



**London Plan Waste
Forecasts and Apportionments**

Task 4 – Updating the apportionment method
Methodology Report

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APPENDIX 1: APPORTIONMENT REVIEW AND AMENDMENTS PAPER

APPENDIX 2: CONSULTATION SUMMARY

GLOSSARY

Capacity - The amount of waste (in tonnes) that each borough can process using existing facilities.

Criteria - Each criterion is a separate factor or set of factors that affects the amount of waste each borough can be apportioned.

Representative Value (RV) - A value from 0 to 100 that signifies how well each borough performs against a particular criterion on a scale defined by the borough that performed best and the borough that performed the least well.

Suitability Index (SI) / Apportionment Percentages (AP) - A percentage value that represents how much waste would be assigned to each borough for each criterion, i.e. if each criterion were the only one being considered.

Waste apportionment - The percentage of the total waste arisings across Greater London each borough would be assigned to manage.

Waste arisings - The amount of waste that each borough currently generates per annum.

Weighting - A percentage value that represents how much each criterion is worth of the final apportionment.

1.0 INTRODUCTION

SLR and LUC were commissioned to update and verify the GLA's waste arising forecasts, as well as review and revise the apportionment methodology used to calculate waste stream apportionments for each planning authority over the next London Plan period: 2016-2041. This involved undertaking a detailed review of the current apportionment methodology (developed in 2006 and used for apportioning forecasted waste arisings in the adopted London Plan period: 2016-2036) before presenting a number of amendment options (to the Steering Group and other stakeholders) aimed at simplifying and strengthening the robustness of the apportionment methodology for the new London Plan. Feedback from the consultation workshop has been used to develop an updated apportionment methodology, which is described in this report. This report additionally sets out a number of waste apportionment scenarios based on a range of weighted options.

This reports starts with an overarching notes section that presents some general commentary on the number of criteria, data updates and the weighting and calculation process. The report then sets out each of the updated criteria in detail. Each criterion is described using the same format.

Full details of the criteria amendment options considered during the methodology development are presented in an Appendix to this report, accompanied by a summary of the consultation feedback that informed the final apportionment method.

Waste apportionment represents the division of Greater London's waste arisings, assigning each London Borough with an appropriate proportion of the total to manage. Previous versions of the London Plan have focused on apportioning Local Authority Collected Waste (LACW) (formally Municipal Solid Waste) and Commercial and Industrial Waste (C&IW).

This approach is in-keeping with the requirements of Planning Policy Statement 10 (PPS10)¹, which explicitly limits the requirement for apportionment to household waste and commercial and industrial waste, therefore excluding CDEW. For further explanation on the rationale for excluding CDEW, please refer to the Task 2 report (Construction, Demolition & Excavation Waste and Hazardous Waste Forecasts).

¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/11443/1876202.pdf

2.0 OVERARCHING NOTES

2.1 Terminology

The term **Suitability Index (SI)** was used to describe the final result for each criterion in the 2006 study. This value represents how much waste would be assigned to each borough if that criterion were the only one being considered and is expressed as a percentage. LUC recommend that it would be more helpful to refer to these values as **Apportionment Percentages (APs)** in the updated study. For consistency with the source information, SI is used when referring to values from the 2006 report, and AP is used when referring to values in this updated report.

2.2 The Criteria

The 2006 study defined nine criteria:

1. Capacity – Identification of Theoretical Surplus/Deficit in Each Borough
2. Proximity to Waste Arisings
3. Proximity to Sustainable Transport Modes
4. Proximity to the Road Network
5. Ability to Use Sustainable Transport Modes
6. Historic Patterns of Waste Movement
7. Other Land Uses / Environmental Factors
8. Flood Risk
9. Socio-Economic Factors

This updated apportionment defines seven criteria, all of which are described in detail in this report:

1. Theoretical Capacity
2. Waste Arisings (at 2021)
3. Sustainable Transport Modes
4. Road Network Capacity
5. Other Land Use/Environmental Factors
6. Flood Risk
7. Socio-Economic Factors

2.3 Weighting

The 2006 study weighted each criterion as 'High', 'Medium' or 'Low'. A criterion with a 'High' weighting made up 14.3% of the total SI value, one with a 'Medium' weighting made up 9.5%, and one with a 'Low', 4.8%. The updated approach removes the 'High', 'Medium', 'Low' trichotomy in favour of assigning each criterion a simple percentage (%) weighing instead. This makes it clearer how much of the total each criterion is worth, making the method more transparent and simpler to understand.

In the 2006 study, four criteria were grouped into pairs; Criteria 1 and 6, and Criteria 3 and 5. For each pair, the cumulative weighting was applied to their combined SI to give their weighted SI - this meant that each was weighted twice, i.e. the combined Criteria 1 and 6 was classed as 'High', but was worth 28.6% of the total, rather than 14.3%. The updated method applies only a single weighting to each criterion, again, to aid in understanding and clarity. This report sets out eight weighting scenarios

2.4 Calculating SI Values

In order to calculate the SI for each criterion, the 2006 study generated a **Representative Value (RV)** for each borough. The RV signifies how well each borough performs against a particular criterion on a scale defined by the borough that performed best and the borough that performed the least well. In the 2006 study, this gave each borough an RV between 0 and 100 for each criterion, with 100 being the highest performing and 0 the lowest performing. It is important to note that the lowest scoring borough always scored 0, representing the baseline from which all remaining boroughs were scored.

The 2006 study then calculated the SI values for each borough from the RVs by adding the RVs together and calculating as a percentage (%) the proportion each borough's RV was of the total.

The updated approach simplifies the 2006 study SI² calculation method described above to improve the overall transparency of the apportionment methodology and allow the lowest scoring boroughs to score more than 0 where appropriate.

While the 2006 approach is appropriate for some criteria, it is not always appropriate to give the lowest performing borough an SI/AP value of 0%. For example, it is appropriate to calculate a value of 0 against Flood Risk where a borough is completely washed over by Flood Zone 3. However, under the road network criterion, even boroughs with the lowest road densities can process some waste; therefore, in this case an AP value of 0 would be inappropriate. Instead, a value of 0 is applied only to an absence of the features being assessed, with all other values being a % of the total of the assessed criteria. For example, if the criterion were assessing the amount of unconstrained land, only those boroughs with 0ha of unconstrained land would receive an AP of 0%. If the lowest had 100 ha of unconstrained land, and the total area of unconstrained land within London was 10,000 ha, the lowest borough would receive an AP of 1%.

2.5 Changes to Data

Since 2006 there have been many updates to relevant national, regional and local datasets improving resolution and accuracy. Consequently, some of the updated data used in the new 2017 study does not exactly match the 2006 study. For example, measuring linear features, such as roads and railways, with a greater level of accuracy has the apparent effect of increasing their length. While there may be some significant changes in the datasets used, the same datasets will be used for every borough, making the final AP values in this updated study relatively comparable with those calculated in the 2006 study. Figure 1 illustrates this point by showing the same road (offset for clarity) from two different datasets. The top road, representing the updated data set, appears longer than the bottom road due to the increased detail, and the inclusion of roundabouts.

² The term Suitability Index (SI) has been renamed as Apportionment Percentage (AP) as reasoned above (see Terminology section).

Figure 1
The difference between two representations of the same road



It was not always possible to identify the source data used in the 2006 study. In the interests of transparency, this updated apportionment methodology references all datasets used.

2.6 Units

Units of measurement have been simplified and wherever possible, meaningful units of measurements have been used to aid interpretation (e.g. hectares, number of features).

2.7 Other Criteria Considered

Consideration was given to using the apportionment methodology to draw-out spatial variations in demand for specific types of waste management facility across London. Specifically, the potential for using the GLA's Heat Map as a proxy for 'opportunity' for new energy from waste facilities in each borough. It was considered that such an approach would introduce a bias to specific types of waste management facilities; a bias which may not be consistent with the London Plan's waste hierarchy. Therefore, it was agreed that this criterion would not be included.

Consideration was also given to how the apportionment methodology might factor-in the potential for/help to encourage the development of London's circular economy, reducing the City's waste and increasing reuse, repair and recycling rates. However, it was concluded that no meaningful measures could be encouraged directly through the apportionment of London's overall waste outputs and that no meaningful predictions could be made as to how the development of London's circular economy might influence waste outputs at the borough level in the short to medium term, i.e. over the next London Plan period. Therefore, no criteria considering the circular economy were included.

3.0 THE UPDATED APPORTIONMENT CRITERIA

This section presents the updated apportionment criteria, of which there are seven:

1. Theoretical Capacity
2. Waste Arisings (at 2021)
3. Sustainable Transport Modes
4. Road Network Capacity
5. Other Land Use/Environmental Factors
6. Flood Risk
7. Socio-Economic Factors

It is important to note that these criteria numbers no longer match those from the 2006 study.

For each criterion, this section uses the following format:

- Intended purpose of this criterion
- Summary of amendments (including 2006 criteria number)
- Datasets used
- Method
- Resultant data for apportionment

Detail on the consideration of options for modelling each criterion are included in **Appendix 1** and a summary of consultation feedback is included as **Appendix 2**.

3.1 Criterion 1: Theoretical capacity

3.1.1 *Intended Purpose of this Criterion*

This criterion is intended to allocate a greater apportionment to boroughs with greater potential capacity for waste management taking into consideration existing facilities and extent of land potentially suitable for waste management facilities.

3.1.2 *Summary of Amendments (Including 2006 Criteria Number)*

In the 2006 methodology, this factor formed one component of Criterion 1: Identification of theoretical surplus/deficit in each borough. This compared the total estimated capacity and waste arisings to identify whether a borough was in surplus or deficit. In addition to this, Criteria 1 was combined with Criteria 6: Historic patterns of historic waste management capacity, which aimed to take into account existing waste contracts between boroughs.

For this updated apportionment, capacity and arisings have been disaggregated to form two distinct criteria. A number of options were explored with stakeholders, and feedback on these options can be found in Appendix 2. The main rationale for splitting these factors was the ability to apply different weighting to waste arisings and theoretical capacity. Historic waste contracts have not been included; many consultees highlighted a lack of data, and that boroughs should not get lower apportionments as a result of exporting waste to be managed elsewhere. It was also felt to place too much emphasis on contracts for management of local authority collected waste.

Based on consultation feedback, a lower conversion factor of 50,000 tonnes per hectare was used (a reduction from 80,000 tonnes per hectare in the 2006 study).

Further detail on the process of updating the approach to this criterion can be found in Section 3 of Appendix 1 as well as the relevant section of Appendix 2.

3.1.3 Datasets Used

There was significant stakeholder support for the use of Strategic Housing Land Availability Assessment (SHLAA) to inform this criterion. However, the data was not available at the time of preparing this apportionment. The datasets and assumptions used to inform this criterion are listed in Table 3.1.

Table 3.1
Criterion 1: Data Sources and Justification

Dataset	Source	Justification for Inclusion
Current existing capacity	GLA London Waste Map	Best available dataset for existing capacity. This dataset was updated for this study. A four year average was used as this figure had previously been generated within the dataset. ³ It should be noted that the figures do not take account of unutilised capacity of existing waste management facilities.
Potential future capacity	<p>GLA - Industrial Land Supply and Economy Study, 2015: Categories of data used:</p> <ul style="list-style-type: none"> • Light Industry • General Industry • Warehouses • Self-Storage • Open Storage • Vacant Land • Land with vacant buildings • Other industrial <p>This excludes uses of land not typically present in industrial areas, such as waste, utilities, transport and wholesale markets. A conversion factor of 50,000 tonnes/ha used to estimate the capacity based on land area.</p>	Best available data to approximate potential land available for waste uses.

³ Consultees agreed to an approach whereby a three year average would be used to estimate existing capacity, however a four year average was available in the dataset and was considered robust as it contained more values for more sites.

Dataset	Source	Justification for Inclusion
Industrial land release per borough	GLA - Industrial Land Supply and Economy Study, 2015	Used to approximate the level of industrial / employment land release in each borough.

3.1.4 Method

Theoretical capacity for waste management was calculated using the following formula:

Theoretical capacity = Current existing capacity (tonnes) + ((Potential future capacity (hectares) – Potential industrial land release (hectares)) x 50,000 (Tonnes/hectare))

3.1.5 Resultant Data for Apportionment

The data used for this criterion is shown in **Table 3.2**, and is shown spatially in **Figure 2**.





Table 3.2
Criterion 1: Data Used in the Apportionment

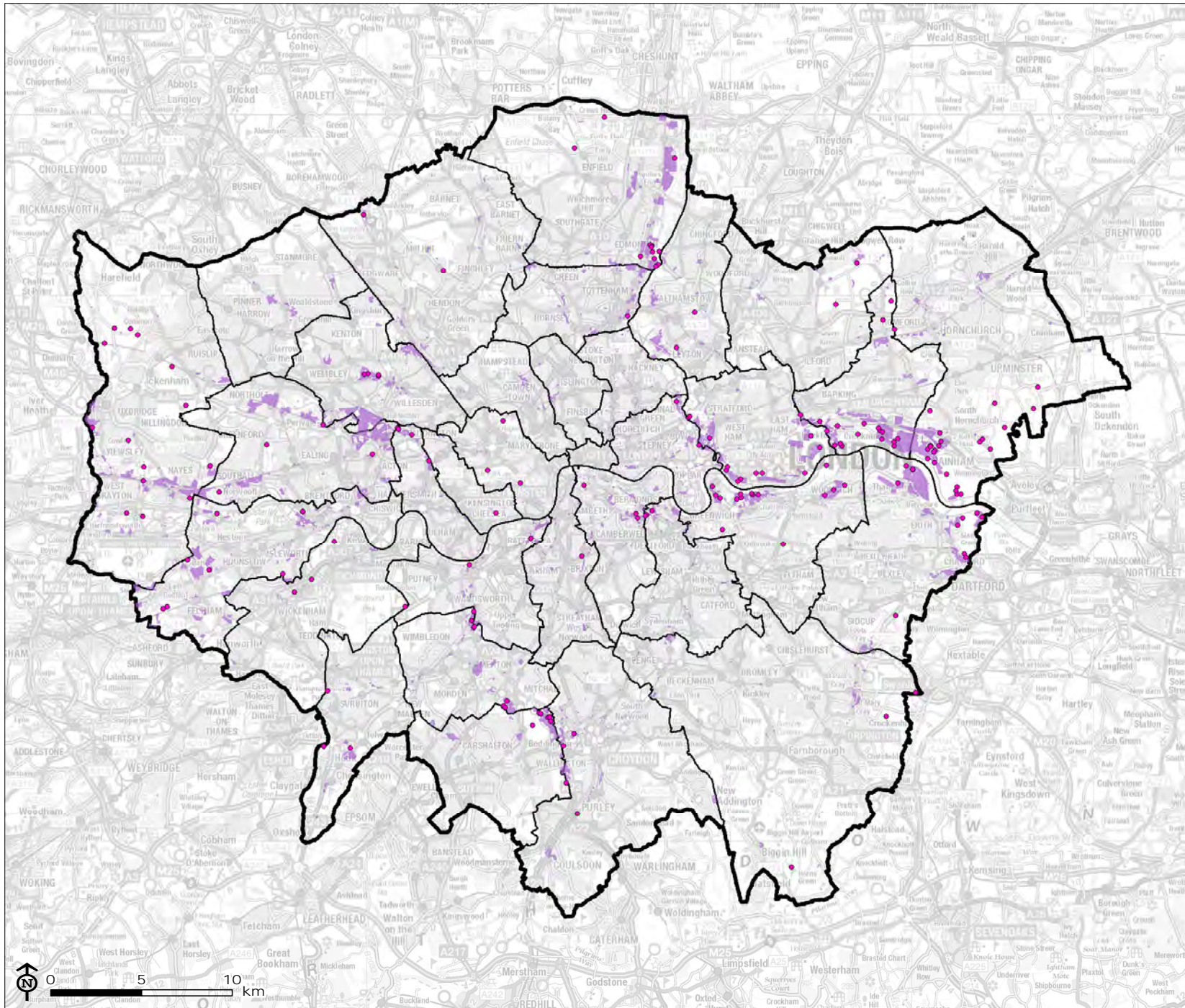
Borough	Current Existing Capacity (kt/annum) - 4 year average	Total Suitable Industrial Land (Ha)	Potential Industrial Land Release (Ha)	Total Potential Land Available (Ha)	Future Capacity kt (Tonnes/Ha) 50000	Total Estimated Capacity (kt)	Apportionment percentage % (AP)
Barking and Dagenham	797.0	422.5	111.3	311.2	15,560	16,357	7.3
Barnet	101.0	78.5	1.8	76.7	3,834	3,935	1.8
Bexley	1,116.6	399.6	45.9	353.7	17,686	18,802	8.4
Brent	174.8	304.3	38.4	265.9	13,293	13,468	6.0
Bromley	141.1	86.2	1.4	84.8	4,240	4,381	2.0
Camden	-	32.1	1	31.1	1,556	1,556	0.7
City of London	-	-	0	0.0	-	-	0.0
City of Westminster	2.1	4.8	0.1	4.7	237	239	0.1
Croydon	184.8	137.2	1.3	135.9	6,794	6,979	3.1
Ealing	79.8	430.1	54.1	376.0	18,802	18,882	8.4
Enfield	975.9	340.2	67.3	272.9	13,647	14,623	6.5
Greenwich	977.2	198.4	52.3	146.1	7,304	8,281	3.7
Hackney	59.9	48.0	2.1	45.9	2,295	2,355	1.1
Hammersmith and Fulham	352.4	66.9	67.5	0.0	-	352	0.2
Haringey	11.5	131.8	31.2	100.6	5,028	5,039	2.3
Harrow	-	55.7	20.6	35.1	1,753	1,753	0.8
Havering	3,006.5	320.2	21	299.2	14,962	17,968	8.0
Hillingdon	845.0	329.2	69.8	259.4	12,969	13,814	6.2
Hounslow	605.9	337.1	12.8	324.3	16,217	16,823	7.5
Islington	-	22.9	5.1	17.8	889	889	0.4
Kensington and Chelsea	1.4	8.3	1.2	7.1	357	358	0.2

Borough	Current Existing Capacity (kt/annum) - 4 year average	Total Suitable Industrial Land (Ha)	Potential Industrial Land Release (Ha)	Total Potential Land Available (Ha)	Future Capacity kt (Tonnes/Ha) 50000	Total Estimated Capacity (kt)	Apportionment percentage % (AP)
Kingston upon Thames	20.8	63.6	0.6	63.0	3,150	3,170	1.4
Lambeth	36.0	65.4	11	54.4	2,721	2,757	1.2
Lewisham	505.3	90.5	10.2	80.3	4,013	4,518	2.0
Merton	190.9	147.9	0.8	147.1	7,355	7,545	3.4
Newham	635.8	319.0	50.7	268.3	13,417	14,053	6.3
Redbridge	150.2	53.7	2.3	51.4	2,569	2,719	1.2
Richmond upon Thames	34.6	26.3	0.7	25.6	1,280	1,315	0.6
Southwark	259.0	100.4	5.5	94.9	4,746	5,005	2.2
Sutton	374.0	125.5	17.7	107.8	5,389	5,763	2.6
Tower Hamlets	2.8	114.0	57	57.0	2,850	2,853	1.3
Waltham Forest	9.8	121.6	26.9	94.7	4,735	4,745	2.1
Wandsworth	137.7	87.6	40	47.6	2,378	2,515	1.1
Total	11,789.8	5,069.5	829.6	4240.5	212,025	223,814	100

London Plan Waste Forecasts and Apportionment

Figure 2: Criterion 1 factors

-  Greater London
-  Borough boundaries
-  Existing waste sites
-  Suitable industrial land



Source: GLA, Ordnance Survey

Map Scale @ A4: 1:300,000



3.2 Criterion 2: Waste Arisings (at 2021)

3.2.1 *Intended Purpose of this Criterion*

This criterion is intended to allocate a greater apportionment to boroughs with greater waste arisings.

3.2.2 *Summary of Amendments (Including 2006 Criteria Number)*

In the 2006 methodology, this factor formed one component of Criterion 1: Identification of theoretical surplus/deficit in each borough. This compared the total estimated capacity and waste arisings to identify whether a borough was in surplus or deficit.

For this updated apportionment, capacity and arisings have been disaggregated to form two distinct criteria. A number of options were explored with stakeholders, and feedback on these options can be found in Appendix 2. The main rationale for splitting these factors was the ability to apply different weighting to waste arisings and theoretical capacity.

Further detail on the process of updating the approach to this criterion can be found in Section 3 of Appendix 1 as well as the relevant section of Appendix 2.

3.2.3 *Datasets Used*

Data used for this criterion was generated by SLR through Task 1 of this study.

Table 3.3
Criterion 2: Data Sources and Justification

Dataset	Source	Justification for Inclusion
Projected household waste arisings by borough (2021)	SLR, 2017	Represents most up to date waste arisings projections.
Projected commercial and industrial waste arisings by borough (2021)	SLR, 2017	Represents most up to date waste arisings projections.

3.2.4 *Method*

Total annual arisings for each borough were calculated using the following formula:

Total waste management requiring management (kilotonnes) = Projected household waste arisings (kilotonnes) + Projected C&I waste arisings (kilotonnes)

3.2.5 *Resultant Data for Apportionment*

The data used for this criterion is shown in **Table 3.4**, and is shown spatially in Figures 3 and 4.

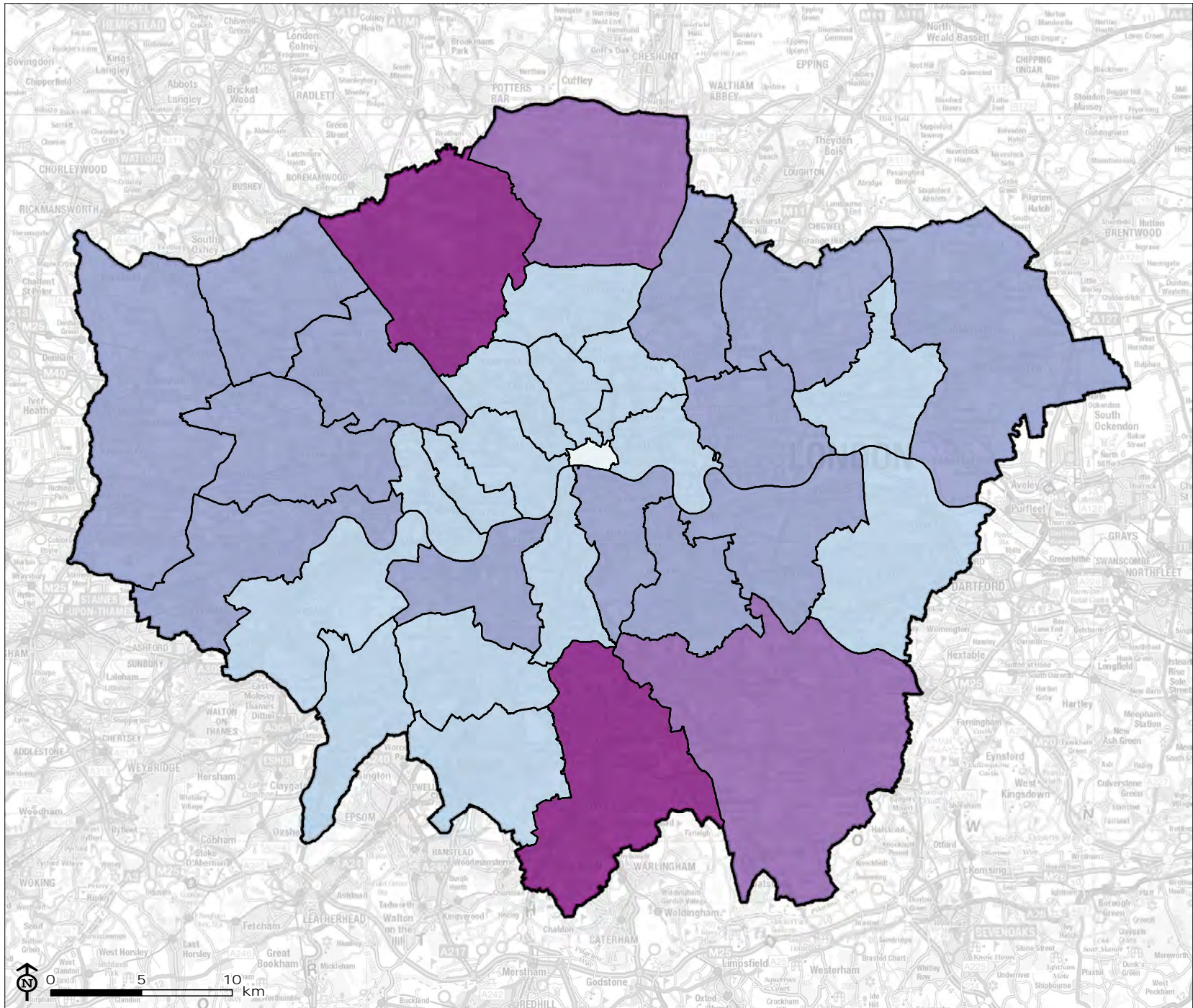
Table 3.4
Criterion 2: Data Used in the Apportionment

Borough	Projected Household Waste Arisings by borough 2021 (kilotonnes)	Projected Commercial and Industrial Waste Arisings by borough 2021 (kilotonnes)	Waste Requiring Management (kilotonnes)	Apportionment percentage % (AP)
Barking and Dagenham	92	122	214	2.6
Barnet	161	154	315	3.8
Bexley	98	127	225	2.7
Brent	104	156	259	3.2
Bromley	127	123	249	3.0
Camden	84	276	360	4.4
City of London	4	226	230	2.8
City of Westminster	95	627	722	8.8
Croydon	159	146	305	3.7
Ealing	100	191	291	3.5
Enfield	132	173	305	3.7
Greenwich	112	97	209	2.5
Hackney	94	89	183	2.2
Hammersmith and Fulham	57	126	183	2.2
Haringey	94	96	190	2.3
Harrow	108	80	188	2.3
Havering	105	125	229	2.8
Hillingdon	105	242	347	4.2
Hounslow	101	159	260	3.2
Islington	65	177	241	2.9
Kensington and Chelsea	59	143	201	2.5
Kingston upon Thames	64	88	152	1.8
Lambeth	94	114	208	2.5
Lewisham	109	82	191	2.3
Merton	76	97	174	2.1
Newham	124	120	244	3.0
Redbridge	114	82	196	2.4
Richmond upon Thames	82	98	179	2.2
Southwark	118	174	292	3.6
Sutton	78	83	161	2.0
Tower Hamlets	78	182	260	3.2
Waltham Forest	110	92	202	2.5
Wandsworth	106	144	251	3.1
Total	3,207	5,009	8,217	100

London Plan Waste Forecasts and Apportionment

Figure 3: Criterion 2 household waste arisings (2021)

Greater London
 Borough boundaries
 Household waste arisings at 2021 (kt)
 4 - 50
 51 - 100
 101 - 125
 126 - 150
 151 - 175

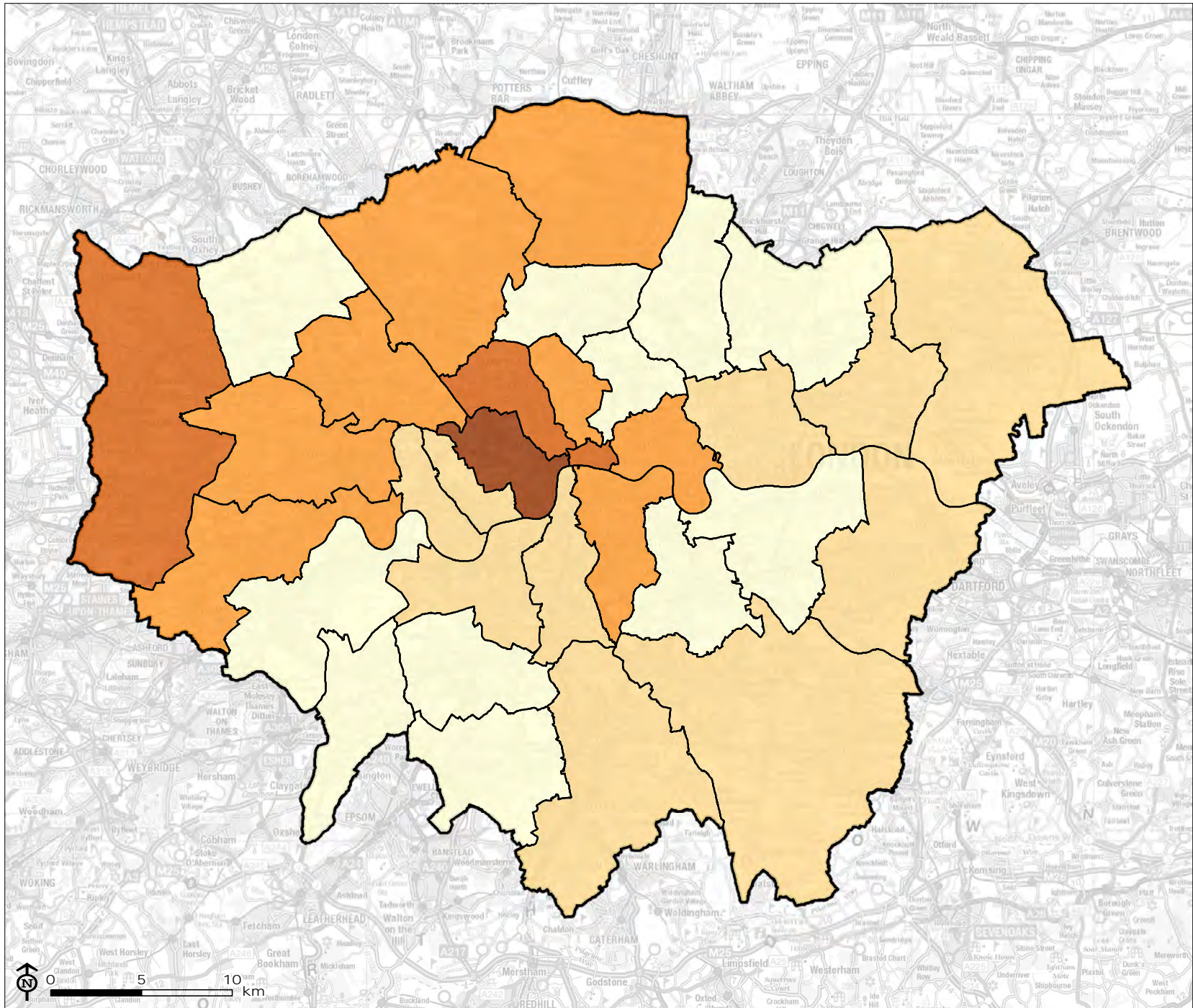
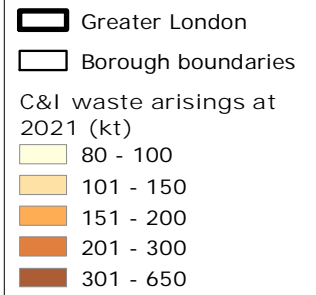


Source: SLR, Ordnance Survey
 Map Scale @ A4: 1:300,000



London Plan Waste Forecasts and Apportionment

Figure 4: Criterion 2 C&I waste arisings (2021)



Source: SLR, Ordnance Survey

Map Scale @ A4: 1:300,000



3.3 Criterion 3: Sustainable Transport Modes

3.3.1 Intended Purpose of this Criterion

This criterion aims to assign a higher apportionment value to boroughs with the ability to transport waste via sustainable modes of transport, specifically via railways and navigable waterways.

3.3.2 Summary of Amendments (Including 2006 Criteria Number)

The 2006 study, Criterion 3: Proximity to sustainable transport modes, calculated values for the density of rail track and the density of navigable waterways, using the average value as the input data for this criterion. Criterion 5: Ability to use sustainable transport modes, calculated the number of wharves in each borough and Criteria 3 and 5 were combined.

Rail and waterways can only be accessed from a small number of locations, and this updated apportionment evaluates each borough's access to railheads and wharves that may be suitable for waste uses. It was additionally considered important to limit the inclusion of suitable rail heads and wharves to those that are within 1km of existing or potential waste sites (as modelled in Criteria 1).

Further detail on the process of updating the approach to this criterion can be found in Sections 4, 5 and 7 of Appendix 1 as well as the relevant section of Appendix 2.

3.3.3 Datasets Used

Data used for this criterion is listed in **Table 3.5**.

Table 3.5
Criterion 3: Data Sources and Justification

Dataset	Source	Justification for Inclusion
Rail heads	Network Rail	Rail has few access points for freight – limited to rail heads only.
Wharves	GLA	Access to waterways requires dedicated access points. Only those wharves that currently process waste and those that could be converted to process waste have been included.
Current existing waste sites	GLA London Waste Map	Best available dataset for existing capacity. This dataset was updated for this study.
Potential future waste sites	GLA - Industrial Land Supply and Economy Study, 2015: Categories of data used: <ul style="list-style-type: none"> Light Industry 	Best available data to approximate potential land available for waste uses. It is important to note that the full extent of these areas in GIS has

Dataset	Source	Justification for Inclusion
	<ul style="list-style-type: none"> General Industry Warehouses Self-Storage Open Storage Vacant Land Land with vacant buildings Other industrial <p>This excludes uses of land not typically present in industrial areas, such as waste, utilities, transport and wholesale markets.</p>	been used without any adjustments for industrial land release (as these figures were not available as mapped locations).

3.3.4 Method

For each borough, the number of rail heads and suitable wharves within 1km of existing or potential waste sites was calculated in GIS. A separate Apportionment Percentage was calculated for each, and the average Apportionment Percentage was used in the apportionment model.

3.3.5 Resultant Data for Apportionment

The data used in the model is shown in Table 3.6 and illustrated in Figure 5.

Table 3.6
Criterion 3: Data Used in the Apportionment

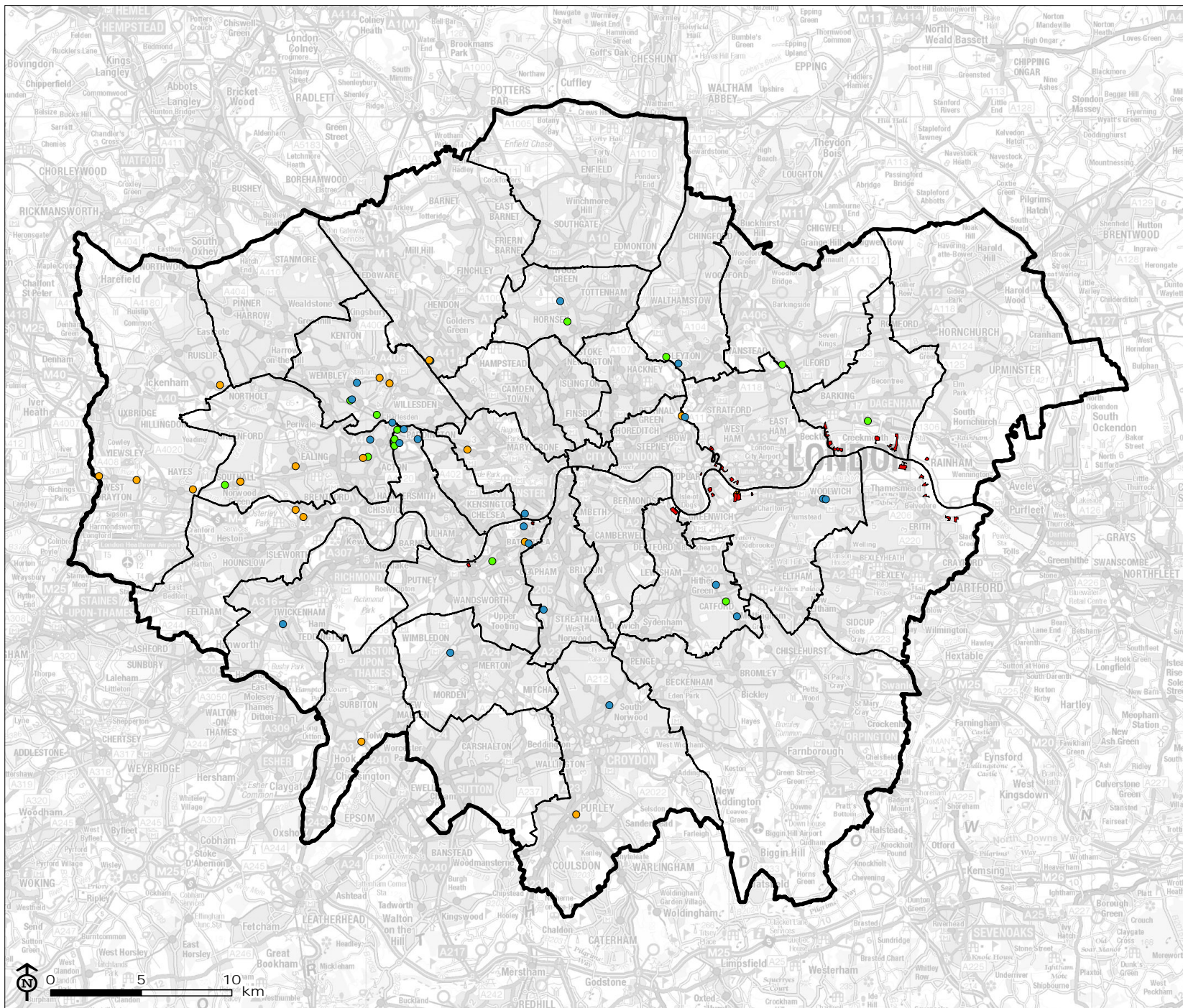
Borough	Number of Railheads	AP of Number of Rail Heads within 1km of Current or Potential Sites	Number of Wharfs	AP of Number of Wharfs within 1km of Current or Potential Sites	Average of Apportionment Percentage % (AP)
Barking and Dagenham	1	1.9	11	25.6	13.7
Barnet	2	3.7	0	0.0	1.9
Bexley	0	0.0	7	16.3	8.1
Brent	6	11.1	0	0.0	5.6
Bromley	0	0.0	0	0.0	0.0
Camden	0	0.0	0	0.0	0.0
City of London	0	0.0	1	2.3	1.2
City of Westminster	2	3.7	0	0.0	1.9
Croydon	2	3.7	0	0.0	1.9
Ealing	8	14.8	0	0.0	7.4
Enfield	0	0.0	0	0.0	0.0
Greenwich	4	7.4	6	14.0	10.7
Hackney	0	0.0	0	0.0	0.0

Borough	Number of Railheads	AP of Number of Rail Heads within 1km of Current or Potential Sites	Number of Wharfs	AP of Number of Wharfs within 1km of Current or Potential Sites	Average of Apportionment Percentage % (AP)
Hammersmith and Fulham	6	11.1	2	4.7	7.9
Haringey	2	3.7	0	0.0	1.9
Harrow	0	0.0	0	0.0	0.0
Havering	0	0.0	1	2.3	1.2
Hillingdon	4	7.4	0	0.0	3.7
Hounslow	2	3.7	0	0.0	1.9
Islington	0	0.0	0	0.0	0.0
Kensington and Chelsea	0	0.0	1	2.3	1.2
Kingston upon Thames	1	1.9	0	0.0	0.9
Lambeth	1	1.9	0	0.0	0.9
Lewisham	3	5.6	1	2.3	3.9
Merton	1	1.9	0	0.0	0.9
Newham	1	1.9	6	14.0	7.9
Redbridge	0	0.0	0	0.0	0.0
Richmond upon Thames	1	1.9	0	0.0	0.9
Southwark	0	0.0	0	0.0	0.0
Sutton	0	0.0	0	0.0	0.0
Tower Hamlets	1	1.9	2	4.7	3.3
Waltham Forest	2	3.7	0	0.0	1.9
Wandsworth	4	7.4	5	11.6	9.5
Total	54	100	43	100	100

London Plan Waste Forecasts and Apportionment

Figure 5: Criterion 3 sustainable transport nodes

- Wharves
- Rail heads**
 - Depot
 - Freight Marshalling Yard
 - Other Freight Terminal
- Greater London
- Borough boundaries



Source: GLA, National Rail
 Map Scale @ A4: 1:300,000



3.4 Criterion 4: Road Network Capacity

3.4.1 Intended Purpose of this Criterion

This criterion aims to assign a higher apportionment percentage to boroughs where heavy goods vehicles have the potential to move around the strategic road network more readily, spending less time on non-strategic roads that are more vulnerable to congestion.

3.4.2 Summary of Amendments (Including 2006 Criteria Number)

The 2006 study, Criterion 4: Proximity to the road network, calculated the density of the strategic road network in each borough. Using this approach, City of London emerged as the borough with the highest road density, having the resultant effect of assigning a higher apportionment to this borough under this scenario.

This apportionment considers the congestion levels of the ‘Network of Interest’ as defined by Transport for London (TfL). This criterion no longer considers actual road length (or density), rather the average annual weekday delay per kilometre on this Network of Interest.

Further detail on the process of updating the approach to this criterion can be found in Section 6 of Appendix 1 as well as the relevant section of Appendix 2.

3.4.3 Datasets Used

A single dataset provided by TfL was used to inform this criterion as shown in Table 3.7.

Table 3.7
Criterion 4: Data Sources and Justification

Dataset	Source	Justification for Inclusion
Average (Sep 2015-Aug 2016) annual weekday delay per km on Network of Interest.	Transport for London	The Network of Interest is defined by TfL as the best measure of the important roads in London, including all major roads and busy minor roads.

3.4.4 Method

The TfL data includes a single average figure for each borough – the higher the value, the greater the delay on the roads. Using this data in its current format would have the effect of apportioning higher amounts to boroughs with higher levels of road delays. To ready this data for input into the apportionment model, the average delay figure for each borough was subtracted from a notional worst case delay of 4 minutes – a figure marginally higher than the greatest delay (in City of London)⁴. For each borough, this is a measure of the reduction in delay, relative to a notional worst performer.

⁴ Using the ‘actual’ worst performer (CoL) would have the effect of reducing the AP for City of London to zero. As stated in para 2.4 of this report, it was felt that despite having the greatest delays, this criteria should not assume there is zero capacity for moving waste related vehicles through this borough.

Using this method ensured that boroughs with higher levels of delay receive lower apportionments, and vice versa. This was achieved using the following formula:

Value = 4 minutes – average annual weekday delay (mins)

3.4.5 Resultant Data for Apportionment

Through the application of the method described above, the data included in the apportionment model for this criterion is shown in **Table 3.8** and illustrated in Figure 6.

Table 3.8
Criterion 4: Data Used in the Apportionment

Borough	Average (Sep 2015- Aug 2016) annual weekday delay per km on the 'Network of Interest'	Reduction in delay relative to notional worst case of 4 mins	AP of Reduction in delay relative to notional worst case of 4 mins
Barking and Dagenham	0.84	3.16	3.5
Barnet	0.79	3.21	3.5
Bexley	0.52	3.48	3.8
Brent	1.21	2.79	3.1
Bromley	0.78	3.22	3.5
Camden	2.19	1.81	2.0
City of London	3.93	0.07	0.1
City of Westminster	1.71	2.29	2.5
Croydon	1.01	2.99	3.3
Ealing	1.02	2.98	3.3
Enfield	0.63	3.37	3.7
Greenwich	0.93	3.07	3.4
Hackney	1.52	2.48	2.7
Hammersmith and Fulham	1.68	2.32	2.5
Haringey	1.59	2.41	2.6
Harrow	0.78	3.22	3.5
Havering	0.41	3.59	3.9
Hillingdon	0.42	3.58	3.9
Hounslow	0.74	3.26	3.6
Islington	1.94	2.06	2.3
Kensington and Chelsea	1.42	2.58	2.8
Kingston upon Thames	0.67	3.33	3.7
Lambeth	1.68	2.32	2.5
Lewisham	1.93	2.07	2.3
Merton	1.25	2.75	3.0
Newham	0.74	3.26	3.6
Redbridge	0.63	3.37	3.7
Richmond upon Thames	1.18	2.82	3.1
Southwark	2.14	1.86	2.0
Sutton	0.96	3.04	3.3
Tower Hamlets	1.28	2.72	3.0

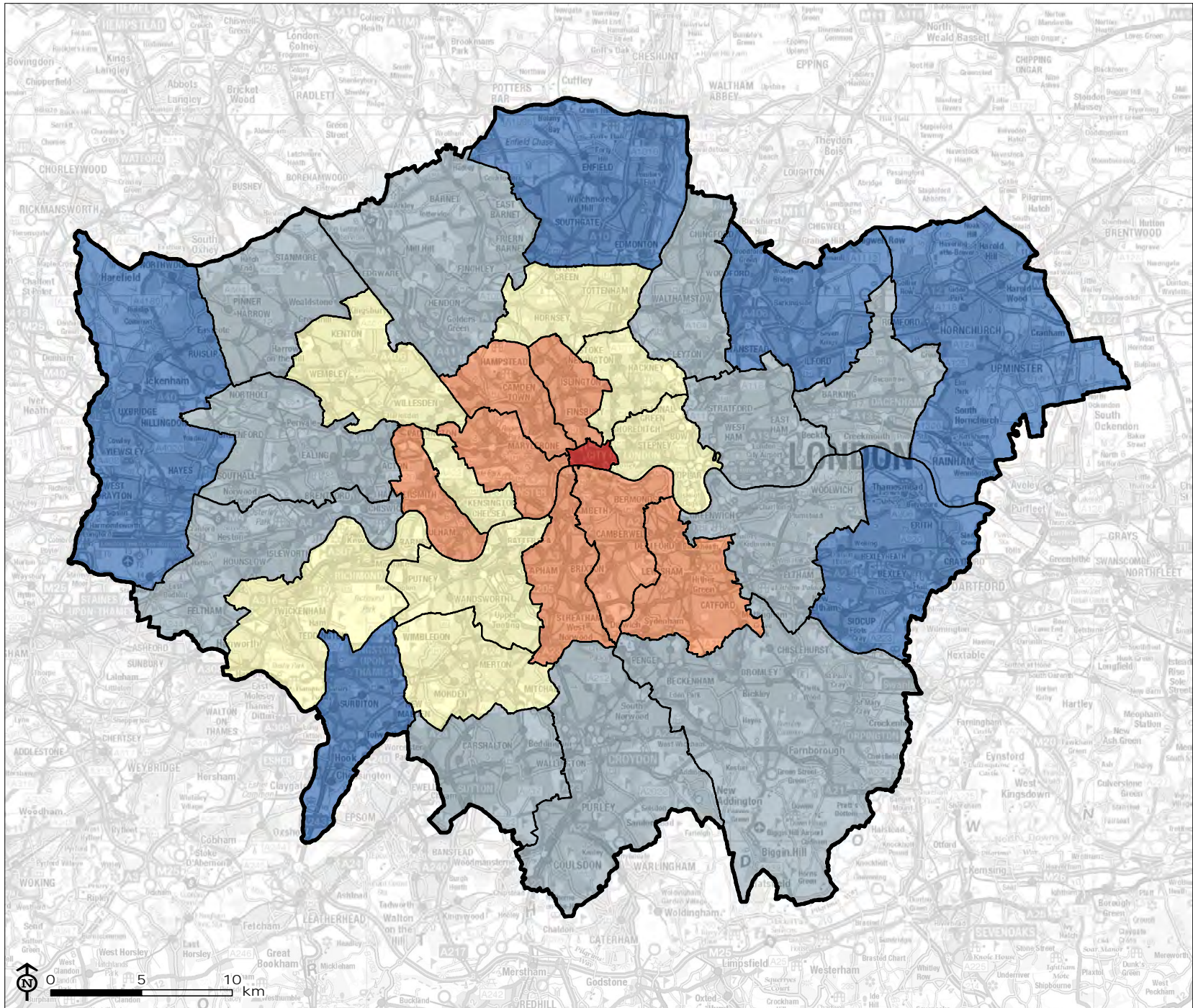
Borough	Average (Sep 2015- Aug 2016) annual weekday delay per km on the 'Network of Interest'	Reduction in delay relative to notional worst case of 4 mins	AP of Reduction in delay relative to notional worst case of 4 mins
Waltham Forest	0.76	3.24	3.6
Wandsworth	1.55	2.45	2.7
Total	N/A	N/A	100

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Figure 6: Criterion 4 road network

Greater London
 Borough boundaries
 Ave annual weekday delays on the 'Network of Interest'

	0.41 - 0.67
	0.68 - 1.02
	1.03 - 1.59
	1.60 - 2.19
	2.20 - 3.93



Source: GLA, TfL
 Map Scale @ A4: 1:300,000



3.5 Criterion 5: Other Land Use/Environmental Factors

3.5.1 Intended Purpose of this Criterion

This criterion aims to assign higher apportionments to boroughs where land that could be considered for future waste use is less ‘constrained’ by planning, cultural heritage and environmental designations.

3.5.2 Summary of Amendments (Including 2006 Criteria Number)

The 2006 study Criterion 7: Other land uses/environmental factors used the amount of each borough’s total land area not designated by environmental designations to inform this criterion. The designations used in the 2006 study included:

- Green Belt
- Metropolitan Open Land (MOL)
- Sites of Importance for Nature Conservation (SINCs)
- Special Areas of Conservation (SACs)
- Special Protection Areas (SPAs)
- Sites of Special Scientific Interest (SSSIs)
- Ramsar sites

The updated apportionment method constrains the assessment to those areas mapped under Criterion 1 as being potentially suitable for future waste use, and includes cultural heritage designations.

Further detail on the process of updating the approach to this criterion can be found in Section 9 of Appendix 1 as well as the relevant section of Appendix 2.

3.5.3 Datasets Used

Table 3.9
Criterion 5: Data Sources and Justification

Dataset	Source	Justification for Inclusion
Potential future waste sites	<p>GLA - Industrial Land Supply and Economy Study, 2015: Categories of data used:</p> <ul style="list-style-type: none"> • Light Industry • General Industry • Warehouses • Self-Storage • Open Storage • Vacant Land • Land with vacant buildings • Other industrial <p>This excludes uses of land not typically present in industrial areas, such as waste, utilities, transport and</p>	<p>Best available data to approximate potential land available for waste uses. It is important to note that the full extent of these areas in GIS has been used without any adjustments for industrial land release (as these figures were not available as mapped locations).</p>

Dataset	Source	Justification for Inclusion
	wholesale markets.	
Green Belt	GLA	Paragraph 6 of the National Planning Policy for Waste states that waste planning authorities should first look for suitable sites and areas outside the Green Belt for waste management facilities that, if located in the Green Belt, would be inappropriate development.
Metropolitan Open Land (MOL)	GLA	Policy 7.17 (MOL) in the London Plan states that MOL is afforded the same level of protection as Green Belt. Furthermore, para 7.58 in the London Plan's supporting text states that paragraphs 79-92 of the NPPF on Green Belts applies equally to MOL.
SINCs	GIGL (via GLA)	SINCs receive a high degree of protection through policies in the Mayor's London Plan and the land-use planning process, specifically policy 7.19.
SACs	Natural England	Appendix B of the National Planning Policy for Waste highlights the importance of minimising adverse impacts on international and national sites of nature conservation.
SPAs	Natural England	
SSSIs	Natural England	
Ramsars	Natural England	
Scheduled Monuments	Historic England	
Listed Buildings	Historic England	Appendix B of the National Planning Policy for Waste highlights the importance of minimising adverse impacts on heritage assets.
Registered Parks and Gardens	Historic England	
Conservation Areas	GLA	
World Heritage Sites	Historic England	

3.5.4 Method

All of the above designations were mapped in GIS and combined to produce one overall layer of combined 'constraints'. This was overlaid onto the land with potential for waste facilities as mapped in Criterion 1, and the area of unconstrained land was included in the model.

3.5.5 Resultant Data for Apportionment

The resultant data included in the apportionment is shown in **Table 3.10** and illustrated in **Figure 7**.





Table 3.10
Criterion 5: Data Used in the Apportionment

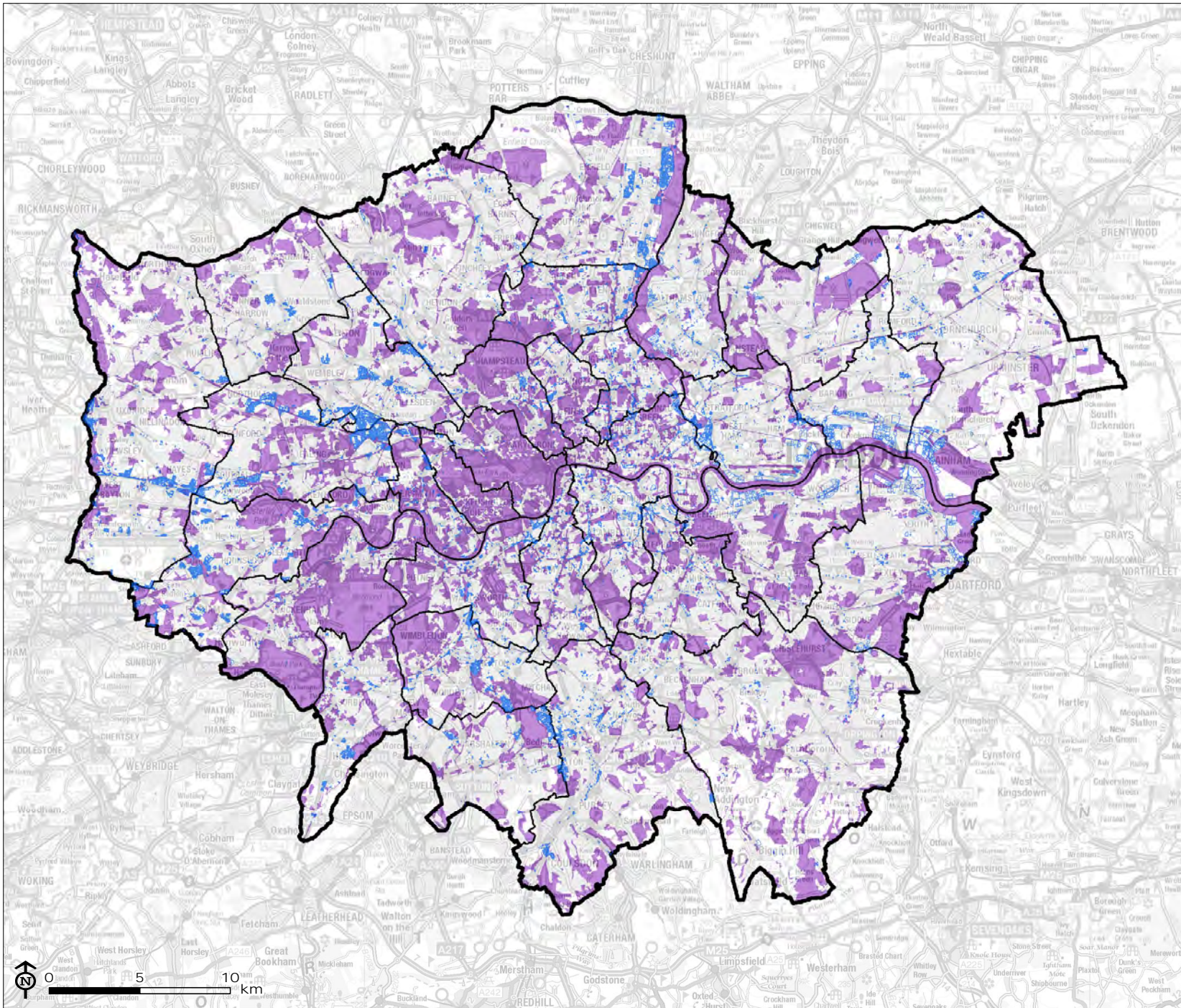
Borough	Total Suitable Industrial Land (Ha)	Total Constrained Area (Ha)	Total Unconstrained Area (Ha)	AP of Total Unconstrained Area
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Borough	Total Suitable Industrial Land (Ha)	Total Constrained Area (Ha)	Total Unconstrained Area (Ha)	AP of Total Unconstrained Area
Barking and Dagenham	422.5	22.2	400.3	8.7
Barnet	78.5	10.5	67.9	1.5
Bexley	399.6	29.0	370.6	8.1
Brent	304.3	11.7	292.6	6.4
Bromley	86.2	9.6	76.6	1.7
Camden	32.1	4.7	27.4	0.6
City of London	0.0	0.0	0.0	0.0
City of Westminster	4.8	1.9	2.9	0.1
Croydon	137.2	3.9	133.3	2.9
Ealing	430.1	26.8	403.4	8.8
Enfield	340.2	12.5	327.7	7.1
Greenwich	198.4	7.6	190.8	4.2
Hackney	48.0	16.0	32.0	0.7
Hammersmith and Fulham	66.9	22.0	45.0	1.0
Haringey	131.8	14.3	117.4	2.6
Harrow	55.7	0.5	55.2	1.2
Havering	320.2	59.9	260.3	5.7
Hillingdon	329.2	60.0	269.2	5.9
Hounslow	337.1	39.3	297.9	6.5
Islington	22.9	3.2	19.7	0.4
Kensington and Chelsea	8.3	1.4	7.0	0.2
Kingston upon Thames	63.6	7.6	56.0	1.2
Lambeth	65.4	11.4	54.0	1.2
Lewisham	90.5	10.1	80.3	1.7
Merton	147.9	3.6	144.3	3.1
Newham	319.0	19.9	299.1	6.5
Redbridge	53.7	9.7	44.0	1.0
Richmond upon Thames	26.3	4.6	21.7	0.5
Southwark	100.4	11.5	88.9	1.9
Sutton	125.5	3.4	122.1	2.7
Tower Hamlets	114.0	25.3	88.7	1.9
Waltham Forest	121.6	8.3	113.3	2.5
Wandsworth	87.6	4.1	83.4	1.8
Total	5069.5	476.4	4593.1	100

London Plan Waste Forecasts and Apportionment

Figure 7: Criterion 5 environmental, cultural heritage and planning

-  Greater London
-  Borough boundaries
-  Suitable industrial land
-  Combined environmental, cultural heritage and planning designations



Source: GIGL, Historic England, GLA, Natural England

Map Scale @ A4: 1:300,000

LUC

3.6 Criterion 6: Flood Risk

3.6.1 *Intended Purpose of this Criterion*

This Criterion aims to assign an apportionment percentage to each borough based on the area not constrained by flood risk.

3.6.2 *Summary of Amendments (including 2006 criteria number)*

The 2006 study Criterion 8: Flood Risk used a value based on the area of each borough outside of flood areas.

The updated apportionment method constrains the assessment to those areas mapped under Criterion 1 as being potentially suitable for future waste use. Areas of flood zone falling within areas defended by flood defences, such as the Thames Barrier, have not been considered to be at risk from flooding.

Further detail on the process of updating the approach to this criterion can be found in Section 10 of Appendix 1 as well as the relevant section of Appendix 2.

3.6.3 *Datasets Used*

Table 3.11
Criterion 6: Data Sources and Justification

Dataset	Source	Justification for Inclusion
Potential future waste sites	<p>GLA - Industrial Land Supply and Economy Study, 2015: Categories of data used:</p> <ul style="list-style-type: none"> • Light Industry • General Industry • Warehouses • Self-Storage • Open Storage • Vacant Land • Land with vacant buildings • Other industrial <p>This excludes uses of land not typically present in industrial areas, such as waste, utilities, transport and wholesale markets.</p>	<p>Best available data to approximate potential land available for waste uses. It is important to note that the full extent of these areas in GIS has been used without any adjustments for industrial land release (as these figures were not available as mapped locations).</p>
Flood Zones 2 & 3 (excluding defended areas)	Environment Agency via GLA	<p>Paragraph 100 in the NPPF and the Technical Guidance on Flood Risk require Local Plans to apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any</p>

Dataset	Source	Justification for Inclusion
		residual risk, taking account of the impacts of climate change and giving preference to locating development in Flood Zone 1, followed by Flood Zone 2 then Flood Zone 3. Table 2 (Flood Risk Vulnerability Classification) in the National Planning Practice Guidance outlines the flood risk vulnerability classifications. Landfill sites and waste management facilities for hazardous waste are considered to be more vulnerable, which means that they are potentially incompatible with flood zones 2 and 3. Other waste, water and sewage treatment works are considered less vulnerable, which means that they are potentially compatible with most flood zones with the exception of flood zone 3b, the functional floodplain.

3.6.4 Method

GIS layers showing the extent of Flood Zones 2 and 3 (and those areas defended by flood barriers) were overlaid onto the land with potential for waste facilities as mapped in Criterion 1, and the area of unconstrained land was included in the model.

3.6.5 Resultant Data for Apportionment

The resultant data included in the apportionment is shown in Table 3.12 and illustrated in Figure 8.





Table 3.12
Criterion 6: Data Used in the Apportionment

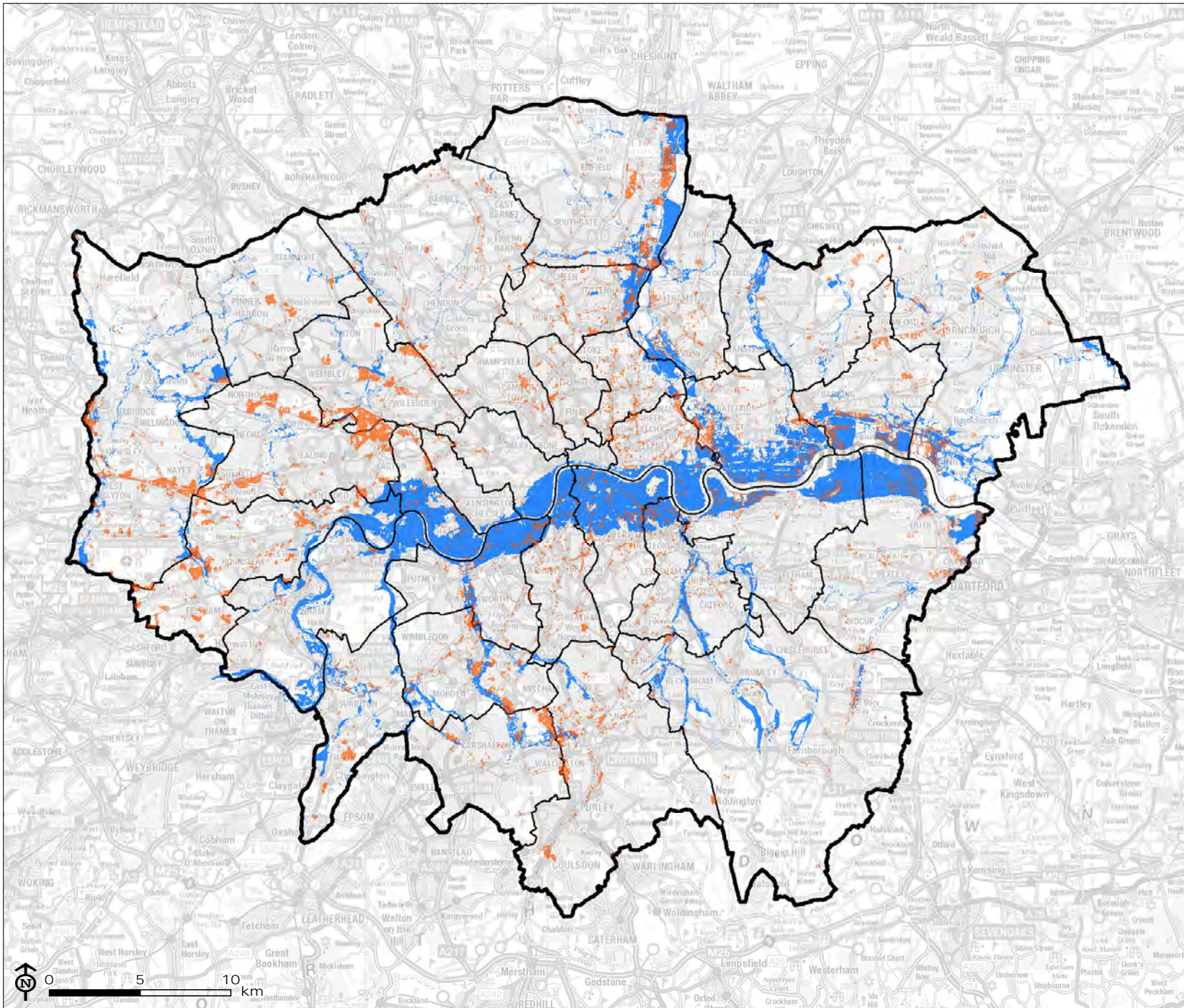
Borough	Total Suitable Industrial Land (Ha)	Flood Risk Area (Ha)	Area not in Flood Risk (Ha)	AP of Flood Risk Area (%)
Barking and Dagenham	422.5	225.2	197.3	5.5
Barnet	78.5	2.7	75.8	2.1
Bexley	399.6	266.3	133.3	3.7
Brent	304.3	5.4	298.8	8.4
Bromley	86.2	9.5	76.7	2.2
Camden	32.1	0.0	32.1	0.9
City of London	0.0	0.0	0.0	0.0
City of Westminster	4.8	0.3	4.6	0.1
Croydon	137.2	12.5	124.7	3.5
Ealing	430.1	6.7	423.4	11.9
Enfield	340.2	102.1	238.2	6.7

Borough	Total Suitable Industrial Land (Ha)	Flood Risk Area (Ha)	Area not in Flood Risk (Ha)	AP of Flood Risk Area (%)
Greenwich	198.4	141.9	56.5	1.6
Hackney	48.0	3.7	44.3	1.2
Hammersmith and Fulham	66.9	22.2	44.7	1.3
Haringey	131.8	41.9	89.9	2.5
Harrow	55.7	0.9	54.8	1.5
Havering	320.2	96.9	223.4	6.3
Hillingdon	329.2	28.3	300.9	8.4
Hounslow	337.1	22.6	314.5	8.8
Islington	22.9	0.0	22.9	0.6
Kensington and Chelsea	8.3	0.0	8.3	0.2
Kingston upon Thames	63.6	2.9	60.7	1.7
Lambeth	65.4	11.8	53.6	1.5
Lewisham	90.5	56.1	34.3	1.0
Merton	147.9	24.0	123.9	3.5
Newham	319.0	183.3	135.8	3.8
Redbridge	53.7	3.0	50.7	1.4
Richmond upon Thames	26.3	6.5	19.8	0.6
Southwark	100.4	73.5	26.9	0.8
Sutton	125.5	19.8	105.7	3.0
Tower Hamlets	114.0	33.6	80.4	2.3
Waltham Forest	121.6	32.8	88.8	2.5
Wandsworth	87.6	65.8	21.8	0.6
Total	5069.5	1502.0	3567.5	100

London Plan Waste Forecasts and Apportionment

Figure 8: Criterion 6 flood risk

-  Greater London
-  Borough boundaries
-  Suitable industrial land
-  Flood risk zones 2 and 3 (excluding areas benefiting from barriers)



Source: GLA

Map Scale @ A4: 1:300,000



3.7 Criterion 7: Socio-Economic Factors

3.7.1 Intended Purpose of this Criterion

This criterion aims to assign higher apportionment percentages to those boroughs where waste facilities are likely to cause less significant adverse socio-economic impacts. Specifically it aims to assign higher apportionment percentages to boroughs with lower levels of social deprivation.

3.7.2 Summary of Amendments (Including 2006 Criteria Number)

The 2006 study Criterion 9: Socio-economic factors calculated two SI values, one for the existing licenced capacity of each borough as an indication of the density of existing waste management facilities, and the other for the borough's deprivation ranking using the 'Average Rank of Scores' index from the Indices of Multiple Deprivation (IMD) data. It aimed to assign higher apportionment percentages to boroughs with lower levels of social deprivation and fewer existing facilities to avoid cumulative impacts.

Stakeholder feedback on proposed updates to this criterion were mixed, and the agreed method for this apportionment considers the levels of deprivation in Lower Super Output Areas (LSOAs) within 1km of those areas mapped under Criterion 1 as being potentially suitable for future waste use.

Further detail on the process of updating the approach to this criterion can be found in Section 11 of Appendix 1 as well as the relevant section of Appendix 2.

3.7.3 Datasets Used

Table 3.13
Criterion 7: Data Sources and Justification

Dataset	Source	Justification for Inclusion
Potential future waste sites	<p>GLA - Industrial Land Supply and Economy Study, 2015: Categories of data used:</p> <ul style="list-style-type: none"> • Light Industry • General Industry • Warehouses • Self-Storage • Open Storage • Vacant Land • Land with vacant buildings • Other industrial <p>This excludes uses of land not typically present in industrial areas, such as waste, utilities, transport and wholesale markets.</p>	<p>Best available data to approximate potential land available for waste uses. It is important to note that the full extent of these areas in GIS has been used without any adjustments for industrial land release (as these figures were not available as mapped locations).</p>
IMD 2015 Deprivation Ranking	ONS	The study aims to apportion more waste to boroughs with

Dataset	Source	Justification for Inclusion
		lower levels of social deprivation, and IMD is the most complete dataset for examining this.

3.7.4 Method

GIS was used to select the LSOAs within 1km of land potentially suitable for future waste use. Within each borough, an average score was generated for these LSOAs. The average rank of the average IMD score was used to inform the apportionment model. Higher levels of deprivation relate to lower rank figures and vice versa i.e. rank 1 is the most deprived LSOA and rank 32,844 is the least deprived LSOA.

3.7.5 Resultant Data for Apportionment

The resultant data included in the apportionment is shown in **Table 3.14** and illustrated in **Figure 9**.

Table 3.14
Criterion 7: Data Used in the Apportionment

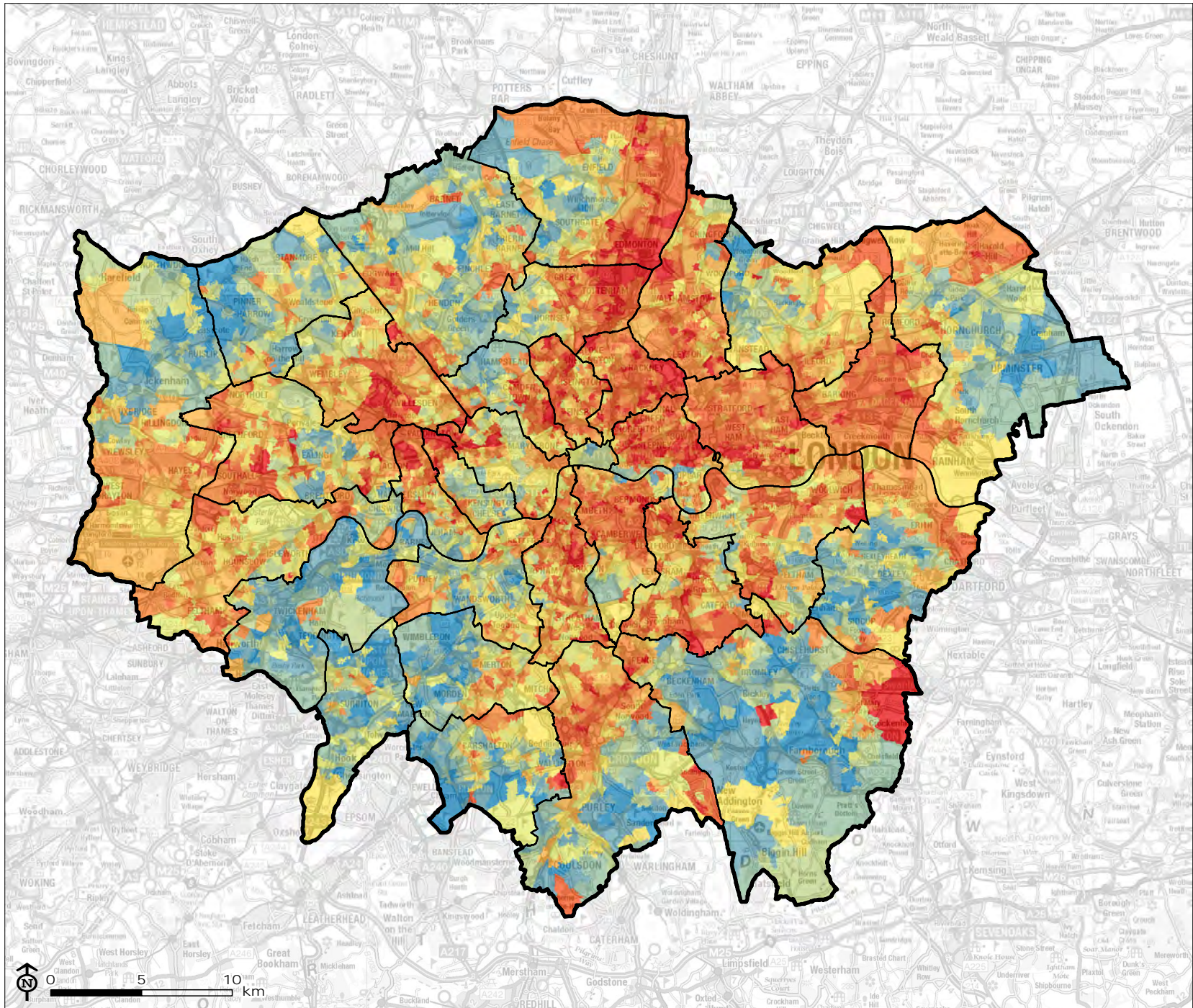
Borough	Deprivation Ranking (Average of Rank of Average Score)	AP of Deprivation Ranking (%)
Barking and Dagenham	7995	1.7
Barnet	17657	3.8
Bexley	18707	4.0
Brent	11854	2.5
Bromley	18643	4.0
Camden	12822	2.8
City of London	14696	3.2
City of Westminster	11909	2.6
Croydon	14509	3.1
Ealing	13521	2.9
Enfield	12288	2.6
Greenwich	12931	2.8
Hackney	6935	1.5
Hammersmith and Fulham	13118	2.8
Haringey	10207	2.2
Harrow	20021	4.3
Havering	17047	3.7
Hillingdon	17287	3.7
Hounslow	15113	3.2
Islington	9257	2.0
Kensington and Chelsea	13479	2.9
Kingston upon Thames	23905	5.1
Lambeth	10651	2.3
Lewisham	11116	2.4
Merton	19745	4.2
Newham	7525	1.6
Redbridge	14741	3.2
Richmond upon Thames	22380	4.8

Borough	Deprivation Ranking (Average of Rank of Average Score)	AP of Deprivation Ranking (%)
Southwark	10582	2.3
Sutton	20736	4.4
Tower Hamlets	8202	1.8
Waltham Forest	9357	2.0
Wandsworth	17066	3.7
Total	N/A	100

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Figure 9: Criterion 7 Index of Multiple Deprivation

Greater London
 Borough boundaries
 IMD decile
 0 - 10% (most deprived)
 10 - 20%
 20 - 30%
 30 - 40%
 40 - 50%
 50 - 60%
 60 - 70%
 70 - 80%
 80 - 90%
 90 - 100% (least deprived)



Source: ONS

Map Scale @ A4: 1:300,000



3.8 Summary of All Apportionment Criteria

A summary of all of the Apportionment percentages is shown in **Table 3.15** below. For each criterion, the highest borough values are indicated in bold red font.

Table 3.15
Summary of Apportionment Percentages by Criterion

Borough	Criterion 1 Theoretical capacity	Criterion 2 Waste arisings	Criterion 3 Sustainable transport	Criterion 4 Road network	Criterion 5 Environmental factors	Criterion 6 Flood Risk	Criterion 7 Socio-economic
Barking and Dagenham	7.3	2.6	13.7	3.5	8.7	5.5	1.7
Barnet	1.8	3.8	1.9	3.5	1.5	2.1	3.8
Bexley	8.4	2.7	8.1	3.8	8.1	3.7	4.0
Brent	6.0	3.2	5.6	3.1	6.4	8.4	2.5
Bromley	2.0	3.0	0.0	3.5	1.7	2.2	4.0
Camden	0.7	4.4	0.0	2.0	0.6	0.9	2.8
City of London	0.0	2.8	1.2	0.1	0.0	0.0	3.2
City of Westminster	0.1	8.8	1.9	2.5	0.1	0.1	2.6
Croydon	3.1	3.7	1.9	3.3	2.9	3.5	3.1
Ealing	8.4	3.5	7.4	3.3	8.8	11.9	2.9
Enfield	6.5	3.7	0.0	3.7	7.1	6.7	2.6
Greenwich	3.7	2.5	10.7	3.4	4.2	1.6	2.8
Hackney	1.1	2.2	0.0	2.7	0.7	1.2	1.5
Hammersmith and Fulham	0.2	2.2	7.9	2.5	1.0	1.3	2.8
Haringey	2.3	2.3	1.9	2.6	2.6	2.5	2.2
Harrow	0.8	2.3	0.0	3.5	1.2	1.5	4.3
Havering	8.0	2.8	1.2	3.9	5.7	6.3	3.7
Hillingdon	6.2	4.2	3.7	3.9	5.9	8.4	3.7
Hounslow	7.5	3.2	1.9	3.6	6.5	8.8	3.2
Islington	0.4	2.9	0.0	2.3	0.4	0.6	2.0
Kensington and Chelsea	0.2	2.5	1.2	2.8	0.2	0.2	2.9
Kingston upon Thames	1.4	1.8	0.9	3.7	1.2	1.7	5.1
Lambeth	1.2	2.5	0.9	2.5	1.2	1.5	2.3
Lewisham	2.0	2.3	3.9	2.3	1.7	1.0	2.4
Merton	3.4	2.1	0.9	3.0	3.1	3.5	4.2
Newham	6.3	3.0	7.9	3.6	6.5	3.8	1.6
Redbridge	1.2	2.4	0.0	3.7	1.0	1.4	3.2
Richmond upon Thames	0.6	2.2	0.9	3.1	0.5	0.6	4.8
Southwark	2.2	3.6	0.0	2.0	1.9	0.8	2.3
Sutton	2.6	2.0	0.0	3.3	2.7	3.0	4.4
Tower Hamlets	1.3	3.2	3.3	3.0	1.9	2.3	1.8

Borough	Criterion 1 Theoretical capacity	Criterion 2 Waste arisings	Criterion 3 Sustainable transport	Criterion 4 Road network	Criterion 5 Environmental factors	Criterion 6 Flood Risk	Criterion 7 Socio-economic
Waltham Forest	2.1	2.5	1.9	3.6	2.5	2.5	2.0
Wandsworth	1.1	3.1	9.5	2.7	1.8	0.6	3.7
Total	100	100	100	100	100	100	100

The following section explores a range of apportionment scenarios for consideration.

4.0 APPORTIONMENT SCENARIOS

Through the use of weighting, a range of apportionment scenarios have been developed to apportion Household waste and Commercial & Industrial waste streams.

This section sets out eight scenarios as follows:

- Scenario 1: Theoretical Capacity Led
- Scenario 2: Waste Arisings (at 2021) Led
- Scenario 3: Sustainable Transport Modes Led
- Scenario 4: Road Network Capacity Led
- Scenario 5: Other Land Use/Environmental Factors Led
- Scenario 6: Flood Risk Led
- Scenario 7: Socio-Economic Factors Led
- Scenario 8: Equal Weighting

Under scenarios 1-7, the lead criterion is given a weighting of 40% and the remaining 60% is distributed equally amongst the other criteria, resulting in a weighting of 10% each.

Under scenario 8, each criterion is given the same weighting, with a resultant weighting of 14.3% per criterion.

These weighted contributions are applied to the overall amount of waste requiring apportionment for both household and C&I waste at 2021 and 2041:

- Household waste 2021: 3,207 kt
- Household waste 2041: 3,546 kt
- Commercial and Industrial waste 2021: 5,009 kt
- Commercial and Industrial waste 2041: 5,180 kt

4.1 Scenario 1: Theoretical Capacity Led

This apportionment scenario gives the highest weighting to capacity as shown in **Table 4.1**. The resultant apportionment (in kt per borough) is shown in **Table 4.2**.

Table 4.1
Weightings for Scenario 1: Theoretical Capacity Led

Criterion	Weighting %
1: Theoretical capacity	40
2: Waste arisings	10
3: Sustainable transport	10
4: Road network	10
5: Other land uses/environmental factors	10
6: Flood risk	10
7: Socio-economic factors	10

Table 4.2
Scenario 1: Apportionment by Borough at 2021 and 2041

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Barking and Dagenham	208	230	325	337
Barnet	76	84	118	122
Bexley	206	227	321	332
Brent	170	188	266	275
Bromley	71	79	111	115
Camden	43	48	67	69
City of London	23	26	36	37
City of Westminster	52	58	82	85
Croydon	99	109	154	160
Ealing	229	254	358	370
Enfield	160	177	250	259
Greenwich	128	142	200	207
Hackney	40	45	63	65
Hammersmith and Fulham	59	65	92	95
Haringey	74	82	116	120
Harrow	51	57	80	83
Havering	178	197	278	288
Hillingdon	175	193	273	283
Hounslow	183	203	287	296
Islington	32	35	49	51
Kensington and Chelsea	33	37	52	54
Kingston upon Thames	65	71	101	104
Lambeth	51	56	80	82
Lewisham	70	77	109	112
Merton	97	108	152	157
Newham	165	183	258	267
Redbridge	53	58	83	85
Richmond upon Thames	46	51	72	75
Southwark	63	69	98	101
Sutton	82	91	129	133
Tower Hamlets	66	72	102	106
Waltham Forest	75	83	117	121
Wandsworth	83	92	129	134
Total	3,207	3,546	5,009	5,180

4.2 Scenario 2: Waste Arisings Led

This apportionment scenario gives the highest weighting to arisings as shown in Table 4.3. The resultant apportionment (in kt per borough) is shown in Table 4.4.

Table 4.3
Weightings for scenario 2: Waste Arisings Led

Criterion	Weighting %
1: Theoretical capacity	10
2: Waste arisings	40
3: Sustainable transport	10
4: Road network	10
5: Other land uses/environmental factors	10
6: Flood risk	10
7: Socio-economic factors	10

Table 4.4
Scenario 2: Apportionment by Borough at 2021 and 2041

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Barking and Dagenham	163	180	255	263
Barnet	96	106	150	155
Bexley	151	167	236	244
Brent	143	158	223	231
Bromley	82	90	127	132
Camden	78	87	123	127
City of London	50	55	78	81
City of Westminster	136	150	212	219
Croydon	105	116	163	169
Ealing	182	202	285	294
Enfield	133	147	208	215
Greenwich	117	129	182	189
Hackney	52	57	81	83
Hammersmith and Fulham	79	87	123	127
Haringey	75	82	116	120
Harrow	66	73	103	106
Havering	128	141	200	207
Hillingdon	156	173	244	252
Hounslow	142	157	221	229
Islington	56	62	87	90
Kensington and Chelsea	55	61	86	89
Kingston upon Thames	69	76	107	111
Lambeth	64	70	99	103
Lewisham	73	80	113	117

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Merton	85	94	133	138
Newham	133	147	208	215
Redbridge	64	71	100	104
Richmond upon Thames	61	68	96	99
Southwark	75	83	117	121
Sutton	76	84	119	123
Tower Hamlets	84	93	131	135
Waltham Forest	78	86	122	126
Wandsworth	101	112	158	164
Total	3,207	3,546	5,009	5,180

4.3 Scenario 3: Sustainable Transport Led

This apportionment scenario gives the highest weighting to sustainable transport as shown in Table 4.5. The resultant apportionment (in kt per borough) is shown in Table 4.6.

Table 4.5
Weightings for Scenario 3: Sustainable Transport Led

Criterion	Weighting %
1: Theoretical capacity	10
2: Waste arisings	10
3: Sustainable transport	40
4: Road network	10
5: Other land uses/environmental factors	10
6: Flood risk	10
7: Socio-economic factors	10

Table 4.6
Scenario 3: Apportionment by Borough at 2021 and 2041

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Barking and Dagenham	270	299	422	436
Barnet	77	85	120	124
Bexley	203	225	317	328
Brent	166	184	259	268
Bromley	52	58	82	85
Camden	36	40	57	59
City of London	34	38	53	55
City of Westminster	69	76	108	112
Croydon	87	96	135	140
Ealing	219	243	343	354
Enfield	97	108	152	157

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Greenwich	195	216	305	315
Hackney	30	33	47	49
Hammersmith and Fulham	133	147	208	215
Haringey	70	78	110	113
Harrow	44	48	68	71
Havering	112	124	175	181
Hillingdon	151	167	236	244
Hounslow	129	143	201	208
Islington	28	31	43	45
Kensington and Chelsea	43	47	67	69
Kingston upon Thames	60	66	94	97
Lambeth	48	53	75	78
Lewisham	88	97	138	142
Merton	74	82	115	119
Newham	181	200	282	292
Redbridge	41	46	64	67
Richmond upon Thames	49	55	77	80
Southwark	41	45	64	66
Sutton	58	64	90	93
Tower Hamlets	85	94	132	137
Waltham Forest	72	80	113	117
Wandsworth	164	181	256	264
Total	3,207	3,546	5,009	5,180

4.4 Scenario 4: Road Network Led

This apportionment scenario gives the highest weighting to road network capacity as shown in Table 4.7. The resultant apportionment (in kt per borough) is shown in Table 4.8.

Table 4.7
Weightings for Scenario 4: Road Network Led

Criterion	Weighting %
1: Theoretical capacity	10
2: Waste arisings	10
3: Sustainable transport	10
4: Road network	40
5: Other land uses/environmental factors	10
6: Flood risk	10
7: Socio-economic factors	10

Table 4.8
Scenario 4: Apportionment by Borough at 2021 and 2041

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Barking and Dagenham	171	190	268	277
Barnet	93	103	145	150
Bexley	162	179	252	261
Brent	142	157	222	229
Bromley	86	96	135	140
Camden	55	61	86	89
City of London	24	26	37	38
City of Westminster	76	83	118	122
Croydon	100	111	157	162
Ealing	180	199	281	290
Enfield	133	147	208	215
Greenwich	125	138	195	202
Hackney	56	62	88	91
Hammersmith and Fulham	82	90	128	132
Haringey	78	86	121	126
Harrow	78	86	121	126
Havering	139	154	217	224
Hillingdon	153	170	239	248
Hounslow	146	161	227	235
Islington	49	55	77	80
Kensington and Chelsea	59	65	92	95
Kingston upon Thames	86	95	135	139
Lambeth	64	70	99	103
Lewisham	72	80	113	116
Merton	94	104	147	152
Newham	139	154	217	225
Redbridge	77	85	120	124
Richmond upon Thames	70	78	110	113
Southwark	61	67	95	98
Sutton	90	99	140	145
Tower Hamlets	82	91	128	132
Waltham Forest	89	98	138	143
Wandsworth	98	108	153	158
Total	3,207	3,546	5,009	5,180

4.5 Scenario 5: Environment Led

This apportionment scenario gives the highest weighting to environmental, cultural heritage and other land use considerations as shown in Table 4.9. The resultant apportionment (in kt per borough) is shown in Table 4.10.

Table 4.9
Weightings for Scenario 5: Environment Led

Criterion	Weighting %
1: Theoretical capacity	10
2: Waste arisings	10
3: Sustainable transport	10
4: Road network	10
5: Other land uses/environmental factors	40
6: Flood risk	10
7: Socio-economic factors	10

Table 4.10
Scenario 5: Apportionment by Borough at 2021 and 2041

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Barking and Dagenham	222	245	347	358
Barnet	73	81	114	118
Bexley	202	224	316	327
Brent	174	192	271	281
Bromley	68	76	107	111
Camden	42	46	66	68
City of London	23	26	36	37
City of Westminster	52	57	81	84
Croydon	97	107	151	156
Ealing	233	257	363	376
Enfield	166	184	259	268
Greenwich	132	146	207	214
Hackney	37	41	58	60
Hammersmith and Fulham	67	74	104	108
Haringey	77	85	120	124
Harrow	55	61	86	89
Havering	156	172	243	251
Hillingdon	172	190	269	278
Hounslow	174	192	271	280
Islington	32	35	50	51
Kensington and Chelsea	33	37	52	54
Kingston upon Thames	63	69	98	101
Lambeth	50	56	79	81

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Lewisham	67	74	105	108
Merton	95	105	149	154
Newham	167	185	261	270
Redbridge	50	56	79	81
Richmond upon Thames	45	50	70	73
Southwark	60	66	93	96
Sutton	83	92	130	134
Tower Hamlets	72	79	112	116
Waltham Forest	78	86	122	126
Wandsworth	90	99	140	145
Total	3,207	3,546	5,009	5,180

4.6 Scenario 6: Flood Risk Led

This apportionment scenario gives the highest weighting to flood risk as shown in Table 4.11. The resultant apportionment (in kt per borough) is shown in Table 4.12.

Table 4.11
Weightings for Scenario 6: Flood Risk Led

Criterion	Weighting %
1: Theoretical capacity	10
2: Waste arisings	10
3: Sustainable transport	10
4: Road network	10
5: Other land uses/environmental factors	10
6: Flood risk	40
7: Socio-economic factors	10

Table 4.12
Scenario 6: Apportionment by Borough at 2021 and 2041

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Barking and Dagenham	191	211	299	309
Barnet	79	88	124	128
Bexley	161	178	251	260
Brent	193	214	302	312
Bromley	73	81	114	118
Camden	45	50	70	73
City of London	23	26	36	37
City of Westminster	53	58	82	85
Croydon	103	113	160	166
Ealing	262	290	410	424

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Enfield	162	179	253	261
Greenwich	108	119	168	174
Hackney	42	47	66	68
Hammersmith and Fulham	69	77	108	112
Haringey	77	85	120	124
Harrow	59	65	91	95
Havering	161	178	252	261
Hillingdon	197	217	307	318
Hounslow	196	217	306	317
Islington	34	37	53	55
Kensington and Chelsea	34	38	53	55
Kingston upon Thames	67	74	105	109
Lambeth	54	59	84	87
Lewisham	59	66	93	96
Merton	98	109	154	159
Newham	141	156	221	228
Redbridge	55	61	86	89
Richmond upon Thames	46	51	72	74
Southwark	48	53	75	78
Sutton	86	95	134	139
Tower Hamlets	75	83	117	121
Waltham Forest	78	87	122	126
Wandsworth	78	86	122	126
Total	3,207	3,546	5,009	5,180

4.7 Scenario 7: Socio-Economic Led

This apportionment scenario gives the highest weighting to socio-economic factors as shown in Table 4.13. The resultant apportionment (in kt per borough) is shown in Table 4.14.

Table 4.13
Weightings for Scenario 7: Socio-Economic Led

Criterion	Weighting %
1: Theoretical capacity	10
2: Waste arisings	10
3: Sustainable transport	10
4: Road network	10
5: Other land uses/environmental factors	10
6: Flood risk	10
7: Socio-economic factors	40

Table 4.14
Scenario 7: Apportionment by borough at 2021 and 2041

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Barking and Dagenham	155	171	241	250
Barnet	95	105	149	154
Bexley	163	181	255	264
Brent	137	151	214	221
Bromley	91	101	142	147
Camden	63	69	98	101
City of London	53	59	83	86
City of Westminster	76	84	119	123
Croydon	99	109	154	160
Ealing	176	195	275	284
Enfield	123	136	192	198
Greenwich	119	132	186	192
Hackney	45	49	70	72
Hammersmith and Fulham	84	93	132	136
Haringey	73	81	115	119
Harrow	85	94	133	137
Havering	136	151	213	220
Hillingdon	151	167	236	244
Hounslow	142	157	222	230
Islington	47	52	73	76
Kensington and Chelsea	60	66	93	96
Kingston upon Thames	100	111	157	162
Lambeth	61	68	95	99
Lewisham	73	81	114	118
Merton	106	117	165	171
Newham	120	133	188	194
Redbridge	72	79	112	116
Richmond upon Thames	87	96	135	140
Southwark	63	70	98	102
Sutton	100	111	157	162
Tower Hamlets	70	78	110	113
Waltham Forest	74	81	115	119
Wandsworth	107	119	168	173
Total	3,207	3,546	5,009	5,180

4.8 Scenario 8: Equal Weighting

This apportionment scenario gives equal weighting to all criteria as shown in Table 4.15. The resultant apportionment (in kt per borough) is shown in Table 4.16.

Table 4.15
Weightings for Scenario 8: Equal Weighting

Criterion	Weighting %
1: Theoretical capacity	14.3
2: Waste arisings	14.3
3: Sustainable transport	14.3
4: Road network	14.3
5: Other land uses/environmental factors	14.3
6: Flood risk	14.3
7: Socio-economic factors	14.3

Table 4.16
Scenario 8: Apportionment by Borough at 2021 and 2041

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Barking and Dagenham	197	218	308	319
Barnet	84	93	131	136
Bexley	178	197	278	288
Brent	161	178	251	260
Bromley	75	83	117	121
Camden	52	57	81	84
City of London	33	36	51	53
City of Westminster	73	81	115	118
Croydon	98	109	154	159
Ealing	212	234	331	342
Enfield	139	154	217	225
Greenwich	132	146	206	213
Hackney	43	48	67	70
Hammersmith and Fulham	82	90	128	132
Haringey	75	83	117	121
Harrow	62	69	98	101
Havering	144	160	225	233
Hillingdon	165	183	258	267
Hounslow	159	176	248	256
Islington	40	44	62	64
Kensington and Chelsea	45	50	71	73
Kingston upon Thames	73	81	114	118
Lambeth	56	62	87	90
Lewisham	72	79	112	116
Merton	93	103	145	150
Newham	150	165	234	242
Redbridge	59	65	92	95
Richmond upon	58	64	90	93

Borough	HH waste apportionment (kt) 2021	HH waste apportionment (kt) 2041	C&I apportionment (kt) 2021	C&I apportionment (kt) 2041
Thames				
Southwark	59	65	92	95
Sutton	82	91	128	133
Tower Hamlets	76	84	119	123
Waltham Forest	78	86	121	125
Wandsworth	103	114	161	166
Total	3,207	3,546	5,009	5,180

4.9 Summary of Apportionment Scenarios

A summary of the apportionment scenarios is shown in Table 4.17 for household waste (2021) and Table 4.18 for commercial and industrial waste. These are also illustrated in Figure 10.

A supporting spreadsheet has been provided to the GLA as an output of this study allowing for additional or alternative scenarios to be developed for consideration.

Table 4.17
Summary of Apportionment Scenarios for Household Waste (2021)

Borough	Scenario 1: Capacity	Scenario 2: Arisings	Scenario 3: Sustainable transport	Scenario 4: Road network	Scenario 5: Environment	Scenario 6: Flood risk	Scenario 7: Socio- economic	Scenario 8: Equal weighting
Barking and Dagenham	208	163	270	171	222	191	155	197
Barnet	76	96	77	93	73	79	95	84
Bexley	206	151	203	162	202	161	163	178
Brent	170	143	166	142	174	193	137	161
Bromley	71	82	52	86	68	73	91	75
Camden	43	78	36	55	42	45	63	52
City of London	23	50	34	24	23	23	53	33
City of Westminster	52	136	69	76	52	53	76	73
Croydon	99	105	87	100	97	103	99	98
Ealing	229	182	219	180	233	262	176	212
Enfield	160	133	97	133	166	162	123	139
Greenwich	128	117	195	125	132	108	119	132
Hackney	40	52	30	56	37	42	45	43
Hammersmith and Fulham	59	79	133	82	67	69	84	82
Haringey	74	75	70	78	77	77	73	75
Harrow	51	66	44	78	55	59	85	62
Havering	178	128	112	139	156	161	136	144
Hillingdon	175	156	151	153	172	197	151	165
Hounslow	183	142	129	146	174	196	142	159
Islington	32	56	28	49	32	34	47	40
Kensington and Chelsea	33	55	43	59	33	34	60	45
Kingston upon	65	69	60	86	63	67	100	73

Borough	Scenario 1: Capacity	Scenario 2: Arisings	Scenario 3: Sustainable transport	Scenario 4: Road network	Scenario 5: Environment	Scenario 6: Flood risk	Scenario 7: Socio- economic	Scenario 8: Equal weighting
Thames								
Lambeth	51	64	48	64	50	54	61	56
Lewisham	70	73	88	72	67	59	73	72
Merton	97	85	74	94	95	98	106	93
Newham	165	133	181	139	167	141	120	150
Redbridge	53	64	41	77	50	55	72	59
Richmond upon Thames	46	61	49	70	45	46	87	58
Southwark	63	75	41	61	60	48	63	59
Sutton	82	76	58	90	83	86	100	82
Tower Hamlets	66	84	85	82	72	75	70	76
Waltham Forest	75	78	72	89	78	78	74	78
Wandsworth	83	101	164	98	90	78	107	103
Total	3,207	3,207	3,207	3,207	3,207	3,207	3,207	3,207

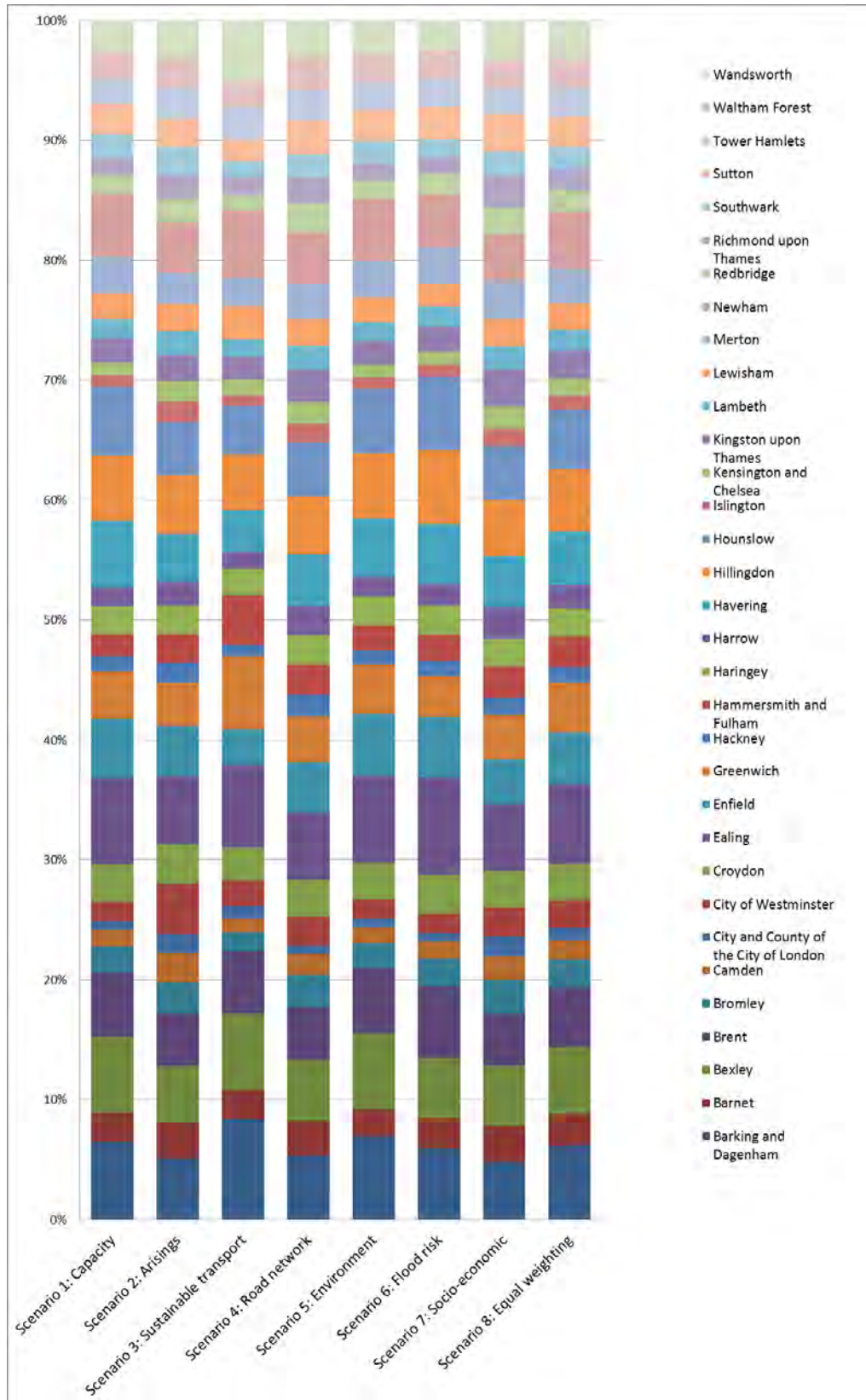
Table 4.18
Summary of Apportionment Scenarios for Commercial and Industrial Waste (2021)

Borough	Scenario 1: Capacity	Scenario 2: Arisings	Scenario 3: Sustainable transport	Scenario 4: Road network	Scenario 5: Environment	Scenario 6: Flood risk	Scenario 7: Socio- economic	Scenario 8: Equal weighting
Barking and Dagenham	325	255	422	268	347	299	241	308
Barnet	118	150	120	145	114	124	149	131
Bexley	321	236	317	252	316	251	255	278
Brent	266	223	259	222	271	302	214	251
Bromley	111	127	82	135	107	114	142	117
Camden	67	123	57	86	66	70	98	81
City of London	36	78	53	37	36	36	83	51

Borough	Scenario 1: Capacity	Scenario 2: Arisings	Scenario 3: Sustainable transport	Scenario 4: Road network	Scenario 5: Environment	Scenario 6: Flood risk	Scenario 7: Socio- economic	Scenario 8: Equal weighting
City of Westminster	82	212	108	118	81	82	119	115
Croydon	154	163	135	157	151	160	154	154
Ealing	358	285	343	281	363	410	275	331
Enfield	250	208	152	208	259	253	192	217
Greenwich	200	182	305	195	207	168	186	206
Hackney	63	81	47	88	58	66	70	67
Hammersmith and Fulham	92	123	208	128	104	108	132	128
Haringey	116	116	110	121	120	120	115	117
Harrow	80	103	68	121	86	91	133	98
Havering	278	200	175	217	243	252	213	225
Hillingdon	273	244	236	239	269	307	236	258
Hounslow	287	221	201	227	271	306	222	248
Islington	49	87	43	77	50	53	73	62
Kensington and Chelsea	52	86	67	92	52	53	93	71
Kingston upon Thames	101	107	94	135	98	105	157	114
Lambeth	80	99	75	99	79	84	95	87
Lewisham	109	113	138	113	105	93	114	112
Merton	152	133	115	147	149	154	165	145
Newham	258	208	282	217	261	221	188	234
Redbridge	83	100	64	120	79	86	112	92
Richmond upon Thames	72	96	77	110	70	72	135	90
Southwark	98	117	64	95	93	75	98	92
Sutton	129	119	90	140	130	134	157	128
Tower Hamlets	102	131	132	128	112	117	110	119

Borough	Scenario 1: Capacity	Scenario 2: Arisings	Scenario 3: Sustainable transport	Scenario 4: Road network	Scenario 5: Environment	Scenario 6: Flood risk	Scenario 7: Socio- economic	Scenario 8: Equal weighting
Waltham Forest	117	122	113	138	122	122	115	121
Wandsworth	129	158	256	153	140	122	168	161
Total	5,009	5,009	5,009	5,009	5,009	5,009	5,009	5,009

Figure 10
Summary of Apportionment Scenarios



AYLESBURY

7 Wornal Park, Menmarsh Road,
Worminghall, Aylesbury,
Buckinghamshire HP18 9PH, UK
T: +44 (0)1844 337380

BELFAST

Suite 1 Potters Quay, 5 Ravenhill Road,
Belfast BT6 8DN, UK, Northern Ireland
T: +44 (0)28 9073 2493

BRADFORD-ON-AVON

Treenwood House, Rowden Lane,
Bradford-on-Avon, Wiltshire BA15 2AU,
UK
T: +44 (0)1225 309400

BRISTOL

Langford Lodge, 109 Pembroke Road,
Clifton, Bristol BS8 3EU, UK
T: +44 (0)117 9064280

CAMBRIDGE

8 Stow Court, Stow-cum-Quy,
Cambridge CB25 9AS, UK
T: +44 (0)1223 813805

CARDIFF

Fulmar House, Beignon Close, Ocean
Way, Cardiff CF24 5PB, UK
T: +44 (0)29 20491010

CHELMSFORD

Unit 77, Waterhouse Business Centre,
2 Cromar Way, Chelmsford, Essex
CM1 2QE, UK
T: +44 (0)1245 392170

DUBLIN

7 Dundrum Business Park, Windy
Arbour, Dundrum, Dublin 14 Ireland
T: +353 (0)1 2964667

EDINBURGH

4/5 Lochside View, Edinburgh Park,
Edinburgh EH12 9DH, UK
T: +44 (0)131 3356830

EXETER

69 Polsloe Road, Exeter EX1 2NF, UK
T: +44 (0)1392 490152

GLASGOW

4 Woodside Place, Charing Cross,
Glasgow G3 7QF, UK
T: +44 (0)141 3535037

GRENOBLE

BuroClub, 157/155 Cours Berriat,
38028 Grenoble Cedex 1, France
T: +33 (0)4 76 70 93 41

GUILDFORD

65 Woodbridge Road, Guildford
Surrey GU1 4RD, UK
T: +44 (0)1483 889 800

LEEDS

Suite 1, Jason House, Kerry Hill,
Horsforth, Leeds LS18 4JR, UK
T: +44 (0)113 2580650

LONDON

83 Victoria Street,
London, SW1H 0HW, UK
T: +44 (0)203 691 5810

MAIDSTONE

Mill Barn, 28 Hollingworth Court,
Turkey Mill, Maidstone, Kent
ME14 5PP, UK
T: +44 (0)1622 609242

MANCHESTER

8th Floor, Quay West, MediaCityUK,
Trafford Wharf Road,
Manchester M17 1HH, UK
T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE

Sailors Bethel, Horatio Street,
Newcastle-upon-Tyne NE1 2PE, UK
T: +44 (0)191 2611966

NOTTINGHAM

Aspect House, Aspect Business Park,
Bennerley Road, Nottingham NG6 8WR,
UK
T: +44 (0)115 9647280

SHEFFIELD

Unit 2 Newton Business Centre,
Thornccliffe Park Estate, Newton
Chambers Road, Chapeltown,
Sheffield S35 2PW, UK
T: +44 (0)114 2455153

SHREWSBURY

2nd Floor, Hermes House, Oxon
Business Park, Shrewsbury SY3 5HJ,
UK
T: +44 (0)1743 239250

STAFFORD

8 Parker Court, Staffordshire Technology
Park, Beaconside, Stafford ST18 0WP,
UK
T: +44 (0)1785 241755

STIRLING

No. 68 Stirling Business Centre,
Wellgreen, Stirling FK8 2DZ, UK
T: +44 (0)1786 239900

WORCESTER

Suite 5, Brindley Court, Gresley Road,
Shire Business Park, Worcester WR4
9FD, UK
T: +44 (0)1905 751310