APPENDIX 1

What goes into Rushmoor bins?

MEMBERS LIVE
Waste & Recycling Seminar

APPENDIX 2

FOOD WASTE COLLECTION WORKING GROUP

TERMS OF REFERENCE

A. ROLES AND TASKS

1. To consider and recommend on arrangements for the introduction of a separate food waste collection, as part of the Climate Change Action Plan

2. To consider and recommend on aspects of the implementation plan, including the detailed service design

3. In consultation with the Council's contractor and WDA (waste disposal authority – Hampshire County Council), to make the necessary disposal arrangements

4. To consider and make recommendations on the implications for the Council's current refuse and recycling collection service in light of the adoption of a separate food waste collection service

5. To prepare and make arrangements for implementing a communication strategy to support these service changes and complement the engagement and awareness principles set out in the Climate Change Strategy

B. MEMBERSHIP

A cross-party group of councillors, established by the Cabinet, in accordance with the provisions to secure political balance.

The Group will have six members, consisting of:

- Four Conservative Group Members (to include The Cabinet Member for Operational Services and the Chairman of the Policy & Project Advisory Board) and two minority Group Members
- The Members to be appointed by the Leaders of the political groups

C. CHAIRMAN

The Portfolio Holder for Operational Services will be Chairman of the Group

D. REPORTING ARRANGEMENTS

As appropriate, the Group will make recommendations direct to Cabinet on the proposals which have been discussed

E. SCHEDULE OF MEETINGS

The food waste collections Group will be due to meet monthly from November 2020 – dates to be circulated and agreed

APPENDIX 3

Final Report

Collection Options for Rushmoor Borough Council

This report provides Rushmoor Council with information on the relative cost and performance of different collection options, which include the move to fortnightly residual collections and/or the introduction of a separate food waste collection. The results will aid decision making around when and how to implement a separate food waste collection and reduced residual waste collection frequency.

Project code: RCY147-013
Research date: August 2020 **Date:** September 2020

WRAP's vision is a world in which resources are used sustainably.

Our mission is to accelerate the move to a sustainable resource-efficient economy through re-inventing how we design, produce and sell products; re-thinking how we use and consume products; and re-defining what is possible through re-use and recycling.

Find out more at www.wrap.org.uk

Document reference (please use this reference when citing WRAP's work):
[WRAP, Year, Town, Title of Report, Prepared by xx]

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Front cover photography: Image of Rushmoor Borough Council Kerbside Collection Service provided by Rushmoor Borough Council

Contents

Acknowledgements

We would like to thank officers from Rushmoor Borough Council for their help and cooperation in providing data for this project.

1.0 Background and Introduction

Eunomia was commissioned by WRAP, on behalf of Rushmoor Borough Council (RBC), in August 2020 to carry out modelling of household waste and recycling kerbside collection service options.

Prior to the COVID-19 pandemic, RBC provided residents with a weekly residual collection. However, due to resource constraints caused by the pandemic this was reduced to a fortnightly residual waste collection service, which was run from April to the end of August 2020. Although side waste was accepted during this time the change led to increases in dry recycling yields. In September, weekly residual collection will be reinstated, as agreed by Members.

Due to the success of fortnightly collections in promoting recycling, RBC sought to determine the effect that a long-term change to the service would have on performance and service costs. Therefore, the purpose of this project was to model service options, which include the move to fortnightly residual collections and/or the introduction of a separate food waste collection. This will provide RBC with cost, operational and performance information for each of the proposed options. The results will aid in decisions around when and how to implement a separate food waste collection and reduced residual waste collection frequency.

1.1 Current Service (Pre-COVID-19)

The household waste and recycling service operated by RBC prior to the COVID-19 pandemic is shown in Table 1. The service offered prior to COVID-19 consists of:

- a weekly residual collection, where approximately two thirds of properties used a 240-litre wheeled bin, and the final third a 140-litre wheeled bin. New bins distributed for residual waste are currently a 140-litre sized bin.
- a fortnightly twin stream dry recycling collection. Fibres, plastics, and metals are collected in a 240-litre wheeled bin, and glass in a separate box. The recycling service was not altered during the COVID-19 pandemic.
- a charged garden waste service, which is collected fortnightly from properties who subscribe to the service.
- no food waste service is currently provided.

Table 1: Waste and Recycling Service Provided by Rushmoor Borough Council Pre-COVID-19

Service	Collection Type	Collection Frequency	Containment	Collection Vehicle Type
Residual	Residual	Weekly	240-litre/140-litre wheeled bins	26 t RCV
Dry Recycling	Twin Stream (Container + Glass)	Fortnightly	240-litre wheeled bin/44-litre box	26 t Split Back RCV
Garden	Charged	Fortnightly	240-litre wheeled bin	26 t/32 t RCV

1.2 Households

The number of households covered by each collection service is described in Table 2. This shows the number of households offered the services, based on the service summary data provided by RBC. The modelling focuses on 'core' households with standard access (SA), this means we exclude flats with four-wheeled communal bins (CB) and any households on narrow access (NA) rounds.

Table 2: Number of Households Offered the Service

	Service Type	Dry Recycling	Garden*	Residual
Number of Households	Standard Access (SA)	34,521	9,955	34,521
	Narrow Access (NA)	129	10	129
	Communal Bin (CB)	6,600	0	6,600
	Total	**41,250**	**9,965**	**41,250**

**Notes: Number of subscribed properties*

1.3 Waste Arisings

Waste arisings data were provided by RBC, whilst compositional information in the form of the 2018 Project Integra composition report was provided by Hampshire County Council (HCC).

The overall composition and tonnage of waste in the baseline for standard access households modelled can be seen in Table 3. For dry recycling, only tonnages from properties in scope of the modelling (e.g. street level housing) are broken down by material.

Table 3: Baseline Waste Arisings in Rushmoor (2019/20)

Dry Recycling	Tonnes
Newspapers and magazines	1,188
Other paper	341
Corrugated card	546
Non corrugated card	648
Plastic bottles	420
Glass flint	649
Glass brown	387
Glass green	413
Steel cans	176
Aluminium cans	92
Compostable garden waste	3,015
Tonnes of Recycling/Organic treatment (excl. contamination)	***7,875***
Tonnes of contamination	***624***
Tonnes of Refuse	***16,650***
Total Tonnes of Kerbside Household Waste Modelled	**25,149**
Kerbside Recycling Rate (excl. communal bin flats)	31.3%

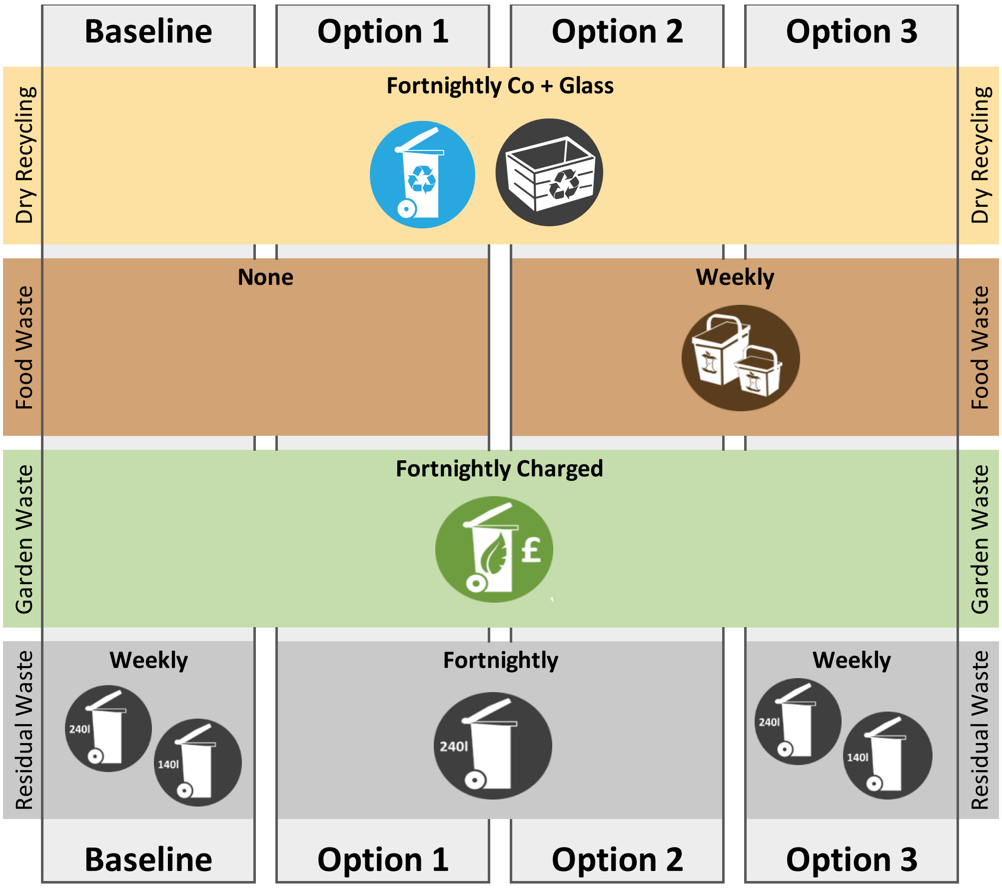
1.4 Options Modelled

The options modelling was carried out using WRAP's Kerbside Analysis Tool (KAT). KAT is a model created in Microsoft Excel that allows users to forecast the likely performance and cost of potential changes to kerbside collection services. The model calculates vehicle requirements based on average round sizes, which consider a number of factors such as the average number of loads/day based on the available capacity on the vehicle, amount of waste collected, speed of collection and ultimately the time available in the day to collect waste from households.

Prior to modelling the future options, a baseline model was established in KAT for RBC using the operational information provided and detailed in Appendix A. The baseline model reflects as closely as possible the number of vehicles, crews and containers required for the service and the costs associated with them.

The options assessed as part of this study were defined and agreed by RBC and WRAP, in discussion with Eunomia. The baseline and three core collection options were modelled, as shown in Figure 1.

Figure 1: Baseline Service and Collection Options Modelled



- **Baseline:** pre-COVID kerbside service
- **Option 1 – F Res:** Fortnightly residual, fortnightly container + glass, fortnightly charged garden waste.
- **Option 2 – F Res FW:** Fortnightly residual, separate weekly food waste, fortnightly container + glass, fortnightly charged garden waste.
- **Option 3 – W Res FW:** Weekly residual, separate weekly food waste, fortnightly container + glass, fortnightly charged garden waste.

In all options, dry recycling and garden waste collections were not changed. In Options 1 and 2, residual collection frequency was decreased to fortnightly and in Options 2 and 3, a separate food waste collection was introduced.

1.5 Report Structure

This report discusses the findings of the study and is structured as follows:

- Section 2.0 presents the Kerbside collection modelling results.
- Section **Error! Reference source not found.** summarises overall findings of the project.
- The appendices contain greater technical detail regarding the work carried out to produce the results reported in the main body of the report:
  - Appendix A details the assumptions that underpin the modelling
  - Appendix B presents the results of the benchmarking exercise
  - Appendix C details a comparison of forecasted 2020/21 tonnages with modelled results

2.0 Kerbside Collection Modelling Results

This section presents the results of the kerbside collection options modelling, including the impact of the different options on the recycling rate achieved and the quantity of waste generated.

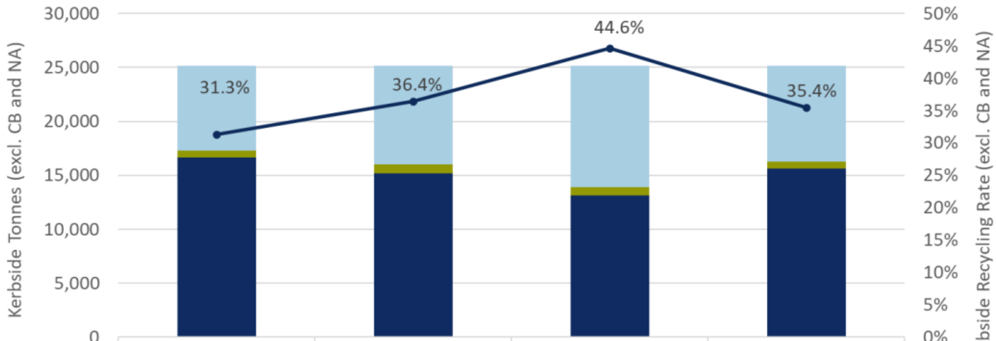
The options modelled are set out in section 1.4. As discussed in section 1.2, for the purpose of modelling the impact of the changes to waste collection at kerbside, a number of properties (including communal bin properties and households serviced with non-core vehicles e.g. narrow and restricted access properties) have been excluded from the detailed modelling.

2.1 Performance

All of the future options considered increased recycling rates above the baseline level of performance, as shown in Figure 2.

Option 1, where residual collection frequency was decreased to fortnightly, results in an increase in recycling performance of 5.1%, and indicates a rise in recycling rates could be achieved if the measures implemented through the COVID-19 pandemic were made permanent. An increase in the recycling rate of 4.1% was observed for Option 3, with the introduction of a separate food waste collection but residual collection remaining weekly. However, by far the largest increase in recycling rates (+13.3%) was observed for Option 2 through the combination of reducing the residual collection frequency to fortnightly, the introduction of separate food waste collection and increased dry recycling as a result of constrained residual capacity.

Figure 2: Indicative Modelled Kerbside Recycling Rate by Option (Excluding Communal Bin Flats and Narrow Access Properties Not Modelled)



	Baseline	Option 1 - F Res	Option 2 - F Res FW	Option 3 - W Res FW
Tonnes of Recycling/Composting (excl. contamination)	7,875	9,151	11,222	8,911
Tonnes of Contamination	624	813	813	624
Tonnes of Refuse (excl. contamination)	16,650	15,185	13,113	15,614
Kerbside Recycling Rate (excl. communal bin flats and narrow access)	31.3%	36.4%	44.6%	35.4%

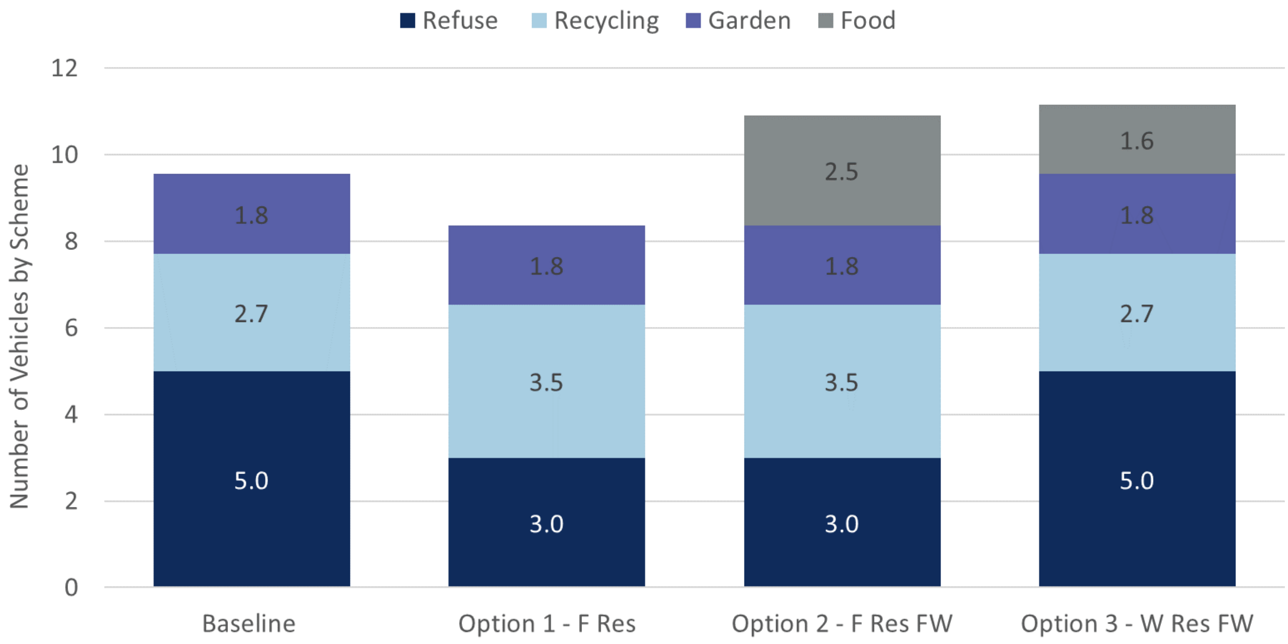
2.2 Vehicles

The estimated vehicle requirements for each option are set out in Figure.

It should be noted that KAT rounds up the vehicle requirements when calculating costs and resource requirements, e.g. if 6.1 vehicles is calculated, KAT will cost for 7 vehicles and crew. Showing the non-integer values allows the potential available spare capacity on vehicles to be assessed, to take account of both differences in tonnages that may be achieved compared to those modelled, and how changes to household numbers might be absorbed or dealt with differently.

Equally, where the vehicle requirements only marginally tip to the next vehicle (e.g. 0.1 or 0.2 of a vehicle above the previous integer), it is possible that the additional vehicle may not be required immediately. For example, if the crew were to work a slightly longer day or if the composition of material collected on the vehicles, and therefore compaction, differs slightly from that modelled, the additional vehicle may not be necessary. This work does not consider the potential efficiency savings available from partnership working.

Figure 3: Number of Collection Vehicles by Option



Key observations, in terms of vehicles requirements for different waste services and options, are discussed below.

Residual Waste

- Option 3 requires the same number of residual waste vehicles as the baseline, as there is no change in the residual collection frequency and the small decreases in residual tonnages through diversion into the food waste system is not substantial enough to decrease the collection capacity required.
- The fortnightly residual collection in Options 1 and 2 mean that only three residual waste collection vehicles are likely required.

Food Waste

- Options 2 and 3, which introduce a separate weekly food collection require additional food waste specific vehicles for this service. In Option 3, 1.6 food waste vehicles would be required to collect the predicted tonnages each week through introduction of the service.

- In Option 2, the increase in food waste yield predicted with the introduction of a fortnightly residual collection means 2.5 vehicles would be required. This is greater than two collection vehicles predicted by the Contractor.

Dry Recycling

- As there would be no change in the services or the tonnages of dry recycling, in Option 3, there is no change in the number of recycling vehicles needed compared to the baseline.
- In Options 1 and 2, increases in dry recycling tonnages through reduced residual capacity each week lead to an additional 0.8 dry recycling vehicles required to operate the service compared to the baseline.

Garden

- It is predicted there would be no change to the garden waste service in any of the options modelled and therefore, there is no change in the number of vehicles required to run the service.

2.3 Collection Crews

The number of staff required to run the service is closely linked to the number of vehicles required in each option and is shown in Table 4.

Option 1 requires fewer staff than the baseline, as the move to a fortnightly residual collection means the number of residual drivers and loaders is reduced, which offsets the increase in recycling crew needed.

Options 2 and 3 see increases in the number of staff required compared to the baseline. This is due to the introduction of the separate food waste collection. In Option 2 this is slightly offset by the reduction in residual staff needed for fortnightly collections, however, an increase in dry recycling crews means that, in total, additional staff are required.

Table 4: Total Number of Collection Staff Required for Each Service by Option

	Baseline	Option 1 - F Res	Option 2 - F Res FW	Option 3 - W Res FW
Recycling	9	12	12	9
Garden	4	4	4	4
Food	0	0	6	4
Residual	15	9	9	15
Total	**28**	**25**	**31**	**32**

Appendix A Assumptions

A.1 Introduction

The purpose of this report is to set out the assumptions made in the collection modelling work for Rushmoor Borough Council (RBC). A range of data is needed to undertake collection modelling. This includes data in relation to the characteristics of the borough, which are held constant through all modelling options. Much of this has been supplied through, or calculated from, the data provided by RBC.

This report provides details of assumptions regarding:

- Local authority data (Section A.2);
- Time and logistical assumptions (Section A.3); and
- Cost assumptions (Section **Error! Reference source not found.**).

A.2 Local Authority Data

The number of households on each of the collection service types are described in Table 5. This shows the number of households offered the services, based on the service summary data provided by (RBC). The modelling focuses on 'core' households with standard access (SA), this means we exclude flats with four-wheeled communal bins (CB) and any households on narrow access (NA) rounds. Flats that have communal two-wheeled bins are included in the standard access properties as these would experience the same changes to the service.

In RBC, flats are collected on the same rounds as street level properties. Communal bin flats are excluded, with tonnages and working time in the baseline adjusted to recognise this.

Table 5: Number of Households Offered the Service (SA: Standard Access, NA: Narrow Access), CB: Communal Bin)

	Service Type	Co-mingled Dry	Glass	Food	Garden	Residual
Number of Households	SA	34,521	34,521	0	9,955	34,521
	NA	129	129	0	10	129
	CB	6,600	6,600	0	0	6,600
	Total	**41,250**	**41,250**	**0**	**9,965**	**41,250**

A.3 Time and Logistical Assumptions

A.3.1 Vehicles

The vehicles currently utilised by RBC are listed in Table 6. Details for a proposed food waste vehicle are also included for future options.

Table 6: Vehicles Used in Baseline Modelling

Vehicles	Co-mingled Dry	Glass	Food	Garden	Residual
Type	26 t 65-35 split-back RCV		7.5 t RCV	29 t RCV*	26 t RCV
Number	3		2**	1.5	5
Notes:	**Average of 32 t and 26 t vehicles used in the summer* *** Estimated by contractor*				

A.3.2 Tipping Logistics

The time taken to unload the different vehicles (provided by RBC for the current service) is presented in Table 7. RBC also provided data on the average time taken to drive from vehicle depots to start of rounds, from rounds to tipping points, and from the tipping points back to the depot (Table 7).

Table 7: Tipping Times (Minutes)

	Unloading Time	Time from Depot to Start of Round	Time from Round to Tip	Time from Tip to Depot
Current Co-mingled	70	10	15	15
Glass				
Separate Food Waste	20	10	45	45
Garden Waste	60	10	45	45
Residual	60	10	15	15

A.3.3 Participation and Set-Out Rates

Baseline set-out rates are shown in Table 8. In order to increase recycling performance when reducing residual waste containment capacity, we assume a 5% increase in set-out and participation when moving to fortnightly residual collections and this is something that is built into the modelling of future options.

Table 8: Baseline Set-Out Rates

	Co-mingled Dry	Glass	Food	Garden	Residual
Set-Out Rate	70%	35%	N/A	47%	90%

The set-out rate of food waste under fortnightly collections of residual waste from a 240-litre wheeled bin is assumed to be 45%. Under a weekly residual collection system, set-out is predicted to be lower at 30%. For fortnightly residual collections set-out is expected to increase to 95%.

A.3.4 Working Time

The average working hours for the different services, used for the purpose of modelling, were provided by RBC and are shown in Table 9. All services are assumed to operate over five days per week.

Table 9: Working Hours per Day

	Co-mingled Dry	Glass	Food	Garden	Residual
Working Hours	7:00		7:00	7:00	6:08

The crewing levels used on each service are shown in Table 10. It is assumed crewing levels would remain the same for future options. For a separate food waste collection is assumed a standard driver plus one loaders would be used on rounds.

Table 10: Loaders Used in Each Service

	Co-mingled Dry	Glass	Food	Garden	Residual
Number of collection crew including the driver	3		2	2	3
Time driver helps loading	25%		40%	40%	25%

Appendix B Benchmarking

B.1 Structure of this Appendix

This appendix is structured as follows:

Section B.2 the introduction outlines the methodology used and some of the main limitations and assumptions.

Section B.3 benchmarks the yields of residual waste obtained from households with weekly and fortnightly residual collections.

Section B.4 benchmarks the yields of dry recycling obtained from households with weekly and fortnightly residual collections.

Section B.5 compares the yields of authorities with separate food waste collections.

Section B.6 provides a summary of the changes in yield modelled.

B.2 Introduction

This section summarises the benchmarking undertaken for this study, with a focus on those authorities with similar socio-demographic conditions and service configurations as Rushmoor Borough Council (RBC). The key differences in the amount of waste collected and declared as recycled in each of the different options are outlined.

It should be noted that, although the benchmarking is useful in informing our judgement in relation to predicted future yields, it is by no means a perfect science. As you will see from the background discussion below, a number of interrelated factors, which are difficult to unpick from one another, will contribute to an individual authority's performance. The benchmarking exercise merely enables us to tease out some of the broad themes in terms of system performance which, alongside Eunomia's experience elsewhere of these systems, helps inform the yields to be modelled for future options.

The relevance of results from another authority to RBC depends on how similar it is. This is measured using a statistical model, which broadly compares authorities using socio-economic and demographic criteria. We would normally consider results for authorities with a rank below 30 to be very applicable if they have similar collection systems, and would put less emphasis on results with a rank over 50.

The benchmarking is based on 2018/19 WasteDataFlow (WDF) and the collection systems each authority were operating in that year.

B.2.1 Methodology: Capture of Target Materials

For the co-mingled (Co) + glass and two stream (containers + fibres) recycling collection systems (TS) used in the benchmarking below, the data available in WDF relates to the tonnages of co-mingled materials collected, which includes contaminants – i.e. materials that are not target materials.

In order to accurately depict dry recycling yields, it is necessary to consider the amounts of target material collected and the amount of contaminants collected in the systems that are examined.

B.2.2 Methodology: Communal Bin Properties

It is necessary to account for the impact communal bin properties have upon studied waste statistics, as these properties tend to recycle less, and produce less waste overall. Based on yields from communal properties in other authorities, and in the absence of RBC data due to co-collection of communal bins and standard access properties, we have assumed that 43 kg/hh/yr of dry recycling is captured from communal bin properties for RBC.

Similarly, we assume that 19 kg/hh/yr food waste would be captured from communal bin properties where they are offered this service. Average authority yields are re-calculated for low rise properties to account for the lower captures from communal bin properties.

B.2.3 Methodology: Missing Materials

Adjustments have been made to account for authorities that are not collecting the full range of core dry recycling materials (paper, cardboard, plastics, cans, and glass). This allows comparability between the authorities without the absence of materials affecting total dry recyclables collection yield. For mixed plastics a 10 kg/hh/yr adjustment is used, which is a Eunomia standard assumption from our previous modelling experience. For glass and old corrugated cardboard (OCC), 39 kg/hh/yr and 32 kg/hh/yr adjustments were used respectively. These adjustments were calculated from the yields attained by similar authorities collecting these materials.

B.3 Comparing Residual Yields of Authorities with Weekly and Fortnightly Residual Frequencies With and Without Separate Food Waste Collections

This section compares the residual waste collected from authorities

B.3.1 Benchmarking Results

The list of authorities included in the analysis is shown in Table 11. The analysis compares RBC residual yields with authorities using a fortnightly 240 litre residual system, with and without a separate food waste collection. Authorities using 180 litre fortnightly residual collections with a separate food waste collection were also included because, as RBC distribute more 140 litre bins the overall residual capacity will decrease towards this level of service provision.

Table 11: Benchmarking Authorities Used in the Residual Frequency and Food Waste Service Provision Effects on Residual Yield Analysis

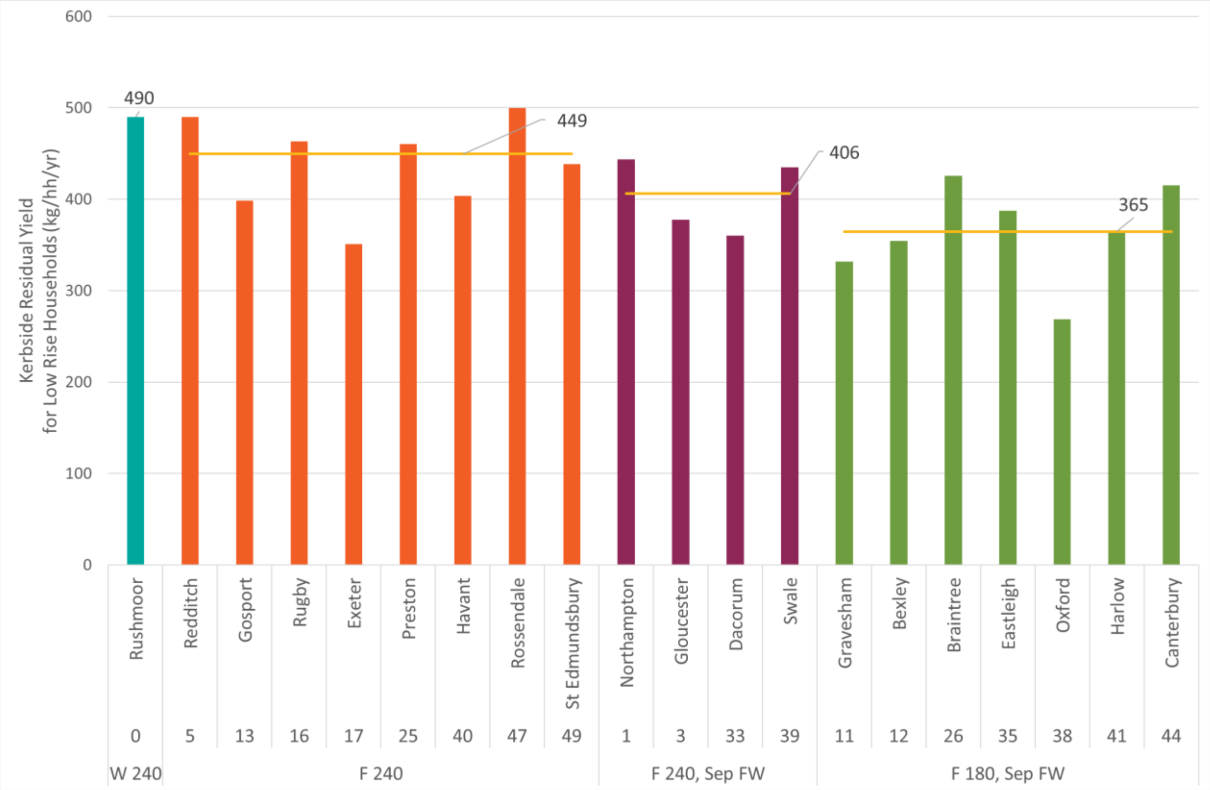
Rank	Authority	Residual Frequency	Residual Bin Size (Litres)	Separate Food Waste
0	Rushmoor	Weekly	240	No
5	Redditch	Fortnightly	240	No
13	Gosport	Fortnightly	240	No
16	Rugby	Fortnightly	240	No
17	Exeter	Fortnightly	240	No
25	Preston	Fortnightly	240	No

Rank	Authority	Residual Frequency	Residual Bin Size (Litres)	Separate Food Waste
40	Havant	Fortnightly	240	No
47	Rossendale	Fortnightly	240	No
49	St Edmundsbury	Fortnightly	240	No
1	Northampton	Fortnightly	240	Yes
3	Gloucester	Fortnightly	240	Yes
33	Dacorum	Fortnightly	240	Yes
39	Swale	Fortnightly	240	Yes
11	Gravesham	Fortnightly	180	Yes
12	Bexley	Fortnightly	180	Yes
26	Braintree	Fortnightly	180	Yes
35	Eastleigh	Fortnightly	180	Yes
38	Oxford	Fortnightly	180	Yes
41	Harlow	Fortnightly	180	Yes
44	Canterbury	Fortnightly	180	Yes

Figure shows the residual yields for the benchmarking authorities listed I Table 11, the data suggests:

- the difference in median residual yields **between the weekly 240 litre and fortnightly 240 litre** groups is **41 kg/hh/yr**.
- a further difference of **43 kg/hh/yr** is observed through comparison of fortnightly 240 litre residual collections **with,** and without a **separate food waste collection**.
- **smaller residual container sizes also showed lower residual yields**, comparing 240 litre and 180 litre residual fortnightly services with separate food waste collected showed a further difference of **41 kg/hh/yr** for authorities using 180 litre bins. Therefore, as more 140 litre residual containers are distributed in RBC, it is predicted residual waste will decrease further.

Figure 4: Residual Yields (kg/hh/yr) for Benchmarking Authorities with Weekly 240-litre Wheeled Bin Residual and Fortnightly 240-litre or 180-litre Wheeled Bin Residual With and Without Separate Food Waste Services (Median Yields Shown by Yellow Line)



B.4 Comparing Dry Recycling Yields of Authorities with Weekly and Fortnightly Residual Frequencies

This section compares the performance of authorities with weekly and fortnightly residual frequencies.

B.4.1 Benchmarking Results

The list of authorities included in the analysis is shown in Table 12. Authorities operating commingled dry recycling collection system are included in the analysis, to ensure viable group sizes. RBC is grouped with 240 litre weekly residual collection authorities because, although 140 litre bins are now distributed as replacements, the majority of the borough still uses 240 litre residual bins. This group is compared with authorities with: 140 litre weekly residual collections; 240 litre fortnightly collections and 180 litre fortnightly collections.

Table 12: Benchmarking Authorities Used in the Residual Frequency Effect on Dry Recycling Yield Analysis

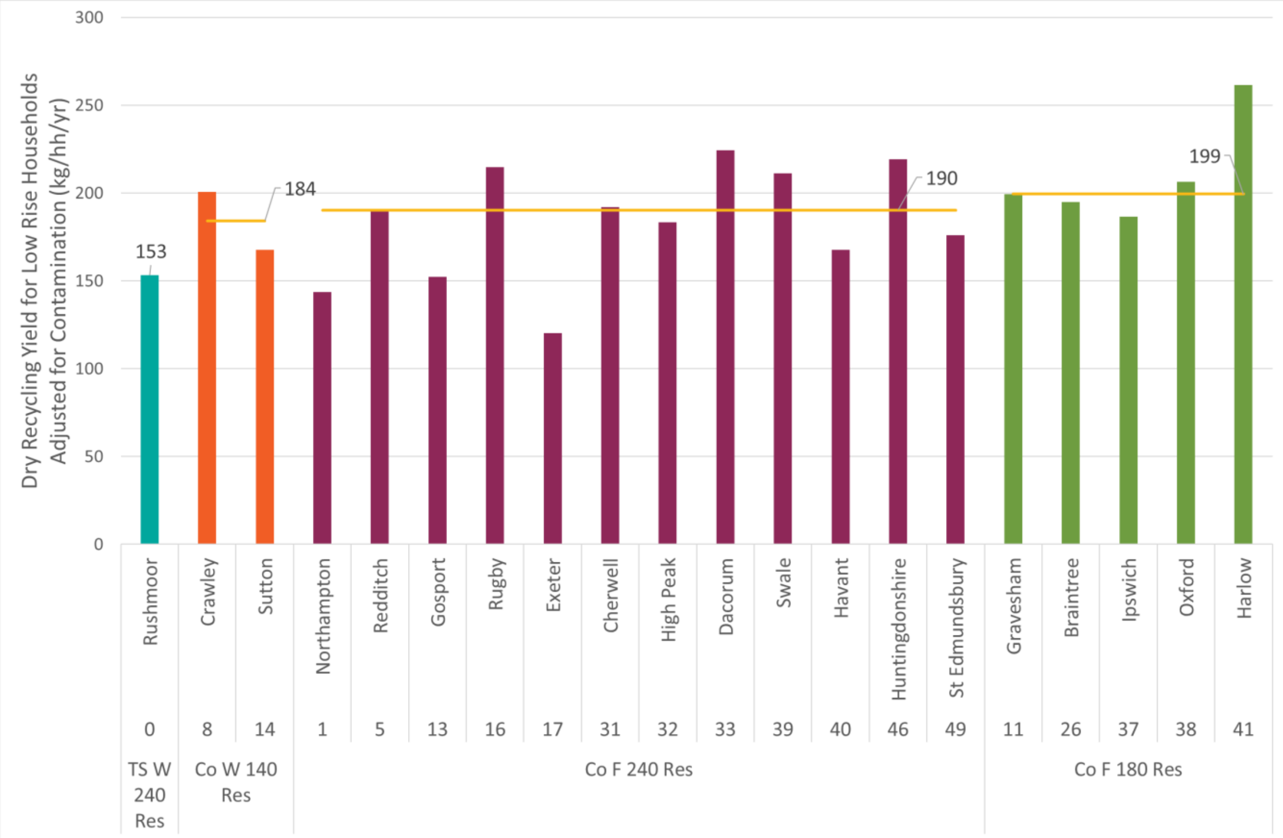
Rank	Authority	Residual Frequency	Residual Bin Size (Litres)
0	Rushmoor*	Weekly	240
8	Crawley*	Weekly	140
14	Sutton	Weekly	140
1	Northampton	Fortnightly	240

Rank	Authority	Residual Frequency	Residual Bin Size (Litres)
5	Redditch	Fortnightly	240
13	Gosport*	Fortnightly	240
16	Rugby	Fortnightly	240
17	Exeter*	Fortnightly	240
31	Cherwell*	Fortnightly	240
32	High Peak	Fortnightly	240
33	Dacorum	Fortnightly	240
39	Swale	Fortnightly	240
40	Havant*	Fortnightly	240
46	Huntingdonshire	Fortnightly	240
49	St Edmundsbury*	Fortnightly	240
11	Gravesham*	Fortnightly	180
26	Braintree*	Fortnightly	180
37	Ipswich*	Fortnightly	180
38	Oxford	Fortnightly	180
41	Harlow*	Fortnightly	180
Notes:	** adjusted for mixed plastics, glass, or OCC*		

Figure shows the dry recycling yields adjusted for contamination, communal bins and missing materials for the benchmarking authorities listed in Table 11. Overall:

- the difference in median **dry recycling** yield between the 240 litre **weekly and fortnightly** groups is **37 kg/hh/yr**.
- **smaller residual container** sizes also **increased dry recycling** yields by a median of **9 kg/hh/yr**, so as more 140 litre residual containers are distributed, it is predicted the dry recycling yield will increase further.

Figure 5: Dry Recycling Yields (Excluding Contamination) for Benchmarking Authorities with Weekly 240-litre or 140-litre Wheeled Bin Residual and Fortnightly 240-litre of 180-lite Wheeled Bin Residual (Median Yields Shown by Yellow Line)



B.5 Food Waste

This section compares the performance of authorities with separate food waste collections. This is to inform modelling of the impact of rolling out separate food waste collections.

B.5.1 Benchmarking Results

The list of authorities included in the food waste analysis is shown in Table 13. We have included all benchmarking authorities with a rank of 50 below who collect weekly separate food waste with residual waste collected fortnightly from 180 or 240 litre wheeled bins. No authorities in the top 50 had a separate food waste collection and a weekly residual collection.

Table 13: Benchmarking Authorities Used for the Food Waste Analysis

Rank	Authority	Residual Bin Size (Litres)
1	Northampton	240
3	Gloucester	240
33	Dacorum	240
39	Swale	240
11	Gravesham	180

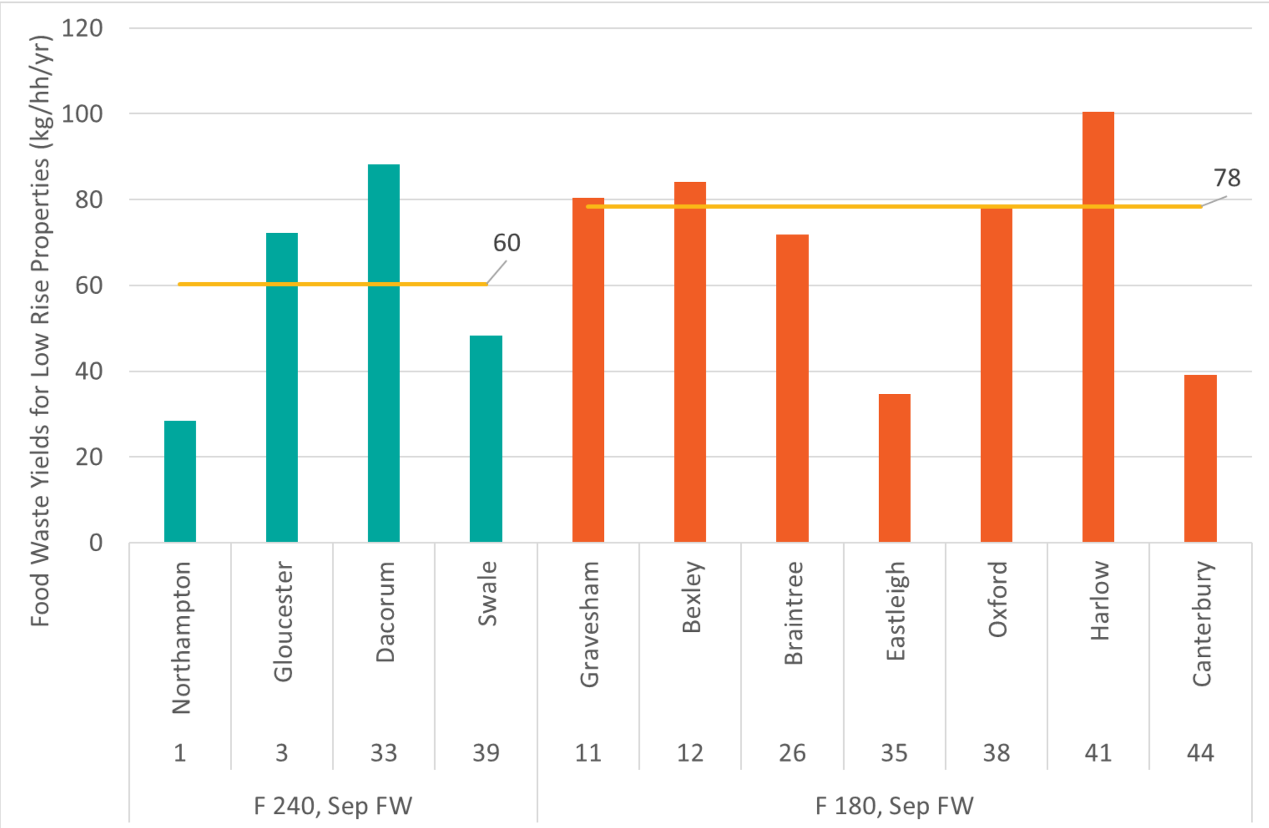
Rank	Authority	Residual Bin Size (Litres)
12	Bexley	180
26	Braintree	180
35	Eastleigh	180
38	Oxford	180
41	Harlow	180
44	Canterbury	180

Figure shows the food waste yields for the benchmarking authorities in Table 13. The benchmarking suggests that the median food waste yields are:

- 60 kg/hh/yr for authorities collecting residual waste fortnightly from 240 litre wheeled bins; and
- 78 kg/hh/yr for authorities collecting residual waste fortnightly from 180 litre wheeled bins.

We note again that this is the yield from low-rise households, since yields have been adjusted for the percentage of communal bins and whether they are offered the service (section B.2.2).

Figure 6: Food Waste Yields (kg/hh/yr) with Benchmarking Authorities (Median Yields Shown by Yellow Line)



No nearest neighbour authorities had a weekly residual and separate food waste collection. Therefore, we have used all English authorities that use a weekly wheeled bin residual and separate food waste collection system Table 14), with the exception of Epsom and Ewell due to an exceptionally high yield, to benchmark the food yield.

Table 14 Benchmarking Authorities with Weekly Residual Collections for the Food Waste Analysis

Authority	Containment	Food Waste Yield 18/19 (kg/hh/yr)
Southend-on-Sea Borough Council	Sacks	49
Brentwood Borough Council	Sacks	33
Hackney London Borough Council	Sacks	31
Camden LB*	Wheeled bin/sacks	25
Windsor and Maidenhead Borough Council	180 litre Wheeled bin/sacks	33
Sandwell MBC	140 litre Wheeled bin	29
Lewes District Council	140 litre Wheeled bin	22
Epsom and Ewell Borough Council	140 litre Wheeled bin	79**
Average		**32**

Notes: **Camden LB uses a combination of weekly and fortnightly residual collections*
*** Epsom and Ewell Borough Council excluded from average due to high food yields reported in 18/19*

B.6 Benchmarking Summary

Table 15 shows the resulting waste flow changes assumed in all the options based on the benchmarking.

Table 15: Benchmarking Yields under Each Option for Dry Recycling (Dry), Food Waste (Food), Garden Waste (GW), and Residual (Res)

Option	Yield Increase from Current Service (kg/hh/yr)		
	Residual	Food	Dry
1. F Res	-41	0	37
2. F Res + Food	-97	60	37
3. W Res + Food	-30	30*	0

*Notes: * slightly reduced from the average of 32 kg/hh/yr in Table 14 as residual sack collections are known to promote food recycling more than the wheeled bin residual collections provided by RBC*

Appendix C Comparison of COVID-19 Service with Modelled Results

C.1 Introduction

During the COVID-19 pandemic Rushmoor Borough Council (RBC) implemented alternate weekly collections (AWC) of residual and dry recycling services from April to the end of August 2020. Prior to this, RBC had offered a weekly residual service, but this could not be continued through the pandemic due to resource restrictions.

In this Appendix we take the actual residual and dry recycling yields achieved by RBC from April to July and forecast predicted yearly tonnage had the service continued. These forecasted yields are then compared against the modelled results for Option 1, which replicated the service as was over the COVID-19 period.

C.1.1 Methodology for Forecasting Residual and Recycling Yields for 2020/21

As data was only available for April to July for 2020 when the COVID-19 service was in place, we needed to forecast predicted tonnages for the whole year in order to allow comparisons with the modelled data.

The full dataset of monthly kerbside residual and recycling tonnages for 2019/20 was used to profile yields across a typical year. The tonnage data used included only those tonnages collected from standard access properties as used in the modelling. This profile was then applied to the 2020 data, allowing monthly tonnages to be forecast for the remainder of 2020/21. These tonnages were then converted to kg/hh/month, using the number of standard access properties provided by RBC.

Using this method, ensures that if tonnages are usually high in the period from April to July, this is accounted for and the forecasted tonnages reflect this.

C.1.2 Methodology for Comparing Forecasted and Modelled Residual and Recycling Yields

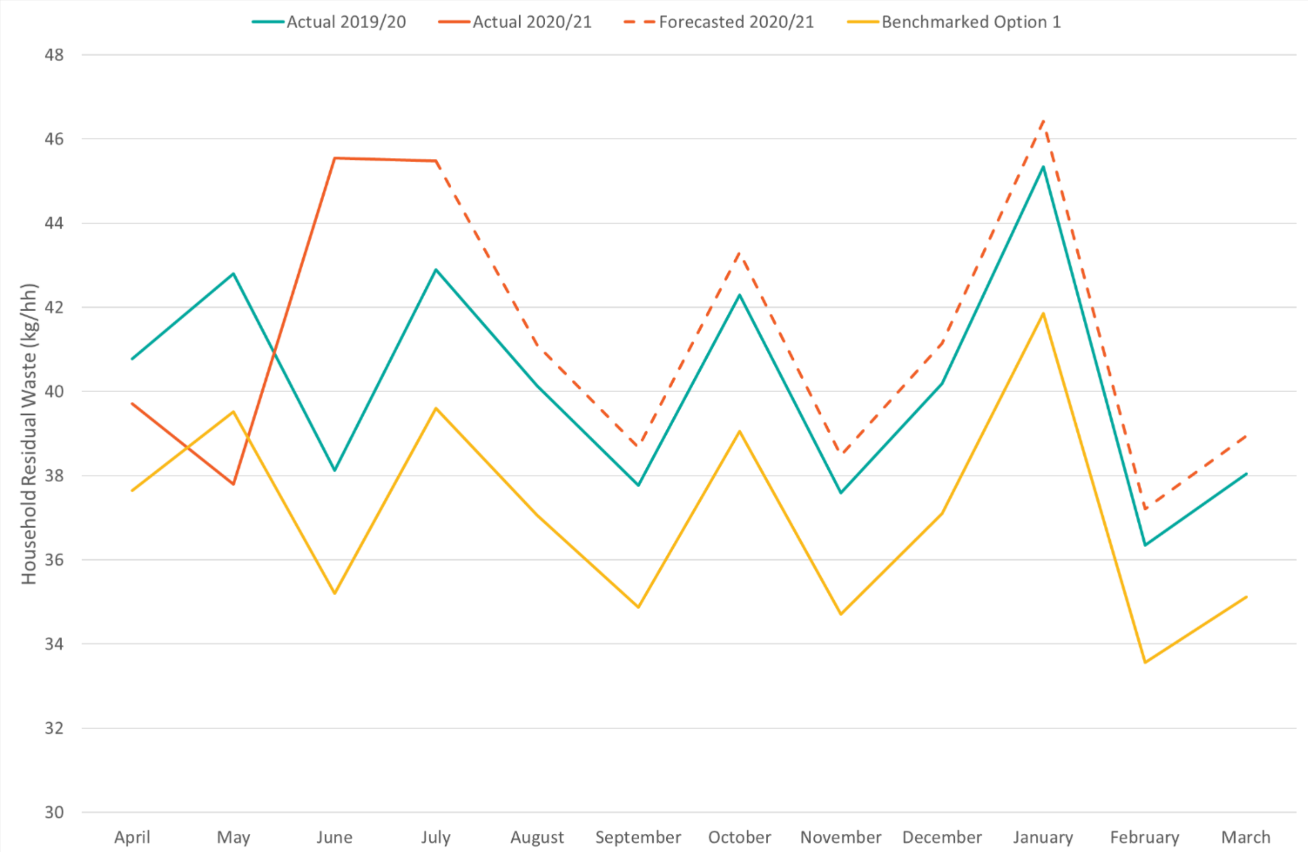
Changes in residual and dry recycling yields modelled from the benchmarking exercise were applied to the annual kg/hh yields of residual waste and dry recycling for modelling Option 1. For residual waste a decrease of 37 kg/hh/yr was applied, and for recycling an increase of 37 kg/hh/yr. These annual kg/hh were then split by month, using the profile described in section C.1.1.

The conversion of both datasets; forecasted 2020/21 tonnages and modelled tonnages, to kg/hh/month allow a direct comparison of predicted yields across one year.

C.2 Comparison of Forecasted Residual Yields with Modelled Residual Yields

The comparison of forecasted residual yields from actual data and modelled residual yields for Option 1 is shown in Figure. The forecasted residual yields are higher than the Option 1 data which models the same collection system. Forecasted yields are also greater than actual 2019/20 yields where a weekly residual collection was offered.

Figure 7: Comparison of Actual 2019/20, Forecasted 2020/21 and Modelled Option 1 Monthly Residual Yields



The differences in annual kg/hh are shown in Table 16. The fact that the modelled residual yields are much lower (50 kg/hh/yr) than the forecasted 2020/21 yields is likely due to the fact that, although over April to August a fortnightly residual service was introduced, there was no limit on the amount of waste that could be presented and side waste was collected. The fact residual tonnages were 13 kg/hh/yr higher than 2019/20 yields, suggests that other behavioural factors, including increased home working/home schooling etc. due to the COVID-19 pandemic also played into the high yields forecast from the April to August dataset.

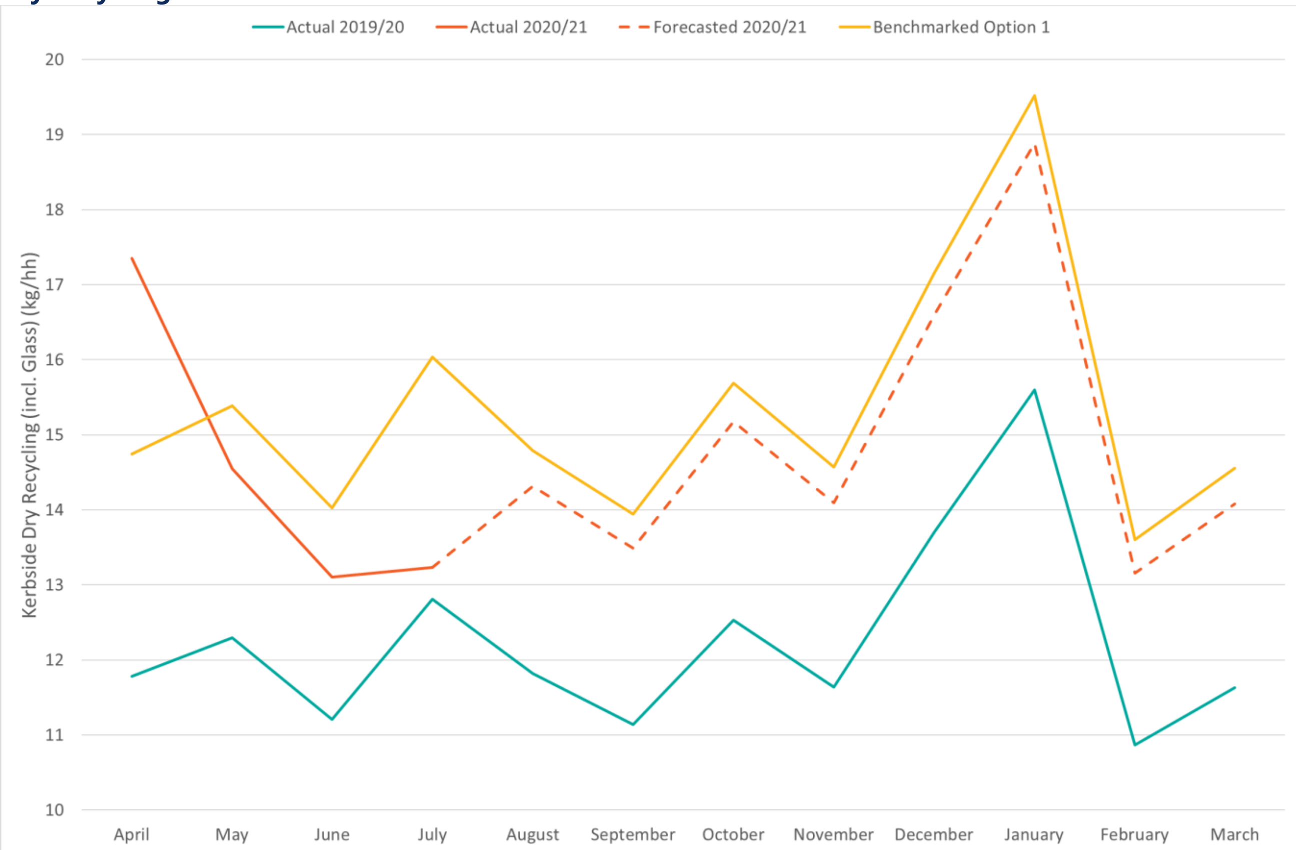
Table 16: Comparison of Actual 2019/20, Forecasted 2020/21 and Modelled Option 1 Annual Residual Yields (kg/hh/yr)

	Residual Yield (kg/hh/yr)
Actual 2019/20	482
Forecast 2020/21	495
Modelled Option 1	445

C.3 Comparison of Forecasted Dry Recycling Yields with Modelled Dry Recycling Yields

The comparison of forecasted dry recycling yields from actual data, and modelled dry recycling yields for Option 1 is shown in Figure. The forecasted recycling yields are similar to the Option 1 data, which models the same collection system. Both forecasted and modelled recycling yields are greater than 2019/20 recycling tonnages.

Figure 8: Comparison of Actual 2019/20, Forecasted 2020/21 and Modelled Option 1 Monthly Dry Recycling Yields



The differences in annual dry recycling kg/hh are shown in Table 17. Both the forecast and modelled yields are greater than the 2019/20 baseline. This suggests the reduction in residual frequency during COVID-19 has encouraged residents to increase recycling and that if these measures had continued an increase in dry recycling of 33 kg/hh/yr could have been achieved. The modelled results also predict an increase in dry recycling of 37 kg/hh/yr. This suggests that the behaviour change observed for dry recycling was mainly due to the change in residual frequency collection, but it is likely that the collection of side waste meant the impact of implementing a fortnightly residual collection on dry recycling yields was lessened slightly.

Table 17: Comparison of Actual 2019/20, Forecasted 2020/21 and Modelled Option 1 Annual Dry Recycling Yields (kg/hh/yr)

	Residual Yield (kg/hh/yr)
Actual 2019/20	167
Forecast 2020/21	199

Modelled Option 1	204

As the forecasted total residual and dry recycling yields are higher than the 2019/20 baseline it is important to also consider the recycling rate (calculated only using standard access kerbside dry recycling and kerbside residual tonnages). Table 18 shows that the recycling rate for the forecasted 2020/21 yields is 3% higher than the 2019/20 baseline. However, the modelled Option 1 of this collection system shows an increase of 5% from the baseline. The slight difference between the forecasted and modelled recycling rates is likely due to the collection of side waste in the forecasted data. However, it can be seen that the move to a fortnightly residual collection, even with the collection of side waste and changes in behaviour due to COVID-19, improves the recycling rate from the pre-COVID weekly residual collection service.

Table 18: Comparison of Actual 2019/20, Forecasted 2020/21 and Modelled Option 1 Recycling Rates

	Recycling Rate
Actual 2019/20	26%
Forecast 2020/21	29%
Modelled Option 1	31%

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