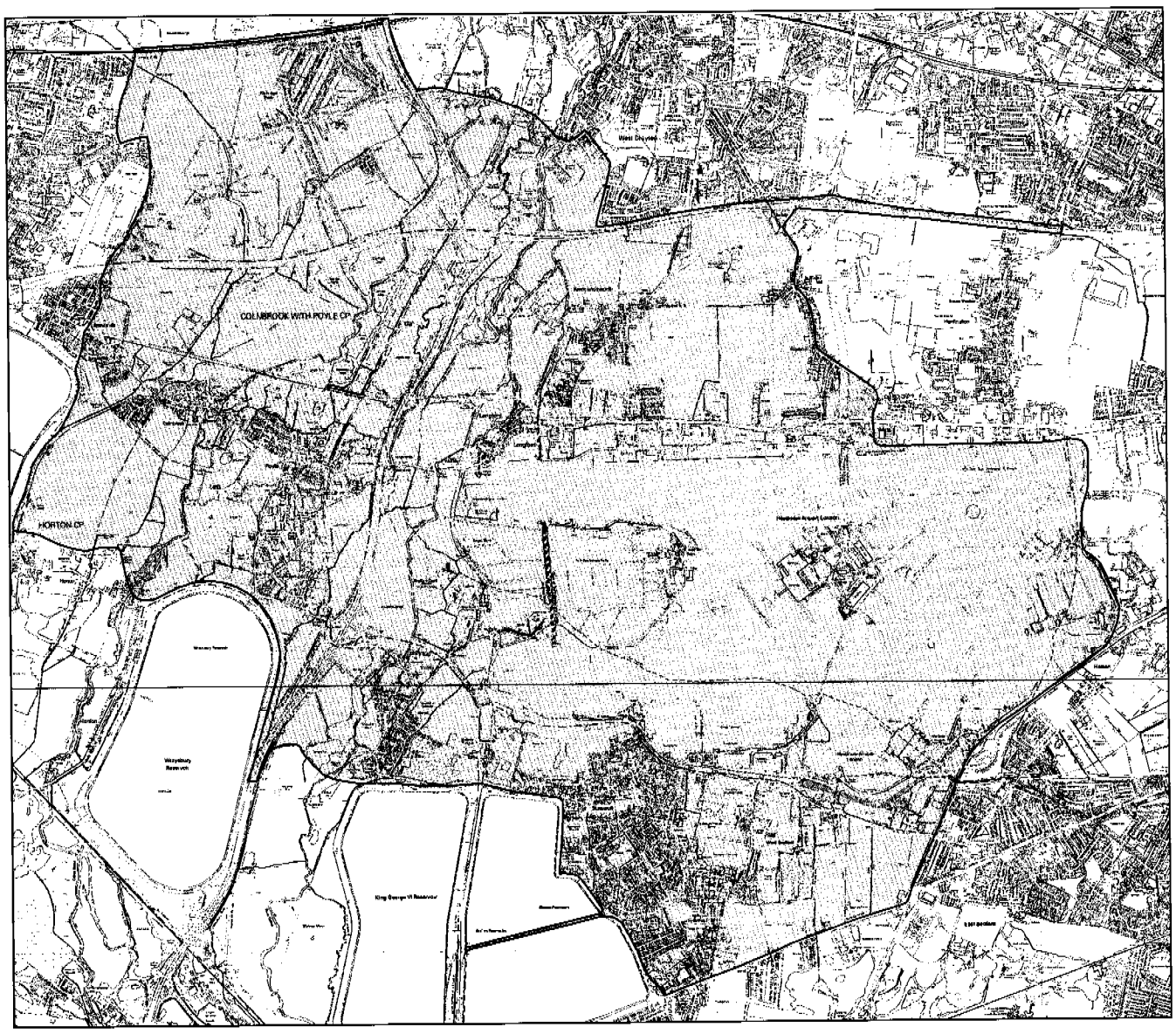


Figure 23 : **Zone of Visual Influence**

Lakeside Energy from Waste Site

Zone of Visual Influence

North *Source : The APP Partnership*

Scale. 1:50 000

1km

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their interchange. The lakes alongside the Colne Brook are the result of previous mineral extraction activity. West of the lakes, landfilling has left a gently domed profile. To the east of the site, the mineral workings have been restored to a flat profile. To the south, the Colnbrook Bypass (A4) rises on an embankment to cross the M25.

8.11 The study area contains relatively few mature trees, probably a result of previous mineral extraction and Dutch elm disease. However, significant wooded areas exist along the Bigley Ditch, between the Lakeside Industrial Estate and the M25, and along the Colne Brook and around the lakes to the west of the site.

8.12 Sparse vegetation exists round the perimeter of the EfW site including willow, elder, hawthorn and ash.

8.13 Around Colnbrook West Lake including the site for the Visitor Centre and car-park, there is a mix of willow, poplar, ash, blackthorn, hawthorn and elder. Willows and poplars are the tallest species and rise to between 15m to 20m.

8.14 As a recent landfill site, the vegetation on Tanhouse Farm Landfill is limited to emerging scrub.

Visual Context

8.15 The ZVI identifies the area within which views of the proposed development may be obtained based solely on an analysis of the topography of the area. Since it does not take account of the screening effect of intervening vegetation and development it represents a worst case scenario.

8.16 A series of photographs around the ZVI have been taken to illustrate the visual context and views towards the site from a range of distances and receptors. The photographs were taken on 10 and 15 February 1999, 2 March 1999 and 21 June 1999. With the exception of the photographs taken in June, the photographs represent the worst visual case due to the absence of foliage on deciduous vegetation.

8.17 Most views in the study area contain elements of the road network, industrial development, pylons and power lines and airport-associated activities. Residential development is also scattered throughout the study area. The flat topography allows open views across the site except where there is intervening development or vegetation. From many locations in the study area, the Lakeside site and existing stack are fully screened by the intervening development and vegetation. Where views of the stack are obtained, it is frequently seen in the context of existing development including the pylons and power lines and road lighting and signs along the surrounding road network.

8.18 The views obtained were analysed and the results are summarised below with reference to the viewpoints shown in Figure 24.

Long Distance Views

8.19 From viewpoint 1 to the north east, the existing stack on the EfW site is barely visible. Established vegetation filters views of the M4/M25 interchange although the gantry signs are prominent above the vegetated horizon.

8.20 Views from viewpoint 2 are dominated by the elevated M4/M25 junction which is visible on the skyline with gantry signs and traffic. BAA's Prospect Park is also dominant in the view. The pylons next to the Lakeside Industrial Estate and the existing Grundon stack are barely perceptible.

8.21 From the south (viewpoint 5) open views are available across restored agricultural land. The Poyle Trading/Industrial Estate is visible to the west and the M25 to the east. The vertical structures that form part of the motorway traffic management system, are dominant in the view. The existing stack of the waste management plant is barely perceptible and is partially screened by intervening vegetation.

8.22 From the southwest, viewpoint 7 is typical of views obtained from open areas between the Queen Mother Reservoir and the Wraysbury Reservoir. It is at an elevation of approximately 20m AOD, the same as most of the study area. Typical views are of flat featureless pasture land and residential development. Dominant features are the pylons and power lines crossing the landscape. The existing Grundon stack is barely visible.

8.23 Viewpoint 8 is from the top of the embankment of the Queen Mother Reservoir. From this elevated position, the settlement of Brands Hill and Colnbrook are visible in the middle ground with residential and industrial development extending in the distance. Power lines and pylons are significant features. The existing stack is just visible on the horizon above existing intervening vegetation and development.

8.24 From the west (viewpoint 10, the road bridge over the M4 between Brands Hill and Langley) the M4 predominates, with mature woodland forming part of Richings Park either side of the carriageway. To the southeast, views of Lakeside Industrial Estate across the restored grassland are possible. The pylons through the industrial estate and the existing CWI stack are also visible. The residential areas of Langley and Richings Park are visible. Intervening vegetation, including the mature woodland of Richings Park, partially screen views of Grundon's stack and the power lines, which appear as faint vertical elements on the horizon.

Local Views

8.25 Local views, that is from under 2km from the Lakeside site, are illustrated by viewpoints 3, 11-13, 15-19 and 21.

8.26 Viewpoint 11 is from north of the M4. The view here is generally open with the pylons and associated power lines dominant. The M4 signs and lighting are just visible in the distance, as is Grundon's existing stack.

8.27 Also from the north, viewpoint 12 (the public footpath, FP2, on the overbridge over the M4) represents the view from the most elevated position along the Colne Valley Way footpath (Figure 28a). From here, Old Slade Lake and the surrounding vegetation is visible with filtered views to the Lakeside Industrial Estate. The buildings on Lakeside Industrial Estate, pylons and power lines and existing Grundon stack are also visible.

8.28 Viewpoint 13 is illustrative of the view from the footpath network in Waterside Park to the northeast. The view is contained by the raised M25 embankment, beyond which the northern part of the Lakeside Industrial Estate is visible along with the pylons. The existing waste management plant and stack are visible through the intervening vegetation. As the park landscape matures the visual effect will be reduced.

8.29 Viewpoint 3 is from the roundabout along the A4 with the A3044 looking west towards the site (Figure 29a). It is typical of views from the western edge of Harmondsworth and Longford and from the A4 approaching the site from the west. Several urban elements are in the view including traffic, lighting, signs and gantries and traffic lights. The Lakeside Industrial Estate buildings and pylons are visible with the existing waste management building and stack.

8.30 Viewpoint 15 represents typical views from the western edge of Longford. The Coln Trading Estate and Lakeside Industrial Estate buildings, including the waste management building and stack, and pylons are partially visible through the existing vegetation along the M25 corridor.

8.31 From viewpoint 16 (the Bath Road crossing over the M25) the M25, M4 and A4 and associated features are dominant structures. The Coln Trading Estate and Lakeside Industrial Estate including the Lakeside site and stack are visible in the distance but partially screened by the A4 embankment.

V10
Great Western Railway
Richings Park
Langley
V1
V11
West Drayton
West Drayton
V9
V/P 12
V2
M4
Old Slade Lake
Old Wood
Orlitts Lake North
V13
Harmondsworth
Brands Hill
V/P 21
COLNBROOK WITH POYLE CP
Orlitts Lake South
Lakeside Industrial Estate
Waterside Park
Queen Mother Reservoir
A4
Colnbrook West
Prospect Park
V19
V8
V/P 3
Pippins Park
Longford
Colnbrook
Longford
V/P 17
V18
Colin Trading Estate
V 15
Poyle
Bath Road
V16
1 km
Heathrow Airport
V7
M25
A3044
Poyle Trading Estate
Horton
Wraysbury Reservoir
V5
2 km
Wraysbury Reservoir
3 km
King George VI Reservoir
Staines Reservoir
Stanwell

Figure 24 :
Location Plan and Photographic Viewpoints

Lakeside Energy from Waste Site

(V) Photo Viewpoint

(VP) Photomontage Viewpoint

• Proposed Visitor Centre

Proposed Temporary Construction Compound

------ Power Lines

North

Source: The APP Partnership

Scale. 1:25 000

1km

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8.32 Viewpoint 17 from Pippin's Park, Poyle, to the south of the site, is representative of views from the northern edge of Poyle (Figure 30a). The views towards the site are generally contained by the intervening vegetation and the embankment of the Colnbrook Bypass beyond it. Grundon's existing stack is visible on the skyline from this point, although from other locations in the park it is screened by intervening vegetation.

8.33 Viewpoint 18 gives a typical view from the residential area of Poyle. The existing vegetation, boundary fencing and garages enclose the view. There are no direct views towards the Colnbrook Bypass (A4) or the existing waste management building. The top of the existing stack may, however, be visible from a few locations within this residential area.

8.34 Viewpoint 19 is the Colnbrook Bypass (A4). The view is dominated by the bypass rising to cross the M25. The development adjacent to the A4 is visible through breaks in the roadside vegetation, along with filtered views of the Grundon site and stack with taller elements of the Lakeside Industrial Estate beyond.

8.35 Also from the west, viewpoint 21 (FP2, between the M4 and A4) is typical of views obtained for much of the length of the footpath, with views over the open generally flat grassland (Figure 31a). The Lakeside Industrial Estate is fully screened by intervening vegetation with only the waste management stack visible.

Landscape Character

8.36 Landscape classification is the process of analysing landscape resources by classifying them into landscape character areas i.e. areas of broadly similar distinct characteristics, elements and features which are made up of several smaller landscape units displaying a degree of uniformity. Following the identification of the landscape units around the EfW site and with the assessment of the wider study area it was possible to identify five Landscape Character Areas (Figure 25).

8.37 For this assessment, landscape character has been determined by reference to the topography of the area, development pattern and landcover. The relative strength of the landscape types is determined by the contribution of individual components that form the landscape character. This has been assessed and is graded as strong, medium or weak. The character and strength of the landscape units and areas is described below and shown on Figure 25.

8.38 Unit A to the east of the Lakeside Industrial Estate is an area of poorly restored landfill used for agricultural purposes. Transport corridors, industrial and commercial development and the pylons dominate the area. It is generally flat although steep embankments slope up to the A4 Colnbrook Bypass. The area is mainly rough grassland with mature willow trees running along the Bigley Ditch. There is a sparsely planted bund to the west of the ditch and a hedgerow along the eastern edge of the Colnbrook Branch Line. Trees surround the pond in the southwest corner of the site and there is also an area of scrub and trees along the embankment of the A4. The strength of character for Unit A is weak as a result of poor quality restoration and general lack of enclosure.

8.39 Unit B lies to the west of the Lakeside Industrial Estate. The area is characterised by the Colne Brook, lakes and associated vegetation. The extent of the vegetation gives it a enclosed and sheltered character. The Colne Valley Way runs along the western boundary of the area. The unit displays a strong character.

8.40 Unit C is to the west of Colne Brook and includes Tanhouse Farm Landfill. This is an area of poor pasture land, influenced by urban land uses. The land was previously worked for minerals and has been restored to a gently domed landform. There is evidence of tipping and HGV parking along the A4 frontage. Old Wood, a prominent mature woodland, adjoins the M4. The unit has a weak character determined by the lack of landscape enclosure and landscape structure, its damaged/fragmented nature and numerous visual detractors.

8.41 Unit D includes Iver South Wastewater Treatment Works. The perimeter of the works supports scrubby unmanaged vegetation with occasional stands of naturally regenerating trees. Public footpath FP2 passes east-west to the north of this area and FP6 which forms part of the Colne Valley Way passes to the east. The unit has a weak character, lacking strong visual elements, and being heavily influenced by the adjacent M4 and the industrial nature of its use.

8.42 Unit E, south of the Grundon site is bounded by the A4 to the north and the settlements of Colnbrook and Poyle to the south. There is a mixture of pasture, recreational open space and commercial uses. Scrubby vegetation exists associated with field edges, the A4 and parcels of disused land. Taller trees exist along the settlement edge. The area is crossed by pylons and power lines and heavily influenced by the A4 (T). The unit has a medium landscape character.

8.43 Following the identification of the landscape units around the EfW site and with the assessment of the wider study area it has been possible to identify broad areas of landscape character. Five Landscape Character Areas were defined (see Figure 25).

Character Area 1: Colnbrook and Poyle Flood Plain

8.44 The area is influenced by reservoirs, past and present mineral extraction, landfill and restoration and supports a large-scale field pattern defined by hedgerows and fences. Infrastructure associated with transport, power and communications is particularly evident. The area generally demonstrates a weak fragmented landscape character.

Character Area 2: Richings Park and Thorney

8.45 This area is influenced by the settlement of Richings Park and associated former parkland although the effects of past gravel extraction, restoration and the M25 and M4 corridors are also evident. Mature vegetation is associated with settlement edges, the former parkland and river corridor. There is developing vegetation around the Richings Park Golf Course, motorways and restored agricultural land. The area generally has a strong landscape character.

Character Area 3: The West Drayton Waterbodies

8.46 Areas of open water remaining from former mineral extraction, river corridors and associated vegetation dominate this area. The strength of character enables land uses such as motorways, rail lines and pylons to be assimilated without significant detrimental effect to the character of the area as a whole.

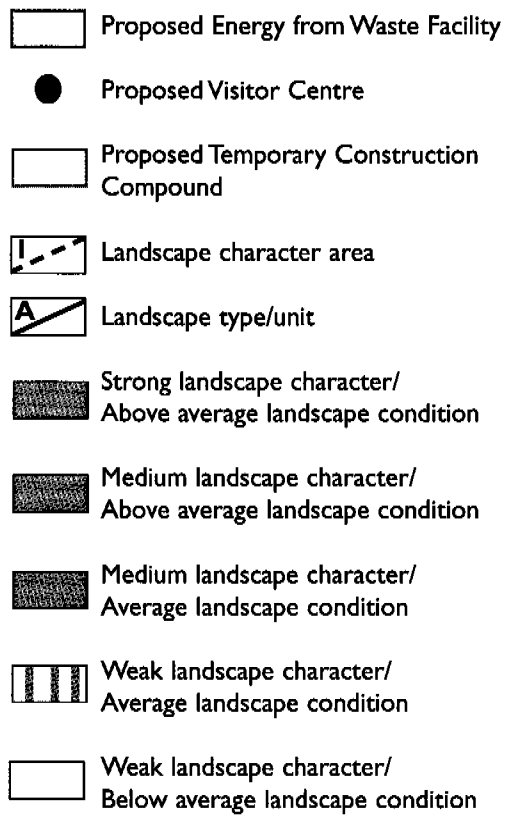
Character Area 4: Waterside (Prospect) Park

8.47 This is an area of emerging parkland landscape. The area is currently undergoing substantial new land forming, planting and construction and potentially has a strong character.

Character Area 5: The Poyle M25 Corridor

8.48 This is an area heavily influenced by the M25 motorway, commercial and industrial development and gravel extraction. It has a diverse range of land uses with little continuity, producing a weak, degraded character. To the west of the motorway, the field pattern is barely discernible. Dense, scrubby vegetation is evident in places associated with mineral workings. The River Colne and associated vegetation exerts a positive influence as does land to the north east of Wraysbury Reservoir. To the east of the motorway the heavily degraded agricultural landscape is influenced by Heathrow Airport, commercial operations, tipping and abandonment. Noise and light from the M25 dominate the area.

Figure 25 :
Landscape Character and Condition



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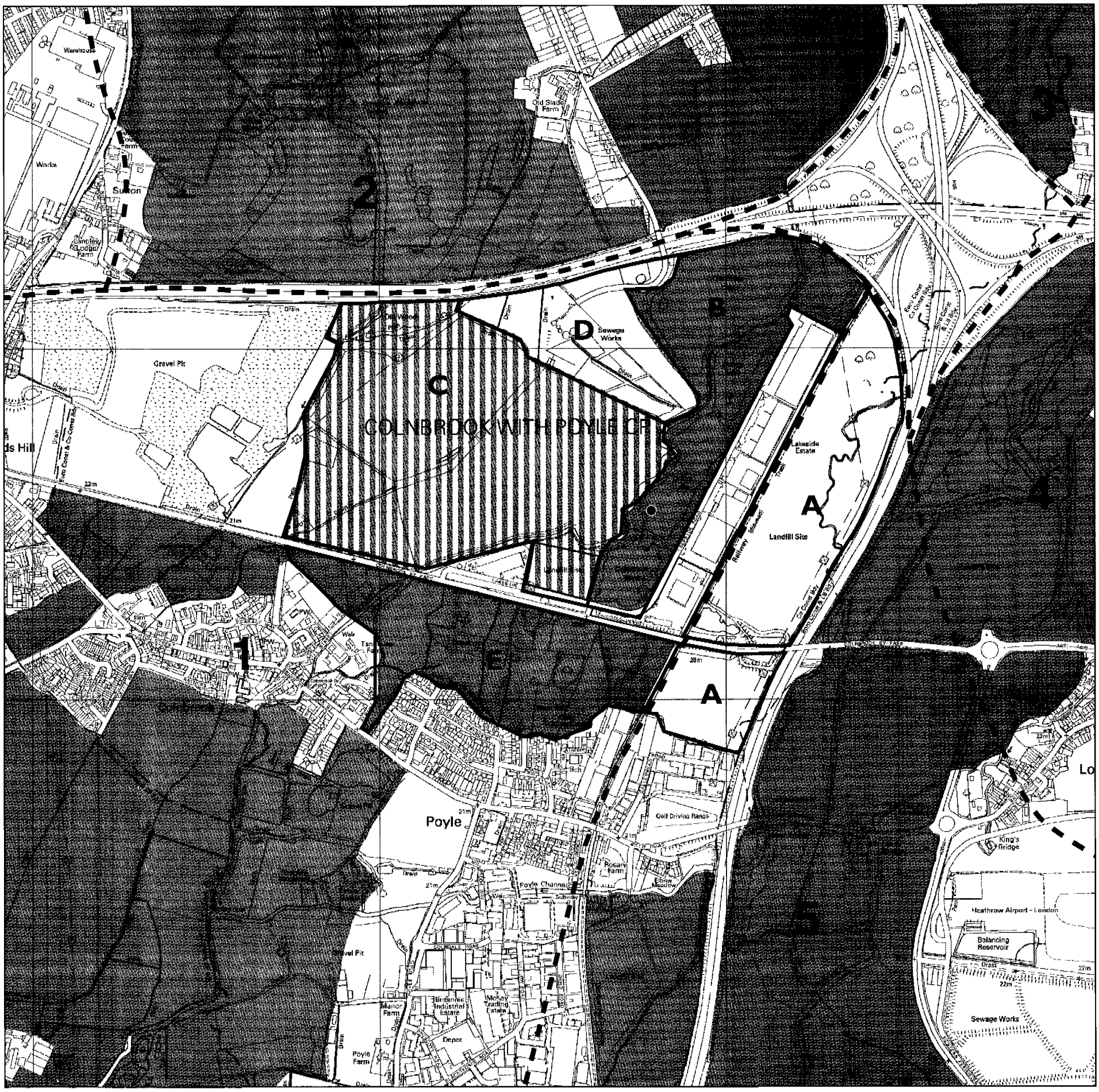

Warehouse
Works
Sutton
Old Slade Farm
Gravel Pit
Drain
Old Willow Pit
Sewage Works
D
C
B
A
E
COLNBROOK WITH PONLE CP
Lakeside Estate
Landfill Site
Railway (disused)
Colnbrook By-Pass
Poyle
Golf Driving Range
Poyle Channel
Rosary Farm
Elbow Meadow
Manor Farm
Britannia Industrial Estate
McKay Trading Estate
Depot
Poyle Farm
King's Bridge
Heathrow Airport - London
Balancing Reservoir
Sewage Works

Landscape Quality

8.49 Landscape quality is dependent on the strength of character and condition of a landscape area. Landscape condition has been determined by reference to the condition of the individual components for example trees, other vegetation, buildings and other features and the condition of the landscape overall. The relative landscape condition of the landscape units and areas is shown on Figure 25.

8.50 The overall condition within the study area is poor, reflecting evidence of past disturbance. The area is still much affected by urban influences. New urban influences, for example BAA's Prospect Park have been offset by improvements as landfill is restored. The strength of landscape character also varies considerably. There are a few locations where areas possess both strong landscape character and above average condition, for example, landscape unit B. However, there are also areas that have a weak landscape character and poor landscape condition. Therefore the study area is of poor landscape quality within which there are areas of better quality.

Landscape Aims and Objectives

8.51 From the landscape and visual survey the following design parameters for the EfW facility were established:

a. The building should be no larger than that required to house all the necessary plant. Particular attention should be paid to the design, form and choice of materials. In this area the industrial structures are harsh and, at best, utilitarian. The lack of quality of these buildings should not be used as a benchmark. Given that the EfW structure has to be large, and will be seen from a number of viewpoints, there is an opportunity to design a landmark building of quality.

b. The proposed stack must not exceed 75m in height – the maximum acceptable to the Civil Aviation Authority. To reduce the effect of wind vortices on overhead aircraft and on Heathrow Airport, the building should have a curved/tapered roof;

c. The form of the building should be carefully considered to break up the large built mass by gaps in the structure, integrating the stack with the building design, using colour to reduce the building's prominence and using high quality design and materials to give it an attractive appearance.

8.52 To assimilate the development as far as possible into the surrounding environment, a strategy was established with the following elements:

a. It is impossible to fully screen a building of this size from close-up. However, the survey shows that most views will be filtered through existing vegetation or seen over the tops of intervening structures. Planting should be carried out along the approaches to the EfW site and along the site boundaries to provide screening to the lower elevations of the development and to increase the roadside planting, in accordance with the policies and strategies for the Colne Valley Regional Park.

b. The view from the rights of way along and west of the Colne Brook are perhaps the most significant available to the public. The landscape of the lakes and the Colne Brook should be strengthened, with management of existing vegetation, additional planting and improved access to the landscape resource.

c. A landscape scheme should be implemented for Tanhouse Farm, including planting proposals to strengthen the landscape structure and enhance the landscape character and quality of the area.

d. Where possible, with the agreement of landowners off-site, additional planting should be offered to strengthen the landscape of the area generally.

Implications of Policies

Metropolitan Green Belt

8.53 The Green Belt has a largely structural role to play in the settlement pattern of the area. Landscape quality is not necessarily relevant to designation, although the long-term nature of the designation makes it desirable to seek to improve landscape quality in Green Belt.

8.54 The Lakeside Road Industrial Estate is outside the Green Belt but will be seen from it. The site of the proposed Visitor Centre and the temporary construction compound at Tanhouse Farm Landfill are both within the Green Belt (see Figure 13). Planning Policy Guidance Note 2, Green Belts, sets out the purposes of the designation (paragraph 1.1) which are to:

- check unrestricted sprawl of large built up areas;
- prevent neighbouring towns from merging;
- assist in safeguarding the countryside from encroachment;
- preserve the setting and special character of historic towns, and
- assist in urban regeneration by encouraging the recycling of derelict and other urban land.

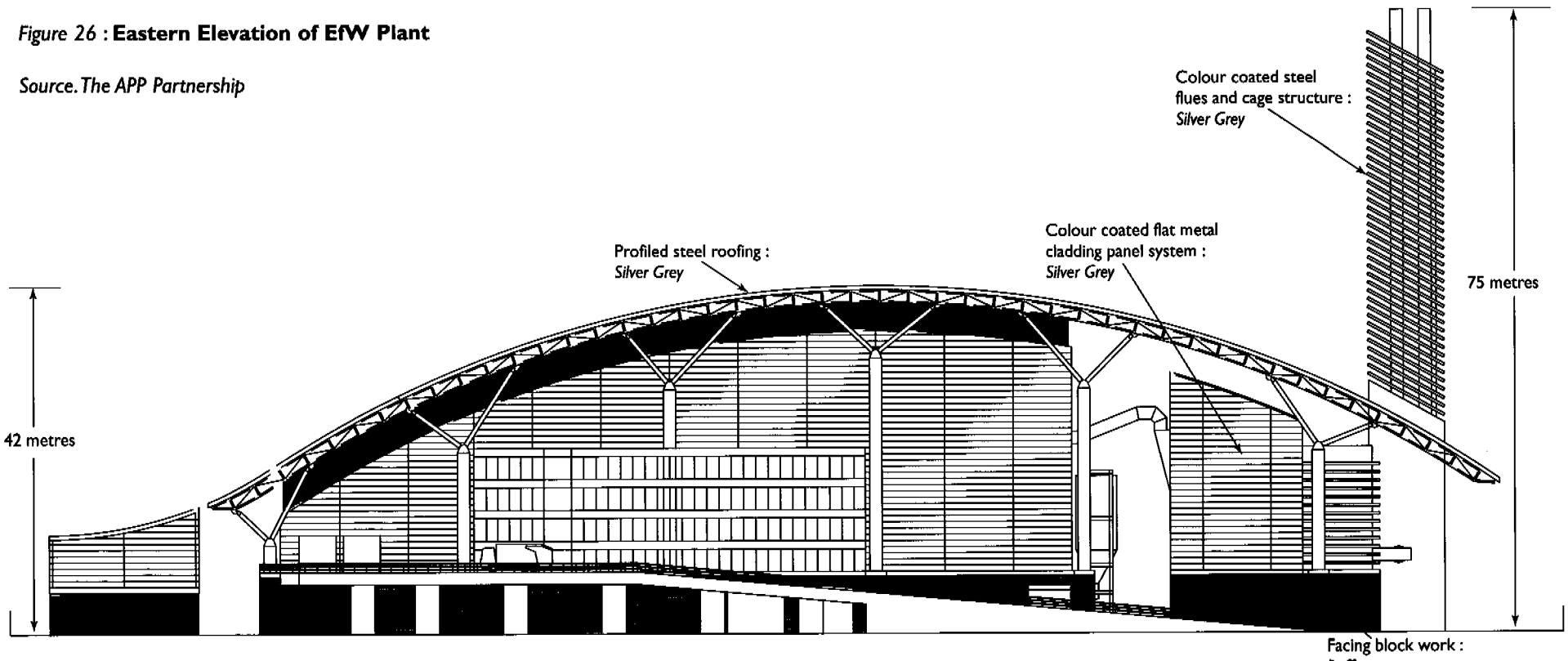
Green Belts have a positive role to play in fulfilling various objectives to:

- provide opportunities for access to the open countryside for the urban populations;
- provide opportunities for outdoor sport and outdoor recreation near urban areas;
- retain attractive landscapes and enhance landscapes near to where people live;
- improve damaged and derelict land around towns;
- secure nature conservation interest, and
- retain land in agricultural, forestry and related uses.

8.55 There is a general presumption against inappropriate development in the Green Belt.

Figure 26 : **Eastern Elevation of EfW Plant**

Source. The APP Partnership



Special circumstances need to be shown to justify such development allowed in the Green Belt. When any large scale development or redevelopment of land occurs in the Green Belt it should so far as possible contribute to the achievement for the use of land in Green Belts.

Strategic Gap

8.56 Although no boundary has as yet been defined, the Draft Slough Local Plan notes the importance of maintaining a Strategic Gap in the open area between the eastern edge of Slough, Colnbrook and Poyle and Greater London and restricts development which could affect the openness of the Green Belt in this area (Policy C6).

Colne Valley Regional Park

8.57 The Lakeside site lies within the Colne Valley Regional Park. One of the key aims of the strategy for the park is "to provide accessible facilities and opportunities for countryside recreation". Further details on this designation are given in Chapter 4, Environmental Context.

Linear Park

8.58 An area along the northern boundary of Tanhouse Farm Landfill site and along the western boundary of Orlitts Lake South and North and Old Slade Lake is proposed for a Linear Park in the Draft Slough Local Plan (Policy CG2). Development proposals which would prejudice the proposed cycleway/footpath or would detract from user's enjoyment of this route will not be permitted.

Landscape Policies

8.59 Policy ENV7 of the adopted South Bucks Local Plan and Policy EN3 of the Draft Slough Local Plan requires all new development to include comprehensive landscape proposals. The landscape which would be affected is Green Belt.

Impact of the Proposal

Summary of the Design Proposals

Energy from Waste Plant Design

8.60 The design of the building follows the strategy outlined above (Figure 26). In particular:

i. The profile of the roof of the building is curved to reduce the overall height and mass of the building.

ii. The design of the roof has also been considered when viewed from above, so that an aesthetically attractive feature is visible from numerous and frequent aircraft passing relatively low over the building, on approach to and departure from Heathrow Airport.

iii. A break in the building has been introduced to allow limited intervisibility through the building, to reduce the perceived mass of the building from certain locations.

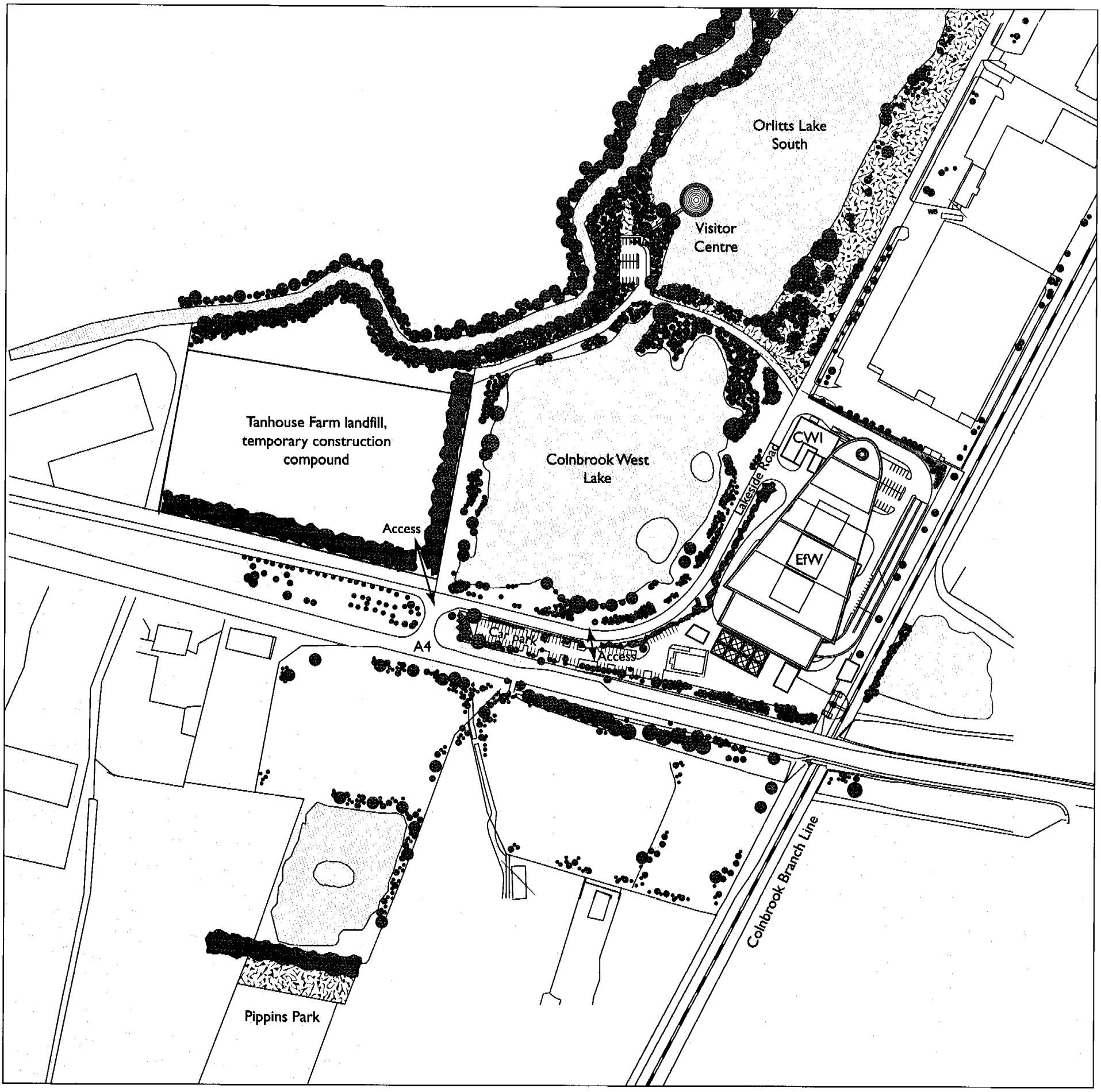

Orlitts Lake South
Visitor Centre
Tanhouse Farm landfill, temporary construction compound
Colnbrook West Lake
Lakeside Road
CWI
EfW
Access
A4
Car Park
Access
Colnbrook Branch Line
Pippins Park

Figure 27 :
Landscape Proposals

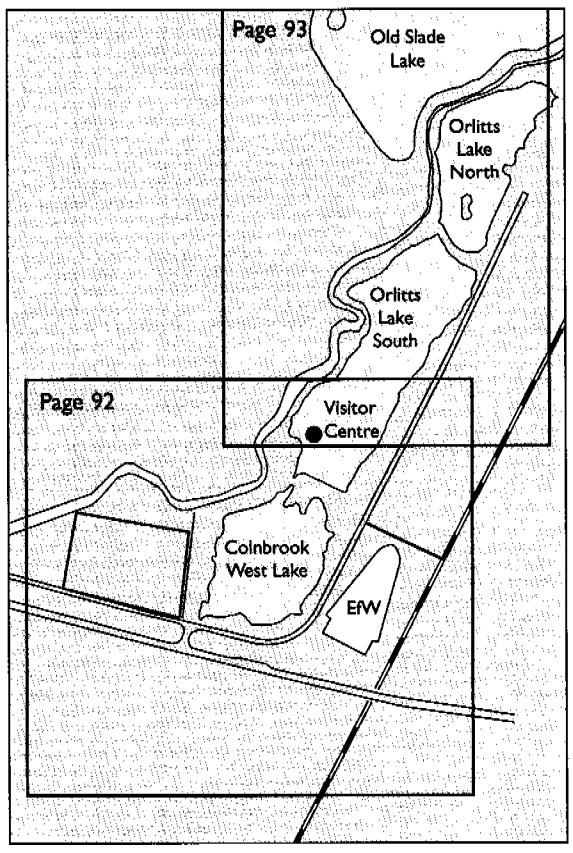
EfW Plant

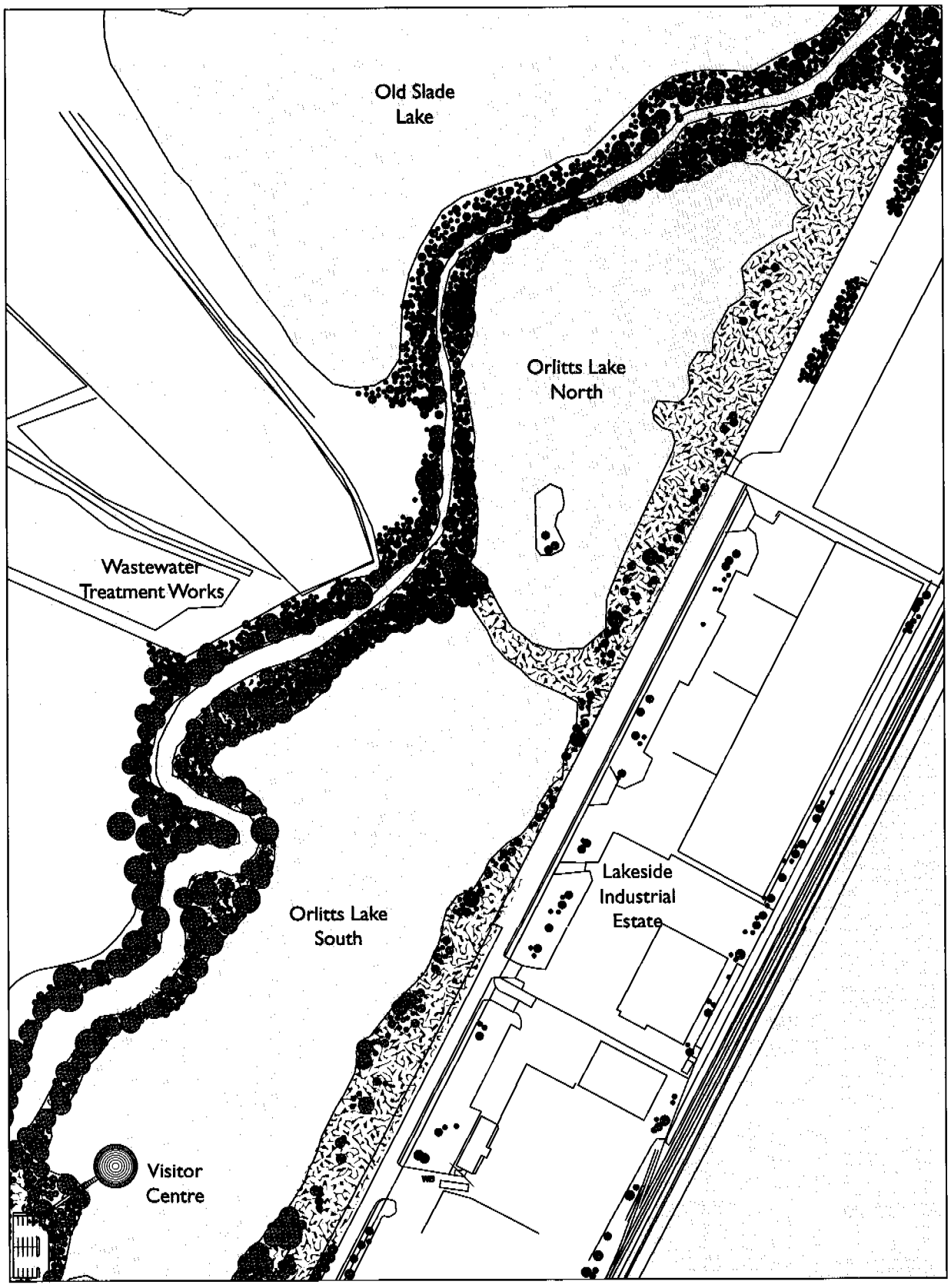
Existing Trees and Shrubs

Proposed Planting

Enhanced Planting

Proposed Temporary Construction Compound





North

Source. The APP Partnership

Scale.

100m

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iv. Vertical elements have been incorporated into the building elevations to divide the building façade and thus reduce the perceived mass of the building.

v. The building will be light grey in colour, so minimising its visual prominence in the landscape. The appearance of the building will recede when viewed against the sky and its perceived scale will be less obvious. The use of reflective materials will be limited to prevent building glare within the landscape.

vi. The existing vegetation that presently partly screens car parking and buildings between Lakeside Road and the Colnbrook Bypass will be retained.

The Visitor Centre Design

8.61 The Visitor Centre has been designed to reflect the architectural form and materials of the Waste to Energy plant. It will be perceived as a low profile feature in a more rural environment, and its use will promote access to and appreciation of the nature conservation resource of the adjacent lakes.

8.62 The location has been selected to provide views of the open water, lakeside vegetation, wildlife, and views of the proposed EfW plant. The Visitor Centre will provide a facility to observe wildlife and educate on the energy from waste process.

8.63 Car parking for the Visitor Centre has been located to limit the effect on existing vegetation.

Landscape Proposals

8.64 Landscape proposals for the Lakeside EfW development include planting round the EfW site, Orlitts Lake South and North, the proposed Visitor Centre and Tanhouse Farm Landfill and off-site planting (Figure 27).

Energy from Waste Site

8.65 The northern boundary of the EfW site is lined with existing poplar trees. Where there are gaps planting is proposed to create a continuous screen to the northern boundary.

8.66 The southern boundary of the site adjacent to the Colnbrook Bypass (A4), already has extensive landscaping.

8.67 The landscape proposals along Lakeside Road include the planting of the entrance to Lakeside Road from the Colnbrook Bypass (A4) to create a green entrance to the site.

8.68 The site's frontage along Lakeside Road will be grassed, with tree planting to create an informal edge to the site's existing car-park. The tree species will reflect the existing vegetation around the lakes.

8.69 Landscape measures are also proposed along Lakeside Road, adjacent to the EfW plant. The construction of the building and new access to the site from Lakeside Road will result in the loss of a row Leyland Cypress. Proposed screen mounding and shrub and tree planting will replace this and create a well vegetated frontage to the building, providing screening to the lower elements of the development. The planting will be informal and the species will reflect the existing vegetation along the banks of Colnbrook West Lake.

8.70 The planting proposals to Lakeside Road will also enhance the route to the proposed Visitor Centre on Orlitt's Lake South, along Lakeside Road with access via a track off Lakeside Road.

Orlitt's Lake South Planting Proposals

8.71 The existing vegetation around Orlitt's Lake South and the site of the Visitor Centre will be managed to improve its condition and structure. Additional planting will also be undertaken within the existing vegetation, to increase its screening effect. The planting will reflect the species of the existing vegetation and will be selected to encourage wildlife.

8.72 These planting proposals will enhance the scenic quality of the lake setting and of the informal footpath network around the lakes. They will also enhance views from the Visitor Centre, access track and the informal footpaths.

Tanhouse Farm Landfill

8.73 The landscape proposals for Tanhouse Farm Landfill, on completion of construction and removal of the construction compound include the restoration of the land, planting of Tanhouse Farm Landfill boundaries, and the regrading of the land adjacent to Lakeside Road, providing a gently profiled screen mound with substantial planting.

Off-Site Landscape Proposals

8.74 In addition to on-site landscape proposals, off-site planting by agreement with landowners will be considered, where additional planting will screen views of the proposed development or provide visual amenity to compensate for the impact of the proposed development.

8.75 Off-site planting will also be considered, assuming the agreement of the landowner, at Pippin's Park to reinforce the existing boundary planting, increase the enclosure within the park and reinforce existing screening of the views towards the EfW facilities.

Assessment of Impact

Demolition and Construction Impacts

8.76 The construction of the proposed development will be phased over approximately two years, and during that period the impacts on the landscape and visual scene will vary. Any visual impacts arising from construction will be temporary and not sufficient to influence or alter the landscape character and quality of the immediate landscape types, the broader landscape character areas or the wider study area.

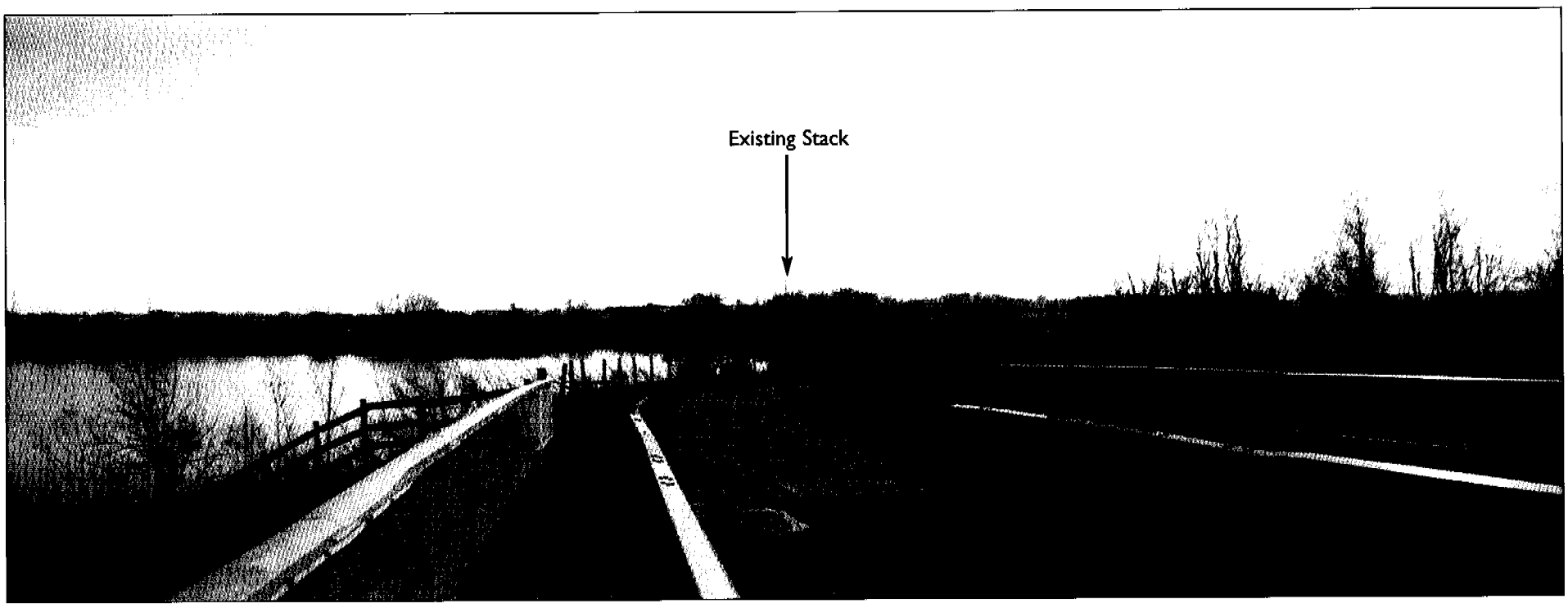


Figure 28a : **Photomontage - Existing View from Bridge over M4 on Footpath FP2 (Viewpoint 12)**
Source : The APP Partnership

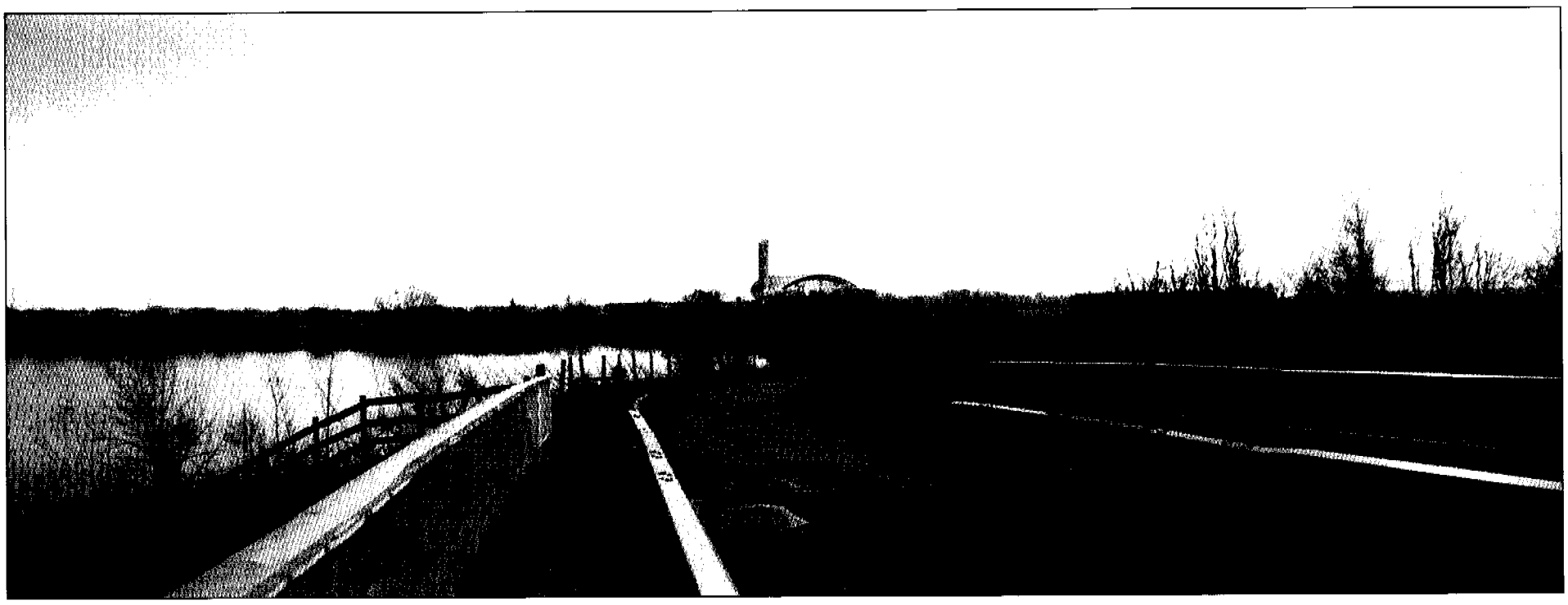


Figure 28b : **Photomontage - View from Bridge over M4 on Footpath FP2 with EfW (Viewpoint 12)**
Source : The APP Partnership

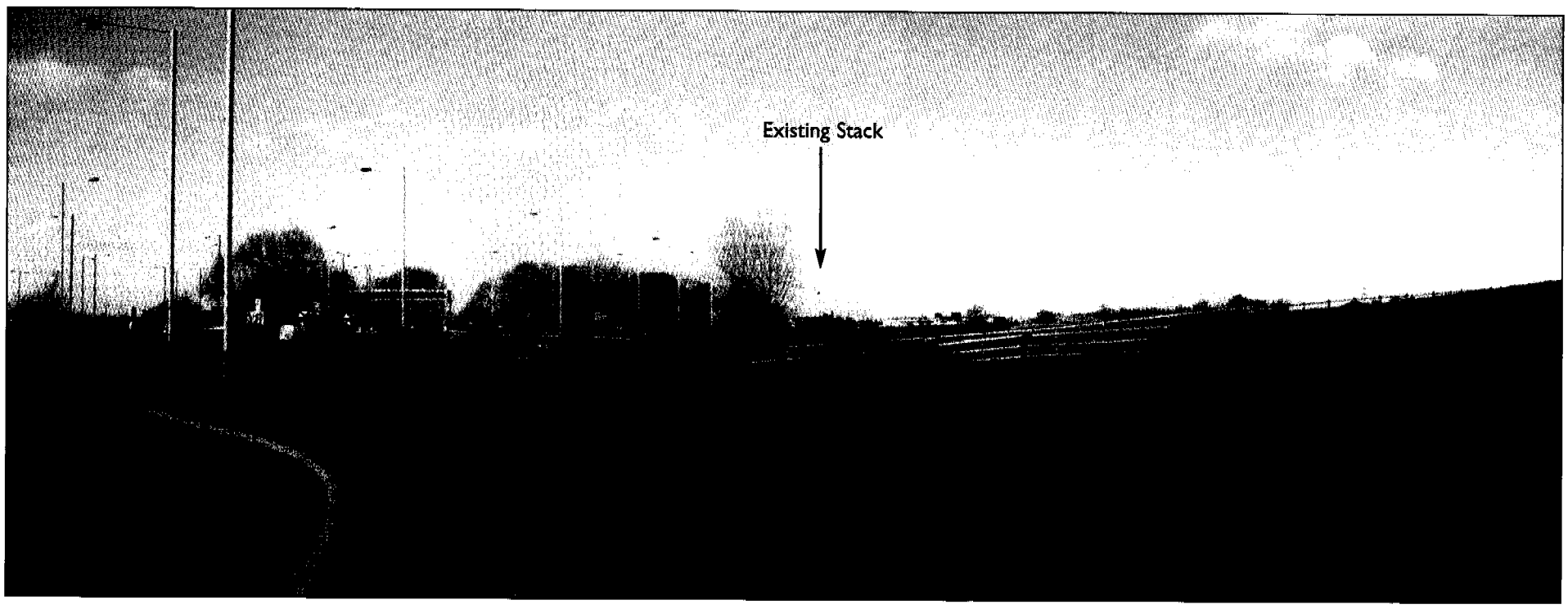


Figure 29a : **Photomontage - Existing View from A4 Moor Roundabout (Viewpoint 3)**
Source :The APP Partnership

Figure 29b : **Photomontage - View from A4 Moor Roundabout with EfW (Viewpoint 3)**
Source :The APP Partnership

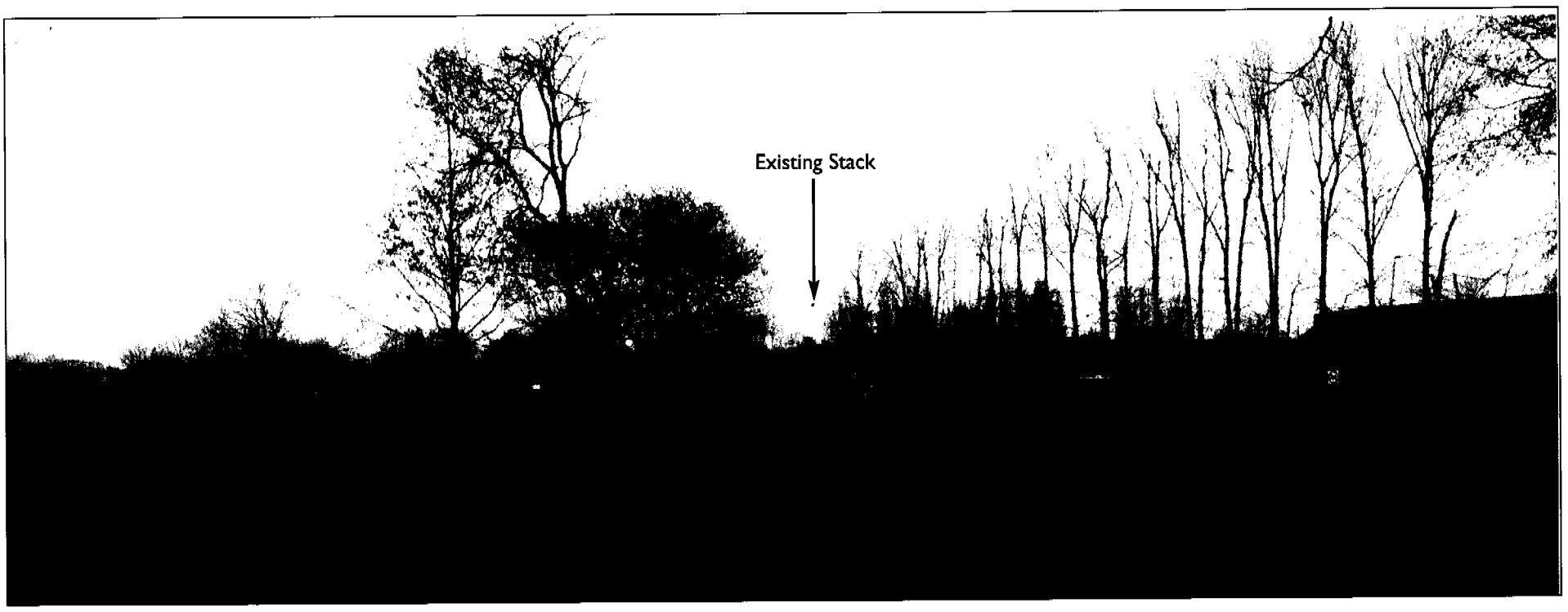


Figure 30a : **Photomontage - Existing View from Pippins Park, Poyle (Viewpoint 17)**
Source :The APP Partnership

Figure 30b : **Photomontage - View from Pippins Park, Poyle with EfW (Viewpoint 17)**
Source :The APP Partnership

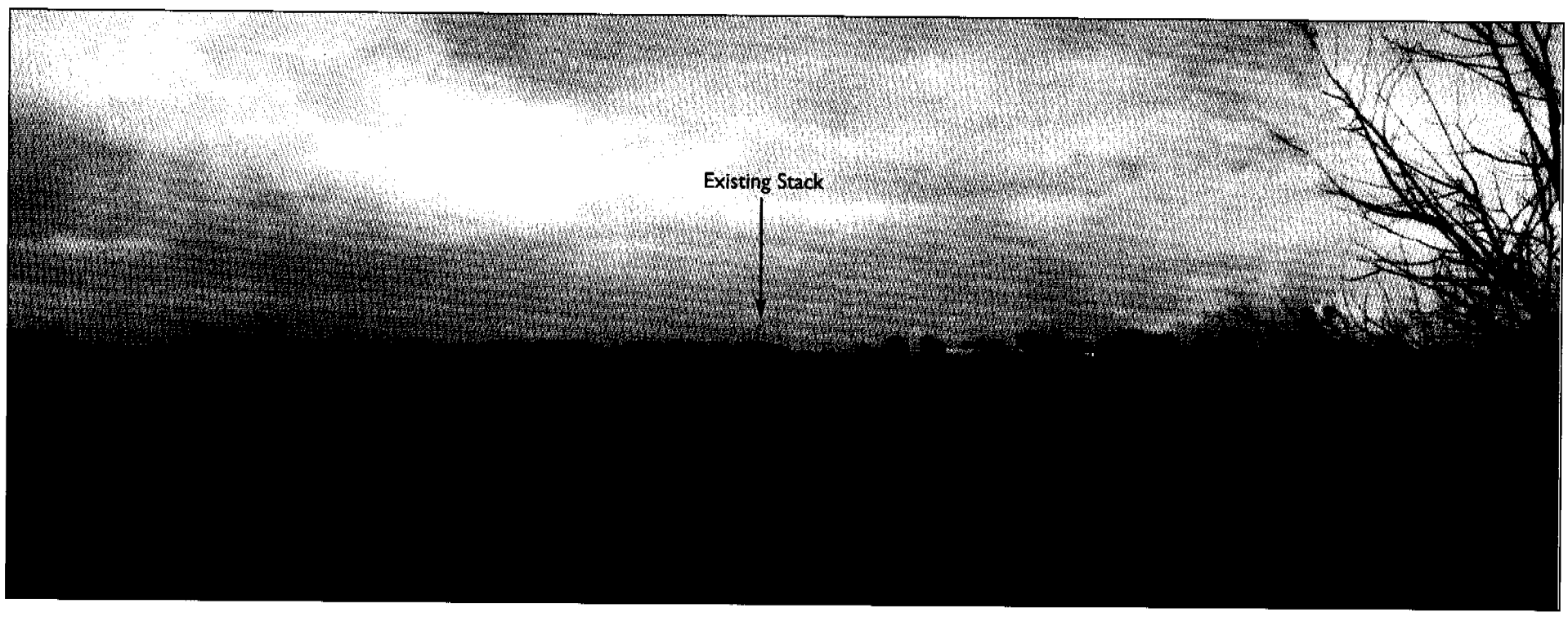


Figure 31a : **Photomontage - Existing View from Footpath FP2 (Viewpoint 21)**
Source :The APP Partnership

Figure 31b : **Photomontage - View from Footpath FP2 with EfW (Viewpoint 21)**
Source :The APP Partnership

Operational Impacts

Visual Effects

8.77 The degree of visual impact is dependent on both the sensitivity of the receptor and scale of change in the view. Views from a public highway are considered to be less sensitive than those from a public park or footpath where visual amenity is an important aspect of the functional use of the area.

8.78 For this assessment a major adverse change in view includes unobstructed views of the EfW building and stack from a distance greater than 1km. Moderate adverse change in view includes partial or filtered views of the building or stack from a distance under 1km. A minor adverse view includes the very top of the building and stack from local views or open views over a distance of 2km or more.

8.79 The visual impact has been assessed in winter when most vegetation is devoid of leaves and as such gives a worst case. The location of the views selected also illustrates the most prominent viewpoint from a particular area and therefore, again, represents the worst case.

8.80 The visual impact on views from the photographic viewpoint locations identified on Figure 24 has been assessed as follows:

Long Distance Views

8.81 From viewpoint 1, representative of views from the northeast, the EfW plant and stack will be visible on the horizon beyond the M4/M25 interchange. Due to the distance of the view, other existing detractors and the open, restored grassland and lakes that will still be dominant features the visual impact is considered to be minor.

8.82 From viewpoint 2, from the east, the plant and stack will again be visible above the vegetated skyline. The visual impact is considered to be minor due to the distance to the EfW plant and numerous existing and urban features within the view.

8.83 From viewpoint 5, from the south, the roof of the EfW plant and stack will be visible above the intervening vegetation. Although it will appear as a new element on the horizon, the light grey colour of the building and stack will ensure that they recede into the distance. However, the views of the M25 and Poyle Trading Estate and local road elements will still remain more dominant and as the building is at a distance of approximately 1.8km the visual impact will be minor.

8.84 From viewpoint 7 (the south west) the top of the EfW building and stack will be visible above the existing vegetation and development. As the building will be over 2km away and viewed against dominant vertical elements such as the existing pylons the visual impact will be minor.

8.85 From viewpoint 8 (the west) the EfW building and stack will be partially visible above the vegetated horizon. From this elevated location on top of the embankment of the Queen Mother Reservoir the visual impact will be moderate.

8.86 From viewpoint 9 (the northwest) the EfW building and stack will be seen above the restored landfill area and vegetation. However it will be seen in the context of intervening development, including the M4 motorway, and vertical elements of lighting and pylons. The visual impact will be minor.

8.87 From viewpoint 10 (the north west) the EfW building and stack will be faintly visible above intervening vegetation on the distant horizon over 2.8km away. The pale colours of the building will ensure that the building will not be a prominent feature on the horizon but will be seen in the context of the existing scattered development, housing and vegetation. The overall visual impact is considered to be minor.

Local Views

8.88 From viewpoint 11, the roof and west elevation of the building will be partially visible over of a distance of 1.5km, above the M4 embankments and intervening vegetation. The pale colour of the structure will assist in reducing its prominence. The building will introduce an industrial element into the view resulting in a moderate visual impact.

8.89 From viewpoint 12, (the north) the EfW plant is visible over a distance of approximately 1km above the existing vegetation (Figure 28b). The pale colour of the new, building will restrict its prominence. However it will be seen as a large industrial element in the view. It will be viewed in the existing context of views of industrial units within the Lakeside Industrial Estate and the pylons and power lines running through the estate. The photograph is taken from the most elevated position along public footpath FP2 and is not generally representative of views from this area, which, in the context of views of the industrial units, will be moderate.

8.90 From Viewpoint 13 (the northeast) the EfW plant will be visible beyond the M25 embankment and the pylons. The proposed building will increase the development seen on the horizon and the stack will introduce a significant vertical element into the view. With unobstructed views of the development over 1-2km the impact is generally moderate. As planting in the Waterside Park matures and more screening is provided, the impact will become low.

8.91 From viewpoint 3 (the east) the EfW plant and stack will be partly visible above the intervening vegetation (Figure 29b). Existing traffic lighting and gantry signs will be visible in the view with the EfW plant seen further along the A4. When travelling along the A4 towards the site the impact is considered to be minor.

8.92 From viewpoint 15 the EfW building and stack will be visible on the horizon, seen above the Colnbrook Bypass road bridge and embankment. The building and stack will be seen in the context of existing industrial units and pylons however the relative scale and height of the building will dominate the view. The prominence of the building will be limited by its pale colour. The visual impact of the building is likely to be moderate from this view.

8.93 From viewpoint 16, the plant and stack will be visible beyond the Colnbrook Bypass. The plant will be seen in the context of the Coln Trading Estate, existing pylons and M25 motorway corridor and traffic. The Lakeside Industrial Estate will also be visible beyond the EfW building. The visual impact is considered to be minor.

8.94 The photograph showing the view from viewpoint 17 (Figure 30b) is taken from the most prominent viewpoint in Pippins Park. Generally from views in Pippins Park, the EfW plant will be partially visible beyond the Colnbrook Bypass A4 and through breaks in the vegetation (Figure 30b). The light coloured roof will result in a less prominent structure than the industrial units of the Coln Trading Estate. From other locations in the park and to the rear of housing the building is completely screened by park boundary vegetation with only the stack visible above the vegetation. The visual impact is minor to moderate.

8.95 From viewpoint 18, the residential area of Poyle, the EfW plant and stack will be partially visible above and beyond the existing vegetation within the view. The impact is considered to be moderate.

8.96 Viewpoint 19 represents views from the Colnbrook Bypass A4. The EfW building and stack will be partially visible beyond the Hellmann's factory, A4 traffic and roadside vegetation. The EfW site will be at a lower level than the bypass as the road rises to cross the M25 which helps to reduce the extent of the building that is visible. The pale colour of the building also reduces its visibility. The visual impact is likely to be minor.

8.97 From, viewpoint 21, from the public footpath FP2 looking east towards the site, the EfW building and stack will be visible at a distance of 1km on the horizon above the existing vegetation and industrial elements (Figure 31b). The visual impact is likely to be major.

8.98 From the visual assessment it can be concluded that the EfW facility is generally likely to have a minor to moderate visual impact. In the wider context the low lying flat topography of the study area combined with the numerous elements of industrial development, raised reservoirs, road and rail corridors, residential areas and intervening vegetation means that long distance views are generally limited to filtered views of the roof and stack.

8.99 In the local context the visual impact is more varied, ranging from minor to moderate. Many of the views of the proposals are partial and filtered by existing industrial development, road and rail embankments and vegetation. The design of the building assists in reducing the visual impact with the curved roof, vertical elements to the facades and gap in the building allowing intervisibility also assisting to reduce the perceived scale of the buildings. The selection of pale colours also helps to reduce the dominance of the building.

8.100 The visual impact beyond the ZVI is limited to partial glimpses of the stack at a distance of over 3km. Due to the extent of existing intervening development and vegetation the visual impact is generally insignificant.

Landscape Character

Visitor Centre

8.101 The proposed Visitor Centre and associated car parking occurs within unit B. This introduces a small built feature where there is none at present. However the Visitor Centre will improve public access to Orlitt's Lake South, providing the opportunity to appreciate the wildlife resources of the area. The landscape proposals include the management of existing vegetation and further planting which would strengthen existing character.

Tanhouse Farm Landfill

8.102 The temporary construction compound at Tanhouse Farm Landfill occurs within unit C and will introduce built elements into an area which is currently open. The construction compound will have a temporary urbanising effect on the character of the area. However, on completion of the EfW plant the area will be fully restored. Proposed planting to the site boundaries will increase the vegetation cover providing landscape and visual enhancement, with a resultant beneficial effect on the landscape character.

EfW plant

8.103 From unit A, the proposed EfW development introduces a greater built mass and taller stack. However as these are not entirely new elements, but an increase of existing elements, and the influence of the surrounding transport corridors, industrial and commercial development remains dominant, the proposals do not change the landscape character of the area.

8.104 From unit B the proposed EfW building and stack will be more visible than the existing building increasing the influence of development on the area and thus affecting the landscape character.

8.105 The design of the building with the use of the vertical elements on the elevation and the provision of a break through the building will reduce its perceived mass. The use of light colours on the roof, elevation and stack will also diminish its perceived scale.

8.106 Landscape proposals including planting along the footpaths around the lakes although not fully screening the EfW plant, will limit the effect on the immediate landscape character. However, from a few locations the building will dominate the view, and thus reduce the strength of character and having an adverse effect on the character.

8.107 From unit C, to the west of the EfW site, the plant building and stack will increase the influence of development visible from the area, however this increase will not change the landscape character of the area.

8.108 From unit D, to the north-west of the EfW site, the EfW building and stack will increase the industrial elements visible from the area, therefore increasing the visual intrusion. However this increase is not sufficient to influence the overall landscape character.

8.109 The proposed EfW building and stack will be visible from unit E and will increase the industrial detractors effecting this area. However, with the existing influence of the A4 (T) and pylons the building and stack will not significantly alter the landscape character of the area.

8.110 Therefore, the landscape units immediately surrounding the EfW site are not significantly directly or indirectly affected by the proposals with the exception of landscape unit B. There will be an adverse impact from the visual intrusion of the development on this unit although as the main physical components of the landscape will be unaffected, the landscape character of the unit will remain unchanged.

8.111 The effect on the broader landscape character areas, to which the landscape units make a contribution, will be insignificant.

Landscape Quality

8.112 The impact on landscape strength of character and condition, and thus the landscape quality, resulting from any direct or indirect effects on landscape character has also been assessed.

8.113 Unit A will not be affected directly by the proposals. There will however be an increase in elements of development visible from this area. However due to the influence of the surrounding transport corridors, industrial and commercial development, it is considered that there will therefore be no significant affect on landscape quality.

8.114 Unit B will be directly affected by the development of the Visitor Centre and associated landscape proposals and indirectly affected by intermittent, partial but dominant views of the proposed building and stack. The strength of character and the landscape condition of the landscape unit will be reduced. The landscape quality will therefore also be reduced. However as the impact from the EfW site is intermittent, and affects the northern extent of the landscape unit to a lesser extent, the impact on the strength of character and condition is insufficient to a significantly effect the landscape quality.

8.115 The landscape character of unit C will be temporarily affected by the construction compound. However, the landscape proposals will directly strengthen the character and improve the condition of the Unit. Whilst the EfW building and stack will be partially visible, these elements will be seen in the context of existing development. Therefore, whilst there is an indirect increase in the influence of development, the proposals within the landscape unit directly improve the strength of landscape character and therefore the landscape quality.

8.116 Landscape Units D and E will not be directly affected by the Lakeside EfW proposals. There will be indirect effects from views of the EfW building and stack. However as these views are seen in the context of existing dominant urban, transportation and industrial elements, there will be no significant affect on the landscape quality.

8.117 From the assessment of strength of landscape character and landscape condition, it can be concluded that the Lakeside EfW proposals, including the Visitor Centre and temporary construction compound will have a very limited effect on the landscape quality of the surrounding Landscape Units.

8.118 The overall impact on the quality of landscape immediately surrounding the Lakeside EfW proposals is thus insignificant and therefore the impact on the landscape quality of the study area is also insignificant.

Impact on Designated Areas

Green Belt

8.119 The proposal involves the redevelopment of a waste management building within an existing industrial estate, outside the Green Belt. As such the EfW plant itself does not have a direct impact on the designation.

8.120 Although visible over a long distance, the careful design of the building and proposed landscaping will provide an attractive feature which in its setting against existing industrial buildings, pylons, motorway and rail infrastructure will not have an adverse impact on the openness of the Green Belt.

8.121 The use of Tanhouse Farm Landfill as a construction compound will result in the temporary loss of Green Belt to development. On completion, however, Tanhouse Farm will be restored and the proposed planting will enhance the landscape of this part of the Green Belt.

8.122 The small scale of the proposed Visitor Centre in the Green Belt means that it will not affect the function of the Green Belt in checking unrestricted growth of large built up areas and safeguarding the countryside from encroachment. Part of its purpose is to provide access to the lake areas and their nature conservation interest fulfilling some of the objectives of the Green Belt. The proposed planting round the lakes will also further enhance the landscape of the Green Belt.

8.123 Therefore the direct adverse impact of the proposed development on the Green Belt is negligible.

Strategic Gap

8.124 The redevelopment of the existing waste management site and careful design of the EfW building also limit its potential adverse impact on the openness of the proposed strategic gap between the eastern edge of Slough and Greater London.

Colne Valley Regional Park

8.125 The redevelopment of the existing waste management site limits the potential impact on the park area although the proposals will introduce a larger building and stack into the visual scene.

8.126 The proposed additional planting is in accordance with the aims of the Colne Valley Regional Park to enhance the landscape of the park area.

8.127 The Visitor Centre will provide public access to the park area with the opportunity to observe wildlife on the lakes.

8.128 No public rights of way will be directly affected although views of the EfW building will be possible from some routes. Some existing views will however be enhanced by the proposed additional planting.

8.129 The proposals therefore have a limited impact on the scenic quality of the Colne Valley Regional Park and provide some enhancement of the park with the implementation of the landscape proposals.

Linear Park

8.130 The cycleway/footpath within the proposed Linear Park along the northern boundary of Tanhouse Farm Landfill and western boundary of Orlitt's Lake, north and south and Old Slade Lake is enclosed by existing vegetation. There will be intermittent partial views of the proposed EfW building and stack from a few locations along this route.

8.131 Proposed planting round Tanhouse Farm Landfill and the Visitor Centre will screen views towards the EfW building and stack. The remaining views of the plant will be seen in the context of other development such as the pylons of the Lakeside Industrial Estate and the impact on the Linear Park will therefore only be minor.

Cumulative Impacts

8.132 The cumulative landscape and visual impact from the development of Grundon's proposals in combination with other proposed developments in the area has been considered as follows:

LIFE Scheme

8.133 The LIFE proposals would significantly alter the landscape context for the Lakeside EfW site. As well as the built development, road access and rail connections the proposals include landscaping, the creation of nature conservation areas and establishment of footpath and bridleway routes.

8.134 Road and rail access is required through the southern part of the proposed Lakeside EfW site. The Lakeside EfW proposals for this area contain the retained office buildings and car parking. In the event of both LIFE and Lakeside EfW gaining consent the southern area of the Lakeside site could be designed to accommodate the road and rail access with the car park and Grundon's offices located on another site.

8.135 The LIFE proposals would introduce an extensive area of rail sidings to the east of the Lakeside Industrial Estate and introduce a series of substantial buildings of up to 30m in height and 300m in length, across the site to the west. The area would be more developed with the industrial elements, and associated infrastructure, parking, lighting and facilities extending across the area. The landscape proposals would however create a landscape framework to accommodate the development, and create extensive areas of new woodland and parkland.

8.136 The Lakeside EfW proposals could be successfully accommodated within this new landscape. The height of the proposed building would be comparable to those of the LIFE scheme, but the scale of the overall development would be considerably smaller and the EfW building would therefore be a less prominent feature.

8.137 Industrial units for the LIFE proposal would increase the amount of intervening development visible in views towards the Lakeside EfW site, resulting in fewer views of the site, particularly from the south-west, west and north-west.

8.138 Landscape proposals for LIFE introduce areas of raised mounding and substantial areas of planting which will as they mature increase the amount of intervening vegetation surrounding the Lakeside EfW proposals and will provide screening for the Lakeside site, particularly in views from the south, south-west, west and north-west.

8.139 Therefore should the LIFE proposals be implemented, the Lakeside EfW proposals would be a relatively minor development being seen in the context of an industrial area with units of comparable height and greater scale. The Lakeside EfW proposals will not have a significant affect on the physical context, visual context, landscape character or quality of the local or broader surrounding areas.

Heathrow Terminal 5

8.140 The Heathrow Terminal 5 proposal envisages an additional terminal to the west of the existing Terminal 1,2,3 and 4 and a Colnbrook Logistics Centre, required to facilitate the construction of Terminal 5 and the associated proposals.

8.141 Proposals for the Colnbrook Logistics Centre provide rail sidings, car parking, administration and welfare facilities, ancillary buildings, a site visitor centre and materials testing laboratory. The development would be located on land between the Colnbrook Branch Line and the M25 motorway, both north and south of the A4.

8.142 The Heathrow Terminal 5 proposals would accommodate the area of existing Perry Oaks Sewage Treatment Lagoons, necessitating a sludge dewatering works at Iver South Wastewater Treatment Works.

8.143 The sludge dewatering works at Iver South would involve the construction of a press house (62m long by 50m wide and 9m high to pitched roofline), several storage silos and lagoons and embankments for flood protection and screening. Access to the site would be from Lakeside Road, requiring construction of a new road access across the existing bund separating Orlitts Lake (North) from Orlitts Lake (South). There would also be highway improvements works to Lakeside Road itself and access onto the A4(T). The lagoons would be surrounded by a 4.5m high embankment, above existing ground level and the remainder of the site would be surrounded by a 2m high embankment.

8.144 Proposed development of Heathrow Terminal 5 would increase the extent of development to the south-east of the Lakeside EfW site, introducing numerous large scale commercial and industrial buildings on a site which is currently open and flat. The planting proposals for the T5 Spur Road and M25 junction will increase the vegetation cover in the south east of the study area.

8.145 Extensive deposition of excavated material and associated landscape proposals will introduce elevated landforms and substantial areas of planting to the south-east of the Lakeside site, between Terminal 5 and the M25, again increasing the vegetation cover of the study area.

8.146 The Colnbrook Logistic Centre would temporarily introduce industrial development immediately to the east of the Lakeside EfW site.

8.147 The Iver South Works would be located on the site of the existing sewage works. The proposals would however increase the extent of development and land modelling to the north-west of the Lakeside site.

8.148 Terminal 5 proposals introducing new areas of development and landscape will have a minor affect on the physical and visual context within which the Lakeside EfW proposals immediately occur. However, this would not have a significant effect on the landscape character or quality of the broad study area.

8.149 However as a result of the Terminal 5 developments, there would be more large scale buildings, raised landforms and areas of vegetation to the south-east of the Lakeside EfW site. These would provide intervening elements which would further screen, or filter, views of the proposed EfW building from the south-east, reducing the potential visual impact of the proposed building and the area from which glimpses of the proposals may be obtained.

8.150 The views towards the Lakeside EfW site from the north and north-west would also include elements of the Iver South Works and these elements would partially obstruct views of the proposed EfW building again reducing the potential visual impact of the proposed building. The proposed EfW building would also be seen in the context of more industrial elements and therefore the relative visual intrusion would also be reduced.

8.151 The Heathrow Terminal 5 and associated proposals would not significantly alter the landscape character and quality of the study area in which the Lakeside EfW proposals occur. Therefore the effect of the Lakeside EfW proposals would not significantly differ from the effect on the existing landscape and visual scene.

Lakeside EfW, LIFE and Heathrow Terminal 5

8.152 With both the LIFE and Heathrow Terminal 5 proposals the extent of industrial, commercial and infrastructure development would be greater, and there would also be a greater incidence of large scale buildings and units within the study area. Extensive landscape proposals would increase the vegetation cover.

8.153 Redevelopment of the Lakeside EfW site would be a relatively insignificant development within this context.

8.154 The increased development, of substantial scale, within the study area would also obstruct or filter views of the proposed EfW building, so that the relative visual impact from the building would be reduced or eliminated from many more views. The additional raised features and extensive planting included within both the LIFE and Terminal 5 proposals would further filter or screen views of the EfW building and thus further reduce the visual impact of the Lakeside proposal.

8.155 The Lakeside EfW proposals could therefore be successfully accommodated with the landscape, alongside the LIFE and Terminal 5 proposals, with no significant effect on existing landscape features or the physical context and with only minor to insignificant visual impact. These impacts would not be sufficient to significantly alter the landscape character of the study area, which would already be strongly influenced by the urban, industrial and transportation elements of both the existing development and the proposed LIFE and Terminal 5 development. There would therefore be no change in landscape quality arising from the EfW development, in the context of the LIFE and Terminal 5 developments, and thus the overall impact from the Lakeside EfW proposal would be minor to insignificant.

Mitigation Measures

8.156 The EfW building has been architecturally designed to produce the minimum size of building required to house the internal plant and to reduce the perceived mass of the building within the landscape. Design features as set out in paragraph 8.60 include the curved roof profile to reduce the perceived height, gaps in structures to allow visibility through the built form and the subtle use of colour to reduce the building's prominence. The Visitor Centre has been designed to reflect the appearance of the EfW plant.

8.157 Landscape planting, as detailed in paragraphs 8.64 to 8.73, is proposed round the EfW site, around Orlitts Lake and Tanhouse Farm Landfill to assimilate the development as far as possible into the surrounding environs and to enhance the landscape of the area. Proposed off-site planting will provide additional screening for views towards the EfW building and stack.

Significance of the Impact

Demolition and Construction

8.158 The temporary visual intrusion from the construction of the Lakeside EfW facility is minor and will not significantly alter the landscape character or quality.

Operation

8.159 From the visual assessment it can be concluded that the visual impact of the EfW proposal is generally minor.

8.160 Analysis of the landscape character and quality has shown that there will be no significant adverse impact from the EfW plant, Visitor Centre or use of Tanhouse Farm Landfill as a construction compound.

8.161 There will be no significant adverse impact on the Green Belt designation, Colne Valley Regional Park, Strategic Gap or Linear Park.

Summary of the Impact on the Landscape

- The EfW site is surrounded by but lies outside the Green Belt designation. Tanhouse Farm Landfill, which will accommodate the construction compound and the site of the Visitor Centre fall within the Green Belt designation.

- The proposal involves the redevelopment of a waste management building within an existing industrial estate, outside the Green Belt. As such the EfW plant itself does not have a direct impact on the designation. Although visible over a long distance, the careful design of the building and proposed landscaping will provide an attractive feature which in its setting against existing industrial buildings, pylons, motorway and rail infrastructure will not have an adverse impact on the openness of the Green Belt.

- Once construction is completed, Tanhouse Farm Landfill will be restored and the proposed planting will enhance the landscape of this part of the Green Belt.

- The small scale of the proposed Visitor Centre means that it will not affect the function of the Green Belt in checking unrestricted growth of large built up areas and safeguarding the countryside from encroachment. Part of its purpose is to provide access to the lake areas and their nature conservation interest fulfilling some of the objectives of the Green Belt. The proposed planting round the lakes will also further enhance the landscape of the Green Belt.

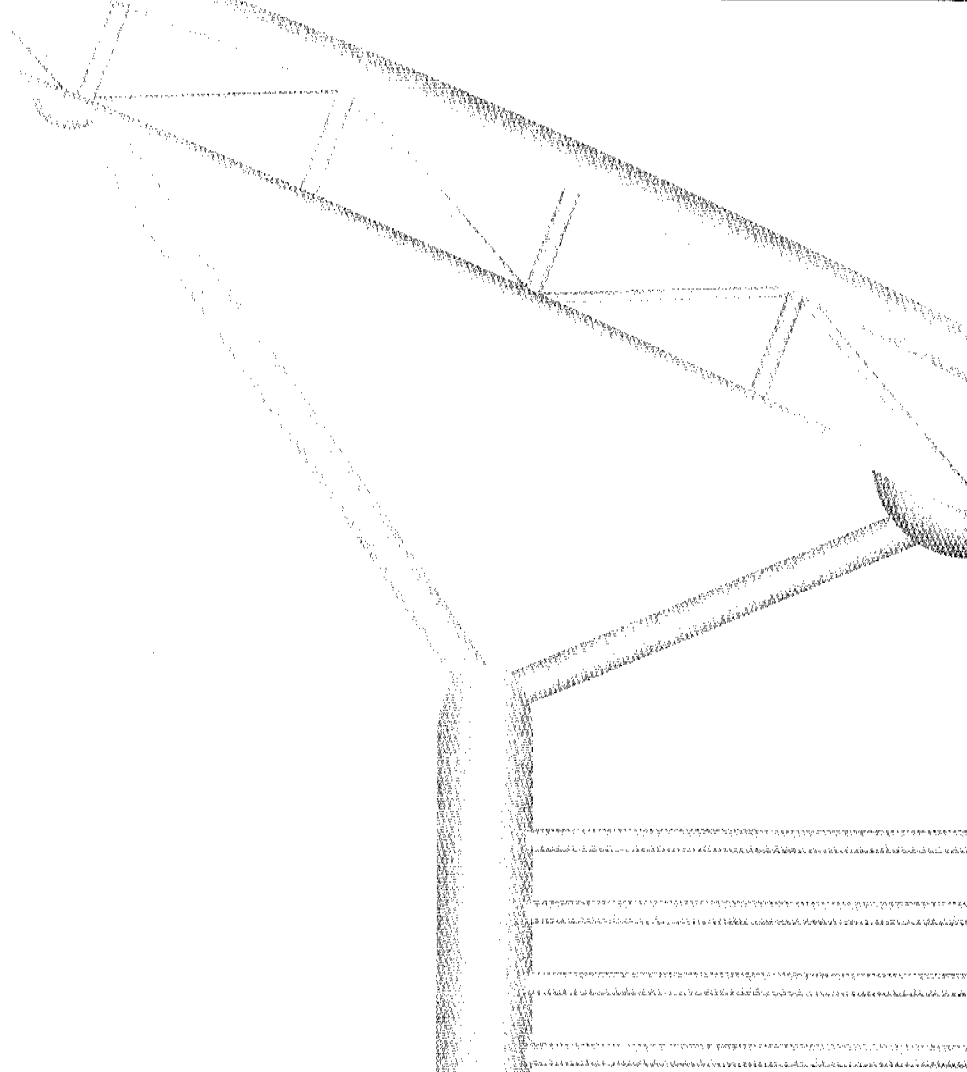
- The Lakeside site lies within the Colne Valley Regional Park. The redevelopment of the existing waste management site limits the potential impact on the park area. The Visitor Centre will provide public access to the park with the opportunity to observe wildlife on the lakes and in the surrounding area. Landscaping proposed as part of the scheme will also enhance this part of the park area.

- The EfW building has been designed to produce the minimum size of building required to house the internal plant and to reduce the perceived mass of the building within the landscape. The Visitor Centre has been designed to reflect the appearance of the EfW plant. Landscape planting is proposed around the EfW site, Orlitts Lake and Tanhouse Farm to assimilate the development into the surrounding environment.

- The landscape within which the Lakeside EfW site lies reflects evidence of past disturbance, with damaged and degraded land use components. Cultural associations are few and scenic quality is low. Transportation corridors, utilities and industrial developments are the dominant and intrusive elements along with other urban infrastructure. The proposals will not introduce an entirely new element in to the existing landscape but replace the existing waste management plant and stack, albeit with a more prominent and larger facility within an existing industrial estate. However the existing intrusive elements will also remain dominant within the study area.

- The Lakeside EfW facility will be a substantial structure, visible from a wide area. However, it will frequently be seen in the context of other industrial and urban structures. From most public vantage points it will be a distant feature. Its scale means it will be more prominent from closer viewpoints. As the facility will be visible from a number of viewpoints, it has been designed to be an attractive landmark building.

- The assessment concludes that the EfW facility will not have a significant effect on the landscape, and will not effect the openness of the adjoining Green Belt.



Chapter Nine

Traffic

Introduction

9.1 This chapter considers the impact of the proposals on the surrounding highway network. It was agreed with the Highway Authority (Slough Borough Council) that the assessment should consider the capacity of junctions at which the proposals may have a material impact in highway terms. The relationship of the site to the highway network is shown in Figure 32.

9.2 During construction and operation, access to the construction compound at Tanhouse Farm Landfill and the Lakeside site will be from the A4 trunk road via Lakeside Road (see Figure 33). A new access will be constructed from Lakeside Road to into the CWI plant. Access to the Visitors Centre will be via a realigned existing private track off Lakeside Road.

9.3 During operation, 440,000 tonnes of domestic, commercial and industrial waste and 17,000 tonnes of clinical waste will be brought to the site annually from Slough and other unitary authorities, Surrey and West London .

9.4 Exports from the site will include 132,800 tonnes of ash from the incineration process, 40,000 tonnes of recyclable material and 2,000 tonnes of non-combustible material per annum. Although, Grundon hopes to remove the bottom ash (120,000 tonnes per annum) by rail this figure has been included in the road traffic impact assessment to give a worst case situation.

9.5 The EfW facility will operate 7 days a week, 24 hours a day. However only 10% of the weekly traffic will arrive and depart from the site during the weekend and only 10% of the daily traffic will arrive and depart between the hours of 19.00 and 07.00.

9.6 Other traffic generating development proposals in the area include BAA's Logistics Centre, Heathrow Airport's Terminal 5 (T5), Iver South Wastewater Treatment Works and the London International Freight Exchange (LIFE). The cumulative impact of these proposals has been considered in this assessment.

Existing Environment

9.7 The site is located on the Lakeside Industrial Estate, which is served by a privately owned cul-de-sac, Lakeside Road. Lakeside Road is 6.35 metres wide with double yellow lines along its length, restricting parking, and speed humps north of the Grundon site. The speed limit is 25 mph. Lakeside Road serves all the units on the industrial estate which include those currently occupied by Safeway, Exel Logistics and DFDS Transport. All the properties that front Lakeside Road have rights of way over it. The road also provides access to the neighbouring lakes.

9.8 Lakeside Road has two separate access points onto the A4, approximately 450 metres apart. The western access is used exclusively to gain access to premises occupied by Hellmann. All other units on Lakeside Industrial Estate use the eastern access. Lakeside Road joins with the A4 by way of a priority junction. At this point the A4 is 8 metres wide with a dedicated right turn into Lakeside Road. The A4 is a trunk road and the responsibility of the Highway Authority.

9.9 Near the junction with Lakeside Road, the A4 has a 60 mph speed limit, which reduces to 50 mph to the east of the site, near the junction with the A3044. Slough Borough Council and the Highways Agency have plans to extend this 50 mph limit west along the A4 across the access to Lakeside Road. On the southern side of the carriageway are The Greyhound public house and BP petrol filling station.

9.10 There is a footway on the south side of the A4. Although there are no formal crossing points, pedestrians can cross the carriageway in two stages using the traffic islands provided in the centre of the road, near the junction of the A4 with Lakeside Road. There are no formal facilities for cyclists in the vicinity of the site. Part of the proposed Sustrans national cycle route runs along the A4 Colnbrook Bypass.

Existing Traffic Flows

9.11 Data on vehicular movements at the junction of Lakeside Road with the A4 Colnbrook Bypass were obtained from a manual classified turning count and automatic traffic count surveys undertaken by Qualidat between 11 and 21 April 1999. The distribution of vehicles turning into Lakeside Road was established from a transport impact assessment (TIA) prepared for the LIFE scheme. This was based on traffic surveys carried out by Count On Us on 25 May 1998.

9.12 The traffic surveys established that the morning and evening peak hours on the A4 on weekdays are 08.00 – 09.00 and 17.00 – 18.00 respectively. Calculations indicate that this section of the A4 is operating within capacity and has significant capacity before congestion can be expected in the peak hours.

9.13 Westbound and eastbound 12 hour weekday traffic flows for the A4 are shown in Table 18. Total 12 hour traffic figures associated with the existing Grundon operations are 464 vehicle movements, made up of 344 HGVs and 120 light vehicle movements.

9.14 Some 30% of Grundon staff are office workers who, for the purposes of the assessment, it is assumed all arrive and leave during peak morning and evening hours. Workshop staff work two shifts (6.30 a.m. – 2.30 p.m. and 2.00 p.m. – 10.00 p.m.). Drivers make up 60% of the workforce, 10% of them start at 3.30 a.m. and leave at 1.00 p.m. and 90% start at 5.00 a.m. and leave at 2.00 p.m.

9.15 The traffic assessment is based on the current Grundon site operation - a basic 5.5 day week, with minimum traffic on Saturday afternoons and Sundays. Grundon has advised that about 16 HGV movements may be associated with operations on some Sundays.

Road Safety

9.16 The Highway Authority supplied road accident statistics for the A4 between the A4/M4 junction and Stanwell Moor traffic signal junction for the past 3 years. The records show that there have been 28 personal injury accidents, 25 of which were slight and 3 severe. No fatal accidents were recorded. Two of the accidents involved HGVs, one at the junction of the A4 and Lakeside Road.

Environmental Change Without the Proposal

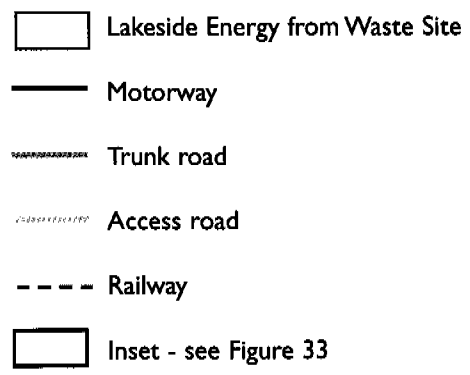
Highway Authority Proposals

9.17 Neither Slough BC nor the Highways Agency proposes significant changes or improvements in the highway network in the area.

Lakeside Site Consented Scheme

9.18 The application site has consent to increase the throughput of the existing CWI and extend the MRF. This would enable the site to incinerate 17,500 tonnes of clinical waste per annum and process 400,000 tonnes per annum through the MRF. Traffic flows associated with this are shown in Table 19. If Grundon fully implemented this authorisation, 740 HGV

Figure 32 : **Highway Network**



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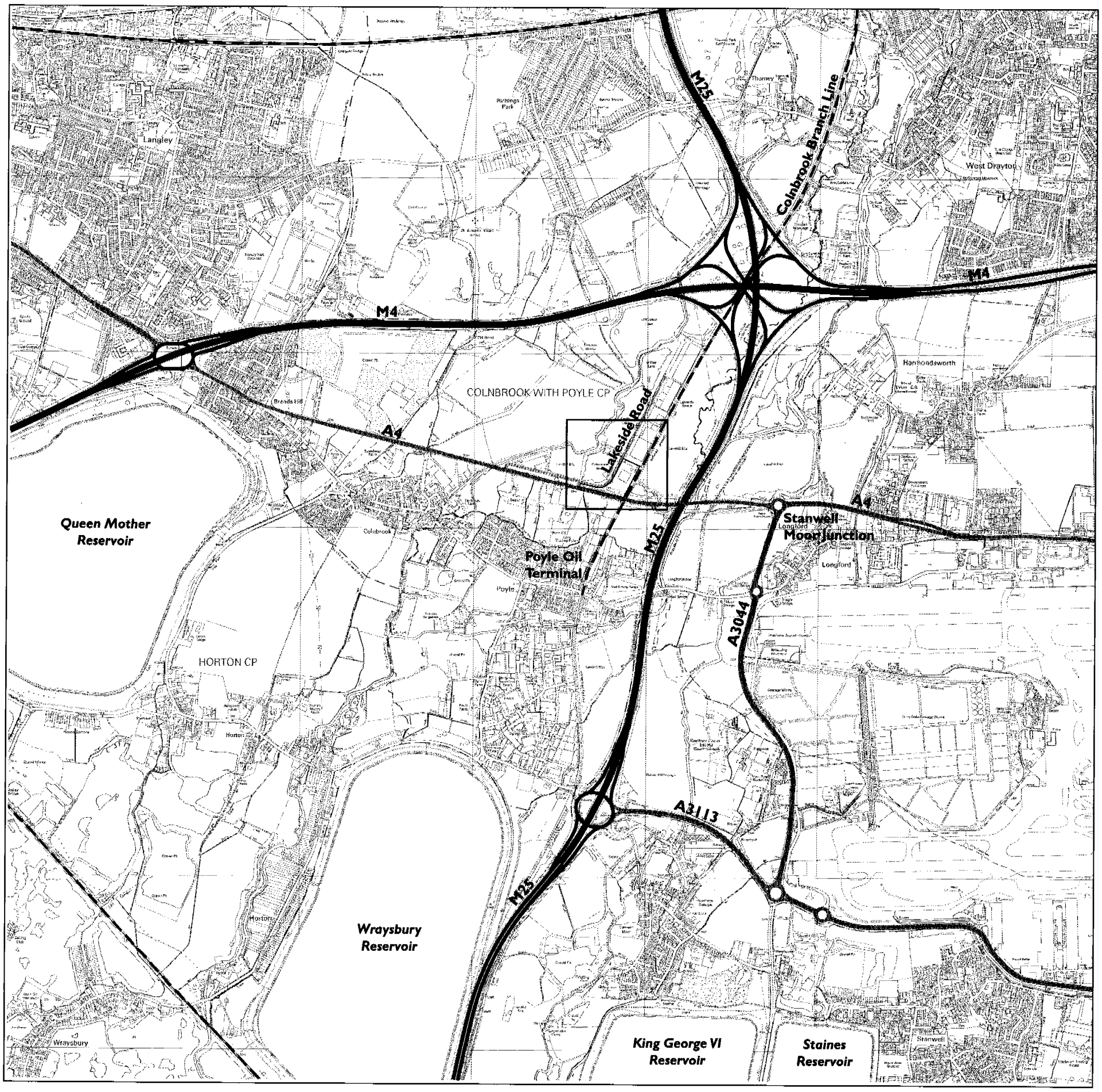

M25
Colnbrook Branch Line
M4
Langley
Richings Park
Thorney
West Drayton
COLNBROOK WITH POYLE CP
Breads Hill
A4
Lakeside Road
Hanhondsworth
Queen Mother Reservoir
Colnbrook
Poyle Oil Terminal
Poyle
Stanwell Moor Junction
Longford
A3044
HORTON CP
Horton
A3113
Wraysbury Reservoir
Wraysbury
King George VI Reservoir
Staines Reservoir
Stanwell

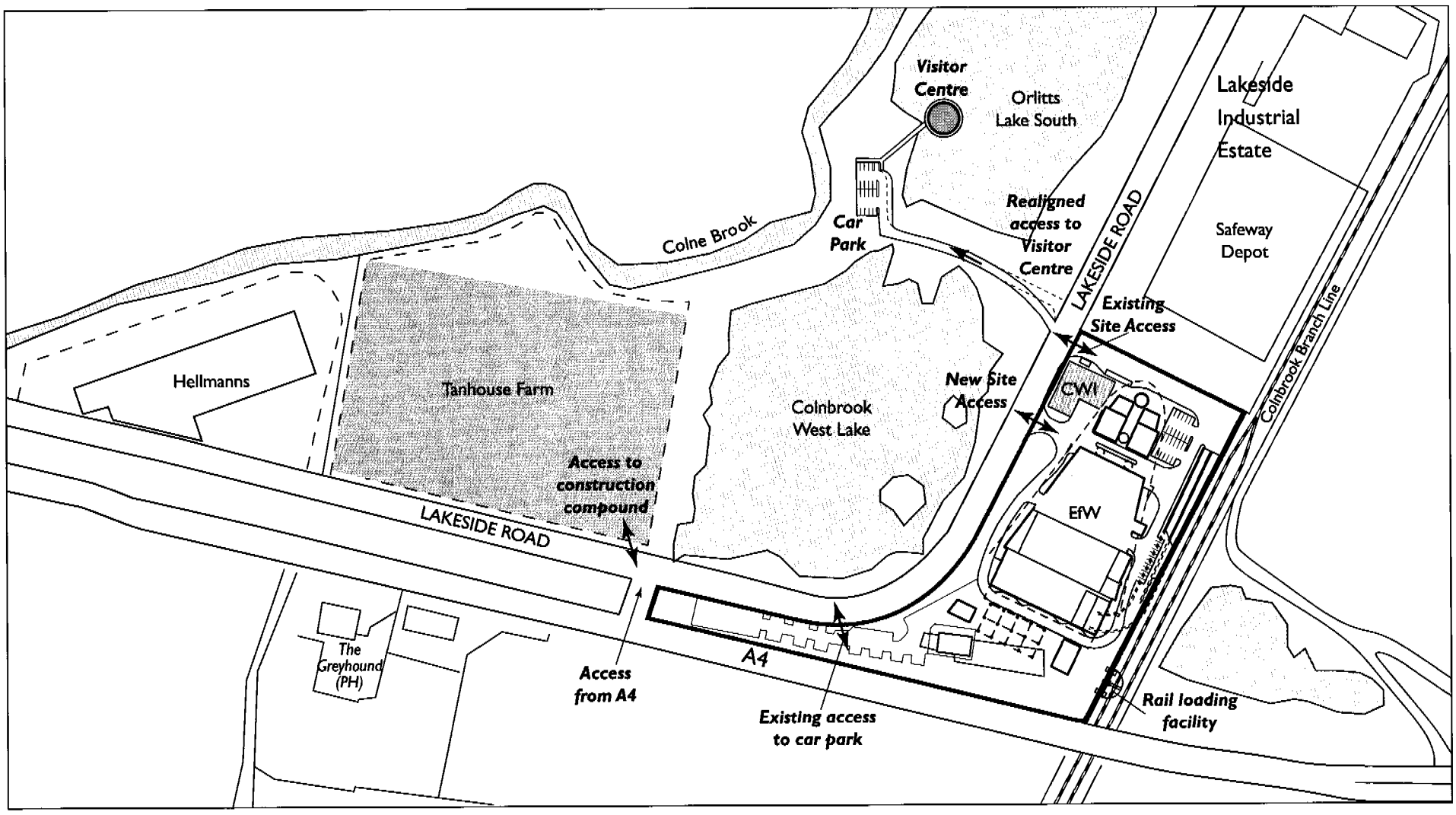


Figure 33 : **Site Access**

Source: The APP Partnership

movements would be generated on the A4 during a 12 hour week-day. This would be an increase from the current situation of 344 HGVs per 12 hour day associated with the existing situation.

9.19 About 300 light vehicle movements per day would also be generated by the consented scheme. This would be an increase of 180 light vehicle movements per day compared with the current situation.

Impact of the Proposals

Demolition and Construction Impacts

9.20 During the construction phase, it is anticipated that approximately 1600 HGV movements will be generated by the removal of material and approximately 1500 HGV movements by delivery of plant and equipment (see Table 20). During the 2 month site clearance (worst case situation) there will be 40 HGV movements per day.

With the continued operation of the CWI (operating at full capacity) generating approximately 336 HGV movements per week, a total of 366 weekly (61 daily) HGV movements is estimated during this phase. This is significantly less than the current HGV movements generated by the site.

9.21 On average, 90 daily light vehicle movements will be generated by construction staff. Together with the light vehicle movements from the operation of the CWI, total light vehicle movements

during this phase will be about the same as the existing light vehicle movements to and from the site.

9.22 In summary, total traffic movements during this phase will be much lower than at present.

Operational Impacts

9.23 The impact of the proposed EfW facility has been assessed for 2004, when the plant is proposed to be commissioned. As a worst case situation, the assessment assumes that the facility will be operating at full capacity from day one, although this is very unlikely. Existing through on the A4 has been adjusted by a growth factor of 1.025 to allow for general traffic growth to 2004.

9.24 Table 21 shows that during the week the proposed EfW facility will generate 524 daily HGV movements. This is significantly less HGV traffic than the site would generate if the CWI and MRF were extended under the consented scheme.

9.25 During the week-end the EfW facility will generate an average 188 HGV movements over a 12 hour day. This is a change to the current situation. During a weekend night (17.00-07.00), the development will generate approximately 12 HGV movements.

9.26 Light vehicle movements associated with Grundon staff will reduce to approximately 80 movements per 12 hour day during the week. This number is significantly lower than that for the existing plant, due to the proposal to relocate the workshops and driver base to enable development of the EfW facility. There will be little or no light vehicle movements associated with staff at weekends.

9.27 The proposed Visitor Centre will have parking for 20 vehicles, 12 bicycles and 2 coaches. Use of the centre will be generally outside peak hours so that the impact of the associated traffic movements is expected to be negligible.

Table 18 :
Week-day Current 12 Hour Traffic Flows on A4

	Existing total traffic flows	Existing HGV flows	Existing total Grundon traffic	Existing Grundon HGVs	Grundon traffic as % total traffic
A4 East	19182	2195	242	185	1.3%
A4 West	18918	2108	222	159	1.2%
Total			464	344	

Table 19 :
Week-day 12 hour Traffic Flows on A4 with Grundon's Consented Scheme

	Existing total traffic flows	Existing HGV flows	Total Grundon Traffic – *Consented Scheme*	Grundon HGVs – *Consented Scheme*	Grundon consented traffic as % total traffic
A4 East	19182	2195	577	410	3.0%
A4 West	18918	2108	463	330	2.4%
Total			1040	740	

Traffic Flows

9.28 The guidelines for TIA published by the Institution of Highways and Transportation (IHT) recommend that an assessment should include all junctions and links where the proposals would result in an increase in traffic of 5% where congestion occurs and in sensitive locations and 10% where congestion is not expected. The percentage increase in traffic resulting from the proposed waste to energy plant in the vicinity of the Lakeside Road/Colnbrook Bypass has therefore been calculated for a.m. and p.m. peak hours (0800 – 0900 and 1700 – 1800).

9.29 Table 22 shows that the traffic generated by the proposed EfW facility will have a negligible impact on the A4 at peak hours and will have less impact than if the consented scheme was to be implemented.

9.30 The current Grundon site accounts for 30.4% of traffic on Lakeside Road in the a.m. peak hour and 12.8% of traffic in the p.m. peak hour. With the consented scheme (assuming no changes in the traffic generated by other occupiers), these proportions would rise to 73.7% and 32.8% respectively. With the EfW scheme, the relevant proportions would be 57.3% and 25.1% respectively.

9.31 The assessment indicates that in 2004 the existing Lakeside Road/ A4 junction will operate within capacity in the morning and evening peak hours.

9.32 The increased traffic flows on the first section of Lakeside Road will not have a detrimental impact on its operation. The road was designed to serve a large industrial estate and to accommodate HGVs.

9.33 The traffic flows associated with the operation of the EfW facility will be less than the existing site would generate if Grundon extended the CWI and MRF in accordance with existing consents and authorisations.

Road Safety

9.34 With the low level of increases in traffic flows it is not anticipated that the EfW facility will have a detrimental effect on the accident record of the section of the A4 between the A4/M4 junction and Stanwell Moor traffic signal junction.

Cumulative Impacts

9.35 The proposed LIFE development comprises facilities for the transfer of goods from road to rail, distribution units, and internal railway network, estate offices and lorry park. It is proposed that the LIFE scheme will be operational in the year 2011.

9.36 Under the LIFE proposal, two new entrance roads to Lakeside Road would be constructed, with access directly to/from the A4. The main, eastern access road would be approximately 170 metres to the west of the existing main Lakeside Road access, which would be stopped up. The new, western access would be approximately 250 metres to the west of the existing main Lakeside Road access. Both new junctions would be traffic signal controlled and would incorporate a revised alignment of the A4 to the north of the existing route.

9.37 Road access to the Grundon EfW facility would then be from a new road off the main (eastern) entrance road.

9.38 A TIA has been produced in support of the LIFE application taking account of Grundon's existing (but not consented) traffic. The results of the TIA show that the proposed new site access junction would operate well within operational capacity.

9.39 If Heathrow T5 proceeds Thames Water Utilities proposes to upgrade the existing Iver South Wastewater Treatment Works off Lakeside Road. As part of this scheme, Lakeside Road would be widened to 7.3 metres using land on the western side of the carriageway and improvements would be made to the Lakeside Road/A4 junction.

Table 20 :
HGV Movements During Construction of EfW Facility

HGV Activity	Total HGV Movements	Average Weekly Movements
Removal of material (over 2 months)	1600	200
Delivery of fill	220	2
Delivery to concrete batching plant	1000	9
Delivery of steel	200	2
Delivery of crane	12	2
Delivery of mobile equipment	24	2
Total	**3056**	

Table 21 :
Week-day 12 hour Traffic Flows on A4 with EfW Facility (2004)

	Total traffic flows - 2004	Existing HGV flows	Grundon traffic - EfW	Grundon HGVs - EfW	Grundon traffic as % total traffic
A4 East	19642	2195	335	291	1.7%
A4 West	19372	2108	269	233	1.4%
Total			604	524	

9.40 The impact of traffic associated with the EfW facility and the LIFE scheme was assessed on the new Lakeside Road/A4 junction proposed as part of that development The assessment was carried out for 2011 when the LIFE scheme would be operating at full capacity. The results of the assessment show that with both schemes operating at full capacity the new junction would operate well within its theoretical design capacity.

Mitigation of Impacts

9.41 Grundon will prepare a Green Transport Plan which will seek to encourage staff to travel to work by non-car modes of transport or to car-share. There is already an established frequent bus service to and from the site. Grundon will discuss any improvements required with the local bus company. The proposal incorporates secure cycle parking facilities as well as shower and changing facilities for staff who cycle to work.

9.42 Grundon will liaise with the Highway Authority and developers of other major projects in the area regarding phasing of schemes in order to minimise impacts on the local highway network.

Significance of the Impact

9.43 During the construction phase for the EfW facility, HGV movements will be significantly less than the current 344 daily HGV movements generated by the site. These movements will therefore have a negligible effect on the operation of the adjacent highway network.

9.44 During the week the operation of the EfW facility will generate 524 daily HGV movements and 80 light vehicle movements.

Table 22 :
A4 and Lakeside Road Peak Traffic Flows

	Existing Total Traffic Flows	Current Grundon Traffic	Grundon Traffic as % Total Flows	Grundon Consented Traffic	Consented Traffic as % Total Traffic	2004 Traffic Flows	Grundon EfW Traffic	EfW Traffic as % Total Traffic
Lakeside Rd - a.m.	171	52	30.4%	126	73.7%	171	98	57.3%
Lakeside Rd - p.m.	195	25	12.8%	64	32.8%	195	49	25.1%
A4 East a.m.	1819	30	1.6%	74	4.1%	1832	61	3.3%
A4 East p.m.	1800	22	1.2%	52	2.8%	1821	37	2.0%
A4 West a.m.	2110	12	0.6%	31	1.5%	2147	29	1.4%
A4 West p.m.	2078	13	0.6%	33	0.6%	2114	20	0.9%

9.45 During operation, HGVs will also visit the site during the night and at week-ends. The numbers are low and the impact is not considered to be significant.

9.46 The operation of the EfW facility will result in an increase in traffic flows using the Lakeside Road/A4 junction. The effects of this increase on the local highway network are not considered to be significant and the junction will be functioning within its capacity.

9.47 The predicted volume of traffic associated with the operation of the EfW facility will be significantly less than the existing site would generate if Grundon extended the CWI and MRF in accordance with existing consents and authorisations.

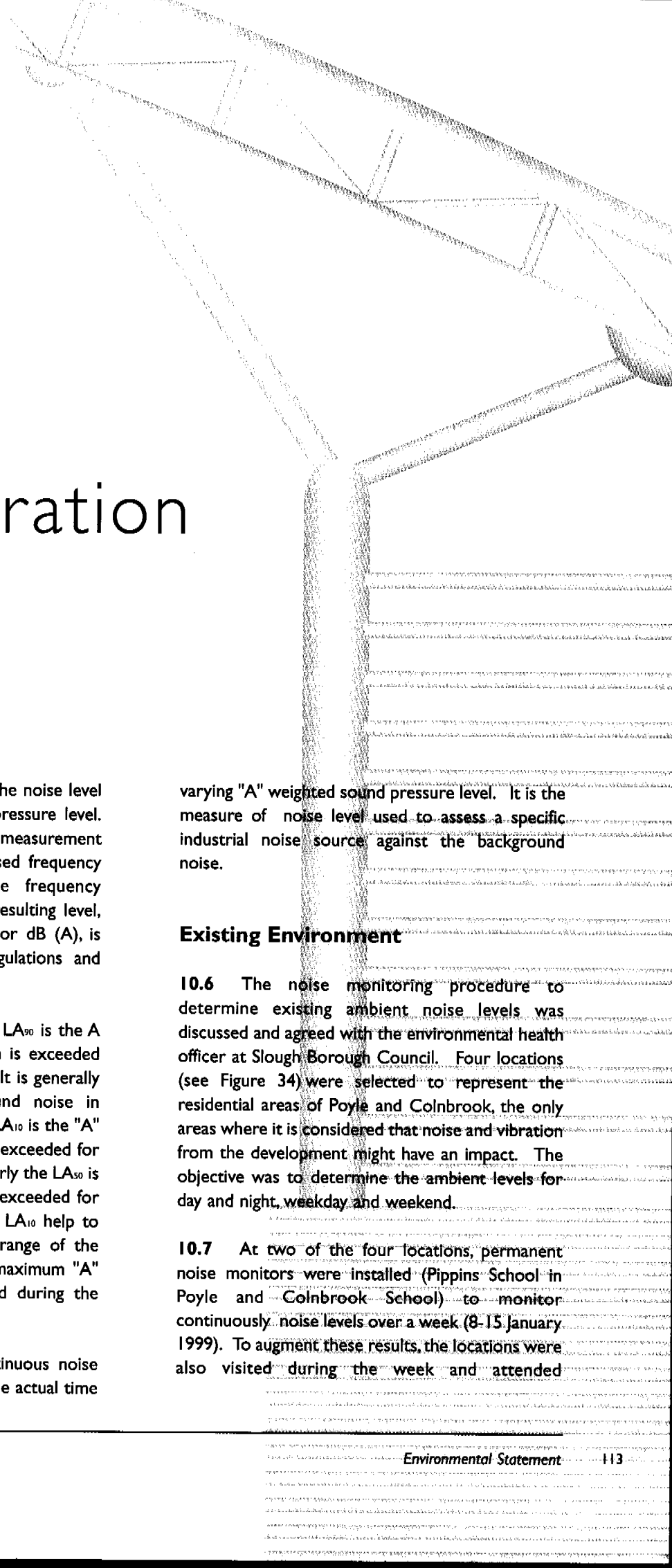
9.48 These traffic flows assume a worst case situation. They will be significantly reduced if the train operating companies are able to provide a service to the EfW facility.

Summary of the Impact of Traffic

- The Lakeside Road site is served by Lakeside Road, a private road which has an access onto the A4.
- During construction and operation of the EfW facility, traffic will continue to use the existing Lakeside Road/A4 junction.
- A new access will be constructed from Lakeside Road to provide access to the CWI. The Visitor Centre will be accessed via a realigned private track off Lakeside Road.
- The EfW facility will operate 7 days a week, 24 hours a day. About 10% of the weekly traffic will arrive and depart during the week-end and about 10% of daily traffic will arrive and depart during the night.
- Existing 12 hour daily traffic flows to the site comprise 344 HGV movements and 120 light vehicle movements.
- An average of 740 HGV movements and 300 light vehicle movements per day would be associated with the consented scheme to extend the CWI and MRF.
- During the construction phase for the EfW facility, HGV movements will be significantly less than the current 344 daily HGV movements generated by the site.
- During the week the operation of the EfW facility will generate 524 daily HGV movements and 80 light vehicle movements.
- During operation of the EfW facility HGVs will visit the site during the night and at week-ends. The numbers are low and the impact is not considered to be significant.
- The operation of the EfW facility will result in an increase in traffic flows using the Lakeside Road/A4 junction. The effects of this increase on the local highway network are not considered to be significant and the junction will be functioning within its capacity.
- The predicted volume of traffic associated with the operation of the EfW facility will be significantly less than the existing site would generate if Grundon extended the CWI and MRF in accordance with existing consents and authorisations.
- The predicted volumes of road traffic will be significantly reduced if the train operating companies can provide a rail service to the EfW facility.

Chapter Ten

10 Noise and Vibration



Introduction

10.1 This chapter assesses the potential impact which noise and vibration from the construction and operation of the Lakeside EfW facility could have on the surrounding environment. Consideration is also given to potential cumulative impacts resulting from other developments including the LIFE scheme, Heathrow Terminal 5 and the BAA Logistics Centre proposed in the area.

Acoustic Terminology

10.2 Noise level is not constant in terms of loudness but changes in amplitude all the time. In order to numerically describe noise levels it is necessary to use statistical parameters. It is common practice to use indices to describe the noise level which has been exceeded for a certain percentage of the measurement period, and an index which gives a form of average of the sound energy over a particular time interval. The former are termed percentile noise levels and are notated LA_{90}, LA_{50} and LA_{10}. The latter is the equivalent continuous noise level and is notated by L_{Aeq}.

10.3 All the parameters refer to the noise level measured as an A weighted sound pressure level. The term "A" weighting implies a measurement made using a filter with a standardised frequency response which approximates the frequency response of the human ear. The resulting level, expressed in "A" weighted decibels or dB (A), is widely used in noise standards, regulations and criteria.

10.4 For the percentile levels, the LA_{90} is the A weighted sound pressure level, which is exceeded for 90% of the measurement time. It is generally used as the measure of background noise in environmental noise standards. The LA_{10} is the "A" weighted sound pressure level that is exceeded for 10% of the measurement time. Similarly the LA_{50} is the A weighted sound pressure level exceeded for 50% of the time. The LA_{50} and the LA_{10} help to provide a numerical picture of the range of the noise levels. The L_{Amax} is the very maximum "A" sound pressure level which occurred during the measurement period.

10.5 The L_{Aeq}, the equivalent continuous noise level, is an energy averaged value of the actual time varying "A" weighted sound pressure level. It is the measure of noise level used to assess a specific industrial noise source against the background noise.

Existing Environment

10.6 The noise monitoring procedure to determine existing ambient noise levels was discussed and agreed with the environmental health officer at Slough Borough Council. Four locations (see Figure 34) were selected to represent the residential areas of Poyle and Colnbrook, the only areas where it is considered that noise and vibration from the development might have an impact. The objective was to determine the ambient levels for day and night, weekday and weekend.

10.7 At two of the four locations, permanent noise monitors were installed (Pippins School in Poyle and Colnbrook School) to monitor continuously noise levels over a week (8-15 January 1999). To augment these results, the locations were also visited during the week and attended

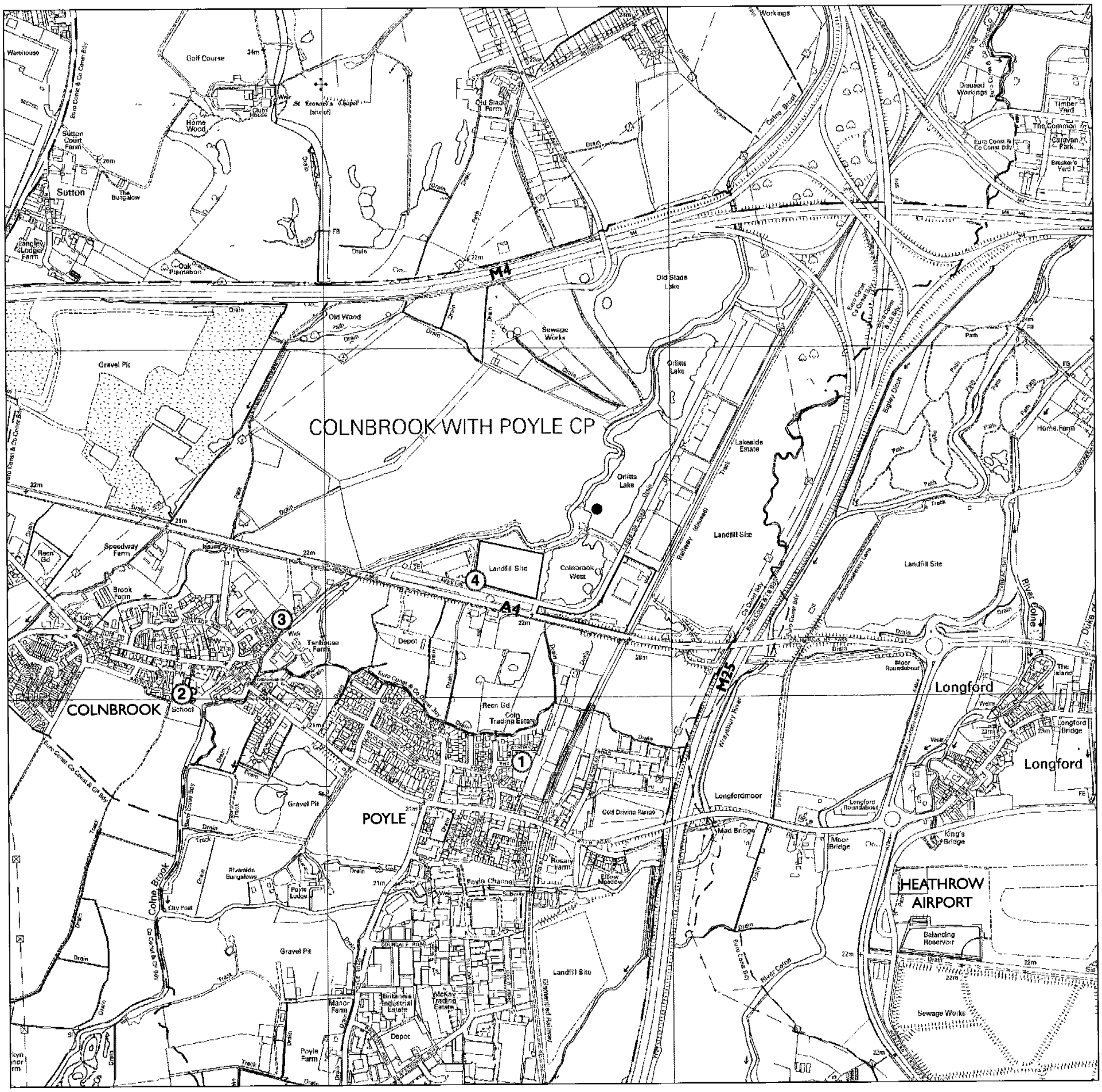

COLNBROOK WITH POYLE CP
COLNBROOK
POYLE
Longford
HEATHROW AIRPORT
M4
M25
A4
Old Slade Lake
Orlitts Lake
Landfill Site
Colnbrook West
Lakeside Estate
Colnbrook Bypass
Colne Brook
River Colne
Wraysbury River
Golf Course
Sutton
Gravel Pit
Sewage Works
Depot
Colnbrook School
Longford Bridge
Mad Bridge
Moor Bridge
Longfordmoor
Golf Driving Range
Colnbrook Trading Estate
Britannia Industrial Estate
McKay Trading Estate
Manor Farm
Poyle Farm
Rosary Farm
Tanhouse Farm
Brook Farm
Speedway Farm
Old Slade Farm
Sutton Court Farm
Langley Lodge Farm
Home Wood
Old Wood
Oak Plantation
Diused Workings
Timber Yard
The Common
Caravan Park
Home Farm
Balancing Reservoir
Landfill Site
Drain
Path
Track
Weir
Subway
Railway (Disused)
Euro Const & Co Const Bdy
Bigley Ditch
Poyle Channel
Elbow Meadow
Moor Roundabout
Longford Roundabout
Accommodation Lane
Club House
Warehouse
Recn Gd
The Bungalow
Riverside Bungalows
Poyle Lodge
City Post
Colne Trading Estate
Golf Course
Gravel Pit
Diused Workings
Sewage Works
Landfill Site
Balancing Reservoir
Longford
Longford Bridge
King's Bridge
Moor Bridge
Longfordmoor
Golf Driving Range
Mad Bridge
Colnbrook West
Colnbrook Bypass
Poyle Channel
Elbow Meadow
Rosary Farm
Tanhouse Farm
Brook Farm
Speedway Farm
Old Slade Farm
Sutton Court Farm
Langley Lodge Farm
Home Wood
Old Wood
Oak Plantation
Timber Yard
Caravan Park
Home Farm
Colnbrook School
Colne Trading Estate
Britannia Industrial Estate
McKay Trading Estate
Manor Farm
Poyle Farm

Figure 34 : Noise Monitoring Locations

Lakeside Energy from Waste Site

Proposed Visitor Centre

Proposed Temporary Construction Compound

Noise Monitoring Location

① Pippins School, Poyle

② Colnbrook School

③ Mill Street, Colnbrook

④ Opposite The Greyhound Public House on A4

Source : ATL Consulting

North

Scale. 1:12 500

500m

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A

measurements taken for day and night time. For the attended measurements, weather conditions were in accordance with the guidelines offered by BS4142 for background surveys (i.e. wind speeds were less than 5 metres per second and there was no rain).

10.8 The survey was scheduled to start under light winds with a northerly component, representing favourable conditions for the noise from the site to propagate towards Poyle and Colnbrook. A northerly air stream also implies that Poyle and Colnbrook are downwind of the M4, A4 and to some extent the M25. A significant difference was considered likely between noise levels under northerly and southerly to south-westerly air streams, when these major noise sources would be upwind of the area of interest.

10.9 During the surveys weather information was obtained using a hand held instrument and from the meteorological office for hourly weather statistics at Heathrow Airport (wind speed, direction and rainfall).

Pippins School

10.10 Housing around Pippins School is the residential area closest to the Lakeside site. The noise monitor was set up in the garden of one of the properties adjacent to the school, approximately 400 metres from the Lakeside site, and 500 metres west of the M25. Poyle is almost directly beneath the Heathrow flightpath for aircraft using the northern runway.

10.11 Large variations in noise level occurred throughout each day. Typically daytime LA_{90} levels are between 10 and 15 dB above minimum night time levels, which occur during the relatively short period between midnight and 05.00 and correspond with periods of relatively low activity on the motorways and at Heathrow Airport. The average background noise levels during this period are provided in Table 23.

Table 23 :
Average Night Time Background Noise Levels at Pippins School, Poyle

Night	Average Night-time L_{A90} (00.00 to 05.00)	Average Hourly Wind Speed m/s	Wind Direction
Friday	49	2	NNW
Saturday	42	2	NNW
Sunday	47	3	N
Monday	41	1-2	SW
Tuesday	41	4	W
Wednesday	32	4	WSW
Thursday	35	5+	SW

10.12 Night time noise levels are considered most relevant for the assessment of continuous noise from the development once commissioned because the proposed scheme will operate 24 hours a day and background noise levels are lowest at night.

10.13 The results indicate the influence of the prevailing wind direction on average noise levels. Lower average noise levels were recorded on the last two nights of the survey, which correspond to winds from a WSW and SW direction, the only direction in which a motorway is not within 1.5 km of the site.

10.14 For daytime noise levels the L_{Aeq} levels are generally in excess of 60 dB between 7am and 10pm. Also daytime hourly L_{Aeq} levels in excess of 70 and occasionally 80 dB are not uncommon during weekdays, with a singly high level peak around late morning corresponding with the Concorde flight schedule.

Colnbrook School

10.15 The permanent monitor was located within the school grounds. The school is approximately 1.3km from the Lakeside site, 400 metres south of the A4, 1.2km south of the M4 and 1.6km west of the M25. Colnbrook is almost directly beneath the

flightpath from Heathrow for aircraft using the northern runway.

10.16 A very similar noise environment exists in Colnbrook to that in the Poyle area.

North End of Mill Street, Colnbrook

10.17 This location was selected as typical of the dwellings at the north-east side of Colnbrook. The location is approximately 1km from the site and 170 metres south of the A4.

10.18 Here, prevailing noise levels were dominated by traffic (local on the A4 and from the motorways), along with noise from distant aircraft operations.

Opposite The Greyhound Public House on A4

10.19 Approximately 420 metres from the Lakeside site, this location is directly alongside the A4 and next to the BP filling station.

10.20 Here, as for Mill Street, prevailing noise levels were subjectively dominated by traffic along with noise from distant aircraft operations.

Implications of Policies

Noise

10.21 Local authorities have powers under the Environmental Protection Act 1990 to serve abatement notices where the noise emitted from any premises, or from vehicles, machinery and equipment in the street, constitutes a statutory nuisance. The Control of Pollution Act 1974 also gives local authorities powers to control noise from construction sites.

10.22 Guidance on planning and noise has been provided by the Government in Planning Policy Guidance Note 24: Planning and Noise. PPG24 sets out the planning powers of local authorities to minimise the adverse impact of noise.

10.23 General guidance on predicting the significance of increases in noise level for construction and operation is set out in:

- Code of Practice BS4142, Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas,
- Code of Practice BS5228, Noise and Vibration Control on Construction and Open Sites, and
- Ministry of Public Building and Works Advisory Leaflet (number 72, 1976), Noise Control on Building Sites.

10.24 Guidance on calculating road traffic noise is given in the former Department of Transport's "Calculation of Road Traffic Noise" (CRTN) and "Design Manual for Roads and Bridges, Volume 11, Environmental Assessment".

Construction

10.25 BS5228 presents methodologies and practices for predicting and controlling noise from construction activities. The document also recognises that different noise levels may be appropriate at different times of the day. The guidance states that noise levels generated during the evening (19.00 to 23.00) may need to be less than daytime (07.00 to 19.00). A figure of 10 dB is quoted.

10.26 Paragraph 10.22 of the advisory leaflet referred to in paragraph 10.23 above suggests that 70 dB L_{Aeq} upper limit is appropriate for noise from construction activities impacting at housing. This is equivalent to a free field noise level of 67 dB L_{Aeq}.

10.27 Based on this guidance, the noise assessment proposes a free field limit of 67 dB L_{Aeq} at housing between the hours of 07.00 and 19.00 weekdays and 07.00 and 14.00 on Saturdays. In the evening, 19.00 to 23.00 and on Saturday afternoons a limit of 57 dBL_{Aeq} is proposed.

Operation

10.28 BS4142 details a methodology for assessing the likelihood of complaints due to noise from an industrial noise source impacting on housing. This technique relies on quantification of the "specific noise level", the noise contribution from the new source expressed in terms of the L_{Aeq} parameter and the existing background level, expressed in terms of the LA_{90} parameter. The difference between these parameters is the measure set forth in BS4142 for the assessment of significance.

10.29 The standard suggests that a difference of around plus 10 dB or more indicates that complaints are likely whereas a difference of around plus 5 dB is of marginal significance. The standard also suggests that if noise from the new source is more than 10dB below the measured background noise level then this is a positive indication that complaints are unlikely.

Traffic

10.30 The CRTN document presents methodologies for establishing noise levels due to road traffic expressed in terms of the LA_{10} metric (the noise level exceeded for 10 % of a given measurement period). This is the standard parameter against which noise from road traffic is judged.

10.31 The Design Manual for Roads and Bridges suggests that 'in the period following a change in traffic flow, people may find appreciable benefits or disbenefits where noise changes are as small as 1 dB (A) – equivalent to a change in traffic flow of 25 %'. For the assessment presented here, an assessment against a + 1 dB increase in the hourly LA_{10} parameter was used as an initial measure of significance. Below this level, the change in noise level was considered to be insignificant.

Vibration

10.32 Part 4 of BS5228 offers guidance with respect to measured levels of vibration at a distance

from various different piling operations. The standard sets out acceptable limits for vibration based on building damage criteria for housing and light and flexible structures such as industrial units utilising framework and cladding. The levels suggested are 10mm/s ppv (peak particle velocity) for housing and 20mm/s ppv for light and flexible structures.

10.33 Driven piling typically causes high vibration levels. However, even for driven piles, measured vibration levels which exceed the suggested guidelines, have generally only been recorded at distances close to the piling operations i.e. less than 10 metres. Two quoted levels are presented as levels where adverse comments would not be expected (0.025mm/s ppv at 250 metres and 0.015mm/s ppv at 300 metres).

Impact of the Proposal

Demolition and Construction Impacts

Noise

10.34 The project will have a number of distinct construction phases, some of which are likely to overlap. To predict the noise levels resulting from the various phases calculations have been undertaken based on the basic noise source strength in terms of sound power level (Lwa) for each equipment item as shown in Table 24.

Table 24 :
Noise Levels from Construction Plant

Plant on site	L_{WA} dB[1]
Piling rig	116
Concrete Breakers	119
Crusher	116
Mobile cranes	106
Welding sets	104
Grinders	115
Concrete pump	109
Concrete poker	102
Concrete batching plant	106
Lorries	105
Excavator	116
JCB's	112
Road roller	108
Water pumps	104
Tower Crane	105
Crawler crane	106
Compressors	103
Oxy welding sets	104
Electric Bolters	110
Ashpalt Spreader	108

[1] LWA = Sound Power Level

10.35 Noise levels at distances from each source have been predicted for each phase, the individual item contributions being combined to provide a "Phase" noise level. Where phases overlap (see Construction Programme, Figure 11 in Chapter 3, Proposals), relevant noise levels have also been combined. This information is summarised in Table 25.

10.36 The noise predictions are likely to slightly over estimate the noise levels, as no correction for any local screening which may occur has been included. This is particularly true for noise propagation towards Poyle. The elevated section of the A4 running across the southern boundary of the Lakeside site provides a substantial earth barrier of approximately 6 metres high, between the site and Poyle.

10.37 Noise levels generated during the construction at control points (i.e. Poyle) will generally be less than the existing day time L_{Aeq} values which are dominated by traffic and aircraft movements and consistently in excess of 70 dB. The levels are also below the proposed upper limits for construction noise at residential properties being a free field limit of 67 dB L_{Aeq} at housing between the hours of 07.00 and 19.00 weekdays and 07.00 and 14.00 on Saturdays and 57 dBL_{Aeq} between 19.00 to 23.00 and on Saturday afternoons.

10.38 During the commissioning phase, plant and equipment will need to be tested at full power. This will include the testing of the boiler pressure relief systems and venting of high-pressure steam to the atmosphere. Unattenuated, they can be one of the loudest sources of noise from industrial plant. Following commissioning such events will only occur in an emergency. The main plant contractor will be required to consider mitigation measures for such occurrences and a means of informing the local community will be developed in consultation with the proposed Local Liaison Group.

Table 25 : **Schedule of Construction Activities and Predicted Noise Levels**

Project Phase	No. of Months	Phase L_{Aeq} at 450 m[1]
Phase 1/2 : Create Clinical Plant and stack, CWI Commissioning	6	62
Phase 3 : Site Clearance & Demolition	2	63
Phase 4 : EfW Plant & MRF Construction	25	62
Phase 5/6 : Roads, Drainage, Landscaping and EFW Plant Commissioning	3	54

[1] Noise level at 450 m, ie representative of Poyle residential area (no attenuation for screening assumed)

Table 26 :
Changes in Noise Levels Arising from Traffic from Consented Scheme and EfW Facility - Weekday

Time	Hourly L_{10} Current situation A	Hourly L_{10} Consented situation B	Hourly L_{10} EfW traffic C	Increase Consented *D (B-A)*	Increase EfW *E (C-A)*
07.00 to 08.00	75.6	75.9	75.8	0.2	0.2
08.00 to 09.00	76.1	76.5	76.4	0.4	0.3
09.00 to 10.00	75.5	76.1	75.9	0.7	0.5
10.00 to 11.00	74.9	75.6	75.3	0.7	0.5
11.00 to 12.00	75.0	75.5	75.3	0.5	0.4
12.00 to 13.00	75.5	76.0	75.8	0.5	0.3
13.00 to 14.00	75.4	75.9	75.8	0.5	0.3
14.00 to 15.00	75.0	75.4	75.3	0.4	0.2
15.00 to 16.00	74.6	74.8	74.7	0.2	0.1
16.00 to 17.00	75.4	75.5	75.5	0.1	0.1
17.00 to 18.00	75.9	76.0	75.9	0.1	0.0
18.00 to 19.00	75.4	75.4	75.4	0.0	0.0

Table 27:
Changes in Noise Levels Arising from Traffic from Consented Scheme and EfW Facility - Weekend

Time	Hourly L_{10} Current situation A	Hourly L_{10} Consented situation B	Hourly L_{10} EfW traffic C	Increase Consented D *(B-A)*	Increase EfW E *(C-A)*
07.00 to 08.00	70.1	70.1	70.6	0.0	0.4
08.00 to 09.00	70.2	70.2	70.9	0.0	0.7
09.00 to 10.00	71.8	71.8	72.6	0.0	0.8
10.00 to 11.00	72.3	72.3	73.0	0.0	0.7
11.00 to 12.00	72.4	72.4	73.0	0.0	0.6
12.00 to 13.00	72.7	72.7	73.2	0.0	0.5
13.00 to 14.00	73.4	73.4	73.8	0.0	0.4
14.00 to 15.00	73.2	73.2	73.5	0.0	0.3
15.00 to 16.00	72.3	72.3	72.5	0.0	0.2
16.00 to 17.00	72.3	72.3	72.4	0.0	0.1
17.00 to 18.00	72.9	72.9	73.0	0.0	0.1
18.00 to 19.00	72.7	72.7	72.7	0.0	0.0

10.39 During the construction phase, construction traffic and traffic associated with the continued operation of the CWI, will be considerably less than the volume that visits the site currently. There will therefore be a reduction in traffic noise during this phase.

Vibration

10.40 The only activity considered as having the potential for perceptible vibration beyond the site boundary is piling, which will be undertaken at the start of construction.

10.41 Based on the guidance given in BS5228 and BS6472 and distance of housing from the site, it is concluded that piling activities will not lead to any perceptible vibration levels in the residential area.

Operational Impacts

Noise

10.42 The two principal elements of operation with the potential for noise impact are any increases in traffic associated with the plant and the noise generated by the continuous plant operation.

Traffic

10.43 Traffic will be generated from this site seven days per week and 24 hours per day, although movements at night and during weekends will be only approximately 10% of the normal day-time movements.

10.44 To assess the noise impact of traffic associated with the development the predicted change in the hourly LA_{10} parameter has been established for weekdays and weekends. This assessment is presented in Tables 26 and 27 for weekdays and weekends respectively.

10.45 The noise levels have been calculated using current, consented and predicted traffic movements for the EfW facility. The average traffic flow figures from the Qualidat Survey (April 1999) have been

Table 28 :
Proposed Noise Limits at Pippins School During Operation of the EfW Facility

Existing Night-time Noise (00.00 to 05.00) L_{A90}	Noise Limits at Pippins School	Wind Direction
49	44	NNW
42	37	NNW
47	42	N
41	*	SW
41	*	W
32	*	WSW
35	*	SW

N.B. * *wind direction not valid for limit derivation, i.e. breeze from Poyle towards the site.*

used as the baseline for the noise assessment. Column D of Tables 26 and 27 show the increase in LA_{10} which would result from traffic increases associated with the implementation of the consented scheme. Column E shows the increase in LA_{10} which would result from traffic increases associated with the EfW facility.

10.46 For night time operations no equivalent assessment is presented as these traffic movements (10% of daytime) are considered insignificant with respect to existing A4 HGV flows.

Plant Operation

10.47 Table 28 shows the existing night time background noise levels at Pippins school, Poyle, along with the implied limits for noise from the EfW facility. A maximum noise limit of 37 dB L_{Aeq} at Pippins School will be set as one of the plant performance specifications, thereby ensuring that the plant will not have any significant noise impact during normal operations.

Vibration

10.48 No adverse comments relating to vibration from the site are expected during either the construction or operation phase of the EfW facility.

Cumulative Impacts

Demolition and Construction Impacts

10.49 The maximum noise level predicted for construction of the EfW facility is 63 dB L_{Aeq} at Poyle. The documentation supporting the Logistics Centre proposals predict a maximum noise level of 52 dBL_{Aeq} at equivalent locations in Poyle during the construction and earthworks phase.

10.50 For construction of the LIFE scheme no specific noise predictions are presented but it is stated that *'in general, noise generated by construction work reduces significantly over a distance of 200-300 metres, such that noise from other nearby sources are predominant. However, this depends greatly on the ambient noise environment in the area. In this case, the noise measurements undertaken indicate that daytime noise levels are such that construction noise would not be expected to have an effect beyond some 200 metres from the work area'* (para 6.46 LIFE Environmental Statement, RPS Group plc).

10.51 It is therefore concluded that in the unlikely event that maximum construction noise from the Logistics Centre, LIFE and EfW facility occur simultaneously, then there would be a noise level of approximately 64 dB (A) at the residential areas of Poyle. This level is less than typical existing day-time noise levels and 3 dB (A) below the proposed maximum for daytime construction activities.

Operational Impacts

10.52 The assessment shows that the proposed EfW facility is unlikely to have any noise or vibration impact of any significance during its operational phase. It is also concluded that the development will not contribute to any cumulative impacts when combined with noise and vibration from other developments in the vicinity of the site for instance the proposed LIFE scheme, Heathrow T5 operations, and operation of the Colnbrook Logistics Centre.

Mitigation Measures

Noise

Demolition and Construction

10.53 To attenuate noise levels from the testing of the boiler pressure relief systems and venting of high pressure steam to the atmosphere, vents will be fitted with a silencer to reduce on-site and environmental noise levels. A method statement setting out the likely noise levels that will be generated and methods of attenuation will be submitted to the local planning authority for approval. Local residents will be informed prior to any testing taking place via the Local Liaison Group.

10.54 Contractors will be required to submit method statements giving plant schedules, working hours and predicted noise levels at residential receiver locations judged against the proposed limits. These assessments will be submitted to Slough Borough Council for approval with a proposed scheme for monitoring noise generated from the construction activities. The scheme will identify key phases with potential for high noise levels such as piling and will provide for sample monitoring of these activities at prescribed locations.

Operation

10.55 The plant contractor will be required to prepare an acoustic design report detailing significant noise sources within the plant and methods of attenuating these to enable compliance with the limits proposed (37 dB LAeq at Pippins School). The study will consider aspects of the design such as the required acoustic performance of the main cladding envelope, the attenuation of individual noise sources, primarily the steam turbine and generator, the air cooled condenser and the induct fans.

10.56 A methodology for checking noise levels during commissioning of the plant will be devised It is likely that this procedure will identify a number of control locations relatively close to the plant (where noise from the plant will be dominant) for noise measurement.

10.57 The procedure will establish a calculation method for converting the noise measurements close to the plant to noise contributions at more distant locations (Poyle). The calculated contributions will be compared with the specified limits.

10.58 Mitigation measures are likely to include:

- acoustic enclosure/building for the main steam turbine and electrical generator;
- adequate noise limits for the external air cooled condenser, including fan selection;
- noise limits for the fans and for stack attenuation downstream of the units;
- attenuation properties for the main building structures, based on expected internal noise levels; and
- specification of doors to minimise noise breakout from the main building.

Vibration

Demolition and Construction

10.59 During test pile operations, vibration levels will be monitored at the adjacent industrial units (within approximately 30 metres of the northern site boundary).

Operation

10.60 No mitigation measures are considered necessary as no vibration impacts arising from operation of the EfW facility were identified.

Significance of Impact

10.61 There will be no significant noise or vibration impact from the construction or operation of the EfW facility.

Summary of Impact of Noise and Vibration

- Noise monitoring was carried out at four locations to represent the residential areas of Poyle and Colnbrook, the only residential areas where noise and vibration from the development could have an impact.
- The assessment showed that noise levels generated during the construction of the EfW facility will generally be less than the existing day time noise levels which are dominated by traffic and aircraft movements.
- Traffic associated with construction of the EfW facility will be less traffic than visits the site currently. There will therefore be no additional noise impact arising from construction traffic.
- During commissioning of the plant, equipment will need to be tested at full power. To reduce noise levels, mitigation measures, including the fitting of silencers, will be agreed with the local planning authority.
- Local residents will be informed of times of potentially noisy plant testing via the Local Liaison Group.
- The assessment concludes that, given the distance of residential properties from the site, piling activities will not lead to any perceptible vibration levels in the residential area.
- A noise limit for operational plant of 37 dB L_{Aeq} at Pippins School will be set. By achieving this limit it is considered that the plant will not have any significant noise impact during normal operation.
- There will be no vibration impacts resulting from operation of the EfW facility.
- Noise levels will be monitored during construction and operation of the EfW facility.

Chapter Eleven

11 Ecology

Introduction

11.1 Consideration has been given to the impact of the proposals on the ecology both within and in close proximity to the Lakeside site. Potential sources of impacts include landtake and excavation; disturbance during construction and operation; direct emissions to land, air and water and noise and vibration. Cumulative impacts of of other proposed developments in the area are also considered.

11.2 As the EfW facility could potentially alter the air emissions from the site, consideration has also been given to the effects of the proposal on ecology located some considerable distance from the proposed development site. Within this wider geographic area the effects of emissions of sulphur dioxide and nitrogen dioxide on the lichen populations and general tree health have been addressed.

11.3 Particular attention has been paid to potential effects on areas covered by statutory (see Figure 35) and non-statutory nature conservation designations. Following consultation with English Nature, the assessment includes the information needed for an assessment of the implications for the potential SPAs and SACs.

11.4 Four sites of international conservation significance lie within 20km of the proposed development. Only one of these sites is in the immediate vicinity of the proposed development.

11.5 Two candidate Special Areas of Conservation (cSAC) have been designated under the EC Habitats Directive (92/43/EEC). Windsor Forest and Great Park cSAC is 8 km to the south west, and Burnham Beeches cSAC is 11km to the north west. Both these sites are made up of a number of Sites of Special Scientific Interest (SSSIs).

11.6 The proposed Thames Basin Heaths SPA lies 20km to the south west of the site.

11.7 Two sites are under consideration for classification as Special Protection Areas (SPAs) under the EC Birds Directive (79/409/EEC).

11.8 The area which English Nature is considering as The South West London Waterbodies potential SPA includes the complex of lakes adjacent to Lakeside Road, Colnbrook. The designation process is at a very early stage and the boundaries for the site have not yet been defined. The process of selection and proposal will be lengthy because not all of the waterbodies have been designated as SSSIs, a requirement for classifying SPAs.

11.9 Wetland sites designated as SPAs will also satisfy the criteria for designation under the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat.

11.10 The Habitats Directive is enforced in this country through The Conservation (Natural Habitats &c) Regulations 1994. As required by the Habitats Regulations, the first stage of an assessment of the implications of the development for the SPAs and cSACs has been undertaken following consultation with English Nature.

11.11 Four sites of national importance for nature conservation lie within the vicinity of the Grundon site. These are Staines Moor SSSI, located 3km to the south, Wraysbury and Hythe End Gravel Pits SSSI, 4km to the south, Windsor Forest and Great Park SSSI and Burnham Beeches SSSI.

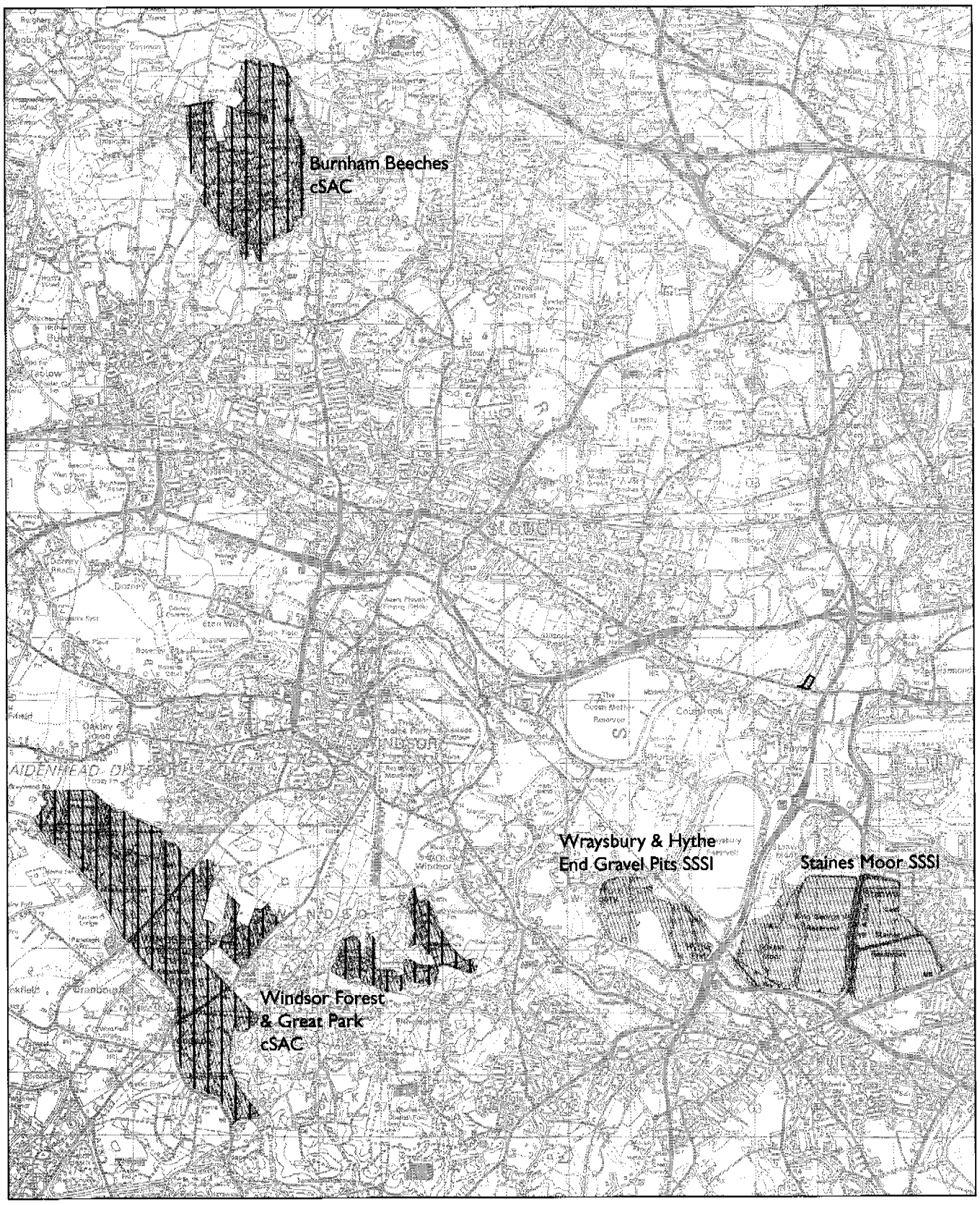


Figure 35 :
Statutory Nature Conservation Designations

Lakeside Energy from Waste Site

SSSI

cSACs

N.B. English Nature has not identified a boundary for the South West London Waterbodies potential SPA

Approximate Scale. 1km

North

Source: Ecological Planning and Research

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A

11.12 Slough Borough Council has identified the complex of lakes at Colnbrook, which includes Old Slade Lake, Orlitts Lake and Colnbrook West Lake as a non-statutory Wildlife Heritage Site (see Figure 36). The council considers that the vegetation and waterfowl populations of these lakes are of at least district importance. Of particular note are the populations of Kingfisher.

The Existing Environment

11.13 The assessment was based on existing recent surveys relating to the general area conducted by English Nature, Slough Borough Council and the LIFE project team and specific surveys related to the Grundon project and on background information collected from English Nature. This provided information on the designated sites, existing habitats, mammal, invertebrate and fish species and bird counts.

11.14 Two red list bird species (species identified by nature conservation organisations which are considered to have high conservation concern) were recorded in the vicinity of the proposed development site. These are Song Thrush and Reed Bunting.

11.15 Song Thrush were recorded in Colnbrook West Lake, Colne Brook and near Old Slade Lake.

11.16 Kingfisher are afforded protection under Schedule 1 of the Wildlife and Countryside Act 1981 and Annex 1 of the EC Birds Directive. Two territories were located, one by Colnbrook West Lake and the other near Old Slade Lake. Bat species are afforded protection under the Wildlife and Countryside Act 1981.

11.17 Within the wider area, there is one priority species (the Violet Click Beetle within Windsor Forest cSAC), and two priority habitats (Dry Oak dominated woodland at Windsor Forest cSAC and Beech forests at Burnham Beeches cSAC).

Habitats that may be Affected by the Proposal

The Site and its Immediate Surroundings

11.18 The Lakeside site, which currently supports the MRF, CWI, Grundon's offices and workshop, has no ecological value. The site for the Visitors and Environmental Study Centre was surveyed in March 1999. Figure 36 identifies the nature of the habitats surrounding the sites for the proposed EfW facility and Visitors Centre.

11.19 There are five water bodies near the Lakeside site. Four of these (Old Slade Lake, Orlitts Lake South, Orlitts Lake North and Colnbrook West Lake) are to the west of Lakeside Road and were formed from flooded gravel pits. They are all quite mature lakes but the aquatic vegetation of each differs quite markedly. The fifth water body lies to the east of the Lakeside site.

11.20 The two lakes closest to the site are Orlitts Lake South and Colnbrook West Lake. Orlitts Lake South is surrounded by overhanging willow trees and oaks which are of low ecological value. The development of emergent and marginal vegetation is confined to more open patches. Submerged aquatic flora appears to be dominated by filamentous algae.

11.21 Colnbrook West Lake has a much more extensive development of emergent vegetation including a stand of Lesser Reed Mace in its north east corner. Its margins are shaded by trees in many places and it is used for angling.

11.22 None of the four lakes support any plant species of distinction and all species are common outside the local areas.

11.23 The waterbodies described above are within an area currently being considered as the potential South West London Waterbodies SPA for supporting internationally important numbers of Gadwall, Shoveler and possibly Tufted Duck during the winter.

11.24 Orlitts Lake South is the site for the proposed Visitor Centre, and an associated car-park. This car-park area is characterised by typical urban wasteland vegetation with some surviving woodland species.

Wider Area

11.25 The following important conservation sites have been identified in the wider area of the development site:

- Staines Moor SSSI (3km away)
- Wraysbury and Hythe End Gravel Pits SSSI (4km away)
- Windsor Forest and Great Park cSAC (8km away)
- Burnham Beeches cSAC (11km away)
- Thames Basin Heaths pSPA (20km away)

11.26 Poyle Meadows SSSI is adjacent to Wraysbury Reservoir and forms part of Staines Moor SSSI. The SSSI chiefly consists of Staines Moor, a stretch of the River Colne and three adjacent reservoirs. The site is notified chiefly for its large alluvial meadows, which support a rich flora, and the reservoirs, which hold nationally important populations of wintering wildfowl.

11.27 The Wraysbury and Hythe End Gravel Pits SSSI comprises a mosaic of open water, islands, grassland, scrub and woodland within an area of former gravel extraction. The site supports nationally important numbers of three species of wintering wildfowl together with an important assemblage of breeding birds associated with open waters and wetland habitats.

11.28 Windsor Forest and Great Park has been selected as a cSAC as it contains Dry Oak dominated woodland which is an Annex I Habitat type of Community Interest and the Violet Click Beetle, a rare Annex II species of European interest.

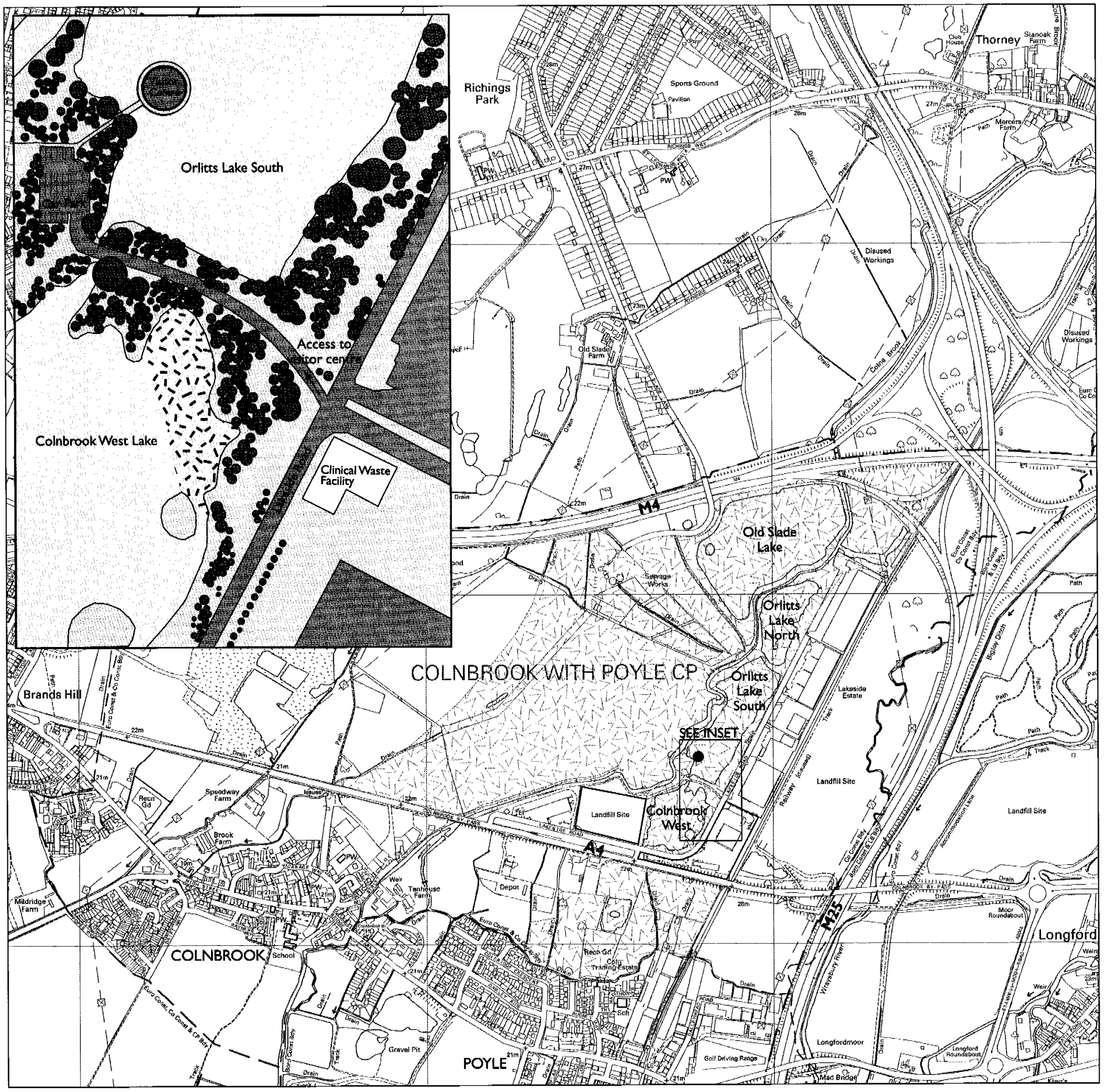

Orlitts Lake South
Car Park
Access to visitor centre
Colnbrook West Lake
Clinical Waste Facility
Richings Park
Sports Ground
Pavilion
Thorney
Club House
Stanoak Farm
Mercers Farm
Disused Workings
Old Slade Farm
Colne Brook
Old Slade Lake
Sewage Works
Orlitts Lake North
Orlitts Lake South
COLNBROOK WITH POYLE CP
SEE INSET
Brands Hill
Speedway Farm
Brook Farm
Mildridge Farm
Tenhouse Farm
Depot
Landfill Site
Colnbrook West
Lakeside Estate
Railway (disused)
Accommodation Lane
COLNBROOK
School
Gravel Pit
POYLE
Colnbrook Trading Estate
Golf Driving Range
Longfordmoor
Longford
Moor Roundabout
Longford Roundabout
Mad Bridge
M4
M25
A4
A4 (LANGLEY BY PASS)

Figure 36 : **Areas of Ecological Interest**

Lakeside Energy from Waste Site

Proposed Temporary Construction Compound

Wildlife Heritage Site

Proposed Visitor Centre

North

Scale. 1:12 500

500m

Based upon the Ordnance Survey 1: 10 000 Scale map with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright O.S. Licence No. AL 50059A

Inset Plan

Trees and scrub

Open water

Swamp/ emergent vegetation

North

Scale Diagrammatic

Source: Ecological Planning and Research

The woods have a large number of old trees which are of high value for their dead wood invertebrates and lichens.

11.29 Burnham Beeches was selected as a cSAC as it contains Beech forests on acid soils which is an Annex I Habitat type of Community Interest. The forests are rich in moss and lichen species and contain some of the largest and most ancient trees in the UK. Their structure creates conditions important for insects and other invertebrates whose larvae depend on rotting wood.

11.30 Thames Basin Heaths pSPA is a heathland of international importance comprising dry heath, wet heath, valley bog, scrub, semi-natural woodland and coniferous plantation with clear felled areas. The site provides breeding and wintering habitats for an important assemblage of heathland bird species and qualifies under Article 4.1 of the EC Birds Directive (79/409/EC) by regularly supporting nationally important breeding populations of three Annex I species: Nightjar, Woodlark and Dartford Warbler.

Species that Might be Affected by the Proposal

The Site and its Immediate Surroundings

11.31 The complex of lakes, grassland, ditches and the Colne River potentially provide a rich habitat for bird species. Surveys of the bird populations of Colne Brook and the surrounding area were undertaken in 1996 and 1998.

11.32 The collection of lakes at Colnbrook may be regarded as of high nature conservation importance for waterfowl. Winter wildfowl populations were surveyed in January 1996 and as part of the range of surveys conducted for the LIFE site in 1998. The LIFE survey was carried out over a 2 month period from February to the end of March.

11.33 The lakes adjacent to Lakeside Road were found to support a range of wildfowl with Orlitts Lake South being used to the greatest extent. The lakes do not hold high counts of waterfowl of national or international significance. Gadwall was noted in the 1996 survey with 24 individuals present on Old Slade Lake and 3 at Orlitts Lake South. This species was not recorded in the 1998 survey. Three Shoveler were recorded at Orlitts Lake South in the 1996 survey but were absent in 1998. Small numbers of Tufted Duck were recorded as present in 1996 and 1998.

11.34 In terms of other water species, the surveys indicated that in a local context, this group of waterbodies were important for Great Crested Grebe, Mute Swan, Canada Goose, Mallard and Coot.

11.35 Kingfishers were recorded on all of the eastern lakes, most often on Old Slade Lake and Colnbrook West Lake. In the early part of the survey Kingfishers were seen on the Colne Brook. As a result of the protection afforded to this species and its high apparent usage of the area, the site is considered to be of high nature conservation importance for Kingfishers.

11.36 Two red list species (Song Thrush and Reed Bunting) were recorded breeding in the vicinity of the proposed development site. The populations of Song Thrush halved between the 1960s and1980s, although it is abundant in Berkshire. The Reed Bunting is a common resident of waterside vegetation throughout Berkshire. The numbers of Song Thrush and Reed Bunting recorded near the site are low and the site is therefore considered to be of low nature conservation importance for these species.

11.37 Bat species including Pipistrelle, Whiskered and Brandts were recorded in the vicinity of the Lakeside site. All bat species are protected by the Wildlife and Countryside Act 1981. As the site holds reasonable numbers of these species it is considered to be of moderate nature conservation importance for bats.

Wider Area

11.38 As the wider area is mainly urban, there are unlikely to be species of particular concern that have not been previously identified.

Implications of Policies

11.39 The lake complex adjacent to the site is within an area being considered as a potential SPA and potential Ramsar site, although no formal boundary of the potential designations has been defined. For the purposes of the environmental assessment it has been assumed that the Visitor Centre and car-park are within the area being considered.

11.40 Within the wider study area there are a numbers of designated sites of national and international conservation importance including SSSI, pSPA and cSAC. The Conservation (Natural Habitats & c.) Regulations 1994 restrict the granting of planning permission for development which is likely to significantly affect a SAC and SPA and which is not directly connected with or necessary to the management of the development site.

11.41 Planning Policy Guidance Note 9: Nature Conservation, sets out the criteria and procedures, including consultation with English Nature, which are required to determine whether a development is likely to have a significant effect on, and will adversely affect the integrity of, sites with national or international designations. For the purposes of considering development proposals, it is Government policy that cSACs and pSPAs should be treated as if they are fully designated sites in terms of the protective mechanisms which apply to it.

11.42 The Biodiversity Action Plan sets out action plans for over 100 species and 14 habitats in response to the Biodiversity Convention at Rio in 1992. The Plan includes a Habitat Statement for Standing Open Water. The conservation objective for this habitat type is to maintain and improve the conservation interest of standing open water bodies, through the use of management plans and sensitive management of adjacent land.

11.43 Slough Borough Council has identified the complex of lakes off Lakeside Road as a Wildlife Heritage Site (see Figure 36). The vegetation and waterfowl populations of the lakes are noted as having at least district importance.

11.44 Policy EN23 of the Deposit Draft Slough Borough Local Plan states that development would not be permitted which would be detrimental either directly or indirectly to designated and future statutory local nature reserves, habitats of specially protected or endangered species, SSSIs and SPAs.

11.45 Policy EN24 advises that special account will be taken of nature conservation interest when determining proposals for development which would be detrimental to identified and future Wildlife Heritage Sites or contains features of local ecological importance.

11.46 The Berkshire Waste Local Plan policies have a strong presumption against allowing waste management schemes adversely affecting designated conservation sites and the aquatic environment.

Impact of the Proposals

Demolition and Construction Impacts

11.47 The construction phase of the development may adversely impact on the site and its immediate surroundings.

11.48 Construction noise will be generated by heavy machinery and traffic movement. The noise studies have shown that the sound generated during the construction phase is predicted to be infrequent and at a lower level than the existing noise environment.

11.49 The impacts of site clearance are expected to be insignificant. The site for the EfW facility contains little or no vegetation and none of ecological interest.

11.50 It is unlikely that construction noise will affect bird populations in the area as they will be used to the relatively high levels of noise already existing in the environment. In the unlikely event that birds using the lakes at Colnbrook are displaced for short periods during times of high level noise, there are alternative waterbodies in the vicinity which these birds could use, during the one or two winters likely to be affected by construction work. The impact on birds during construction is not considered to be significant.

11.51 Noise from the construction of the proposed EfW facility will not occur during the night and as such is unlikely to affect foraging bats. It is likely that some disturbance may occur to bats roosting near the Lakeside site during construction works, although most bats are tolerant of some noise.

11.52 Bats often have a number of day roosts and will move between them, provided that the roosts near the site are not maternity roosts or used for hibernation. As such, the effects of construction noise on bats is not expected to be significant.

11.53 Vegetation clearance will be required for the visitor centre and associated carpark and access road. These grassland areas are not botanically rich and are of negligible conservation value. There may be some Willow or Oak lost in order to provide access to the centre.

Operational Impacts

11.54 During operation a number of impacts have been identified as having the potential to adversely affect the ecology of the immediate surrounding area:

- Noise, vibration, dust and litter which may disturb birds or other wildlife on the lakes and their margins;
- Atmospheric emissions, which may affect plant communities as a result of acidification, toxicity or enrichment;

- Possible water pollution as a result of surface run-off, contaminated spills or blown litter from the EfW facility entering the lake.

11.55 Atmospheric emissions also have the potential to affect a much wider area, including the internationally important conservation sites located up to 20km away.

11.56 Noise from traffic associated with the operating site is predicted to have no significant impact on the ambient noise levels. It is expected that waders and wildfowl are accustomed to noise associated with operation of the existing site.

11.57 Given the current noise levels to which bats and Kingfishers are accustomed, it is likely that they will also become accustomed to low level continuous noise levels from the proposed EfW facility.

11.58 Mitigation measures detailed in Chapter 5, Air Quality, will ensure that there is no dust generation.

11.59 Gas emissions are the only potential cause of adverse impacts on the wider geographic environment. In high concentrations, both nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) can have direct toxic effects on plants and contribute to acid rain which can effect vegetation.

11.60 The dispersion of emissions from the stack was modelled (see Chapter 5) and the effects on the sites of nature conservation importance are detailed below.

11.61 Staines Moor SSSI is located approximately 3km south of the Lakeside site and Wraysbury and Hythe End Gravel Pit is 4km to the south of the site. Given the predicted pattern of dispersion from the site, the low levels of NO_2 and SO_2 contributed by the EfW facility and the prevailing wind from the south west, the emissions from the EfW are unlikely to have effects on these sites of nature conservation importance.

11.62 The lichen flora within the internationally important conservation sites of Burnham Beeches and Windsor Forest and Great Park cSAC is limited and those that remain have survived a history of air pollution stress. Therefore they are not considered to be exceptionally sensitive to fluctuations in NO_2 and SO_2.

11.63 At the levels of SO_2 and NO_2 identified in the modelling, it is unlikely that there will be an effect on the surviving lichen floras of Windsor Forest and Great Park and Burnham Beeches, especially given the existing levels of SO_2 pollution around London.

11.64 Lichens are far more sensitive to the effects NO_2 and SO_2 pollution than are trees. As such the effect on the health of trees in the wider area is also considered as insignificant.

11.65 There is the potential for visitors to the Visitor Centre to disturb wildfowl.

11.66 Water quality is not expected to be effected during construction or operation (see Chapter 6). No ecological impacts are expected to arise from the effects of the proposed development on water quality.

Cumulative Impacts

11.67 Construction and operation of the LIFE and Heathrow T5 proposals would potentially have impacts on ecological features around the Lakeside EfW site.

11.68 The effect of the Visitor Centre and the LIFE proposal could potentially be to increase disturbance to bird populations on Orlitts Lake South. The habitat management and habitat improvements proposed for Orlitts Lake South and Old Slade Lake as part of the LIFE scheme could have a positive effect on the potential SPA.

11.69 It is possible that birds displaced from Perry Oaks Sludge Works due to its loss as part of the T5 proposal may use the complex of lakes at Colnbrook. However, provision of an alternative site is being investigated as part of T5 mitigation and there are a large number of suitable alternative lakes in the area.

11.70 In the unlikely event that the EfW facility has an effect on bats, this would be compensated for by the improved habitats proposed in the LIFE scheme.

Proposed Mitigation Measures

11.71 Specific measures will be taken to mitigate against noise, water and air quality impacts. These are dealt with in detail in the respective chapters of this ES. Whilst these are designed to reduce the significance of the direct impacts, they also provide mitigation for the ecological impacts.

11.72 Construction of the Visitor Centre will take place during the summer, outside the waterfowl breeding season. Measures will be taken to minimise disturbance during construction.

11.73 From an ecological point of view, the Visitor Centre will be ideally situated to heighten public awareness of the value of urban wildlife sites. It is expected that most visitors will be in organised groups so that use of the area can be managed to reduce any potential conflict with nature conservation interests.

Significance of the Impact

11.74 It is anticipated that there will be no significant impacts on the ecology of the surrounding environment (including the pSPAs and cSACs) arising from the construction phase of the EfW facility or Visitor Centre.

11.75 The effects of the operation of the EfW facility on the ecology of the surrounding area are not likely to be significant.

11.76 The impact on the lichen populations from NO_2 and SO_2 from the proposed EfW facility is considered to be insignificant.

11.77 The integrity of the potential SPA will be maintained and species of conservation significance (wildfowl, bats and Kingfisher) are unlikely to be affected.

Summary of the Impact on Ecology

- Within 20km of the proposed EfW site, there are a number of Sites of Special Scientific Interest, two candidate Special Areas of Conservation under the Habitats Directive and two areas under consideration as Special Protection Areas under the EC Birds Directive. The lakes adjacent to Lakeside Road, Colnbrook are within an area being considered by English Nature for inclusion in The South West London Waterbodies potential SPA.
- The lakes support a range of wildfowl included Great Crested Grebe and Mute Swan. The area is of high nature conservation interest for Kingfishers and of moderate importance for bats.
- The site of the proposed EfW facility has no ecological value as it is a developed industrial site.
- The Visitor Centre will be located in the margins of Orlitts Lake South, which is within an area identified as a Wildlife Heritage Site.
- The site for the visitors car park is characterised by urban wasteland vegetation and is of low ecological value.
- To limit any impacts on breeding waterfowl, the Visitor Centre will be constructed during the summer months.
- Neither construction nor operation of the EfW facility are likely to have a significant effect on designated or potential areas of nature conservation importance.
- Emissions to air during operation of the EfW are not considered likely to have a significant impact on the health of trees and plants.
- The Visitor Centre will provide facilities to encourage awareness of the value of urban wildlife sites.

Chapter Twelve

12 Recreation

Introduction

12.1 The recreation value of the area surrounding the proposed Lakeside Energy from Waste (EfW) facility was established. The likely impact of the proposed EfW facility on the recreational use of this area was then assessed.

Existing Environment

12.2 Figure 37 summarises the main recreational resources and activities of the area. Information on these are detailed in the following paragraphs.

Colne Valley Regional Park

12.3 The site is located within the Colne Valley Regional Park which covers an area of approximately 10,300 hectares on the western edge of London between Rickmansworth in the north and Staines in the south. The Park is approximately 23 km long and at its widest point is 6km wide. As shown in Figure 37, the Park includes many urban, transport and industrial uses such as the M25 and M4, as well as Lakeside Road Industrial Estate. The Park is administered and promoted by the Colne Valley Standing Conference, comprising ten local authorities.

12.4 Within the Park there are facilities for riding, walking, cycling, fishing, access to wildlife sites, watersports and golf. Some of these activities are carried out within 1km of the Lakeside site as detailed below. The wider extent of the Park is shown in Figure 13 in Chapter 4.

Rights of Way

12.5 Public rights of way (footpaths, bridleways, and byways) within the study area are limited but provide a basic network for walking, cycling and horse riding. Permissive routes, made available by agreement with landowners, enhances this network.

12.6 Footpath FP1 is located approximately 1800m to the west of the Lakeside site. The northern section of the footpath is currently diverted to avoid the Sutton Lane Pit mineral workings and landfill site.

12.7 Footpath FP2 crosses the central part of Tanhouse Farm between the Colnbrook Bypass and the M4 before turning south west to link up with the concrete track which provides vehicular access to Iver South Wastewater Treatment Works via the Old Slade Lane M4 overbridge. FP2 makes use of this bridge before linking up with footpaths FP24 and FP20 which run north through Old Slade Farm.

12.8 Footpath FP6 is the closest public right of way to the site. It runs north easterly from the Colnbrook Bypass along the Colne Brook and then cuts across Tanhouse Farm to the corner of the Iver South Wastewater Treatment Works. The path then continues between Iver South and Old Slade Lake to join up with Footpath FP2. This path is the closest to the proposed EfW facility.

12.9 Footpath FP6 is part of the Colne Valley Way, one of two long linear paths within the Colne Valley Regional Park. The walk starts at the River Thames in Staines and finishes at the Grand Union Canal at Cowley. Where it crosses the study area the route makes use of bridleways BR4, BR5, BR5a, BR31 and footpaths FP7, FP6 and FP2.

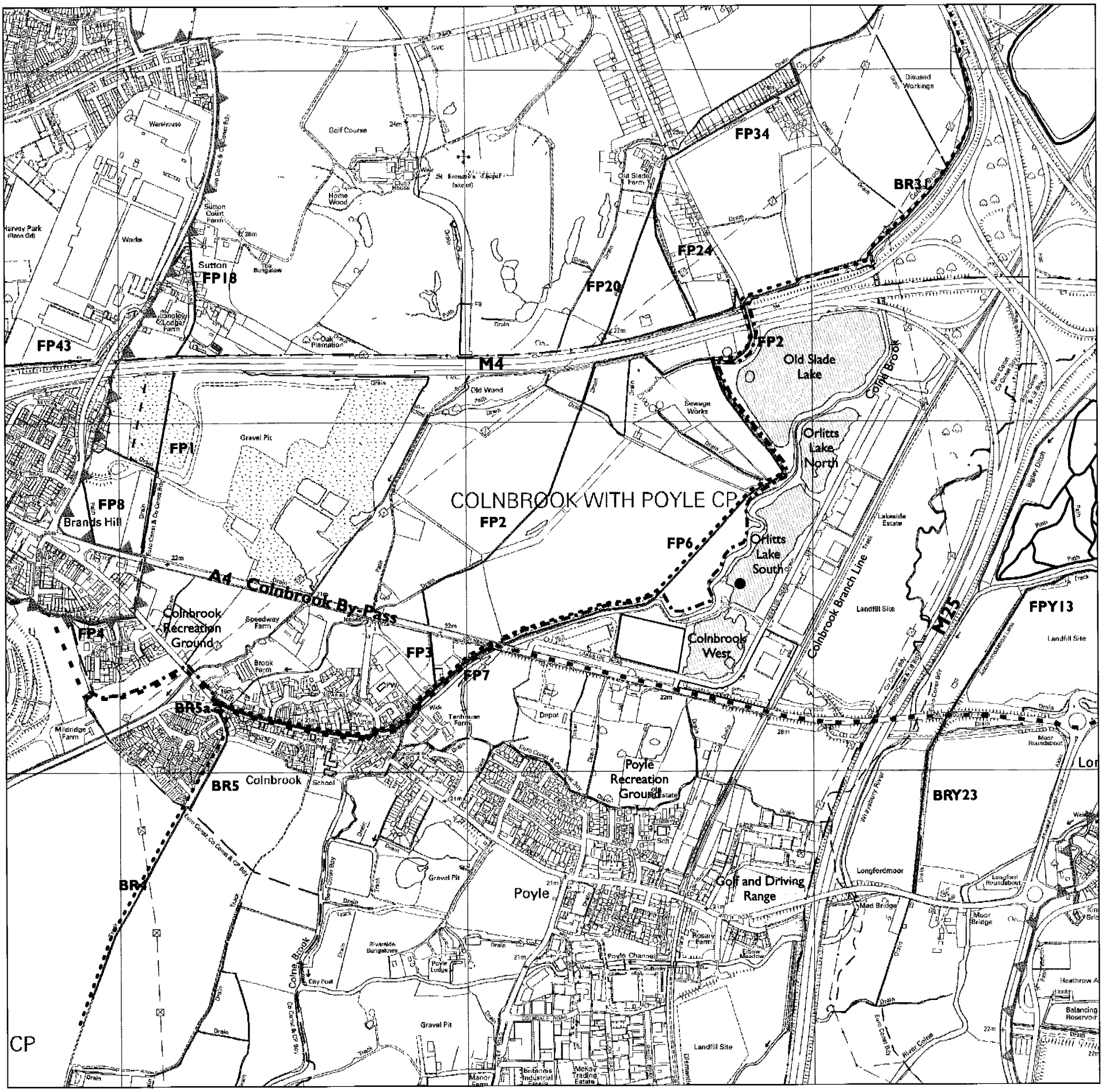

COLNBROOK WITH POYLE CP
FP43
FP18
FP20
FP24
FP34
FP2
FP1
FP8
FP4
FP3
FP7
FP6
BR5a
BR5
BR4
BR3
M4
M25
A4 Colnbrook By-Pass
Brands Hill
Colnbrook Recreation Ground
Colnbrook
Colnbrook West
Poyle
Poyle Recreation Ground
Old Slade Lake
Orlitts Lake North
Orlitts Lake South
Golf Course
Gravel Pit
Landfill Site
Sewage Works
Colnbrook Branch Line
Longford Roundabout
Golf and Driving Range
BRY23
FPY13
CP

Figure 37 :
Recreation

Lakeside Energy from Waste Site

Proposed Temporary Construction Compound

Proposed Visitor Centre

FP Public Footpath

BR Bridleway

Permissive Footpath

Colne Valley Way

Proposed Sustrans Cycle Route

Proposed Linear Park (footpath/cycleway)

Colne Valley Regional Park boundary

Formal Recreation Areas

Diversion of FP1 (10 year duration)

Fishing

Source. RPS Group
The Review of The Local Plan for Slough; Deposit Draft, 1999

North

Scale. 1:12 500

500m

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12.10 The closest bridleway to the development site is BRY23 which runs on the eastern side of the M25 joining up with footpath FPY13 at the A4/Colnbrook Bypass. To the north of the site bridleway BR31 runs alongside the north side of the M4 and slip road with the M25.

Formal Recreational Areas and Open Space

12.11 Two sites are laid out for formal recreation:. Poyle Recreation Ground (known as Pippins Park) adjacent to the Coln Trading Estate and the Colnbrook Recreation Ground, between Colnbrook High Street and the A4.

12.12 A Golf Driving Range is located to the south of the Lakeside site adjacent to the western boundary of the M25.

Fishing

12.13 Old Slade Lake, Orlitts Lake South, Orlitts Lake North and Colnbrook West are open for coarse fishing between May and February. They are managed by Boyer Leisure Ltd. Vehicular access to the lakes is gained from Lakeside Road. There is no public access to the lakes.

Bird Watching

12.14 As access to the lakes is restricted, bird watching opportunities are limited. Hides are accessible from the nearby footpaths.

Policy Context

12.15 Generally, the recreation policies set out within the development plan framework covering the study area seek to maintain and improve recreational facilities and opportunities. Policies are also contained in a number of non-statutory documents.

Adopted Berkshire Structure Plan 1991 - 2006

12.16 The structure plan seeks to promote a range of recreational facilities to aid economic development as well as environmental improvement. Policy R2 states that support will be given to schemes which safeguard and improve informal recreation in the countryside, in particular by improving access, creating links with urban areas and providing signposting, interpretation and management.

The Review of The Local Plan for Slough; Deposit Draft, 1999

12.17 Specific aims and policies within this plan are set down to protect and enhance the existing recreation facilities such as public open space and informal recreation opportunities. The policies that are relevant to the study area are set out below.

12.18 Policy CG1 protects the Colne Valley Regional Park from urbanisation and seeks to maintain and enhance the recreation opportunities and amenity within the park. Within the Plan, the park is recognised as a resource to provide for the recreational needs of West London.

12.19 Slough Borough Council considers that there is an opportunity to create a linear park along the Colne Valley. Policy CG2 safeguards the proposed line of this park and aims to establish the park which will provide paths to be shared between pedestrians and cyclists.

12.20 Draft Local Plan policy CG5 is in line with national guidance in PPG2 (Green Belt), existing strategic Policy C4 and adopted South Bucks Local Plan Policy GB1 in allowing only appropriate uses, which includes outdoor recreation in the Green Belt. Grundon's proposal for the Visitor Centre in this area will offer the opportunity to enhance the environmental quality of this Green Belt area.

Colne Valley Regional Park Strategy – A Vision for the Future and A Strategy for Action, 1995

12.21 The Standing Conference and the local Groundwork Trust, Groundwork Thames Valley (an independent charitable trust established to implement environmental improvements) jointly produced this Strategy. This non-statutory document contains a number of recreational objectives for the Regional Park. They include the provision of recreational facilities, the enhancement and promotion of water areas and the provision of better access to the Park. Although not a statutory planning document the ten local authorities within the park are encouraged to incorporate these objectives into their development plan policies.

Colne Local Environment Agency Plan (LEAP) Consultation Report 1997 and Action Plan 1998

12.22 The study area is located within the area covered by the Colne LEAP. One of the actions identified in the LEAP is to develop the water use recreation strategy of the Colne Valley Regional Park by holding workshops with conservation groups, landowners and recreation groups.

Environmental Change without the Proposals

12.23 A number of changes to the Rights of Way network within the study area are proposed or being implemented.

12.24 Slough Borough Council is in the process of modifying the rights of way network within the study area so that a bridleway circuit is created around Tanhouse Farm. The proposal will also divert footpath FP2, from the existing concrete track into Iver South Wastewater Treatment Works, to a line in the field to the north. The creation of this circuit requires the closure of sections of footpaths FP2 and FP6 and the creation of alternative footpaths and bridleways.

12.25 In addition the Borough Council is investigating the possibility of converting footpath FP7 into a bridleway. This change, in conjunction with the changes to footpaths FP2 and FP6, would create a through route bridleway access between Colnbrook and Richings Park to the north and therefore enhance the access of this area of the Colne Valley Regional Park for horse riding and cyclists.

12.26 The conversion of footpath FP6 to a bridleway also forms a constituent part of the 'Greenways' programme being promoted by Groundwork Thames Valley to create an 18km route between Slough and Uxbridge through the Colne Valley Park. Greenways will be open to walkers, disabled users, cyclists and (where possible) horse riders.

12.27 Part of the planned 'National Cycle Network' between London and Reading, promoted by SUSTRANS and supported and partly funded by the Millennium Commission is proposed to run to the south of the A4 Colnbrook Bypass (Figure 37).

Impact of the Proposal

Demolition and Construction Impacts

12.28 Noise associated with the EfW facility during this phase is unlikely to have an impact on recreational activity within the study area. Footpath FP6 and the Colne Valley Way are the closest recreation facilities to the development site, running adjacent to the construction compound located at Tanhouse Farm Landfill, off Lakeside Road. However this site is to be used mainly for the storage of materials, location of site huts and the parking of vehicles so noise from this area is unlikely to affect the use of these routes.

12.29 Fishermen using the lakes may be disturbed temporarily during the construction of the Visitor Centre.

Operational Impacts

12.30 The traffic associated with operation of the EfW facility will not have an impact upon recreation in the area.

12.31 Provision of a Visitor Centre on the edge of Orlitts Lake South is a positive impact of the proposal. The centre will open up access to one of the lakes and provide information on the running of the EfW facility and the nature conservation interests around the site. The centre has been designed as an attractive and distinctive feature.

12.32 Grundon is prepared to provide a bridge over the Colne Brook to link the Visitor Centre with the proposed linear park. This would enable visitors to cycle or walk to the centre. Grundon will provide space for securing 12 cycles at the Visitor Centre.

Mitigation Measures

12.33 During construction, mitigation measures will be employed to reduce the impacts of noise. These include the production of method statements setting out the likely noise levels and the likely methods of attenuation. These are further described in Chapter 10, Noise and Vibration.

Significance of Impacts

12.34 There are very few predicted impacts on recreational activity within the study area as a result of the proposed development, either during construction or operation. With mitigation measures in place, impacts from traffic and noise are not considered to be significant.

12.35 The provision of a Visitor Centre is a significant positive impact. The purpose of this centre is to provide a major educational resource where it will be possible to study the operation of the EfW facility. This is an area of increasing public interest and waste management also forms part of

the national curriculum. In addition, the centre will provide information and opportunities to study the nature conservation features found in the lakes and open areas around the development site. The details of the Visitor Centre are described in Chapter 3,The Proposals.

12.36 In addition to providing an educational resource the visitor centre opens up access to Orlitts Lake South, which is currently only accessed by fishermen from local angling clubs. The provision of this centre is in line with the aims and policies of the development plan framework outlined. These policies seek to improve and enhance both the recreation environment and access to recreation facilities.

12.37 Apart from the addition of a Visitor Centre, the main impact of the proposals on recreational users will be the introduction of a large building with a high stack. The visual impact of this element of the proposals is described in detail in Chapter 8, Landscape.

Summary of the Impact on Recreation

- The proposed EfW facility is located within the Colne Valley Regional Park which contains recreational resources for the surrounding urban areas. However within the immediate surroundings of the proposed development site recreational facilities are limited to footpaths, bridleways and fishing for members of local angling clubs.
- SUSTRANS propose a cycle route along the route of the A4 and the Local Plan contains a proposal for a linear park along the Colne Brook.
- During construction of the EfW facility there will be limited impacts on recreational users resulting from noise and traffic. Mitigation measures are proposed to ensure that disturbance is kept to a minimum.
- As part of the proposals a Visitor and Environmental Study Centre will be provided on Orlitts Lake South. This facility will open up access to the lake and provide information and study facilities on the operation of the EfW facility and on the nature conservation interests in the area. This centre also conforms with the recreational aims of the development plan framework.

Chapter Thirteen

13 Archaeology

Impacts Assessed

13.1 This chapter describes the known archaeological and historic features around the proposed site for the EfW facility at Colnbrook. It also considers the possible existence of as yet undetected archaeological features, and assesses the likely impact of the proposals on the cultural heritage of the area.

Existing Environment

13.2 The Colne area appears to have supported a high level of human activity throughout prehistoric and historic periods. Records of the Neolithic period are well represented in the Heathrow area and include the important Stanwell neolithic cursus (a monument consisting of two parallel ditches which may have been used as a processional route). Several settlement sites of pre-historic and Roman date are known in the area. Medieval and Post-medieval activity in the Heathrow area is marked by a range of sites and features including manorial estates, industrial buildings, settlement and emerging urbanism.

13.3 A detailed desk based study of the archaeology of the area was undertaken as part of the environmental assessment for the LIFE proposals. The proposed Lakeside EfW facility is surrounded by the LIFE site and much of the archaeological research undertaken for this scheme is therefore relevant to the EfW proposals.

13.4 A 1km study area was defined around the Lakeside site. This area was included in the desk based assessment carried out for the LIFE scheme. This assessment used data obtained from the Sites and Monument Records of Berkshire County Council (Babtie), Buckingham and Greater London (English Heritage). Other sources of data include the National Monuments Record, the Air Photography Library, other air photographs, the scheduled monuments lists held by English Heritage, Listed Building registers, planning designations, historic maps and accounts of previous archaeological work in the area.

13.5 The assessment revealed thirteen sites of archaeological interest within the study area. These sites (and the listed buildings located within the study area) are plotted on Figure 38. The recorded sites have produced finds from the following periods: Neolithic (4500–2400BC), Bronze Age (2400–700BC), Roman (43AD-410AD), Medieval (410–1499AD), Post Medieval (1499-1799), and modern (1800-present day). Two sites in the study area contain evidence of activity from several different historic periods. Only two of the archaeological sites identified are close to the Lakeside site. Both are listed as features of uncertain date although it appears that the sites to the east of the Lakeside site, identified as linear features (2), are actually modern land drains.

Neolithic

13.6 The Heathrow area has produced evidence of neolithic field systems and ritual landscapes. Prominent amongst these monuments is the Stanwell Cursus (5). The monument consists of two parallel ditches about 20m apart, orientated north west to south east, extending for a distance of 3.5 km. Cursus monuments are interpreted as possible processional ways or ceremonial routes between territories. They are often associated with a range of other neolithic sites and monuments and

a number of settlements of this period have been located in the Heathrow area.

13.7 Sites 1 and 7 also show evidence of Neolithic activity.

Bronze Age

13.8 Several Bronze Age sites have been discovered in the Heathrow area. Artefacts including flint finds which could be from the Bronze Age have been found in the study area at Slade Lane (1).

Roman

13.9 Roman sites are scattered throughout the area and include rural settlements and field systems. One site within the study area at Slade Lane (1) is recorded as having Roman remains present including pieces of pottery.

Medieval/Post Medieval

13.10 The post medieval period within the study area is represented by the continuing existence of the medieval villages of Colnbrook, with its cornmill, millhouse, tannery and watermills, Poyle and Longford. Three sites (7, 9 and 10) record evidence of this period in the study area. Find number 10 is a medieval skillet handle found at Longford Moor.

Modern

13.11 The pattern of settlement in the area changed very little until the late 19th century and the arrival of the airport in the 1940's. Much of the land around the Lakeside site in the postwar period was used for sand and gravel extraction and later backfilled with a variety of wastes. The only modern site recorded within the study area is a WWII RAF decoy east of the M25 (4).

Features of Uncertain Date

13.12 Seven sites in the study area are of uncertain date. The alluvium deposited by the River Thames tributaries produced fertile, easily worked and well drained soils for early agriculture. Aerial photography has highlighted a number of undated but possible prehistoric cropmarks of ditch systems and enclosures in the study area (2, 8, 11, 12 and 13). There has also been a spot find of a hammerstone pebble (3).

Archaeological Potential

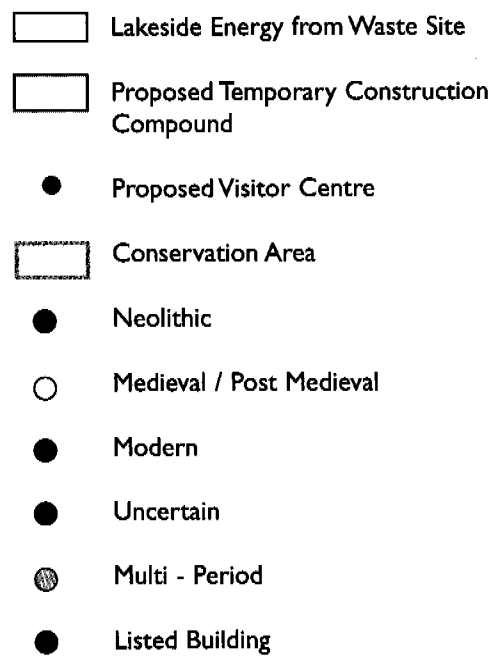
13.13 There are no recorded sites on the land for the proposed EfW plant and only thirteen sites within the study area (see Figure 38). Three of these nearby sites (2, 12 and 13) are cropmarks and are recorded as being of unknown origin and importance. The site closest to the proposed EfW facility has been recorded as a complex of intersecting rectangular shaped cropmarks. However, an archaeological watching brief conducted during gravel extraction, discovered that the rectilinear features were, in fact, modern drains.

13.14 Figure 38 also shows listed buildings. There are no listed buildings on the Lakeside site or in its immediate vicinity. The nearest listed structure is the milestone at Mad Bridge, 600 metres to the south east. The milestone dates from 1741 and is Grade II Listed.

13.15 There are a number of listed buildings in Colnbrook Conservation Area and Longford Conservation Area. Most of these buildings are grade II Listed, with the exception of the 16th century Ostrich Inn and the 17th century King John's Palace at Colnbrook.

13.16 The site and the immediately surrounding areas have been worked extensively for minerals and then either left wet or infilled with a variety of wastes. Due to the amount of ground disturbance that would have occurred during the gravel extraction operations, it is highly unlikely that any archaeological remains would have survived. Consequently, the archaeological potential of the site is considered to be low.

Figure 38 :
Historic Interest



Source : RPS Group plc

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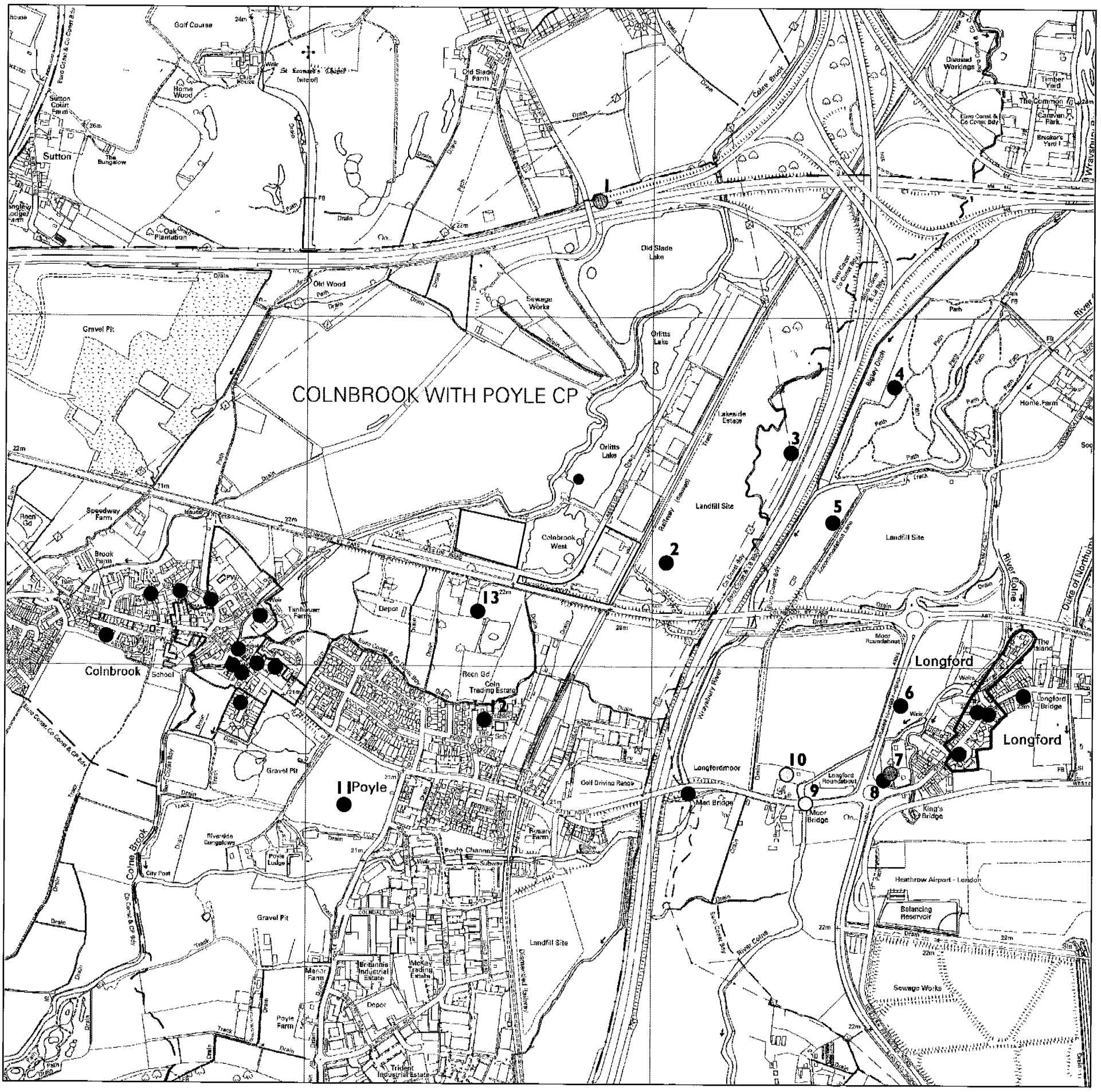
COLNBROOK WITH POYLE CP
Golf Course
Sutton
Sutton Court Farm
Home Wood
Oak Plantation
Old Slade Farm
Old Slade Lake
Old Wood
Sewage Works
Gravel Pit
Orlitts Lake
Lakeside Estate
Landfill Site
Colnbrook West
Speedway Farm
Brook Farm
Tanhouse Farm
Depot
Colnbrook
School
Coln Trading Estate
Poyle
Riverside Bungalows
Poyle Lodge
Poyle Farm
Rosary Farm
Poyle Channel
Subway
Britannia Industrial Estate
McKay Trading Estate
Trident Industrial Estate
Longford
Longford Bridge
Longfordmoor
Mad Bridge
Moor Bridge
Longford Roundabout
Heathrow Airport - London
Balancing Reservoir
Sewage Works
Discussed Workings
Timber Yard
The Common
Caravan Park
Broker's Yard
Home Farm
Coln Brook
River Colne
Wraysbury River
Duke of Northumberland's River
Bigley Ditch
Colne Brook
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Implications of Policies

Statutes

13.17 Statutory protection for archaeology is principally enshrined in the Ancient Monuments and Archaeological Areas Act, 1979 amended by the National Heritage Act, 1983. Nationally important sites are listed in a Schedule of Monuments which is maintained by the Secretary of State for National Heritage. Scheduled Monument consent is required for any works which would affect the fabric of these monuments.

13.18 Listed buildings are protected under the Town & Country Planning Act 1971, as amended by the Planning (Listed buildings and Conservation Areas) Act 1990, which empowers the Secretary of State for the Environment to maintain a list of built structures of historic and architectural significance. Listed building consent is required for any works of alteration or extension which would affect the character of a listed building.

Planning Policy Guidance Notes

13.19 Planning Policy Guidance Note 16: Archaeology and Planning, gives advice to planning authorities on the safeguarding of archaeology within the planning process. The guidance sets out a presumption favouring the physical preservation of nationally important archaeological remains, whether scheduled or not, and their settings. It further provides that where preservation in situ is not justified planning authorities may reasonably require the developer to make appropriate and satisfactory provision for excavating and recording archaeological remains before development begins.

13.20 Planning Policy Guidance Note 15: Planning and the Historic Environment, sets out the Government's policies for the identification and protection of historic buildings, conservation areas and other elements of the historic environment. It explains the role played by the planning system in their protection.

Development Plans

13.21 Policy C4 of the Local Plan for South Bucks, 1989 (the adopted development plan for the area) relates to the conservation of archaeology and natural history. It states that permission will only be granted for proposals affecting historic landscapes, scheduled ancient monuments, or other features of natural history where they will not have an unacceptable impact.

13.22 Policies EN21 and 22 of the deposit draft Local Plan for Slough also relate to archaeological features. Policy EN21 states that development will not be permitted where it fails to preserve archaeological remains or their setting. Policy EN22 requires developments located in areas of archaeological potential to carry out a field evaluation prior to an application being decided. If archaeological remains are discovered then arrangements must be made to preserve the remains in situ.

Impact of the Proposal

13.23 As the site has been extensively worked for sand and gravel deposits and backfilled, it is considered very unlikely that any archaeological deposits would still be present on the site. Consequently, it is considered that the impact of the scheme on archaeological features will be negligible.

13.24 It is not considered that the proposal would adversely affect the setting of the listed buildings identified within the study area as they are either located at some distance from the site or are enclosed within the envelope of existing urban areas.

Mitigation Measures

13.25 As it is unlikely, given the history of the site, that any archaeological features are present, no mitigation measures are considered to be required.

Significance of Impacts

13.26 The proposed EfW facility will not have a significant impact on archaeological remains, listed buildings or conservation areas.

Summary of the Impact on Archaeology

- The study area is generally of high archaeological interest. However, the site and its immediate surroundings have been extensively worked for gravel and filled. Consequently, no impact on archaeological sites is anticipated.
- A number of listed buildings and the Colnbrook Conservation Area lie within the study area. These are located at some distance from the site and it is considered that neither the buildings nor their settings will be adversely affected by the proposals.

Chapter Fourteen

14 Conclusions

Introduction

14.1 From the results of the assessment, this chapter draws conclusions about the overall performance of the scheme, measured against the potential impacts identified in Chapter 4.

The Proposals Compared to the Existing Position

14.2 Grundon's proposals are for redevelopment of its existing Lakeside Road waste management facilities. At present the site houses a MRF serving the area covered by several waste disposal authorities and a CWI with a regional or wider catchment. Grundon has planning consent to enlarge the MRF to accommodate a throughput of 400,000 tonnes of waste per annum and authorisation from the Environment Agency to double the throughput of the CWI to 17,000 tonnes per annum.

14.3 Grundon proposes to replace the existing facilities with an EfW facility (with a capacity of 400,000 tonnes of waste per annum) incorporating a MRF to extract recyclable material. The EfW facility will produce heat and 30MW of electricity for the National Grid, enough for 30,000 households. The catchment area of the proposed EfW facility is expected to include Slough Borough, other unitary authorities in the former county of Berkshire and parts of Buckinghamshire, Surrey and London. The existing CWI capacity will be maintained and re-provided on the redeveloped site, retaining the potential for expansion already authorised.

14.4 The net effect of the proposals will be to extract energy (in the form of electricity and heat) from 400,000 tonnes per annum of waste that would otherwise go to landfill. This will result in a significant contribution to energy supply from renewable resources and a reduction of 90% or more in the volume of landfill space required. The scheme will also be able to supply heat to existing and proposed development in the area.

Need

14.5 Grundon's proposal will provide EfW facilities for a wide surrounding area as part of a sustainable waste management strategy of waste minimisation, recycling and energy recovery.

14.6 Waste Disposal Authorities in the former county of Berkshire at present depend on landfill (both inside and outside the county) as the principal method of disposing of the area's waste. This is contrary to European and UK policies, which regard landfill as the option of last resort. Although the statutory plan for Berkshire envisages that landfill will be phased out by 2006, monitoring shows that alternative methods of disposal have not materialised. Meanwhile the capacity of landfill is likely to be much less than forecast. In these circumstances, the Local Plan acknowledges a need for an EfW facility. A similar situation applies in many other parts of London and South East England.

14.7 There is therefore an urgent need to develop EfW facilities to serve the needs of Waste

Disposal Authorities in Berkshire and adjoining areas. Grundon's Lakeside Road site is well located to serve Slough, other unitary authorities in Berkshire and parts of Buckinghamshire, Surrey and London.

14.8 There is also a national need for more EfW facilities, which the Government considers has an important role in the implementation of both sustainable waste and energy policies. There are at present no EfW plants in the South East and only two in London. More are required if the Government is to achieve its aim of reducing the UK's dependence on landfill.

Alternatives

14.9 The only realistic alternative to Grundon's proposal is an EfW plant on another site in the vicinity. The Berkshire Waste Local Plan includes a checklist of criteria to identify potentially suitable locations for such a plant.

14.10 The Lakeside Road site meets these criteria and, in addition can be served by rail. It is a well-established waste management facility, for which purpose the site is safeguarded in statutory plans. It is on an established industrial estate outside the Green Belt, relatively remote from residential areas and next to main roads and a railway. The site has direct access to the A4 Colnbrook bypass, from which the primary road network is fully accessible. A new rail siding can be built to serve the plant from the Colnbrook Branch Line, which runs along the site.

14.11 Before confirming the suitability of the Lakeside Road site, locations were considered on other industrial estates in Slough, Langley, Colnbrook, Poyle, Stockley Park, Hillingdon, Iver and Uxbridge. None of these estates has overall advantages over the Lakeside Road site as a location for an EfW facility. Potential sites at Smallmead, Reading, and Colthrop, Newbury, identified in the Berkshire Waste Local Plan are also less suitable than Lakeside Road. No locations could be found for an EfW plant outside the built-up area, the surrounding countryside being largely Green Belt and/or the subject of environmental protection policies.

Impacts Assessed

Air Quality

14.12 The air quality impact of the proposed EfW facility has been assessed with reference to current and proposed air quality standards and objectives for the pollutants released.

14.13 Measurements from local monitoring sites show that the air quality in the vicinity of the proposed EfW facility generally meets air quality standards. However, the stringent air quality standards for nitrogen dioxide and particulate matter are not currently met close to major roads (including the M4 and M25), and Heathrow Airport.

14.14 The potential impact on air quality of emissions from the proposed EfW facility was assessed using a dispersion model. The results show that, in general, the contribution from the EfW facility to air pollution is likely to be insignificant.

14.15 A modelling study based on estimated rates of odour emission show that the impact of odorous emissions from the stack, and from handling and storage of waste, will not be sufficient to cause odour nuisance.

14.16 Measures have been developed to control dust generation during demolition of the old plant and construction of the new plant. During operation of the plant, the release of dust from waste and ash handling will be prevented.

Water Environment

14.17 The potential impacts on groundwater and surface water resulting from the construction and operation of the proposed EfW facility were assessed. Account was taken of water quality, drainage, water abstraction areas and floodplain areas.

14.18 Borehole investigations indicate that groundwater quality beneath the site is good and that landfills in the vicinity of the site do not appear significantly to influence groundwater quality.

14.19 Construction works will affect local groundwater flows and levels during excavation activities and dewatering. However, none of the groundwater abstractions in the area is considered to be within the likely zone of disturbance of groundwater flow and levels.

14.20 The assessment concludes that, with mitigation measures in place, the quality of the nearby surface water courses and nearby abstractions will not be significantly affected by construction activities.

14.21 The operation of the new EfW facility will not result in any discharges of process effluent to sewers or local watercourses. Measures will be implemented to ensure that surface water drainage is of adequate quality prior to discharge, and storage areas for oils and chemicals will be fully bunded to contain any leaks and spills. Therefore, there are not expected to be any changes to the quality of groundwater or surface water resources.

14.22 Although the development may result in the slight loss of below ground floodplain storage capacity due to excavation works, the development of the site is not expected to affect flood risks.

Ground Contamination

14.23 The presence and nature of ground contamination at the development site was investigated. The potential risk to the environment and human health from the development of the Lakeside EfW facility has also been assessed.

14.24 The potential for contamination relates primarily to the construction phase of the EfW facility, as this will involve the excavation of large quantities of earth.

14.25 The results of ground investigations indicate that the material used to infill the former gravel pits at the site is not contaminated. Groundwater samples also indicated that the groundwater is of reasonable quality.

14.26 In the unlikely event that ground contamination is encountered at the site, appropriate remedial action will be taken in line with the relevant guidelines.

14.27 The risk assessment concluded that there are not likely to be any significant impacts on the health and safety of site workers, or on surface water or groundwater resources resulting from construction of the EfW facility.

Landscape

14.28 The EfW site is surrounded by but lies outside the Green Belt designation. Tanhouse Farm Landfill, which will accommodate the construction compound, and the site of the Visitor Centre fall within the Green Belt designation.

14.29 The EfW plant itself does not have a direct impact on the Green Belt. Although visible over a long distance, the careful design of the building and proposed landscaping will provide an attractive feature which in its setting against existing industrial buildings, pylons, motorway and rail infrastructure will not have an adverse impact on the openness of the Green Belt.

14.30 Once construction is completed, Tanhouse Farm Landfill will be restored and the proposed planting will enhance the landscape of this part of the Green Belt.

14.31 The small scale of the proposed Visitor Centre means that it will not affect the function of the Green Belt in checking unrestricted growth of large built up areas and safeguarding the countryside from encroachment. Part of its purpose is to provide access to the lake areas and their nature conservation interest fulfilling some of the objectives of the Green Belt. The proposed planting round the lakes will also further enhance the landscape of the Green Belt.

14.32 The Lakeside site lies within the Colne Valley Regional Park. The redevelopment of the existing waste management site limits the potential impact on the park area. The Visitor Centre will provide public access to the park with the opportunity to observe wildlife on the lakes and in the surrounding area. Landscaping proposed as part of the scheme will also enhance this part of the park area.

14.33 The EfW building has been designed to produce the minimum size of building required to house the internal plant and to reduce the perceived mass of the building within the landscape. The Visitor Centre has been designed to reflect the appearance of the EfW plant. Landscape planting is proposed around the EfW site, Orlitts Lake and Tanhouse Farm to assimilate the development into the surrounding environment.

14.34 The landscape within which the Lakeside EfW site lies reflects evidence of past disturbance, with damaged and degraded land use components. Transportation corridors, utilities and industrial developments are the dominant and intrusive elements along with other urban infrastructure. The proposals will not introduce an entirely new element in to the existing landscape but replace the existing waste management plant and chimney stack with a more prominent and larger facility within an existing industrial estate. However, the existing intrusive elements will also remain dominant within the study area.

14.35 The Lakeside EfW facility will be a substantial structure, visible from a wide area. However, it will frequently be seen in the context of other industrial and urban structures. From most public vantage points it will be a distant feature. Nevertheless, its scale means that it will be more prominent from closer viewpoints. As the facility will be visible from a number of viewpoints, it has been designed to be an attractive landmark building.

14.36 The overall conclusion of the assessment is that the EfW facility will not have a significant impact on the character or quality of the landscape and in particular will not affect the openness of the adjoining Green Belt.

Traffic

14.37 During construction and operation, access to the construction compound at Tanhouse Farm and the Lakeside site will be from the A4 via Lakeside Road. A new access from Lakeside Road will provide access to the CWI plant. An existing private track off Lakeside Road will be improved to provide access to the Visitor Centre.

14.38 At present, 12 hour daily traffic flows to the site are 344 HGV movements and 120 light vehicle movements. If existing consents and authorisations were implemented, the site would generate a daily average of 740 HGV movements and 300 light vehicle movements.

14.39 Construction traffic associated with the demolition of existing structures and construction of the EfW facility will be significantly less than the current 344 daily HGV movements generated by the existing operations on the site.

14.40 The EfW facility will operate 7 days a week, 24 hours a day. About 10% of weekly traffic movements are expected to occur at the week-end and 10% of daily traffic movements will be at night. During the week, the operation of the EfW facility will generate 524 daily HGV movements and 80 light vehicle movements.

14.41 Whilst the assessment shows that the operation of the EfW facility will result in an increase in traffic flows using the Lakeside Road/A4 junction, the effects of this increase on the local highway network are not considered to be significant and the junction will be functioning within its capacity.

14.42 The assessment concludes that the predicted volume of HGV traffic associated with

operation of the EfW facility will be significantly less than the existing site would generate if Grundon extended the CWI and MRF in accordance with existing consents and authorisations.

Noise and Vibration

14.43 Noise monitoring was carried out at four locations to represent the residential areas of Poyle and Colnbrook.

14.44 The assessment showed that noise levels generated during the construction phase will generally be less than the existing day-time noise levels, which are dominated by traffic and aircraft movements. There may be some noise associated with plant commissioning and testing.

14.45 The assessment proposes a noise limit from operational plant, which will mean that operation of the plant will not have any significant noise impact during normal operation.

Ecology

14.46 Since the EfW facility could potentially affect emissions from the site to air, the effects of the proposal on the ecology of a wide area was assessed. The site of the proposed EfW facility has no ecological value as it is already fully developed and used for waste management. The Visitor Centre will be located in the margin of Orlitts Lake South, which is within an area identified by Slough Borough Council as a non-statutory Wildlife Heritage Site, particularly for its populations of Kingfisher. The site of the proposed visitor car-park is characterised by urban wasteland vegetation and is of low ecological value.

14.47 Four sites of international conservation significance are within 20km of the proposed development. Windsor Forest and Great Park candidate Special Area of Conservation (cSAC) is 8km to the south-west and Burnham Beeches cSAC is 11km to the north-west. The proposed Thames Basin Heaths Special Protection Area (SPA) lies 20km to the south-west of the site.

14.48 There are also four sites of national importance for nature conservation within the study area. These are Staines Moor SSSI, Wraysbury and Hythe End Gravel Pits SSSI,Windsor Forest and Great Park SSSI and Burnham Beeches SSSI. The nearest SSSI is approximately 3 km from Lakeside Road.

14.49 The group of lakes to the west of Lakeside Road is within an area being considered by English Nature for inclusion in the South West London Waterbodies potential SPA. The designation process is at a very early stage and no boundaries are available. For the purposes of the environmental assessment it has been assumed that the visitor centre and the car-park are within the area being considered. Following consultation with English Nature, the assessment includes the information needed for an assessment of the implications for the potential SPAs and cSACs.

14.50 The assessment concludes that construction and operation of the EfW facility and Visitor Centre is unlikely to have a significant effect on designated or potential areas of nature conservation importance. The Visitor Centre will facilitate greater appreciation of the wildlife of the area. Construction of the Visitor Centre and the car-park will be phased to avoid the bird breeding season.

14.51 Emissions to air during operation of the EfW plant are not considered likely to have a significant impact on the health of trees and plants.

Recreation

14.52 The Lakeside Road Industrial Estate is within the boundary of the Colne Valley Regional Park, which is an environmental resource for the surrounding urban areas. The site of the EfW facilities is already in urban use. Access to the lakes to the west of Lakeside Road is limited to footpaths, bridleways and fishing for members of local angling clubs.

14.53 SUSTRANS propose a cycle route following the line of the A4 and the Local Plan includes a Linear Park proposal for the Colne Brook.

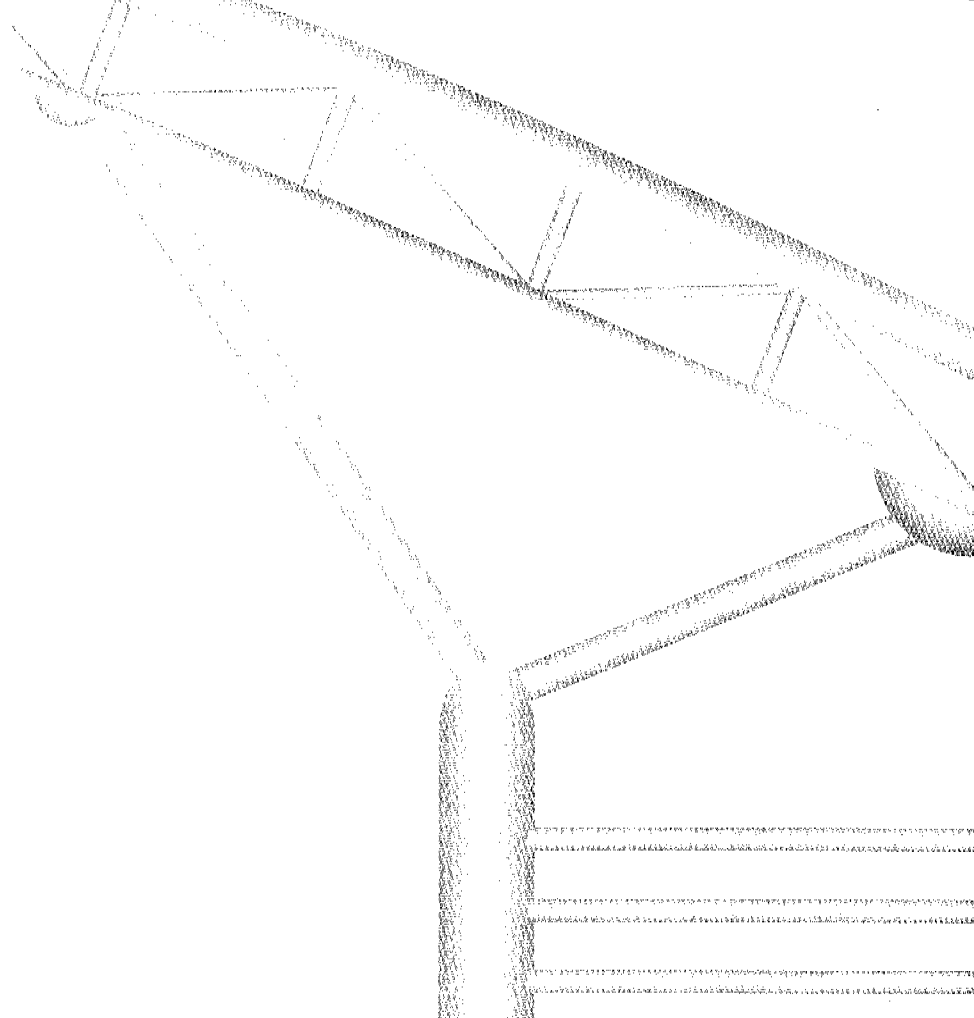
14.54 During construction of the EfW facility there will be limited impacts on recreational users resulting from noise and traffic. Mitigation measures are proposed to ensure that disturbance is kept to a minimum.

14.55 As part of the proposals a Visitor Centre will be provided on Orlitts Lake South. This facility will improve access to the lake and provide information and study facilities on the operation of the EfW facility and on the nature conservation interests in the area.

Archaeology

14.56 An area of 1 km around the Lakeside EfW site was studied. Although this area is generally of high archaeological interest, the application site and its immediate surroundings have been extensively worked for gravel and filled. The assessment showed that the site's archaeological potential is negligible and no impact on archaeological sites is likely as a result of the proposed scheme.

14.57 A number of listed buildings and the Colnbrook Conservation Area lie within the study area. These are located at some distance from the site and the assessment concluded that neither the buildings nor their settings will be adversely affected by the proposals.



Glossary

Abatement plant
Equipment used to reduce emissions of pollutants.

Acidification
To convert into acid – a substance having a pH less than 7.

Acid cation exchanger
An item of plant used in conjunction with the basic anion exchanger to de-ionise (purify) mains water for use in the high pressure boilers and to prevent them scaling up.

Activated carbon injection system
A system which blows controlled quantities of micro-fine activated carbon powder into the flue gas stream to absorb pollutants.

ADMS2
Atmospheric Dispersion Modelling System – A computer program used to predict ground level concentrations of pollutants.

Aggregate
A term used to describe a variety of crushed materials used in the construction industry.

Air cooled condenser
A large item of equipment used to remove latent heat from the spent steam leaving the turbine which causes it to condense so that it can be returned as boiler feed water.

Air cooled grate
A combustion grate in which the primary air used for combustion also cools the grate, helping to prevent premature burn out of the grate bars.

Alluvial deposits
Materials eroded, transported and deposited by watercourses.

Alluvial meadows
Fertile areas composed of alluvial deposits situated next to watercourses.

Anaerobic conditions
Conditions in which oxygen is absent.

Annex I/II Habitats/Species
Natural habitats and species which are of particular importance and whose conservation requires the areas where they are located to be designated as Special Areas of Conservation under the provisions of the EC Habitats Directive (92/43/EEC).

AOD (Above Ordnance Datum)
A measure of the level of ground based on the mean sea level at Newlyn in Cornwall (0 metres).

APC residues
Air Pollution Control residues including fly ash.

Aqueous
A substance which is watery or composed of water.

Aquifer
A water bearing rock strata.

Artesian pressure
The process by which groundwater rises under pressure through the ground.

Atomised
Liquid reduced to a fine spray.

Bag filter
A filter through which incinerated air is passed to remove particulate matter including lime. The filters are cleaned by pulsing compressed air through the bags in sequence.

Bag filter bypass
A duct that enables flue gases to flow around and not through the bag filters during start-up on auxiliary fuel. The bypass is used to achieve statutory operating conditions before the admission of refuse fuel.

Baling Plant
An item of process equipment where certain types of waste are compacted into bales to reduce their bulk.

Basic anion exchanger
An item of equipment that works in conjunction with the acid cation exchanger to de-ionise water.

BGL
Below Ground Level.

Bio-filter system
A proprietary system for treating domestic sewage.

Biological treatment unit
A proprietary biological system for treating domestic sewage.

BOD
Biochemical Oxygen Demand – A measure of the organic strength of water.

Bottom ash
The inert ash residues discharged from the back of the combustion grate.

Bunded area
An area which has been specifically designed to catch and contain any spillage of materials which are stored or used within it.

Calorific value
The amount of energy released when an object is burnt.

CDM
Construction and Design Management.

CEMS
Continuous Emissions Monitoring System.

Civic amenity site
A site provided by a Local Authority for the receipt of civic amenity waste. This generally consists of items such as old furniture, garden waste and other household waste which would usually be collected by the Local Authority.

Clinical waste
Clinical waste usually consists of items such as medicines, equipment, fluids and human or animal tissue which unless rendered safe, may prove hazardous or infectious to persons coming into contact with them. It is derived largely from medical or similar establishments but may also be from domestic, commercial and industrial premises.

Clinker material
The fused material found in bottom ash.

CO
Carbon Monoxide.

COCP
Code of Construction Practice.

Combustion grate
An inclined structure consisting of fixed and moving grate bars which supports the fuel combustion bed, agitates the fuel and enables the introduction of primary and secondary air for good combustion.

Combustion control system
A computer controlled system which monitors combustion conditions and permits all the relevant parameters of the combustion process to be adjusted either automatically or manually to optimise combustion.

Composting facilities
Facilities where green (garden) wastes are received. The waste is shredded and conditioned to produce a compost-like soil conditioner.

Conceptual source pathway receptor model
A schematic representation of the means by which humans receive a dose of pollutant as the result of emissions from a particular source.

Condensing steam turbine
A steam turbine (normally coupled to an alternating current generator) in which the spent steam is condensed back to water and re-used as boiler feed water.

Conservation area
An area designated by a Local Authority under the provisions of the Planning (Listed Buildings and Conservation Areas) Act, 1991 because it is of special architectural or historical significance or it is desirable to preserve the character or appearance of the area.

Contour plotting package
A computer program used to represent the spatial variation in pollutant concentrations as "contours" displayed on a map.

Controlled waters
Water bodies under the jurisdiction of the Environment Agency as defined by Section 104 of the Water Resources Act, 1991. They include groundwaters, inland waters, estuaries and coastal waters.

COSHH
Control of Substances Hazardous to Health.

Cropmarks
Archaeological features.

CRTN
Calculation of Road and Traffic Noise.

cSAC
Candidate Special Area of Conservation – an area designated under the EC Habitats Directive (92/43/EEC) in which habitats or species that are found which are of international importance. UK sites will already be SSSI's.

CWI
Clinical Waste Incinerator.

dB
Decibels – A measurement of sound pressure level.

DETR
Department of Environment, Transport and the Regions.

Dew point
The temperature at which the first liquid forms within a vapour mixture which is being cooled.

Development plan
A statutory document which contains land use policies and proposals which provide a framework for making decisions on development proposals. The 'development plan' may comprise of a Structure Plan (prepared by County Councils) and a Local Plan (produced by District Councils) or a single Unitary Development Plan where the area is controlled by a Unitary Authority.

Dewatering
A temporary artificial lowering of the water table (normally achieved by pumping) during construction to prevent excavations becoming inundated by groundwater seepage.

Diffusion tube
A device consisting of a plastic tube open to the air at one end with a chemical reagent at the other, which is used to measure the concentration of some pollutants, most notably nitrogen dioxide, in air. The quantity of reagent consumed is proportional to the average pollutant concentration in the atmosphere.

Dioxins
A group of organic compounds which are formed as a result of combustion in the presence of chlorine, for example in waste incineration and industrial coal burning.

Dispersion plumes
The emission from a chimney stack following a discharge into the atmosphere.

Dry lime scrubbing system
A flue gas treatment system used to remove acid gases by reaction with dry lime.

Duty of Care
The Environmental Protection (Duty of Care) Regulations 1991 impose a Duty of Care on anyone from producers to carriers and disposers of waste to ensure that waste is not illegally disposed of, does not escape from a person's control, is transferred only to a registered carrier or authorised disposal sites, and all transfers of waste are properly documented.

EA
Environment Agency – the Government Agency responsible for the protection of the environment.

EAL
Environment Assessment Level.

Earth bunds
An earth bank or mound used as a screen or enclosure.

Eddy current separator
A method used to remove non-ferrous metals from waste material.

Effluent
The liquid discharged after a treatment process.

EfW
Energy from Waste – is the combustion of waste under controlled conditions in which the heat released is recovered for a beneficial purpose. This may be to provide steam or hot water for industrial or domestic users, or for electricity generation.

Electro-mechanical interlocks
Physical safeguards built into the plant to prevent operational staff from carrying out operations other than in the prescribed manner.

Emergent vegetation
Plants that grow in the water but have a leaf structure that emerges above the surface.

Employment site
A site identified in a development plan where uses which provide employment will normally only be permitted.

Enrichment
An increased input of nutrients into a biological system which may result in a sudden proliferation of plant life.

Ephemeral watercourse
A short lived or transitory watercourse.

Exhaust flues
The individual flues contained within the main stack envelope carrying the flue gases from each process stream.

Façade noise level
The noise level 1m from a building façade or other similarly noise reflective surface. Façade noise levels re typically assumed to be 3dB higher than levels measured away from a building due to the reflection of sound off the building surface.

Ferrous/Non-Ferrous Separators
Plant items consisting of magnets to remove ferrous material and eddy-current equipment to remove non-ferrous material.

FGR
Flue Gas Recirculation – the process of returning a proportion of the combustion gases to the furnace to provide a reducing atmosphere and inhibit the formation of NOx and SOx.

Field evaluation
Archaeological exploration of a site.

Filamentous algae
A group of aquatic plants which contain chlorophyll and which have a multi-cellular ribbon like body.

Forced draught (FD) fans
Fans that supply air to the underside of the combustion grate. Also referred to as 'combustion fans' and 'primary air fans'.

Furans
Chlorine based organic compounds.

Furnace inlet
An aperture where waste enters the furnace.

Gas scrubbers
Large steel reaction vessels in which the gas scrubbing process takes place.

GPZ
Groundwater protection zone - A zone identified by the Environment Agency as an area where the aquifer would be at risk from potential sources of pollution. GPZ's are graded according to their vulnerability to pollution.

HGV
Heavy Goods Vehicle.

High pressure steam manifold
The point in the steam system at which the steam supplies from the boilers are brought together before admission to the turbine.

Holding tank
A tank for used for storage pending the use of the contents at an operationally convenient time.

Hopper
A type of funnel which collects and channels waste into a storage container.

HCl
Hydrogen Chloride.

HF
Hydrogen Fluoride.

Hydraulic continuity
The conveyance of a liquid through underlying permeable strata.

Hydraulic ram feeder
A hydraulically powered item of process equipment which feeds waste onto the combustion grate.

Hydrocarbons
A group of chemical compounds containing hydrogen and carbon.

Hydrogeology
The branch of geology concerned with the movement of water within the earth's crust.

Inclined grate
A combustion grate tilted at an angle to aid the tumbling action.

Indigenous planting
Planting comprising of species which are native or particular to the local area.

Induced draught (ID) fans
Fans situated before the chimney, which maintain a slight suction within the furnace and abatement equipment to aid the discharge of flue gases to the stack.

Ion exchange process
The removal of ions from solution by the use of a suitable ion exchange medium or bed which has the power to remove or capture the desired ions from solution.

IPC authorisation
An authorisation granted by the Environment Agency to potentially polluting processes which specifies limits on the discharges of pollutants to water and air.

Kv
Kilovolts.

Landfill gas
A gas generated at landfill sites by the decomposition of putrescible waste which consists of a mix of carbon dioxide, methane and a number of other constituents.

Landfill tax
Landfill tax was introduced in 1996 and is levied on registered landfill site operators (in an attempt to reduce the amount of waste produced/disposed of in this manner). Operators can divert up to 20% of their tax liability into environmental bodies for funding a number of approved environmental projects.

Landfill void
Exhausted minerals workings which provide an excavated area which can be filled (landfilled)with waste.

Latent energy
The heat evolved or liberated when a substance changes phase from gas to liquid without any change in temperature.

Leachate
A liquid generated at landfill sites by the solution in water (or other liquids) of chemical compounds which are present in the waste and/or arise through decomposition.

Leaching
A form of chemical weathering brought about by the action of substances dissolved in rainwater.

LEAP
Local Environment Agency Plan.

Level detector
A sensor which monitors the level of waste in the feed chute to the incinerator.The chute is kept filled with waste to prevent backward flow of combustion products . If the waste falls below a safe minimum level, the detector will trigger an alarm.

Lichen
A dual organism formed by a green or blue-green algae and a fungus living together symbiotically.

Listed building
A building designated under the provisions of the Planning (Listed Buildings and Conservation Areas) Act, 1991 because it is of special architectural or historical interest. Any structures within the curtilage of a listed building are also deemed to be listed. It is a criminal offence to make alterations to a Listed building without first obtaining consent from the Local Planning Authority.

LIFE
London International Freight Exchange.

Mg m^{-3}
Milligrams of a substance per cubic metre of air.

MSW
Municipal Solid Waste.

MRW
Mixed Recyclable Waste

MRF
Materials Recovery Facility.

Multi-pass conventional water tube boiler
A boiler consisting of an arrangement of evaporator tubes, superheater tubes and economiser tube sections which transfer heat from the combustion gases to the boiler feed water to convert it into high energy superheated steam.

MW
Megawatts.

NAMAS
National Accreditation of Measurement and Sampling.

NAQS
National Air Quality Standard.

Natural microbial process
A process that takes place as a result of naturally occurring microbes.

Neutralisation pit
A sealed below ground containment pit in which reagents (chemicals which cause a reaction) can safely be added to an effluent to adjust its characteristics.

NOx
Oxides of Nitrogen.

NOx reduction system
A process whereby the oxides of nitrogen created during the combustion process are converted to other substances.

Oil interceptor
A pollution control device connected to the surface water drainage system which intercepts and removes any oil or solids by gravity separation.

OS
Ordnance Survey.

Overband magnetic separators
Magnets arranged over a conveyor belt which remove passing ferrous material.

Particulate matter
Substances present in the discharge in the form of small particles.

PCDD's
Polychlorinated dibenzo dioxins.

PCDF's
Polychlorinated dibenzo furans.

Petal grabs
A grab consisting of curved metal claws which is used for picking up and moving waste.

Phenols
A group of organic compounds containing one or more benzene rings and hydroxy groups.

Picking stations
A section of the EfW facility where waste is separated into different types by manual workers.

Plastics reprocessing
The re-utilisation of plastics wastes.

PM_{10}
Fine particulates less than 10 micrograms in diameter.

Polished de-mineralised water
Water from which dissolved salts have been removed by treatment to make suitable for use in boilers.

Polyclic Aromatic Hydrocarbons
A group of chemicals formed during the incomplete burning of coal, oil, gas and waste.

ppb
parts per billion – the concentration of a pollutant in terms of air volume. 1ppb means that for every billion units of air, there is one pollutant present.

Precipitation tank
A tank in which the solids in an effluent are allowed to settle to the bottom.

Prescribed pollutants
Pollutants for which there are regulations limiting their emissions to air or air concentrations.

Pre-sorted mixed recyclables
Waste items normally from household recycling operations such as plastics and paper which have already been sorted into waste types and are suitable for recycling,

Priority habitat
Habitats identified in the EC Habitats Directive (92/43/EEC) as being in danger of disappearance.

Priority species
Species identified in the EC Habitats Directive (92/43/EEC) as being vulnerable, rare or endangered.

Process effluents
The liquid effluents arising from the EfW process e.g. ash quench water.

Programmable logic controllers
Programmable micro-computers used within the control circuits of modern distributed control systems.

Protection factor
A numerical factor used to reduce concentration limits in order to take account of differences in the exposure times and the variations in sensitivity of individuals and to take account of uncertainties in health effects data.

Putrescible waste
Waste largely composed of material which is subject to biological degradation (decomposition or rotting). Putrescible waste is normally household waste or civic amenity waste although some commercial and industrial waste can be putrescible.

Quench bath
A water bath used to cool down hot ash or other materials.

Ramsar Convention
An international convention on wetlands of international importance held at Ramsar, Iran in 1971 and ratified by the UK Government in 1976. Sites can be designated for any wetland interest including plants and animals and will normally be SSSI's in England and Wales prior to designation.

RCEP
Royal Commission on Environmental Pollution.

Rectilinear features
Archaeological features.

Recycling residues
Non-recoverable waste materials remaining following separation or recovery of recyclables.

Refuse-feed interlock
A device which prevents refuse being admitted to the grate until the prescribed incineration conditions have been reached.

Reserve feed water tank
A tank which holds in reserve, an adequate supply of demineralised water to meet the requirements of the boilers.

River terrace deposits
Deposits of clay, sand and gravel that mark the position of a former flood plain which developed when the river flowed at a higher level.

Scour hole
A hole that has been formed by the abrasive action of rocks being moved in a circular manner in water.

Semi-dry injection system
A flue-gas treatment system whereby a reagent is introduced with water in a finely atomised spray that leaves dry residues from the process that are suitable for removal in bag filters.

Settling tank
See Precipitation tank.

Site of Special Scientific Interest (SSSI)
Areas of nationally important biological or geological features designated under the Wildlife and Countryside Act 1981 and notified by English Nature to landowners and local planning authorities.

SNCR
Selective Non-Catalytic NOx Reduction.

SO_2
Sulphur Dioxide.

Soakaway
A drainage feature which allows water to naturally percolate into the ground.

Soil gases
Gases which are present in soil e.g. carbon dioxide.

Soil matrix
The soil mass.

Special Area of Conservation (SAC)
Area designated under the EC Habitats Directive, and notified to conserve ecological or biophysical features of European importance. UK sites will already be SSSIs.

Special Protection Area (SPA)
An area designated under the EC Directive on the Conservation of Wild Birds, notified to protect the habitat of rare or vulnerable birds or for regularly occurring migratory species. Sites are of European importance and in the UK will already be designated as SSSIs.

Standby oil burners
The auxiliary burners used to achieve and maintain the statutory operating temperatures required for the incineration of waste.

Streams
The number of identical process lines.

Surface heat flux
The rate of heat transfer between the ground and the air above it.

SUSTRANS
A civil engineering charity which designs and builds traffic-free routes for cyclists, walkers and people with disabilities. The charity is currently developing a National Cycle Route which is a Millennium Project.

Tare weight
The weight of an unladen vehicle.

TDI
Tolerable Daily Intake.

TIA
Traffic Impact Assessment – A study conducted to determine what impact traffic generated by a development would have on the surrounding highway network and areas.

Tipping bays
A bay in the tipping hall where refuse collection and bulk transport vehicles empty their waste into a storage bunker beneath the bay.

Tipping hall
The area of the EfW facility where refuse collection and bulk transport vehicles deliver their waste consignments.

Toxicity
The degree of strength of a toxic pollutant.

Toxicological effects
The effect on the human body of toxic pollutant.

Trace metals
Metallic elements which occur in minute quantities in air.

Trommel screen
A rotating cylinder with holes in it, into which material is fed for size separation.

Turnkey contract
A commercial arrangement whereby a main contractor builds a complete plant and hands it over as an operational enterprise after demonstrating its capabilities during a formal commissioning process.

Unitary authority
A Local Government Authority solely responsible for the provision of public services in its administrative area.

Velocity profile
The change in wind speed with vertical distance from the ground.

VOCs
Volatile Organic Compounds.

WDA
Waste Disposal Authority - A County Council or Unitary Authority that is responsible for the disposal of waste produced within its administrative area.

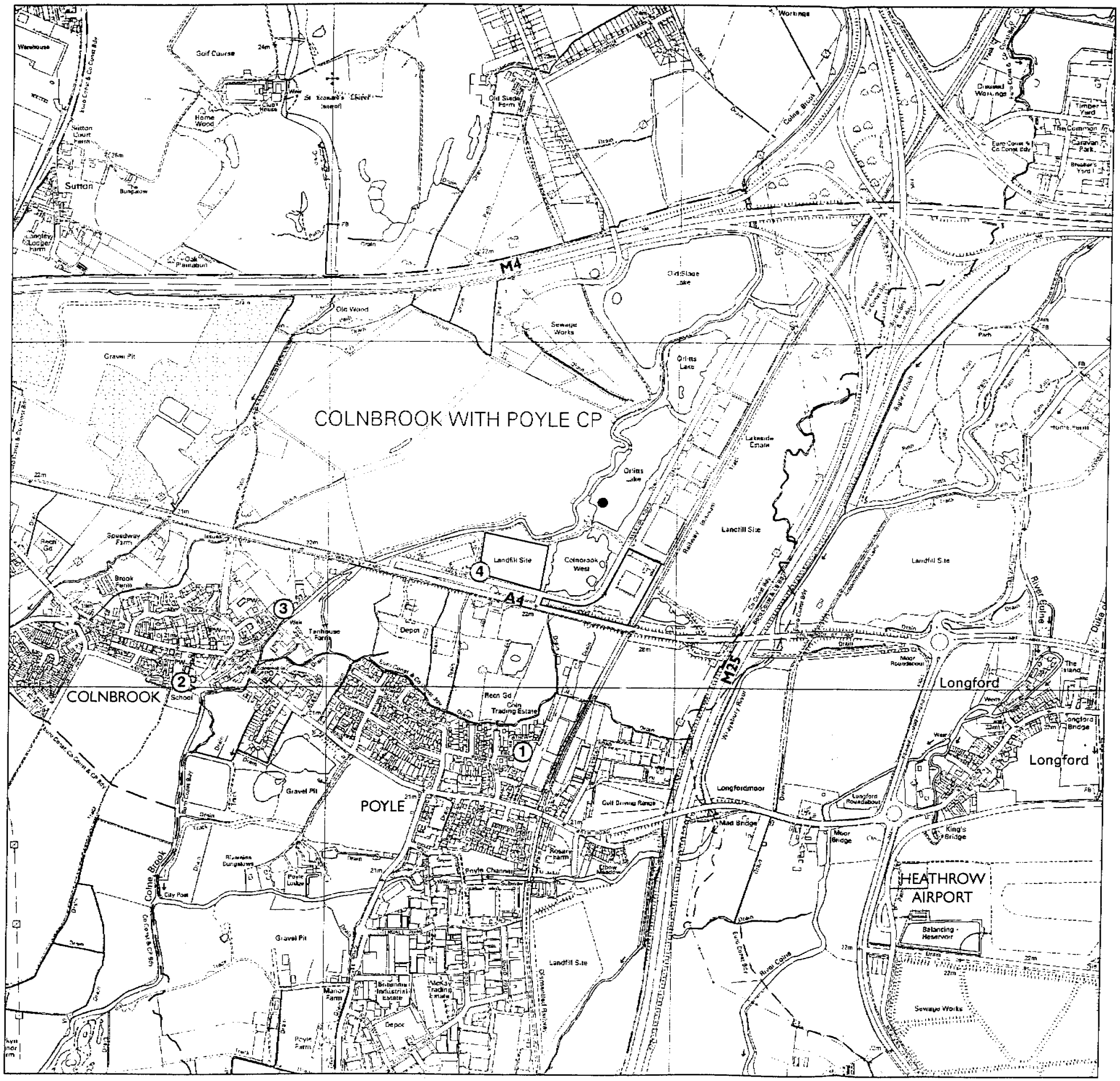
Waste management strategy
A strategy prepared by the waste disposal authority (either a County Council or Unitary Authority) which identifies how waste will be disposed of over a certain period. Such strategies also outline measures to try and reduce the amount of waste that is produced.

Water cooled grate
A grate where water is circulated through the individual grate bars in order to limit their temperature, extend their life and enable the use of primary air to be optimised for combustion purposes (instead of grate cooling).

Water demineralisation plant
A treatment plant which removes the impurities from mains water and renders it fit for use as feed water in the high pressure steam boilers.

WHO
World Health Organisation.

ZVI
Zone of Visual Influence – An area (determined by computer modelling and site observations) from where it is likely that a particular site or development would be visible by a person of average height.



North

Key :

P = Permanent Monitoring
A = Attended Monitoring

Location No :

1 = Pippins School, P,A
2 = Colnbrook School, P
3 = Mill Street, Colnbrook, A
4 = Opposite Public House On A4, A

Figure 1 : Proposed EfW Site and Environmental Noise Monitoring Locations