Buckinghamshire County Council

&

Milton Keynes Council

Waste Management Technical Options Appraisal

Appendices

FORMAL ISSUE

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Appendices

Appendix I: Data Assumptions

Diversion Targets

Diversion targets are defined as meeting the requirements of the Landfill Directive for the diversion of Biodegradable Municipal Waste (BMW) from landfill. The Landfill Allowance Trading Scheme Allowances (of total BMW allowed to be landfilled in any one scheme year) are based on those distributed by DEFRA in their letter of 11 August 2004. [1] [The model is configured so that any amendments in allocations (following the deadline for comments of 8 October 2004) from DEFRA can be incorporated and figures updated].

Assumed Waste Composition

Baseline data used in the Front-end model is taken from the two waste composition analyses, *"Waste and Recycling In Buckinghamshire: A compositional Study" and "Household Waste Composition Study April and November 2000 For Milton Keynes Council"*. This analysed mixed household waste and waste at Household Waste Recycling Centres (HWRCs in BCC), Community Recycling Centres (CRCs in MKC), fly-tippings, litter, and bulky household waste. It is assumed that the waste composition remains stable throughout the contract period.

For calculating compliance with the Landfill Directive, the biodegradable content of mixed MSW is assumed to be 68%, as per the 68% applied by DEFRA in devising the LATS.

The following BMW assumptions have been made for diverted waste according to the study by Parfitt (2002) for the Strategy Unit Report;[2] Organics (i.e. 100% biodegradable) includes paper, newspaper, cardboard, timber, books and 50% of textiles; Inorganics (i.e. non biodegradable) includes glass, cans, metal, plastic, fridges, batteries, oil, white goods, electrical goods, non-electrical households items, non-ferrous metals and 50% of textiles. See the tables below for full details of % BMW.

[1] Disseminated in a letter to all English WDAs on 11 August 2004 from Lindsay Cornish, Head of Waste Strategy Division, on Landfill Allowance Trading Scheme: Provisional Allocation of Landfill Allowances. Available at: http://www.defra.gov.uk/environment/waste/localauth/lats/pdf/allocation-let.pdf

[2] Parfitt, J. (2002) Analysis of Household Waste Composition and Factors Driving Waste Increases. Prepared for and reported in Strategy Unit (2002) Waste Not, Want Not; A Strategy for Tackling the Waste Problem in England. Cabinet Office, London

Table A1: BCC District Waste Composition Data

	Aylesbury Vale			Chiltern			South Bucks			Wycombe		
Waste Composition	% comp	% bio	% BMW	% comp	% bio	% BMW	% comp	% bio	% BMW	% comp	% bio	% BMW
Paper/Card	28.2%	100%	28.2%	26.8%	100%	26.8%	23.3%	100%	23.3%	30.0%	100%	30.0%
Plastic Film	4.5%	0%	0.0%	5.7%	0%	0.0%	4.2%	0%	0.0%	3.8%	0%	0.0%
Dense Plastic	6.4%	0%	0.0%	5.5%	0%	0.0%	5.7%	0%	0.0%	5.0%	0%	0.0%
Textiles	1.6%	50%	0.8%	2.8%	50%	1.4%	2.5%	50%	1.2%	1.4%	50%	0.7%
Misc. Combustible	6.6%	50%	3.3%	4.4%	50%	2.2%	3.6%	50%	1.8%	7.3%	50%	3.7%
Misc. Non Combustible	2.3%	0%	0.0%	1.5%	0%	0.0%	0.8%	0%	0.0%	2.0%	0%	0.0%
Glass	4.7%	0%	0.0%	11.5%	0%	0.0%	8.4%	0%	0.0%	7.4%	0%	0.0%
Organic (kitchen/garden)	32.8%	100%	32.8%	32.5%	100%	32.5%	42.5%	100%	42.5%	32.7%	100%	32.7%
Ferrous Metal	2.3%	0%	0.0%	4.2%	0%	0.0%	3.3%	0%	0.0%	3.2%	0%	0.0%
Non Ferrous Metal	6.6%	0%	0.0%	0.9%	0%	0.0%	1.7%	0%	0.0%	1.5%	0%	0.0%
Fines	4.0%	60%	2.4%	4.2%	60%	2.5%	4.2%	60%	2.5%	5.7%	60%	3.4%
TOTAL	**100.0%**		**67.5%**	**100.0%**		**65.5%**	**100.0%**		**71.4%**	**100.0%**		**70.5%**

Table A2: MKC Waste Composition Data

	Milton Keynes		
Waste Composition	% comp	% bio	% BMW
Paper/Card	25.1%	100%	25.1%
Plastic Film	2.7%	0%	0%
Dense Plastic	3.1%	0%	0%
Textiles	2.3%	50%	1.2%
Misc. Combustible	18.5%	50%	9.2%
Misc. Non Combustible	2.9%	0%	0%
Glass	7.1%	0%	0%
Organic (kitchen/garden)	30.8%	100%	30.8%
Ferrous Metal	2.8%	0%	0%
Non Ferrous Metal	0.9%	0%	0%
Fines	4.0%	60%	2.0%
TOTAL	**100.0%**		**68.7%**

Notes: '% comp', is the percentage that the waste stream represents in the overall waste composition.

'% bio', is the biodegradability of each waste stream, as determined from Parfitt (2002).

'% BMW', is the multiplication of '% comp' and '% bio' and when summed represents the biodegradability of the overall waste stream. It is important to note that as waste composition varies temporally as well as spatially the overall biodegradability of the waste stream will vary. The 68% figure was determined by Parfitt (2002) from a large dataset of authority compositions across England, hence the variations around this calculated above for BCC and MKC.

Baseline Waste Statistics: The table below identifies the baseline waste statistics for Buckinghamshire and Milton Keynes for 1995 to 2004. These baseline figures are used in projecting waste growth throughout the contract. The waste model is also built up from current capture rates of materials in the WCAs

Table A3: BCC Baseline Waste Statistics

Year	1995/6	1996/7	1997/8	1998/9	1999/00	2000/01	2001/2002	2002/2003	2003/2004
AVDC									
Population	154,100	155,800	157,800	159,500	162,700	164,000	165,900	166,100	166,600
Number of households	61,359	62,039	62,764	63,709	64,526	65,301	66,028	66,878	67,728
Household waste arisings excluding HWRC (Tonnes)	51,178	50,908	55,013	55,594	60,338	60,178	57,011	58,294	58,740
Trade and other arisings (Tonnes)							4,014	3,884	3,475
MSW per household (Tonnes)	0.83	0.82	0.88	0.87	0.94	0.92	0.86	0.87	0.87
CDC									
Population	90,400	90,000	91,100	90,400	90,200	89,500	89,200	88,800	88,900
Number of households	35,459	35,659	35,792	35,937	36,058	36,196	36,311	36,424	36,536
Household waste arisings excluding HWRC	28,770	29,301	30,558	30,249	30,949	31,564	31,425	31,871	31,420
Trade and other arisings (Tonnes)							289	341	564
MSW per household (Tonnes)	0.81	0.82	0.85	0.84	0.86	0.87	0.87	0.88	0.86
SBDC									
Population	61,300	61,300	61,100	61,500	61,500	61,900	61,900	61,900	62,000
Number of households	25,165	25,319	25,428	25,495	25,650	25,804	25,899	25,999	26,099
Household waste arisings excluding HWRC (tonnes)	21,917	21,359	23,229	23,039	24,456	25,804	28,996	23,283	23,571
Trade and other arisings (Tonnes)							1,045	5,040	3,151
MSW per household (Tonnes)	0.87	0.84	0.91	0.90	0.95	1.00	1.12	0.90	0.90
WDC									
Population	162,100	161,700	161,200	160,700	161,500	161,700	162,100	161,200	160,500
Number of households	62,967	63,356	63,695	63,926	64,333	64,726	65,016	65,416	65,816
Household waste arisings excluding HWRC (Tonnes)	69,033	61,773	59,513	62,175	65,451	65,527	63,504	64,794	64,400
Trade and other arisings (Tonnes)							1,019	2,254	2,707
MSW per household (Tonnes)	1.10	0.98	0.93	0.97	1.02	1.01	0.98	0.99	0.98
BCC HWRC									
Population	467,900	468,800	471,200	472,100	475,900	477,100	479,100	478,000	478,000
Number of households	184,950	186,373	187,679	189,067	190,567	192,027	193,254	194,717	196,179
HWRC - Household (Tonnes)	82,894	89,402	76,919	66,767	71,977	69,096	68,246	73,085	67,105
Trade and other arisings (Tonnes)							7,852	12,003	11,664
MSW per household (Tonnes)	0.45	0.48	0.41	0.35	0.38	0.36	0.35	0.38	0.34
BCC total									
Population	467,900	468,800	471,200	472,100	475,900	477,100	479,100	478,000	478,000
Number of households	184,950	186,373	187,679	189,067	190,567	192,027	193,254	194,717	196,179
Total Household waste (Tonnes)	253,792	252,743	245,232	237,824	253,171	252,169	249,183	251,327	245,235
Trade and other arisings (Tonnes)							14,218	23,522	21,560
MSW (Tonnes)	202,614	201,835	190,219	182,230	192,833	191,991	202,375	212,670	204,580
MSW per household (Tonnes)	1.37	1.36	1.31	1.26	1.33	1.31	1.29	1.29	1.25

Table A4: MKC Baseline Waste Statistics

MKC	1995/6	1996/7	1997/8	1998/9	1999/00	2000/01	2001/2002	2002/2003	2003/2004
Population	190,400	194,300	196,900	200,000	202,900	205,400	207,060	209,060	210,980
Household waste arisings excluding CRC (Tonnes)	85,773	88,258	91,213	88,678	90,941	97,740	80,626	80,870	82,523
CRC - Household (Tonnes)	15,337	18,198	20,593	19,515	20,641	22,000	26,930	28,351	26,031
Trade and other arisings (Tonnes)							8,409	9,381	9,374
MSW (Tonnes)	101,110	106,456	111,806	108,193	111,582	119,740	115,964	118,602	117,928
MSW per person (Tonnes)	0.53	0.55	0.57	0.54	0.55	0.58	0.56	0.57	0.56

Waste generation is projected on a per dwelling basis (Milton Keynes is generated on a per person basis as housing data was unavailable at the outset). Thus, future waste arisings were predicted, based on projections of planned dwelling increases (from planned number of new homes as detailed in the County Structure Plan) by the Buckinghamshire County Council. The dwelling/population increases determined are provided in the table below:

Table A5: BCC Projected growth in dwellings to 2030

Year	2001	2001-2006	2006-2011	2011-2016	2016-2021	2021-2026	2026-2031
AVDC	69428	4250	4250	5400	4867	4867	4867
CDC	36761	600	600	600	600	600	600
SBDC	26299	500	500	500	500	500	500
WDC	66616	2000	1700	1500	1750	1750	1700
BCC	199104	7350	7050	8000	7717	7717	7667

Table A6: MKC Projected population of MKC to 2030

Year	2005	2010	2015	2020	2025	2030
Population	219,240	250,060	272,050	293,630	317,820	340,430

BCC Waste growth projections

In order to calculate the future growth of the waste in BCC it is essential to look at past waste arisings. To calculate MSW growth MSW has been broken down into three waste streams:

- Collected household waste (includes all household waste except HWRC/ CRC waste)
- HWRC/CRC waste
- Trade and other waste

Collected Household Waste

Collected Household Waste growth rate can be broken down into two factors:

- Housing/population growth
- Social Growth

The predicted growth of houses for BCC has been given by each of the Districts and are stated above (in Table A5). To predict the future social growth we have looked at past arisings per household per year and future legislation (for example, Producer Responsibility (Packaging Waste) Obligations) and strategies (WRAP funds, National and EU strategies).

AVDC

Graph A1: Collected Household waste per household in AVDC

Average waste growth per household per year over last 7 yrs	0.8 %
Average waste growth per household per year over last 6 yrs	-0.2%
Average waste growth per household per year over last 5 yrs	-0.1%
Average waste growth per household per year over last 4 yrs	-1.9%
Average waste growth per household per year over last 3 yrs	-2%

The above graph shows a long term (6 year) average of the waste being reduced by 0.2% per household per year.

SBDC

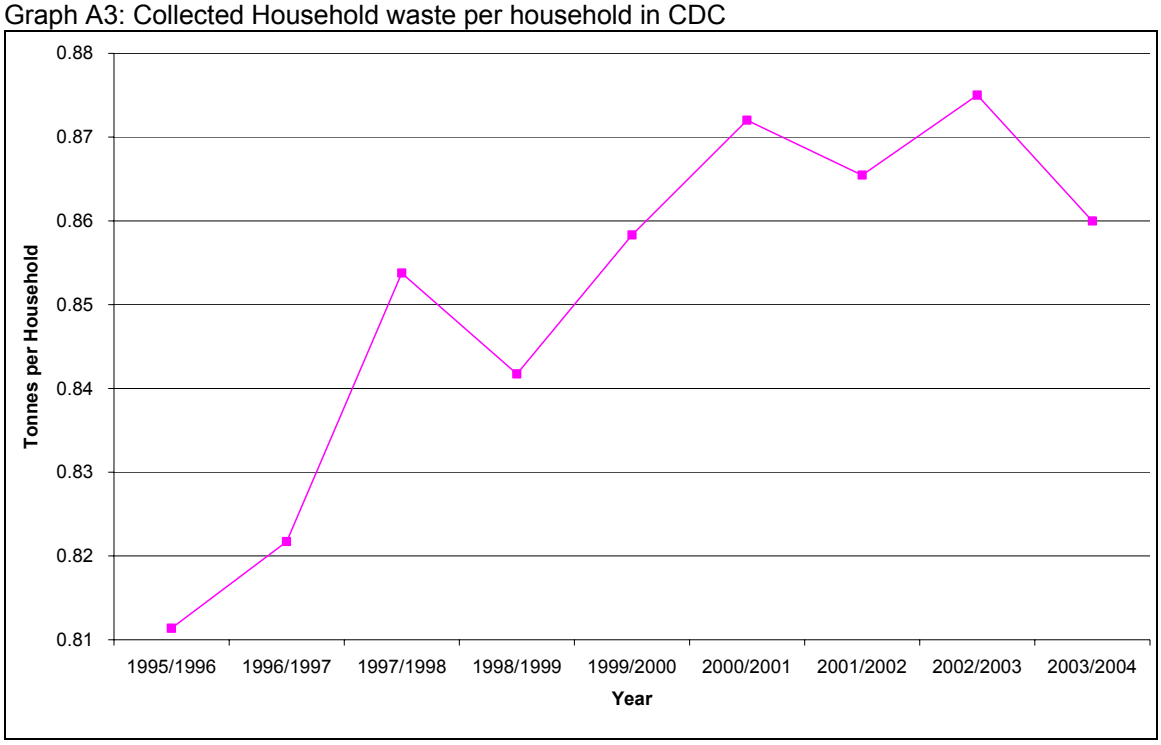
Graph A2: Collected Household waste per household in SBDC

Average waste growth per household per year over last 7 yrs	1.0%
Average waste growth per household per year over last 6 yrs	-0.2%
Average waste growth per household per year over last 5 yrs	-0.1%
Average waste growth per household per year over last 4 yrs	-0.3%
Average waste growth per household per year over last 3 yrs	-3.3%

The above graph shows a long term (6 year) average of the waste being reduced by 0.2% per household per year has been used.

CDC

Graph A3: Collected Household waste per household in CDC

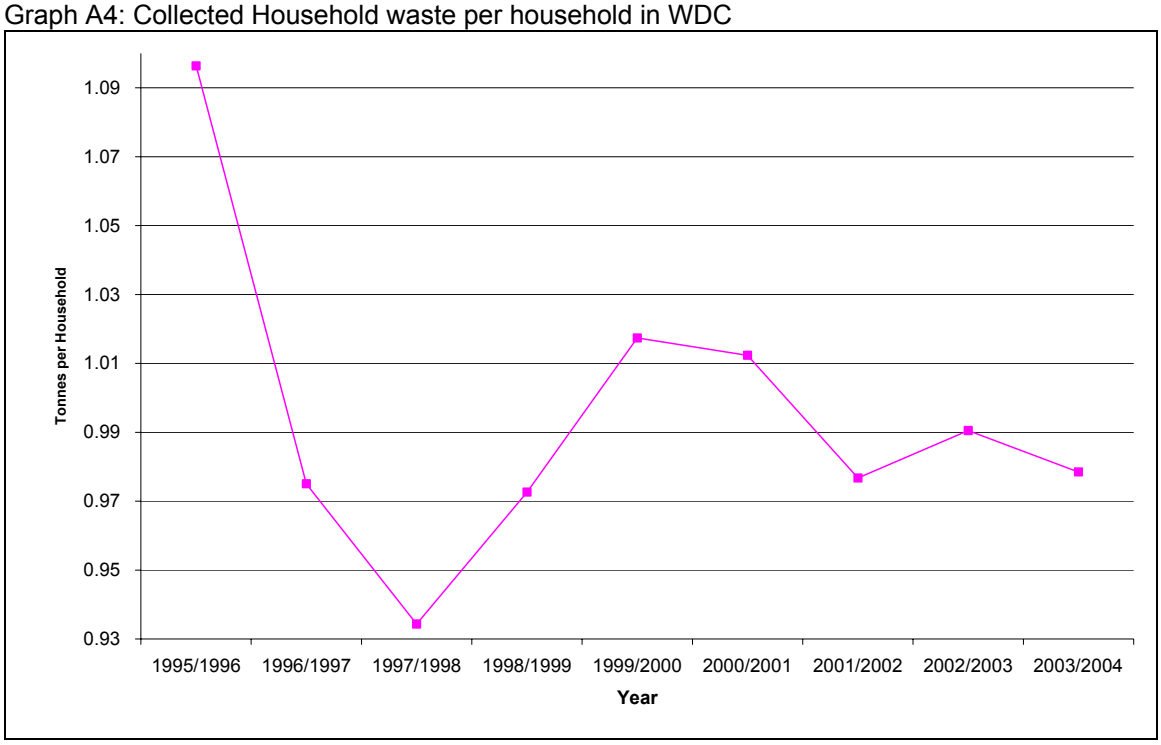


Average waste growth per household per year over last 7 yrs	0.7%
Average waste growth per household per year over last 6 yrs	0.1%
Average waste growth per household per year over last 5 yrs	0.4%
Average waste growth per household per year over last 4 yrs	0.0%
Average waste growth per household per year over last 3 yrs	-0.5%

The above graph shows a long term increase in waste per household per year but the short term (3/4 years) average shows a decrease. We believe that this is the start of decrease and stabilisation of waste growth per household per year in BCC in line with what has been seen in other districts.

WDC

Graph A4: Collected Household waste per household in WDC



Average waste growth per household per year over last 7 yrs	0.1%
Average waste growth per household per year over last 6 yrs	0.8%
Average waste growth per household per year over last 5 yrs	0.1%
Average waste growth per household per year over last 4 yrs	-1.0%
Average waste growth per household per year over last 3 yrs	-1.1%

The above graph shows a long term increase in waste per household per year but the short term (3/4 years) average shows a decrease. We believe that this is the start of a decrease and stabilisation of waste growth per household per year in BCC in line with what has been seen in other districts.

Overall

The assumption that the collected household waste per household per year is decreasing in all four districts can be seen currently in two out of the four districts in BCC.

This minimisation will be due to a number of effects:

- Reduction in packaging
    - the introduction of packaging regulations and enforcement of eco-design
    - WRAP innovation fund (to encourage supermarkets to reduce packaging)
- Producer responsibility – widening of new consumer goals
- Government strategies – National Strategy for resource productivity – "Changing Patterns – UK Government Framework for Sustainable Consumption Production"
- Possible introduction of public charging in the long term

We have modelled the minimisation of 0.2% per annum up until 2020; after 2020 the waste arisings per household per year are assumed to remain constant.

HWRC waste

HWRC waste growth rate can also be broken down into two factors:

- Housing/population growth; and,
- Social Growth.

The predicted growth of houses/ population for BCC has been provided by each of the Districts and is stated above (Table A5). To predict the future social growth we have looked at past arisings per household and future legislation (packaging regulation) and strategies (WRAP funds, National and EU strategies).

BCC HWRC

Graph A5: Collected HWRC waste per household in BCC

Average waste growth per household per year over last 3 yrs	-1.67%
Average waste growth per household per year over last 4 yrs	-2.45%
Average waste growth per household per year over last 5 yrs	-0.64%
Average waste growth per household per year over last 6 yrs	-3.0%
Average waste growth per household per year over last 7 yrs	-5%

The above graph shows a decreasing long term average of much greater than 0.2% per household per year. However in the model we have used a minimisation of 0.2%, the same as the household waste, as we believe that arisings per household are stabilising, and continuing these trends could under estimate future waste arisings.

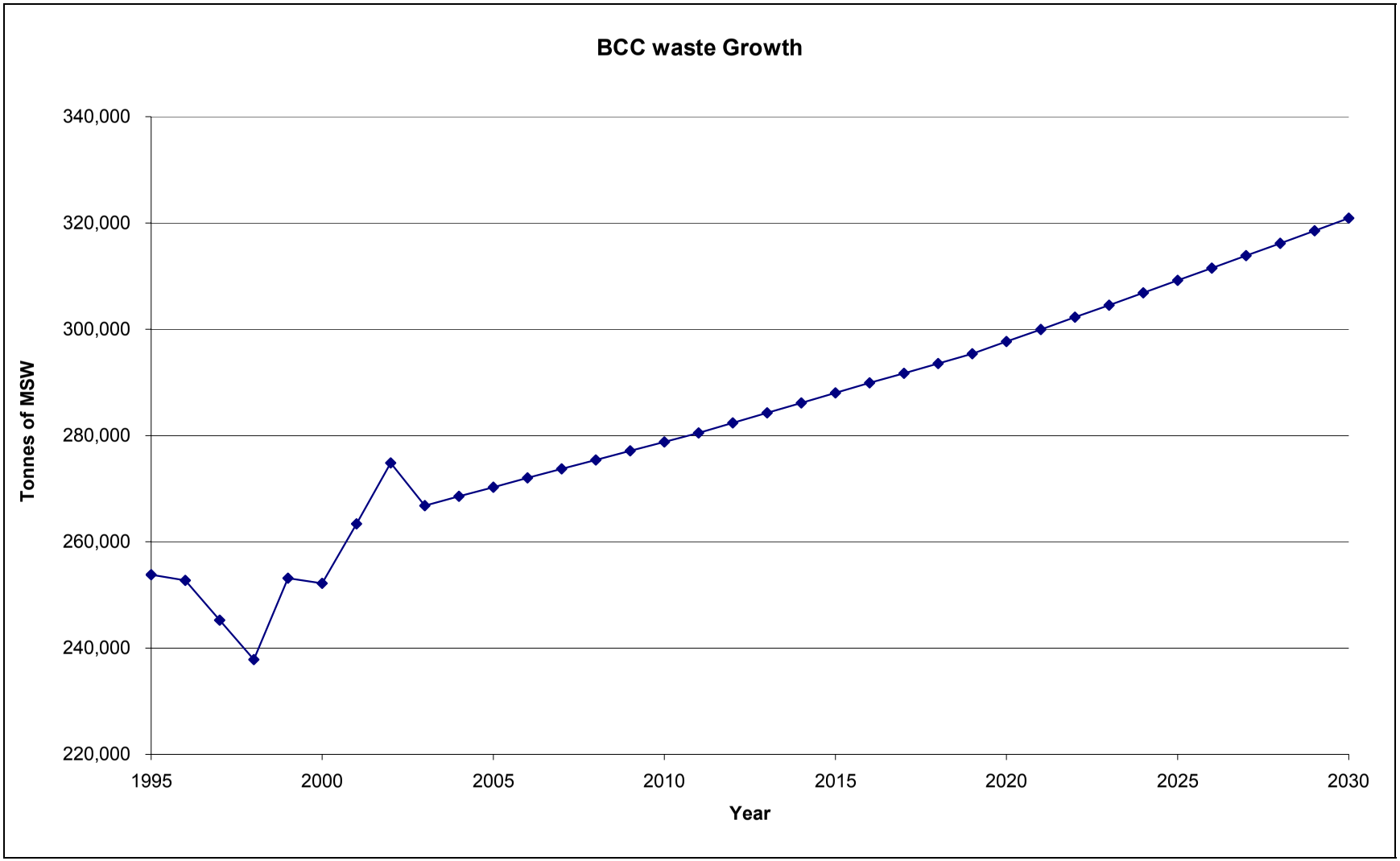
Trade and other Waste

Trade and other waste is assumed to be mainly produced by local shops etc. This waste stream is has been modelled in a manor that accounts for the same fluctuations as experienced by household waste. The two factors that effect total arisings are:

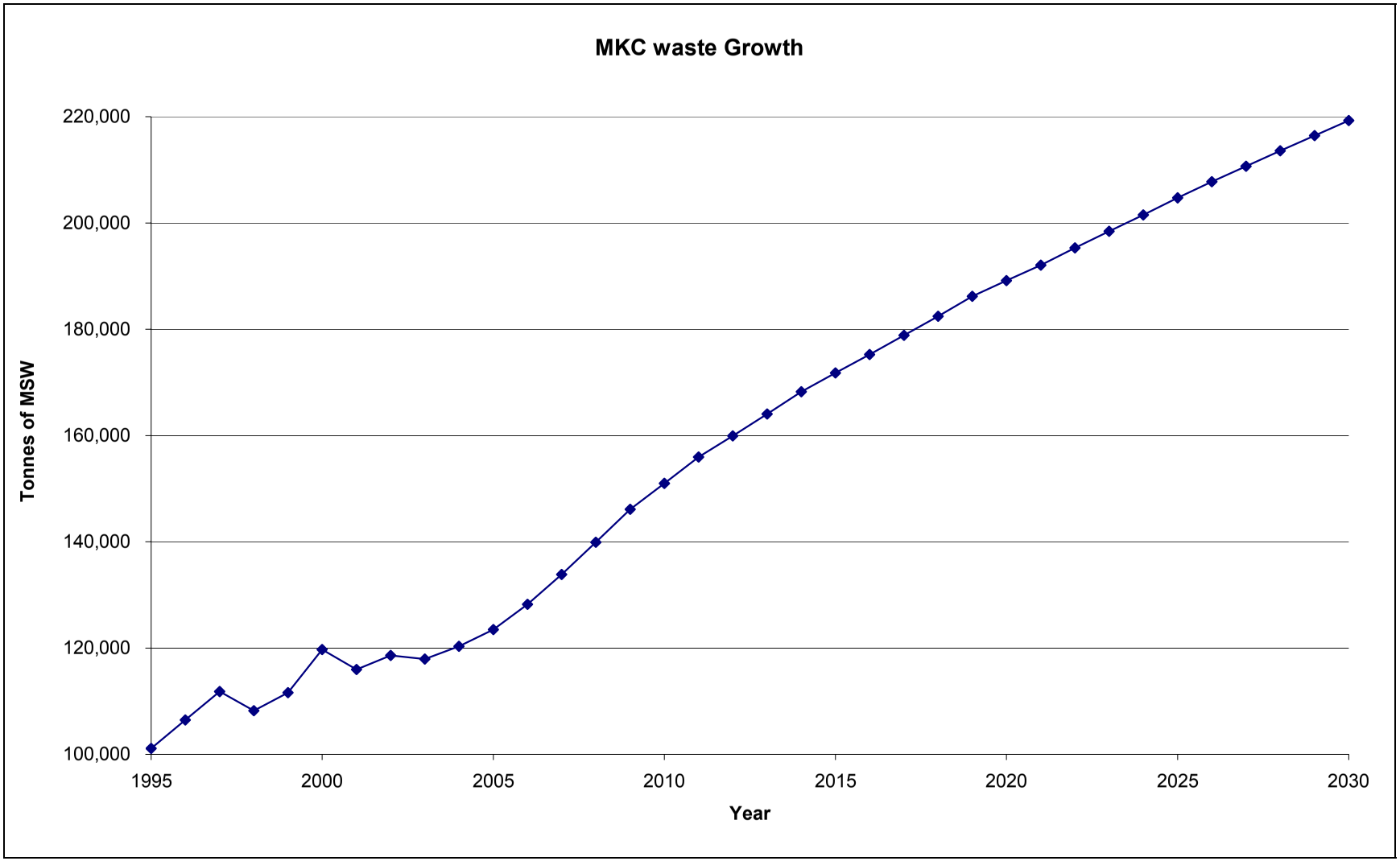
- An increase in population will increase the waste produced by traders
- A decrease future legislation and strategies.

Therefore the future growth in trade waste was calculated by multiplying last years tonnage by the growth used to increase collected household waste.

Graph A5a: BCC Predicted Waste Growth



Graph A5b: MKC Predicted Waste Growth



Appendix II: Capture Rate Methods

Capture Rate

The Capture Rate refers to the amount of a particular waste stream that is diverted by an initiative. It is comprised of four main factors:

- % Targeted: Physical property of waste stream (% of material that the council can recycle)
- % Roll Out: % of households that the Council provide a service to
- % Participation: % of households offered a service who choose to use it (average over year)

% Recognition: Percentage of participating householders who remember to put materials out for recycling/ composting on correct days/ times?

Percentage of participating householders who know what materials can be set out for recycling/ composting?

Percentage of participating householders that are bothered/ or able to set out materials for recycling/ composting at that particular time i.e. the hassle factor of placing materials in the correct box/ receptacle.

Multiplying these four factors together gives the percentage of the waste stream that will be diverted by the initiative. For any given waste stream, a maximum capture rate of about 70% can be achieved by the very best schemes.

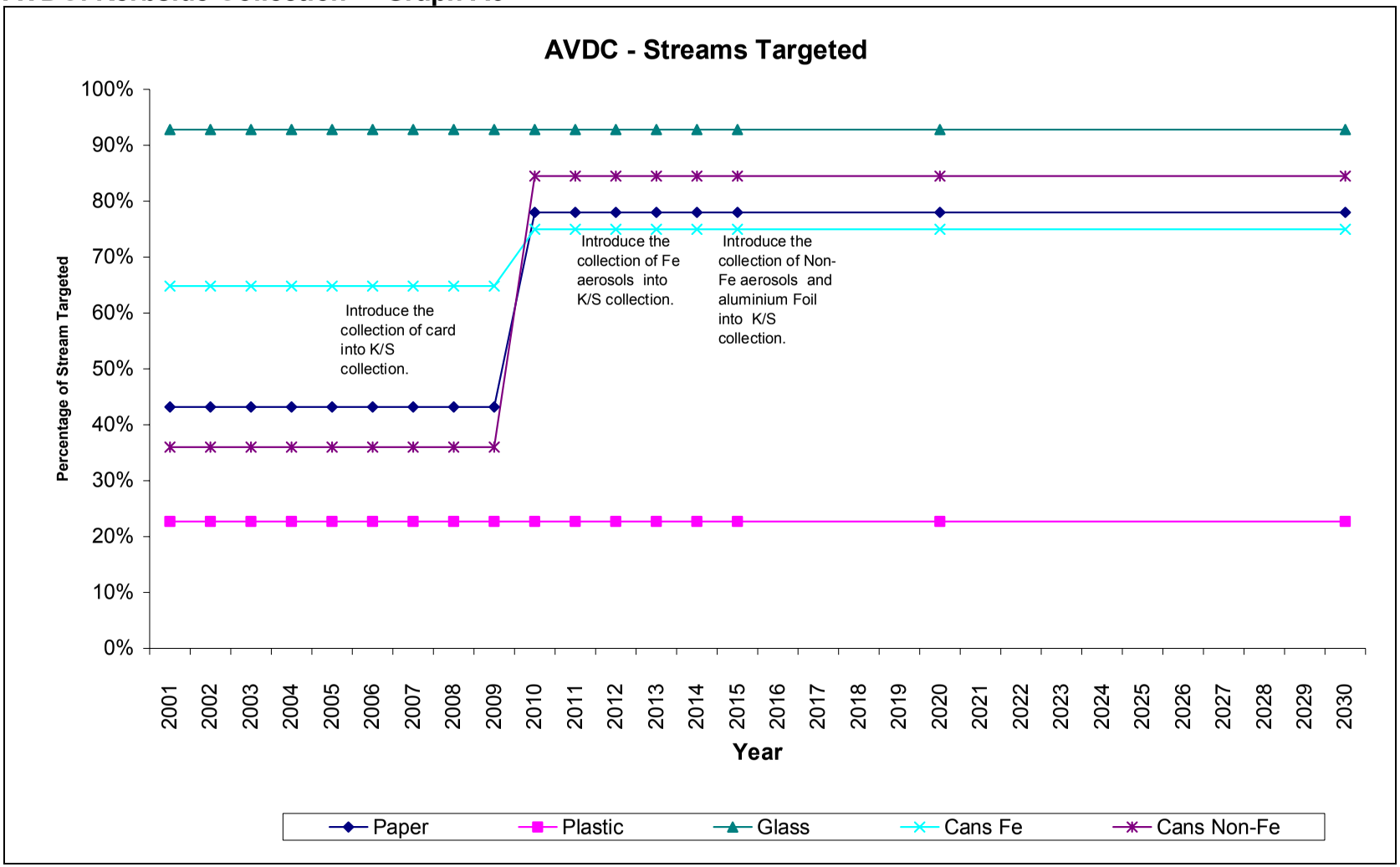
Example Capture rate calculation
The Paper and Card fraction of bin waste includes dirty food packaging, tissues and coated materials, which are not suited to recycling –about 80% is Targeted. A new kerbside recycling service is introduced by a Council, but because of difficult access areas and flats etc, only 95% of households are included in the Roll Out of the service. Among these households there are those who flatly refuse to participate, who drop out over time or use the service very infrequently (termed the set-out rate). Overall, say the equivalent of 70% of potential households regularly Participate in the new service. The final factor is that even among these participants, it is rare to find someone who separates all the correct items all of the time. The Recognition rate reflects the times that a person remembers (or can be bothered) to separate a recyclable waste from their mixed refuse; in this example say an ambitious 90% recognition rate is reached.
The Overall Capture rate of paper and card is therefore 80% (Targeted) * 95% (Roll Out) * 70% (Participation) * 90% (Recognition) = 48% [i.e. less than half of the paper and card fraction is recycled]

These principals were applied to the capture rates based on the predicted tonnages given to Buckinghamshire and Milton Keynes County Council. Where it appeared that the predictions were capturing more than a reasonable amount of that stream the above methodology was used to generate a stream close to 70% to represent a high performance service. These changes were applied to the new waste arisings and composition tonnages as a basis for short and medium term sensitivity models and also the two long-term scenarios.

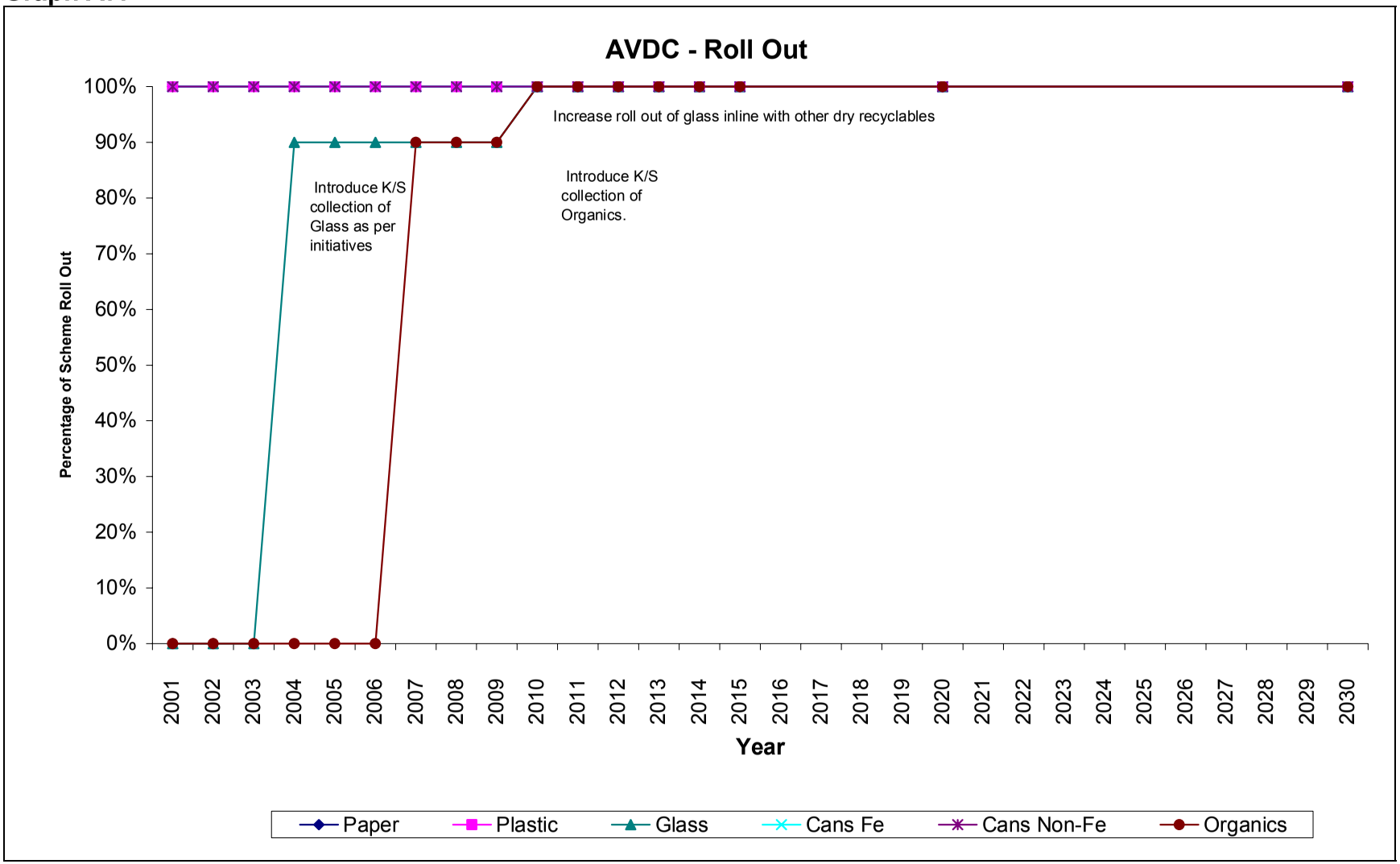
The following pages show the graphs of Buckinghamshire's Districts and Milton Keynes (splitting Kerbside and Bring Bank data) of the above factors. These have taken into consideration the short and long-term initiatives that BCC and MKC have highlighted. We have also predicted future targeted streams, roll out, participation and recognition rates (i.e. the optimised solution). We have ensured that the capture rates do not exceed standards given in the Strategy Unit Report (2002) – Recycling Participation Report.

Bring Bank Capture rates are calculated on the residual waste after the kerbside waste has been taken away.

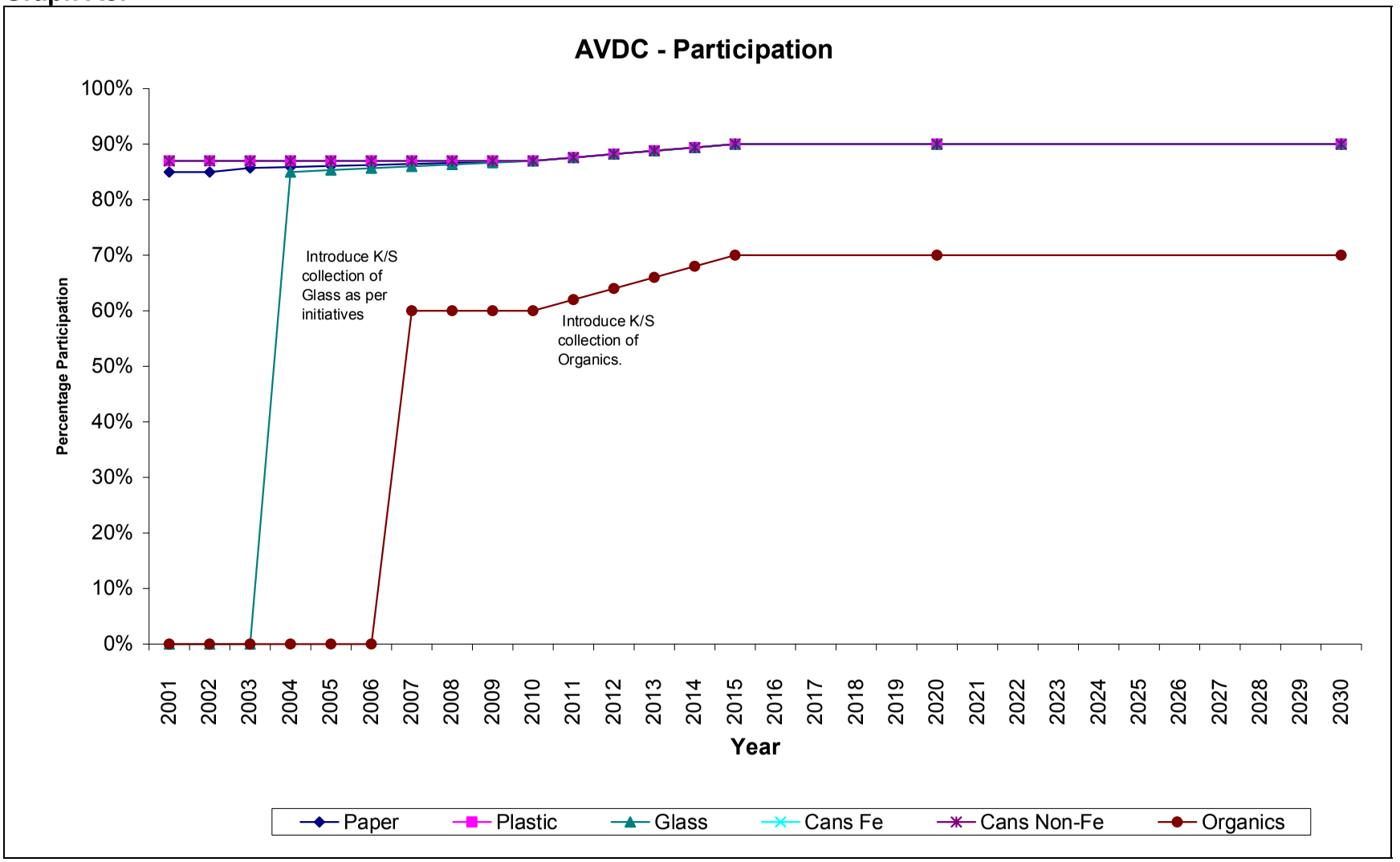
AVDC: Kerbside Collection Graph A6



Graph A7:


AVDC - Roll Out
Percentage of Scheme Roll Out
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Introduce K/S collection of Glass as per initiatives
Increase roll out of glass inline with other dry recyclables
Introduce K/S collection of Organics.
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A8:


AVDC - Participation
Percentage Participation
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Introduce K/S collection of Glass as per initiatives
Introduce K/S collection of Organics.
2001
2002
2003
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2012
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2014
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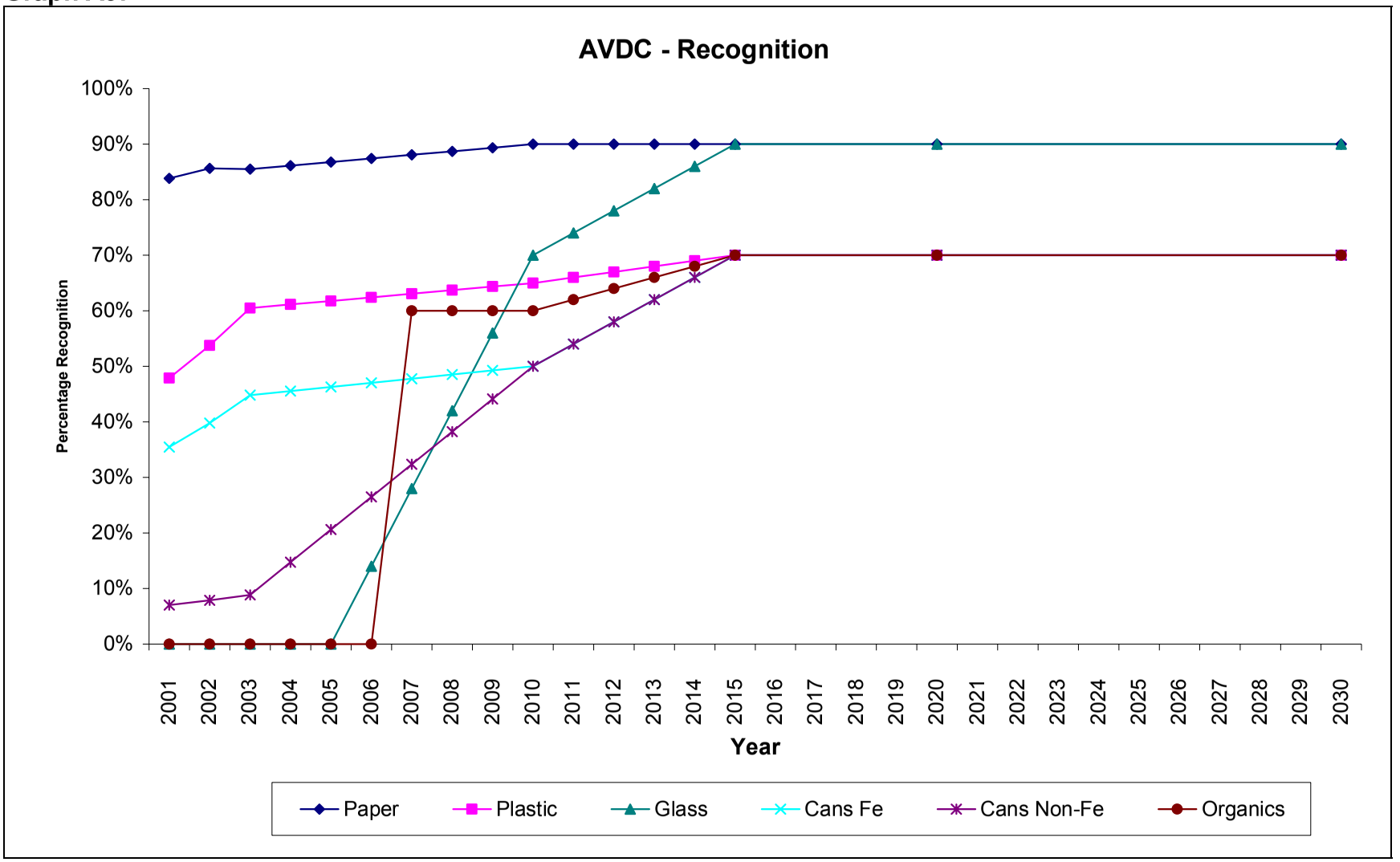
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A9:


AVDC - Recognition
Percentage Recognition
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2001
2002
2003
2004
2005
2006
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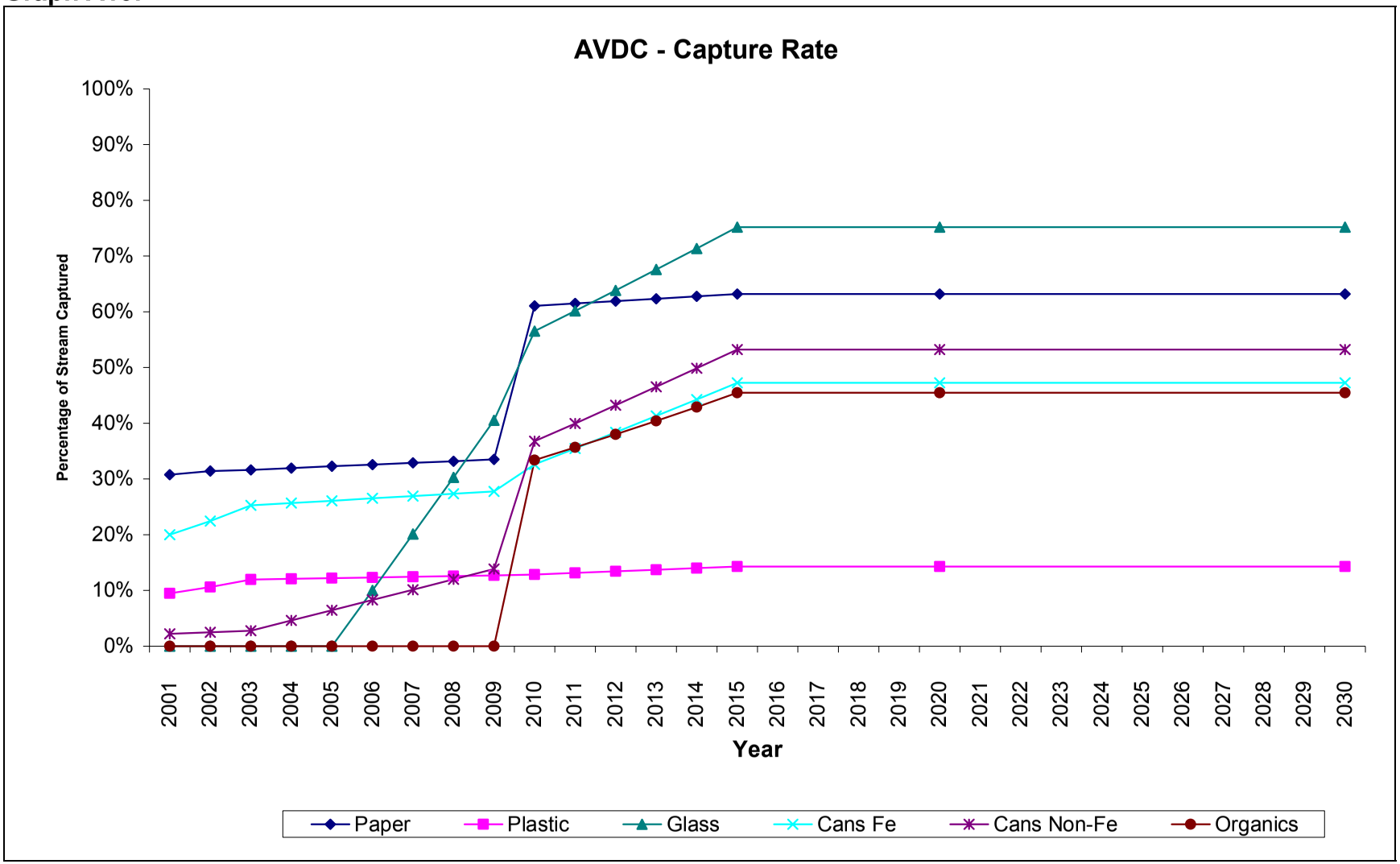
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A10:


AVDC - Capture Rate
Percentage of Stream Captured
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
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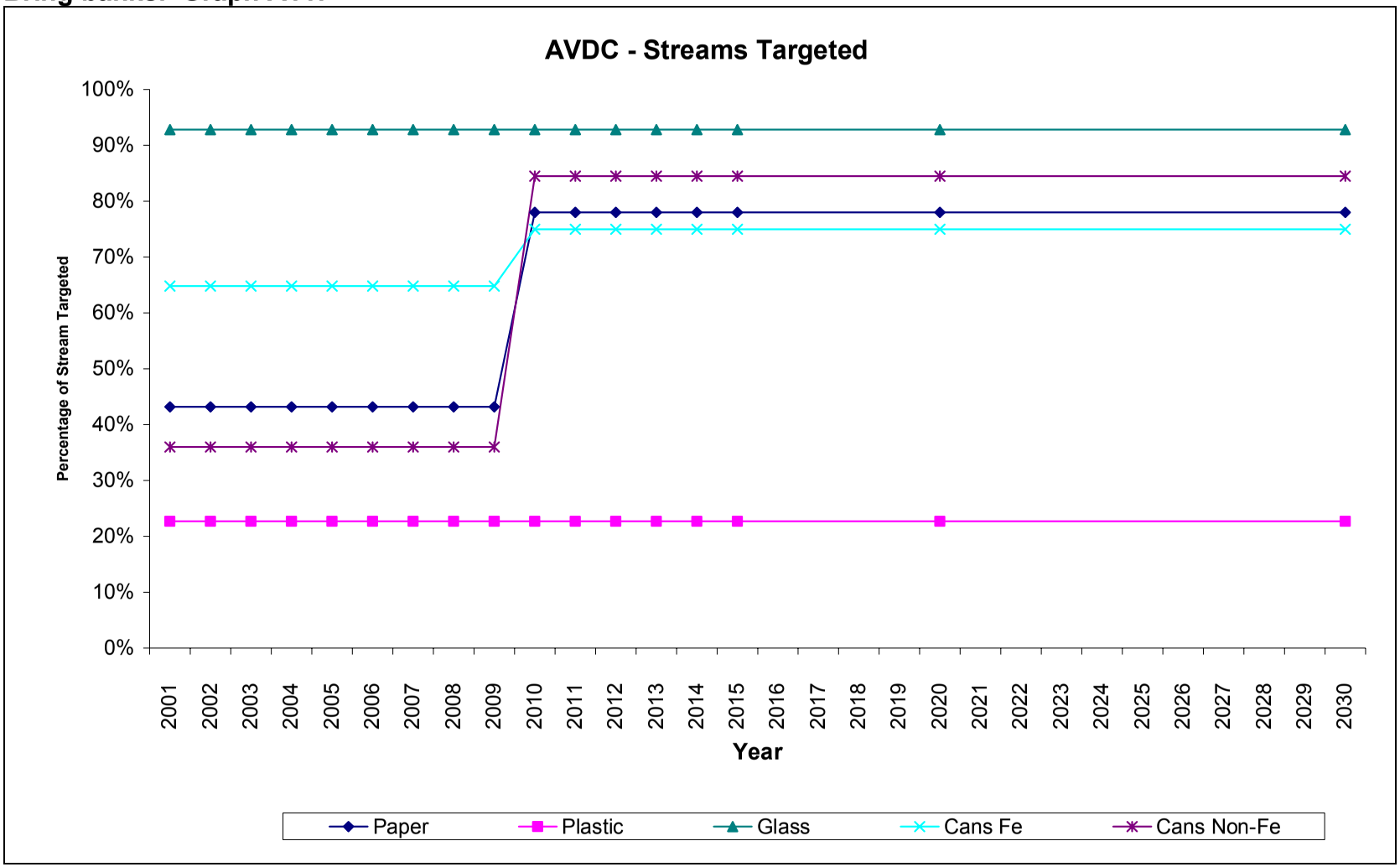
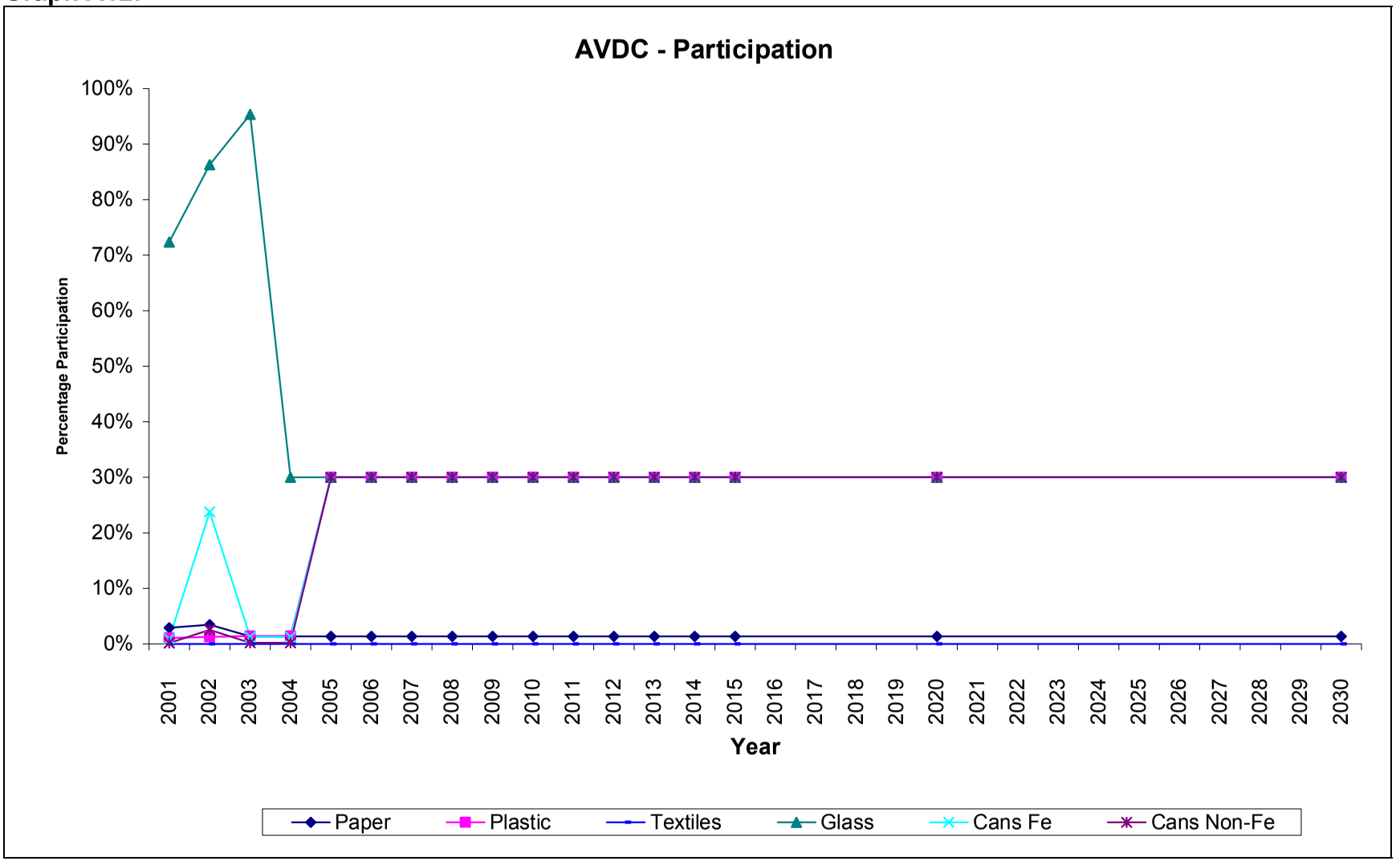
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Bring banks. Graph A11:



Graph A12:


AVDC - Participation
Percentage Participation
100%
90%
80%
70%
60%
50%
40%
30%
20%
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0%
2001
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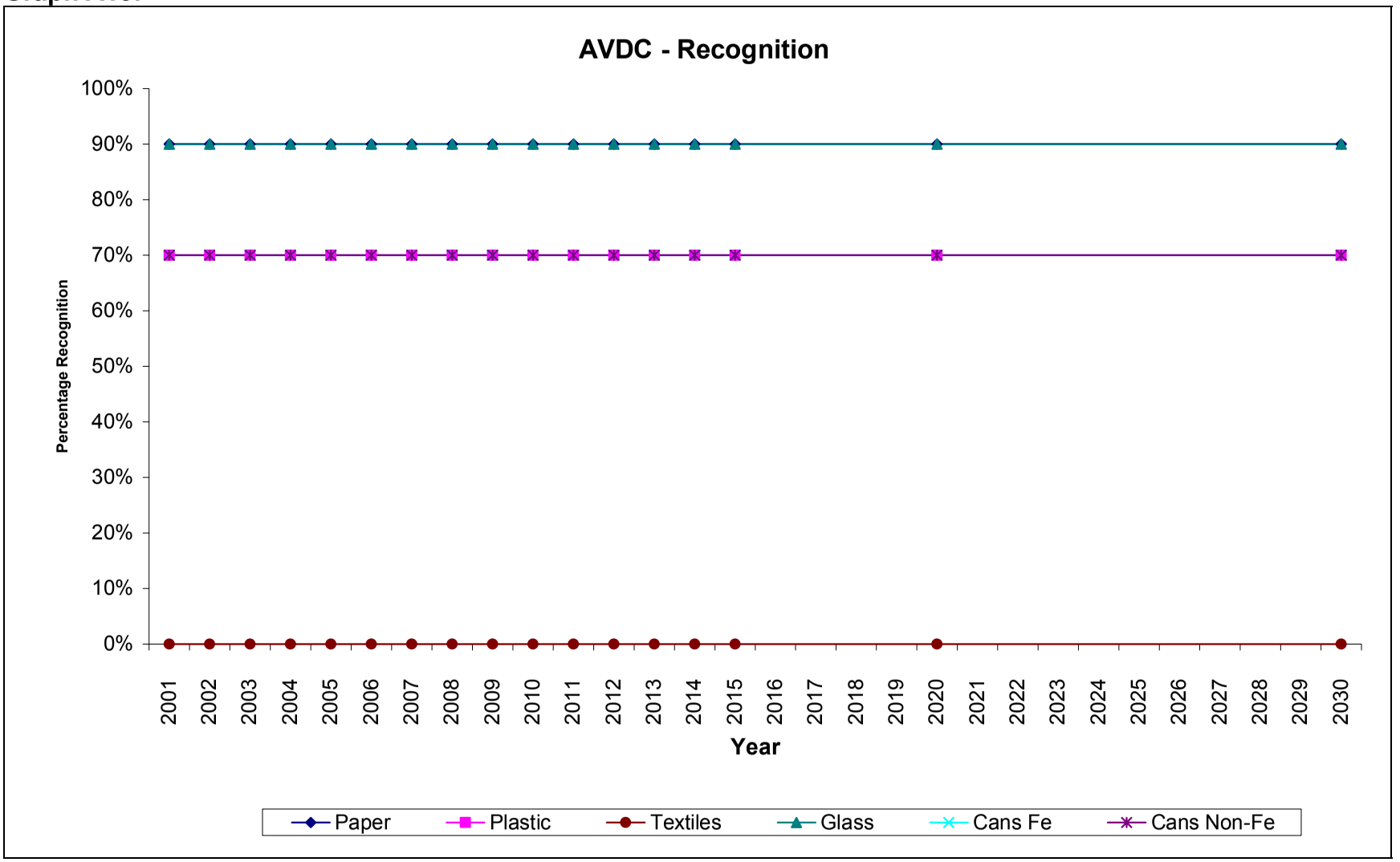
2030
Year
Paper
Plastic
Textiles
Glass
Cans Fe
Cans Non-Fe

Graph A13:


AVDC - Recognition
100%
90%
80%
70%
60%
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Percentage Recognition
2001
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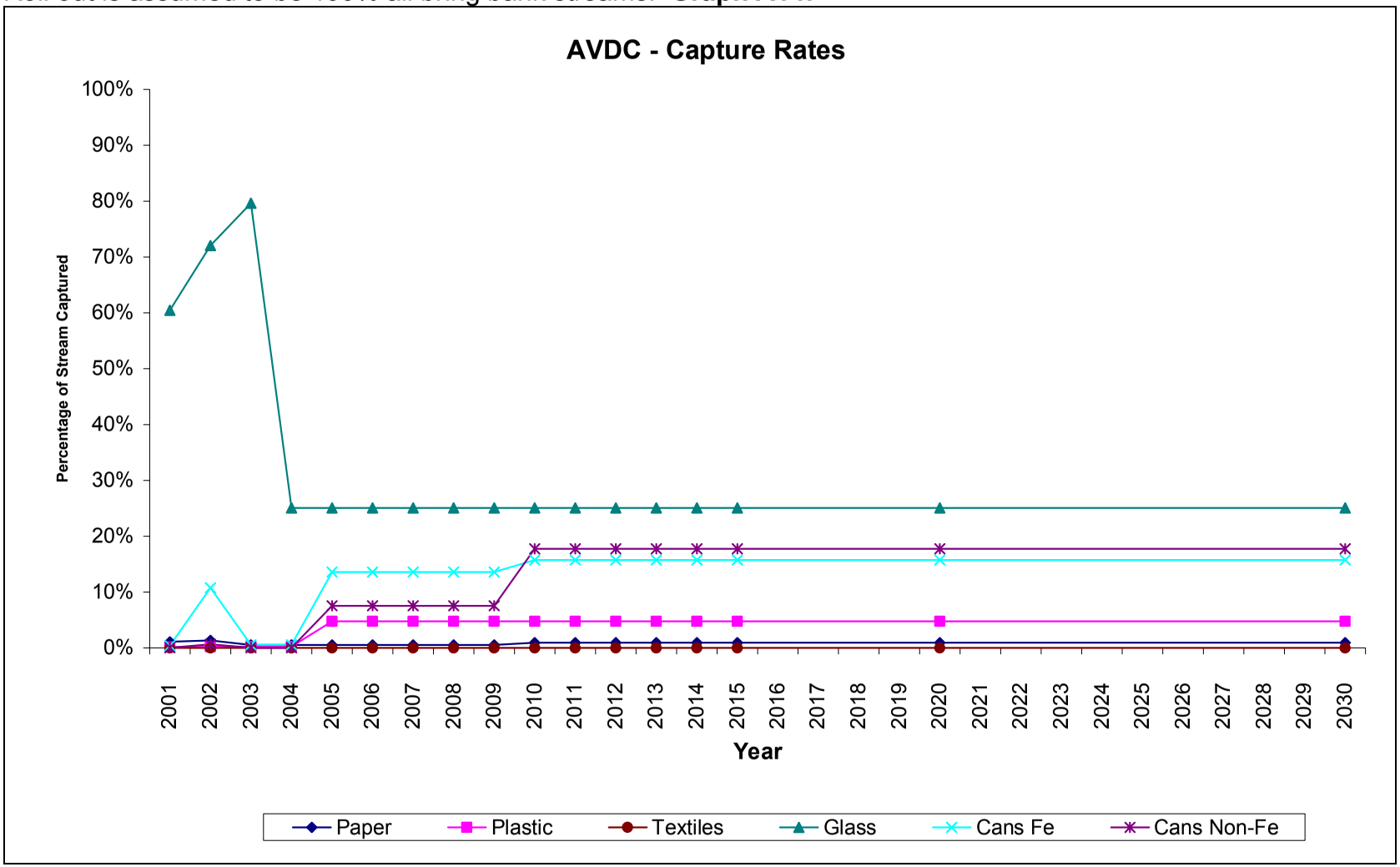
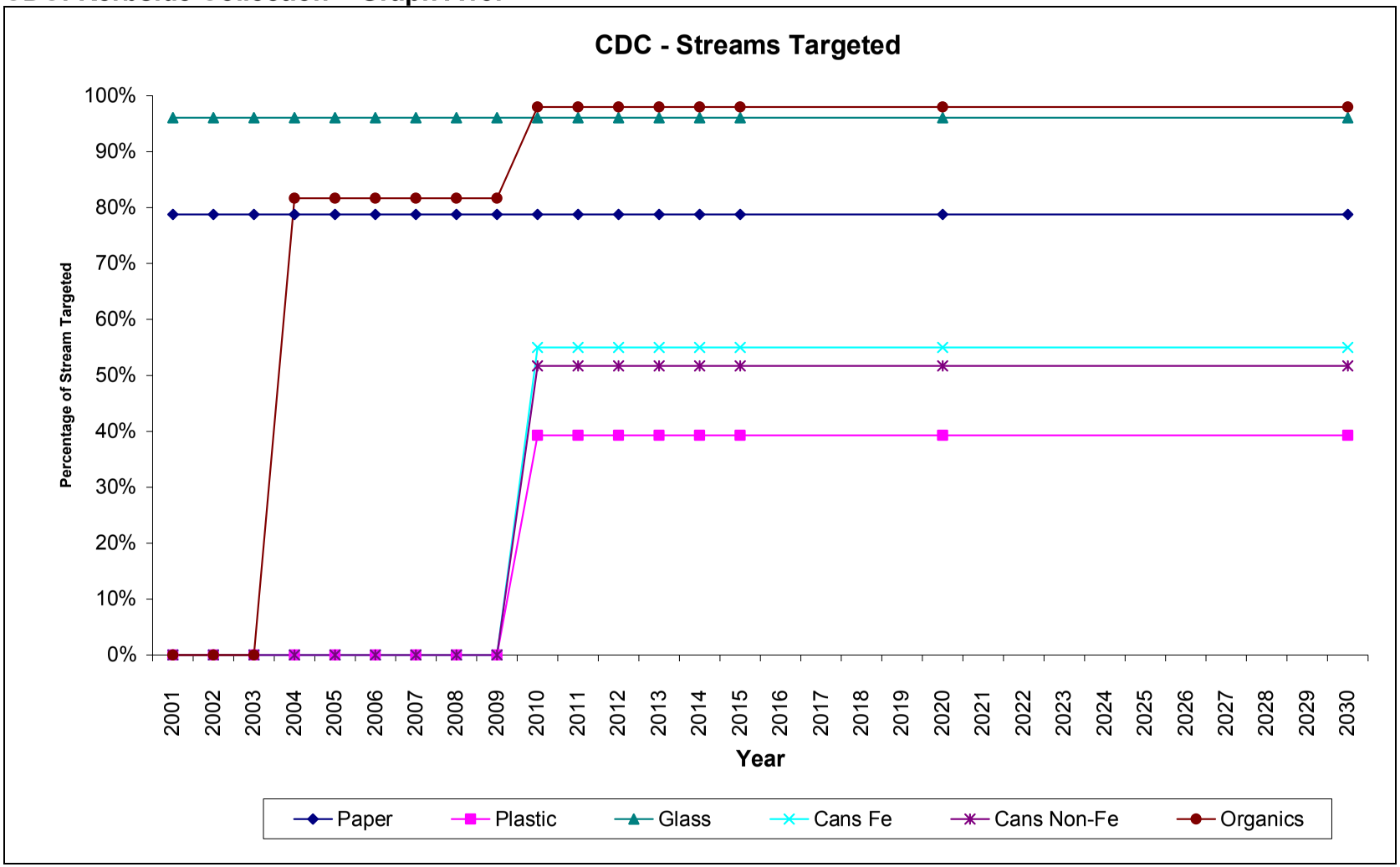
2030
Year
Paper
Plastic
Textiles
Glass
Cans Fe
Cans Non-Fe

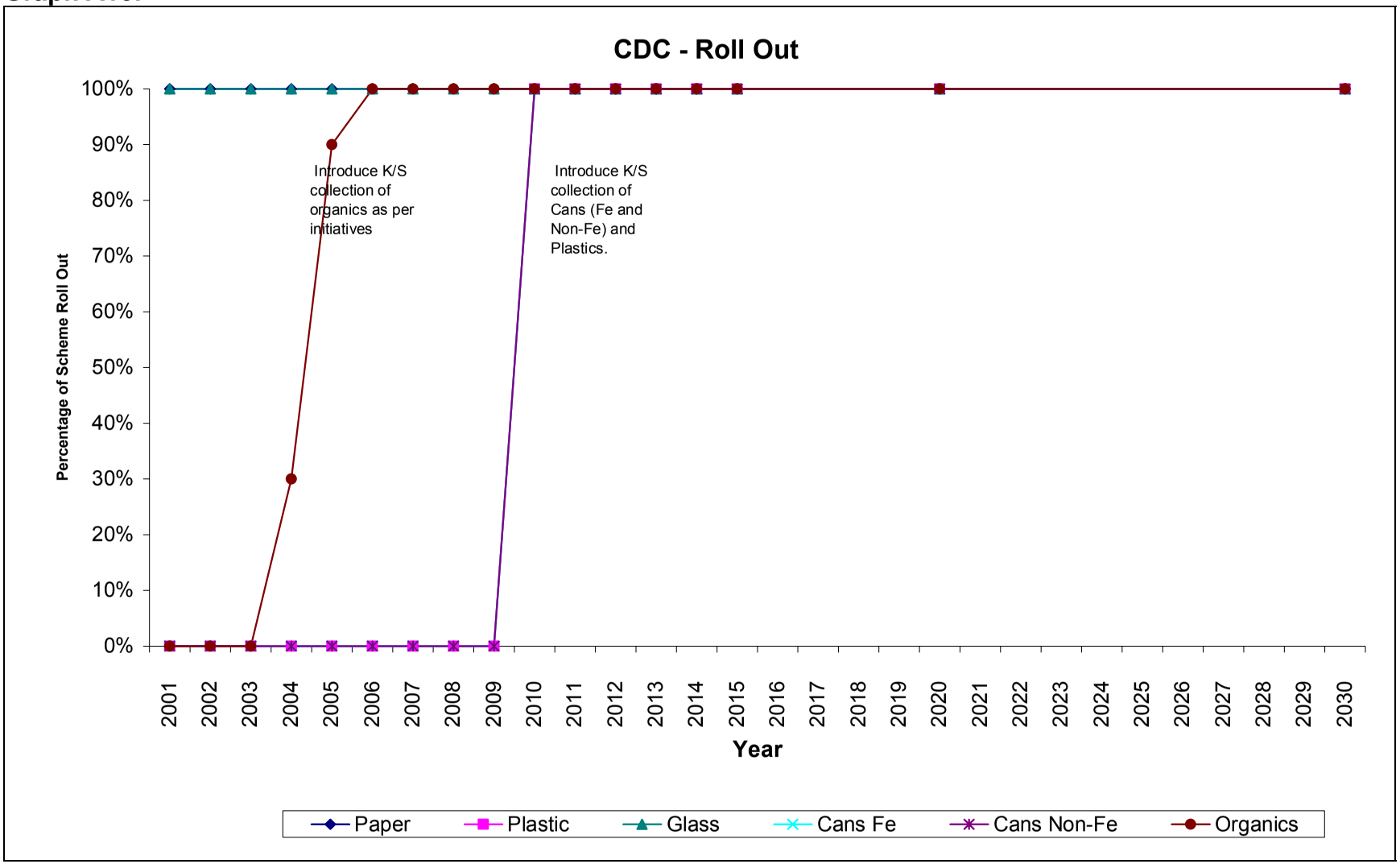
Roll out is assumed to be 100% all bring bank streams. **Graph A14:**



CDC: Kerbside Collection Graph A15:



Graph A16:


CDC - Roll Out
Percentage of Scheme Roll Out
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Introduce K/S collection of organics as per initiatives
Introduce K/S collection of Cans (Fe and Non-Fe) and Plastics.
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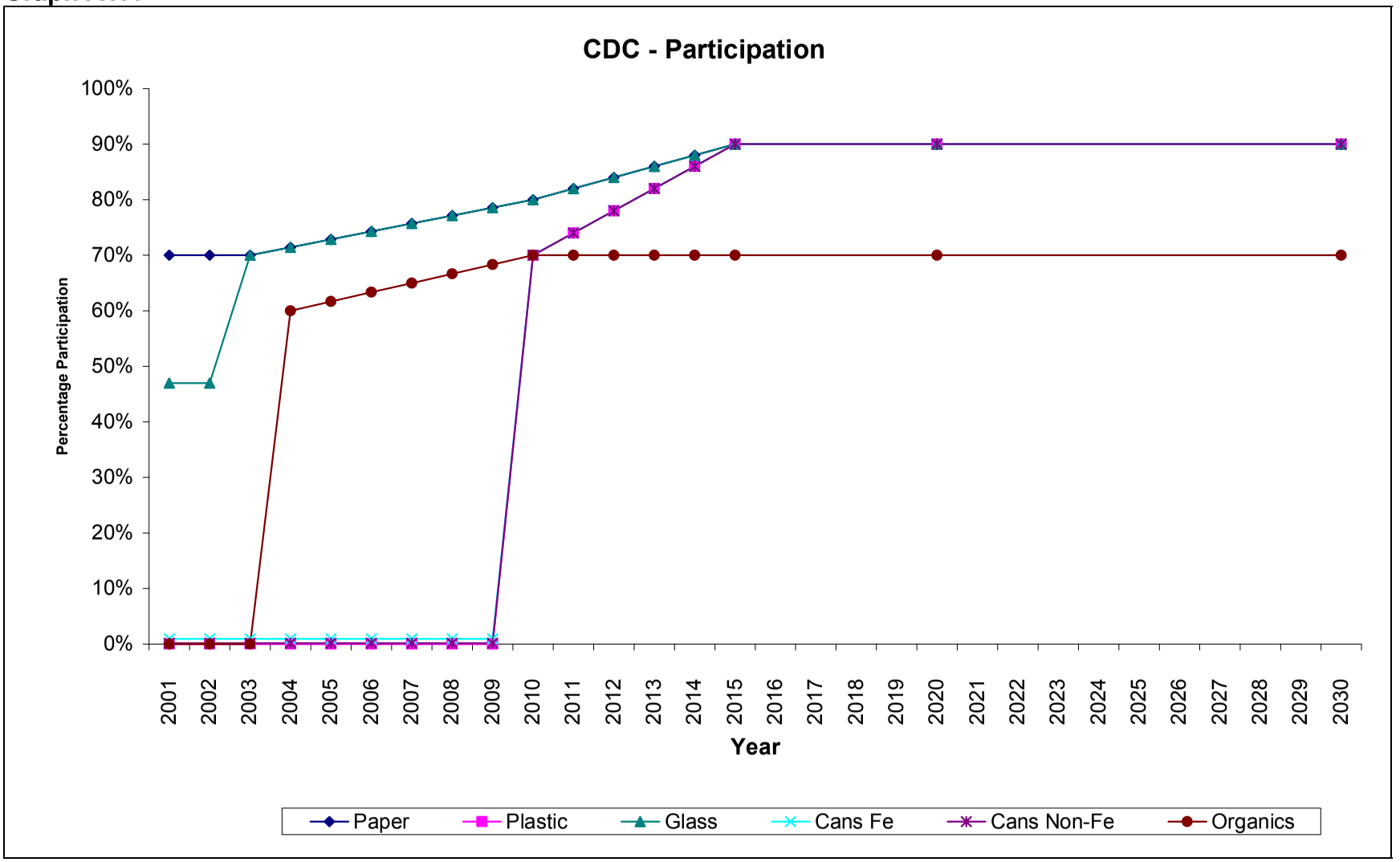
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A17:


CDC - Participation
Percentage Participation
100%
90%
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10%
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2001
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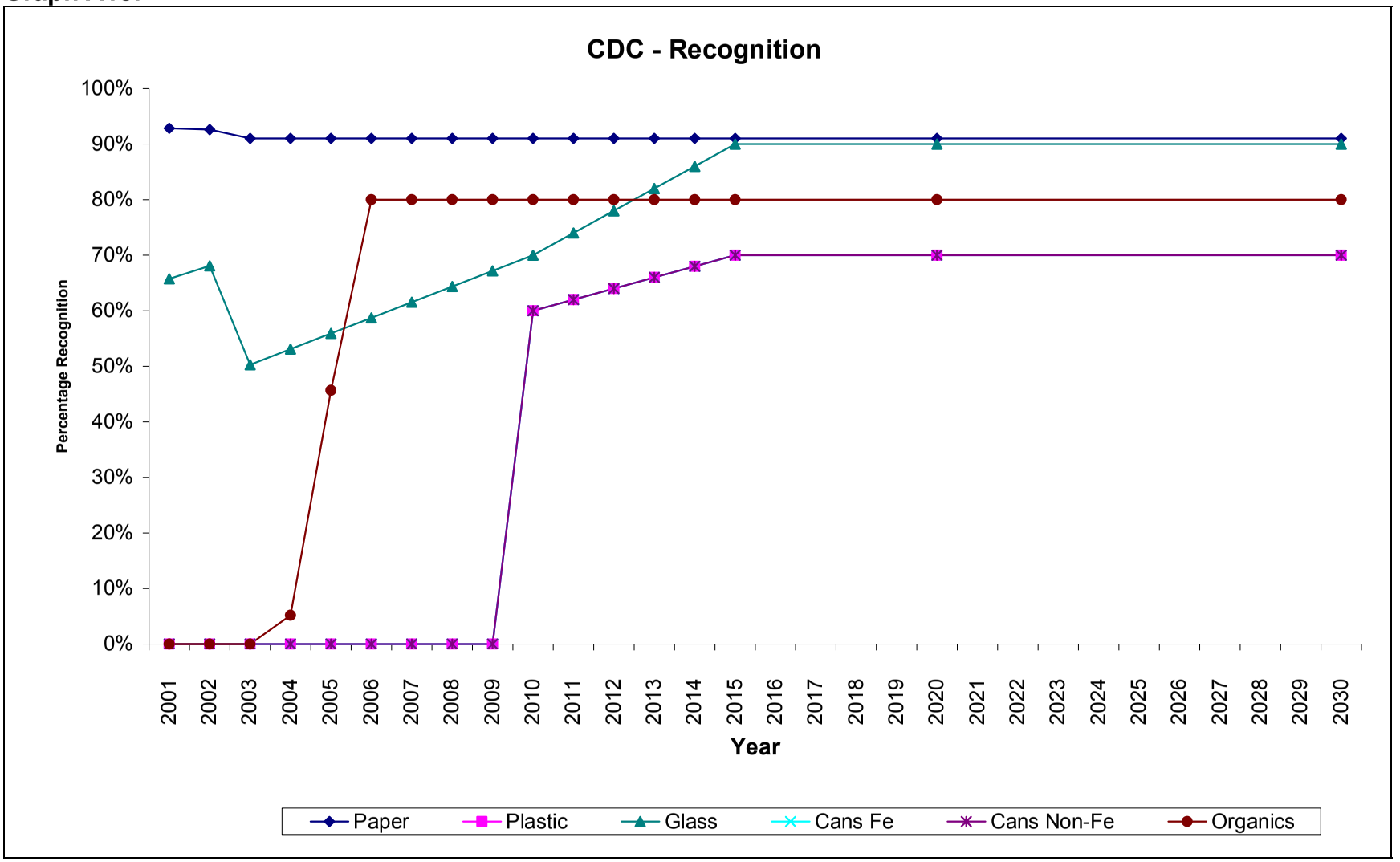
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A18:


CDC - Recognition
Percentage Recognition
100%
90%
80%
70%
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2001
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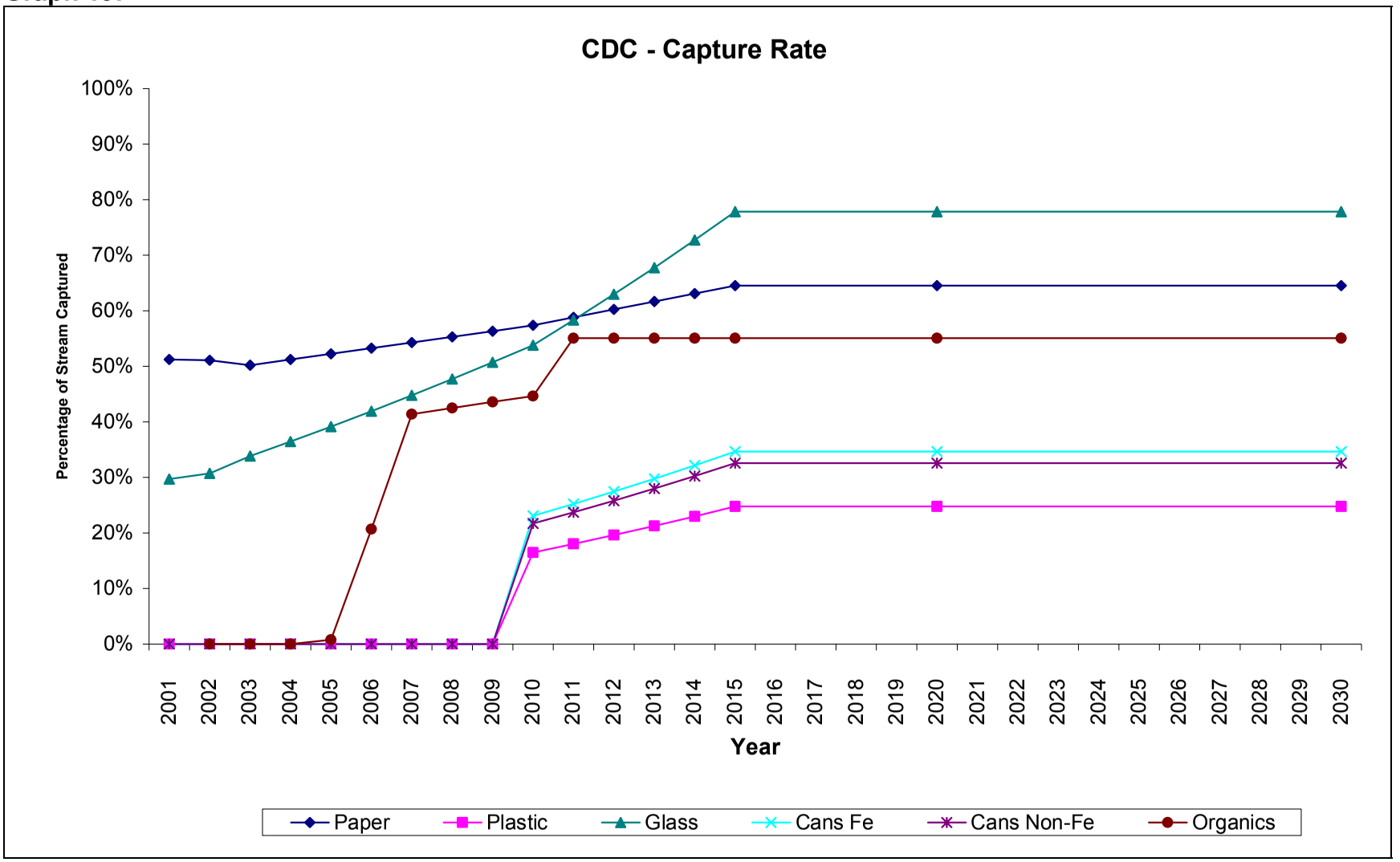
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph 19:


CDC - Capture Rate
Percentage of Stream Captured
100%
90%
80%
70%
60%
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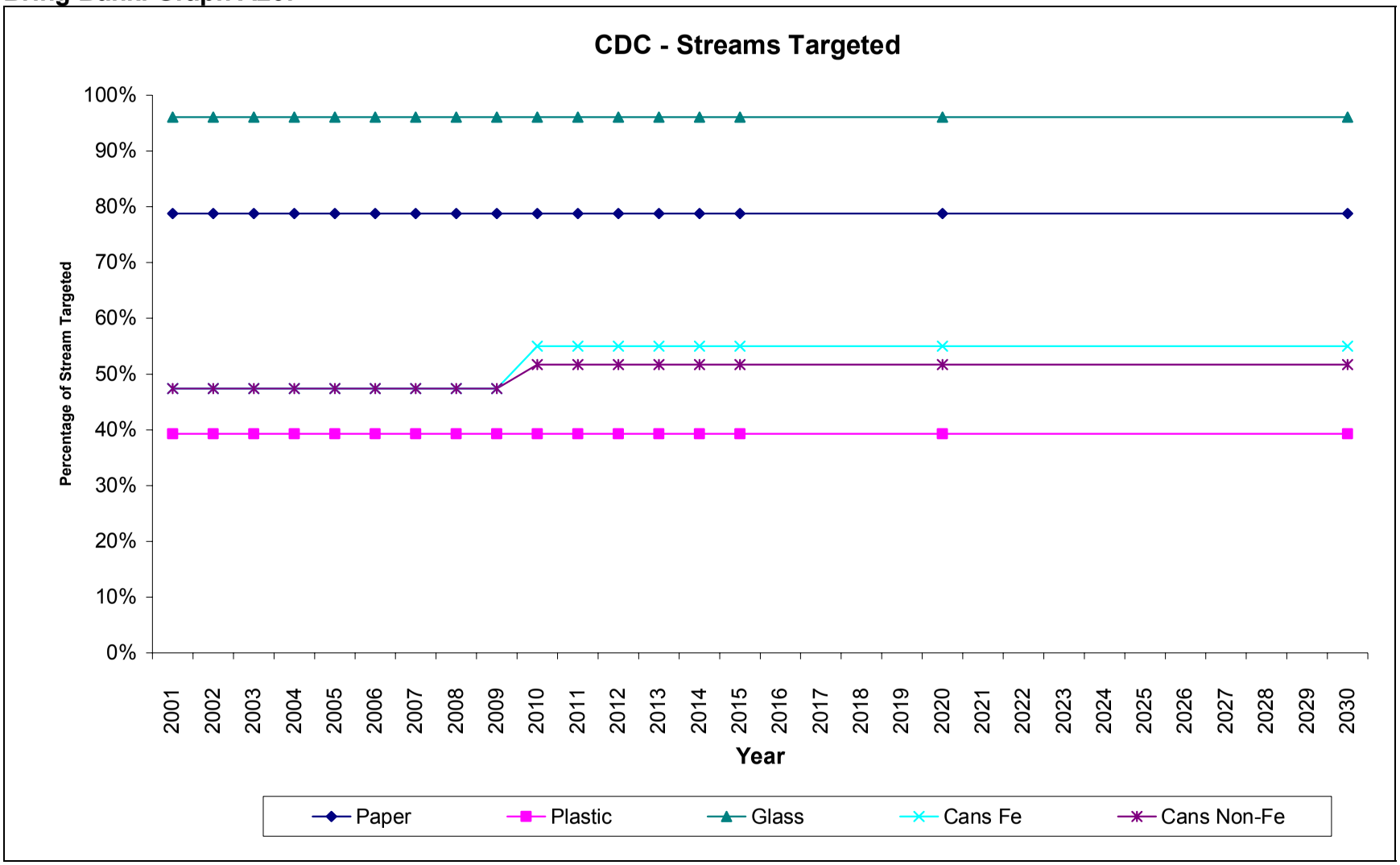
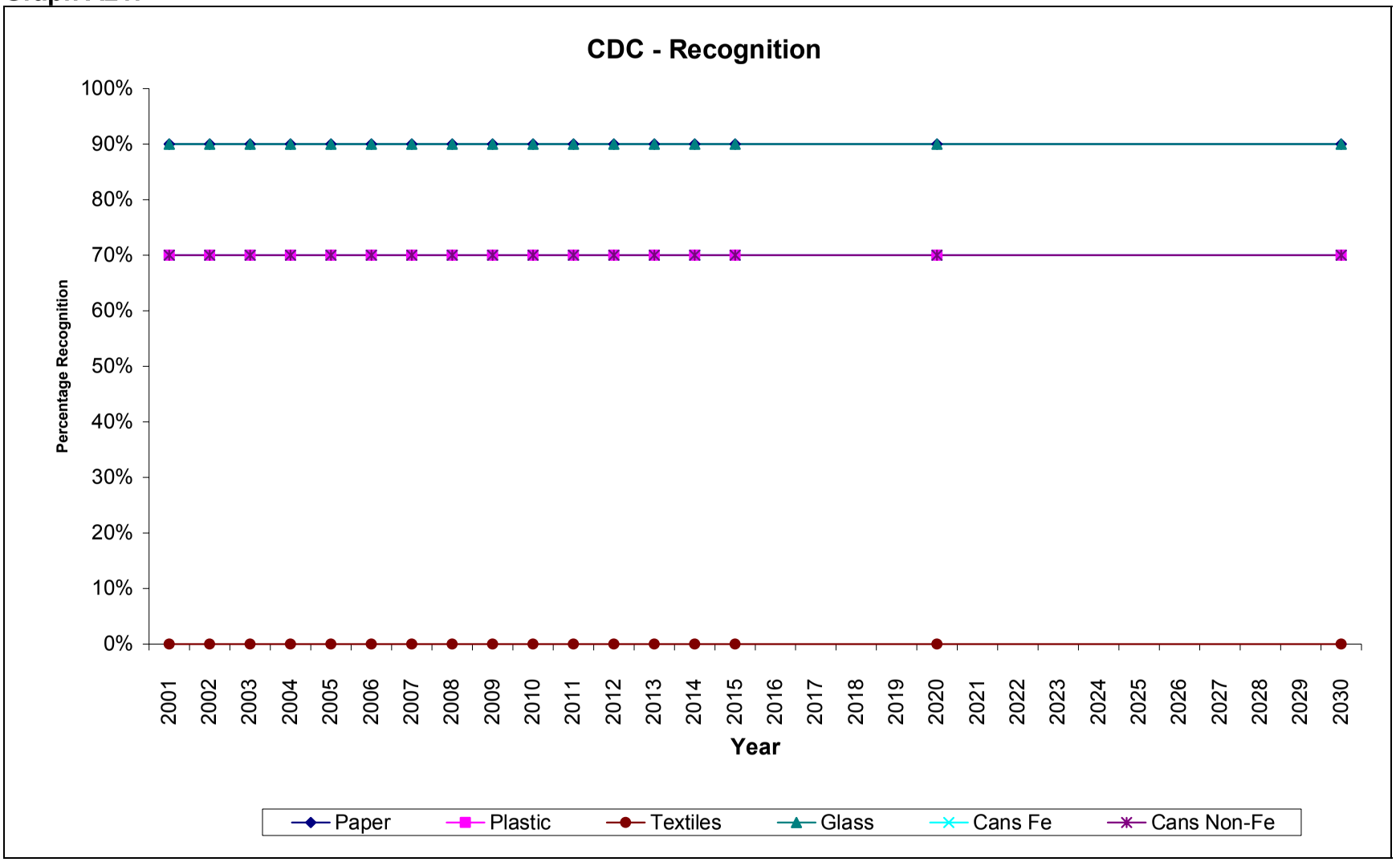
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Bring Bank. Graph A20:



Graph A21:


CDC - Recognition
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage Recognition
2001
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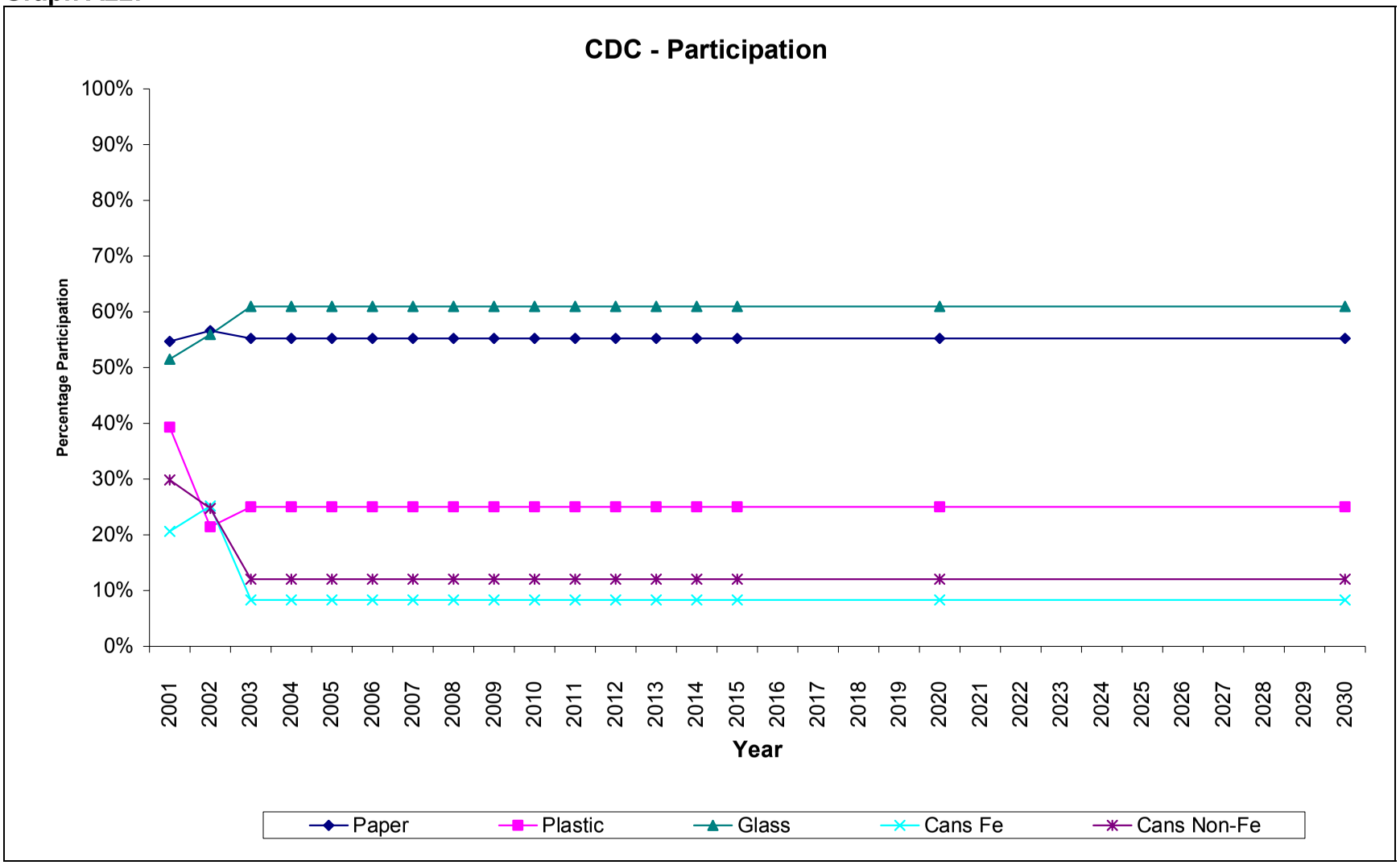
2028
2029
2030
Year
Paper
Plastic
Textiles
Glass
Cans Fe
Cans Non-Fe

Graph A22:


CDC - Participation
Percentage Participation
100%
90%
80%
70%
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2001
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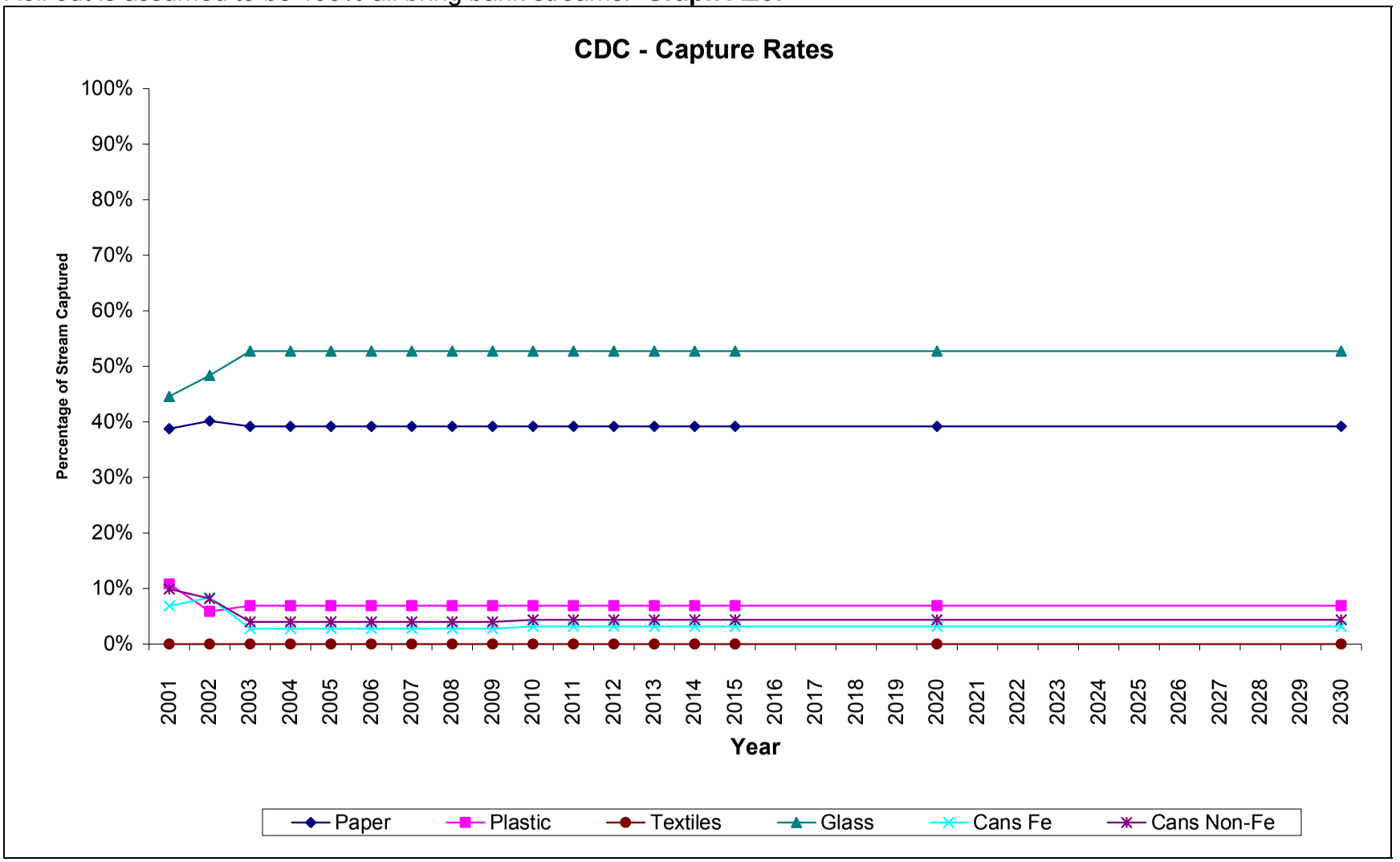
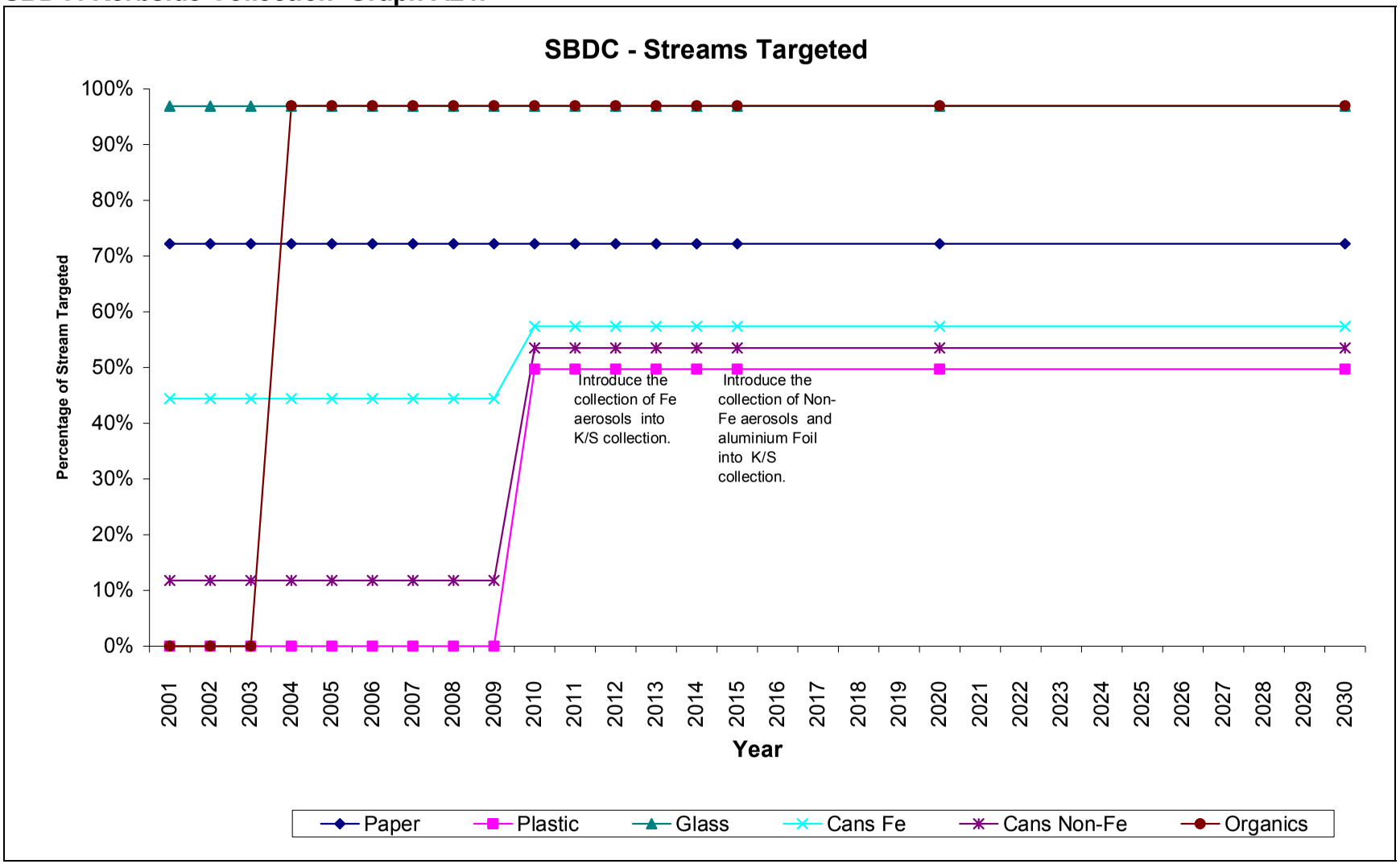
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe

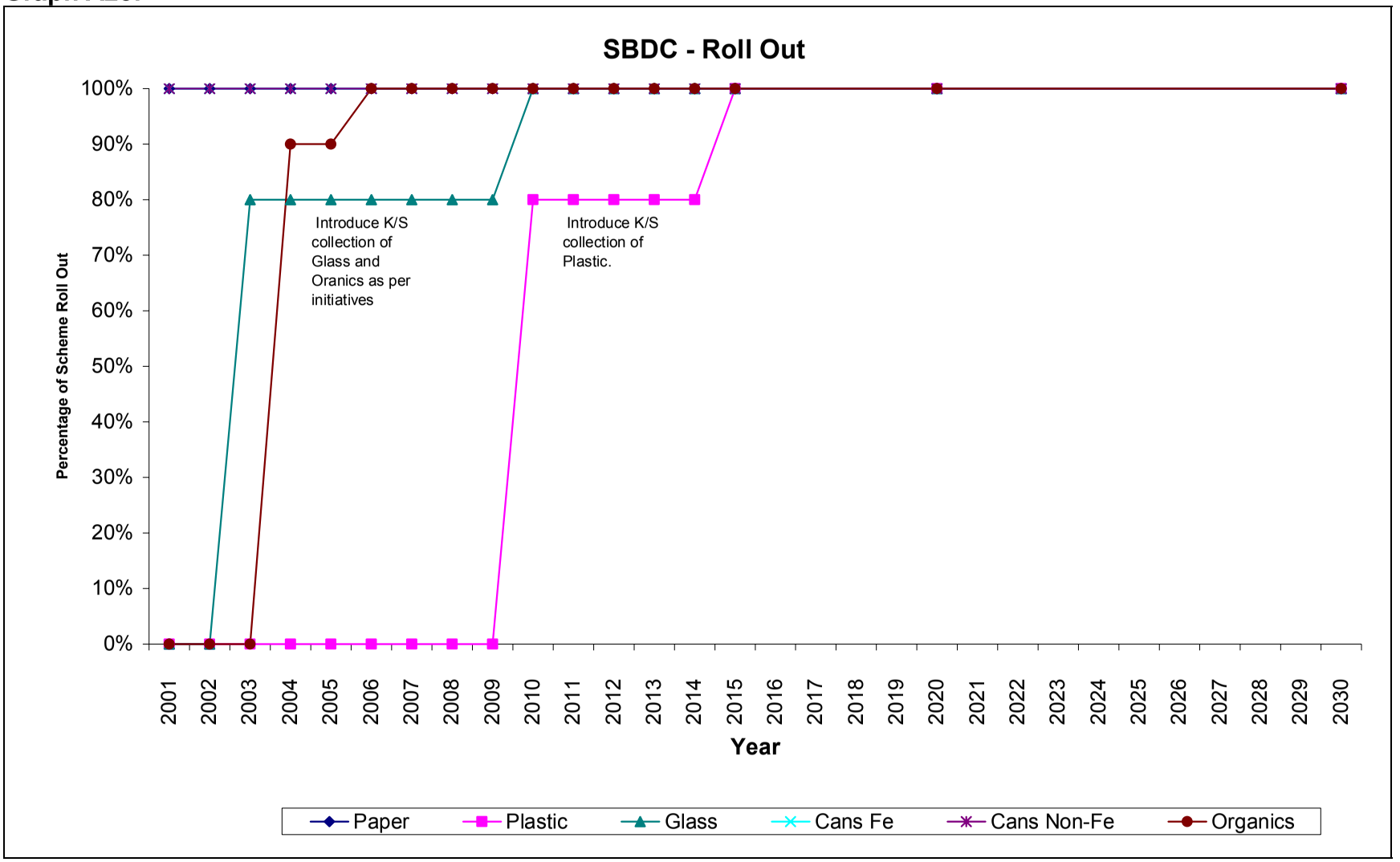
Roll out is assumed to be 100% all bring bank streams. **Graph A23:**



SBDC: Kerbside Collection Graph A24:



Graph A25:


SBDC - Roll Out
Percentage of Scheme Roll Out
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Introduce K/S collection of Glass and Oranics as per initiatives
Introduce K/S collection of Plastic.
2001
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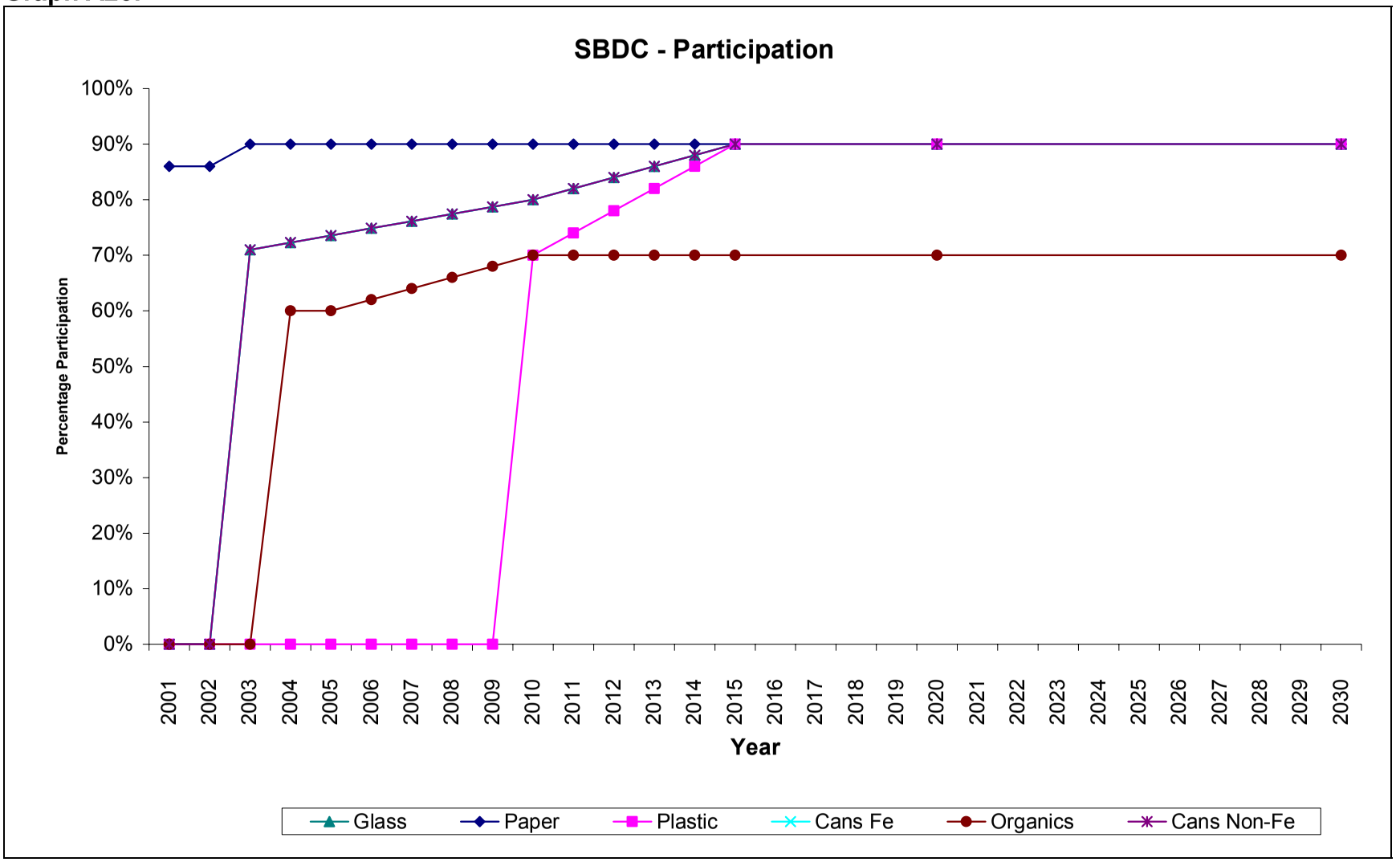
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A26:


SBDC - Participation
Percentage Participation
100%
90%
80%
70%
60%
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2001
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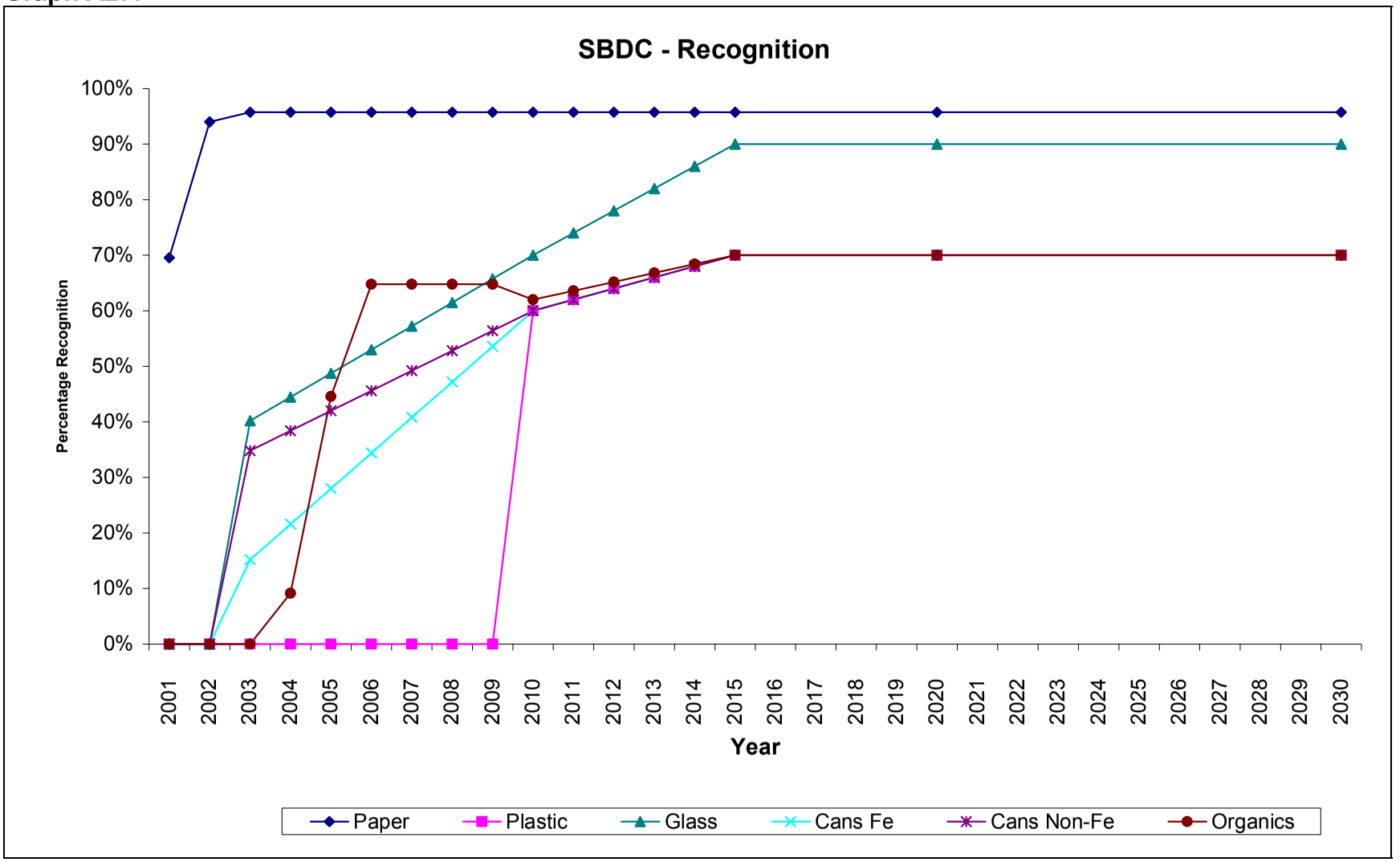
2030
Year
Glass
Paper
Plastic
Cans Fe
Organics
Cans Non-Fe

Graph A27:


SBDC - Recognition
Percentage Recognition
100%
90%
80%
70%
60%
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2001
2002
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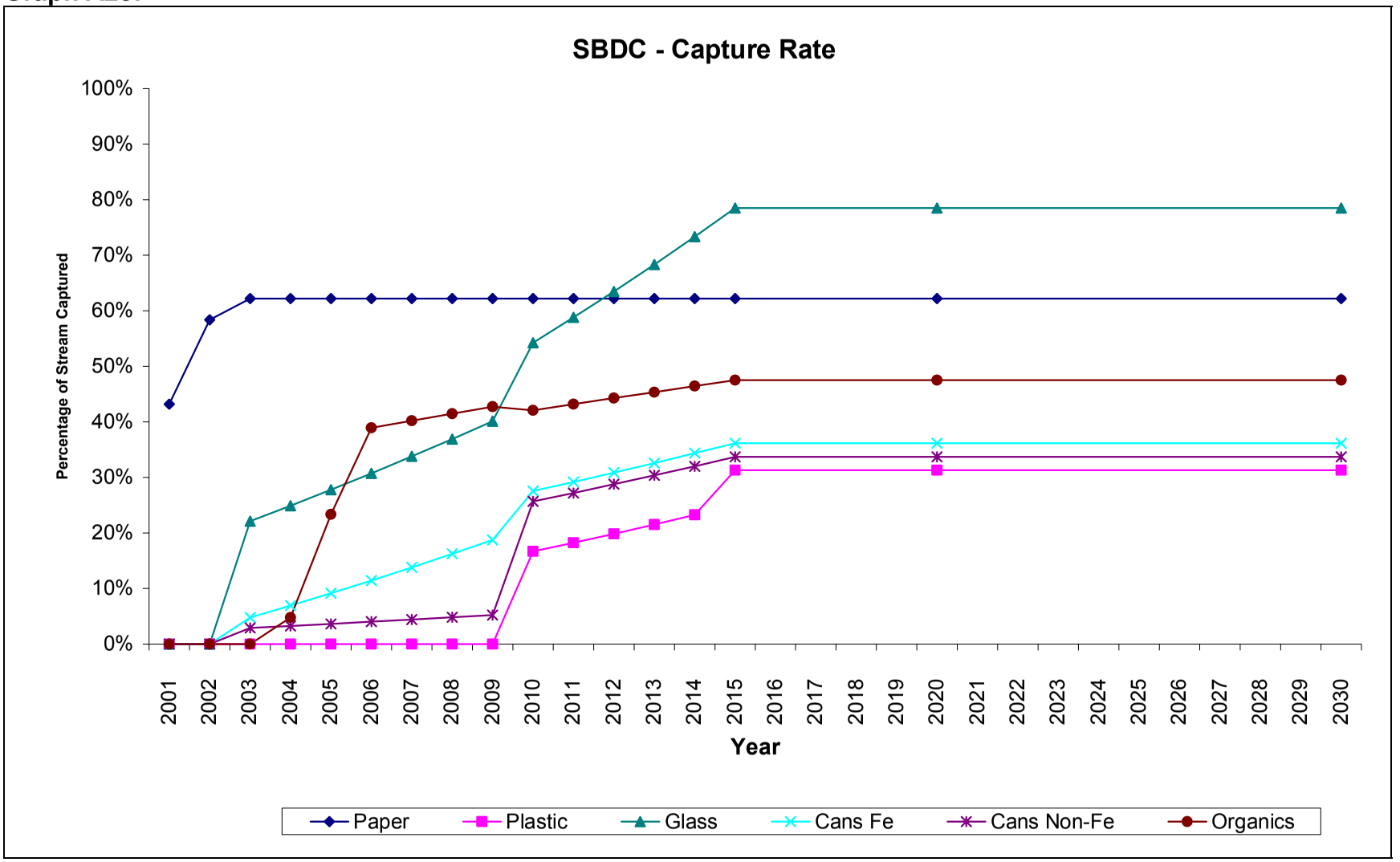
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A28:


SBDC - Capture Rate
Percentage of Stream Captured
100%
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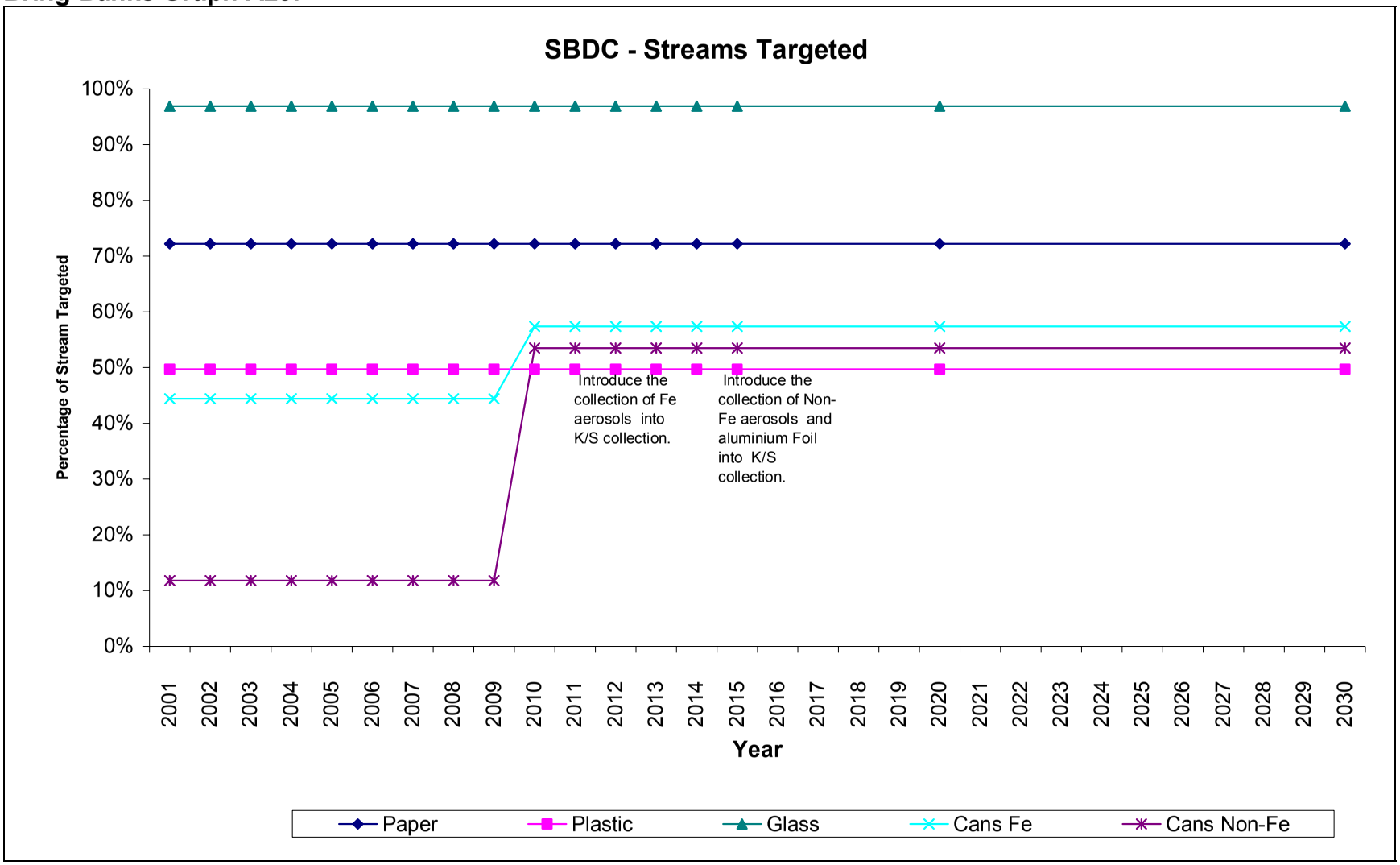
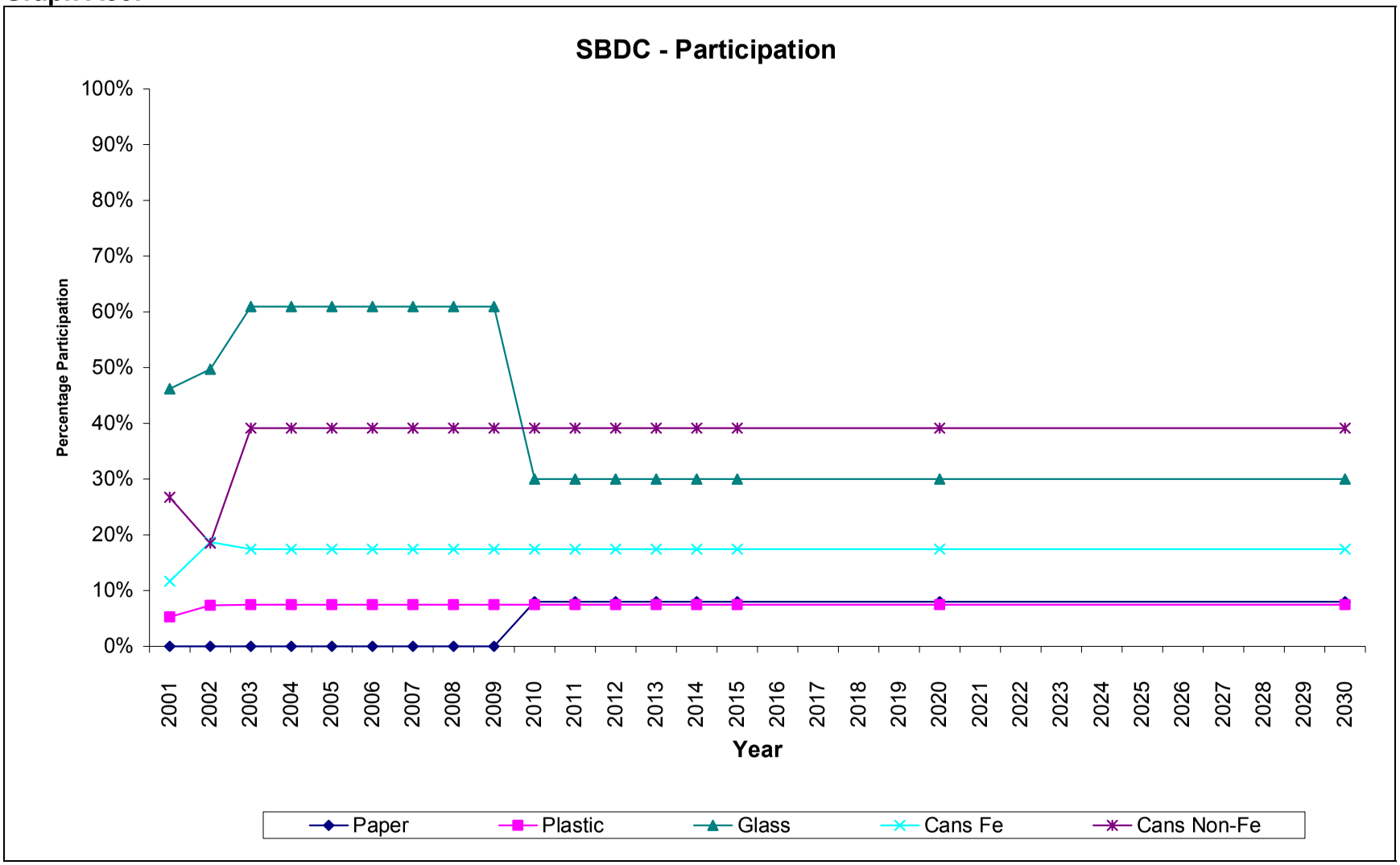
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Bring Banks Graph A29:



Graph A30:


SBDC - Participation
Percentage Participation
100%
90%
80%
70%
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2001
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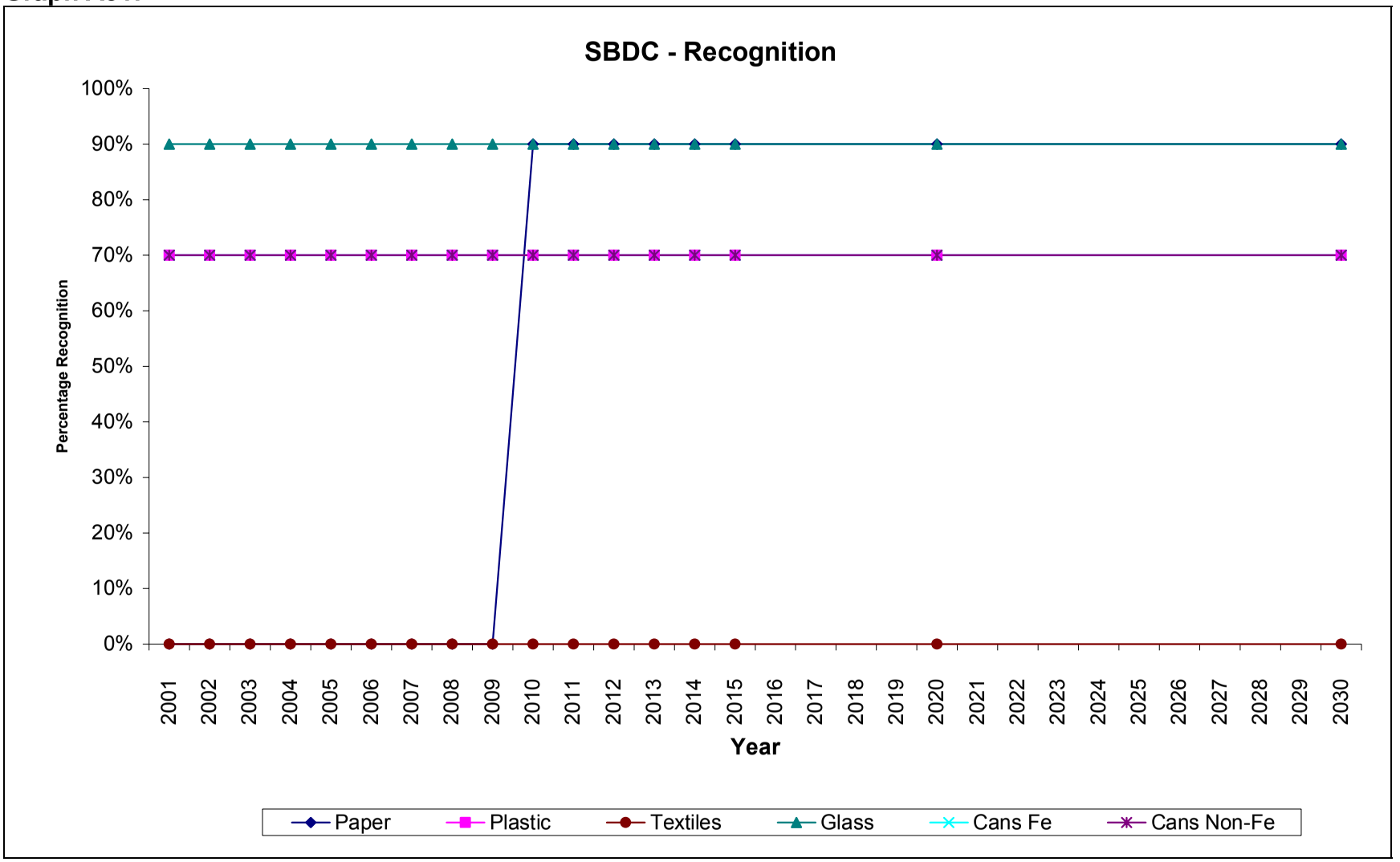
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe

Graph A31:


SBDC - Recognition
Percentage Recognition
100%
90%
80%
70%
60%
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40%
30%
20%
10%
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2001
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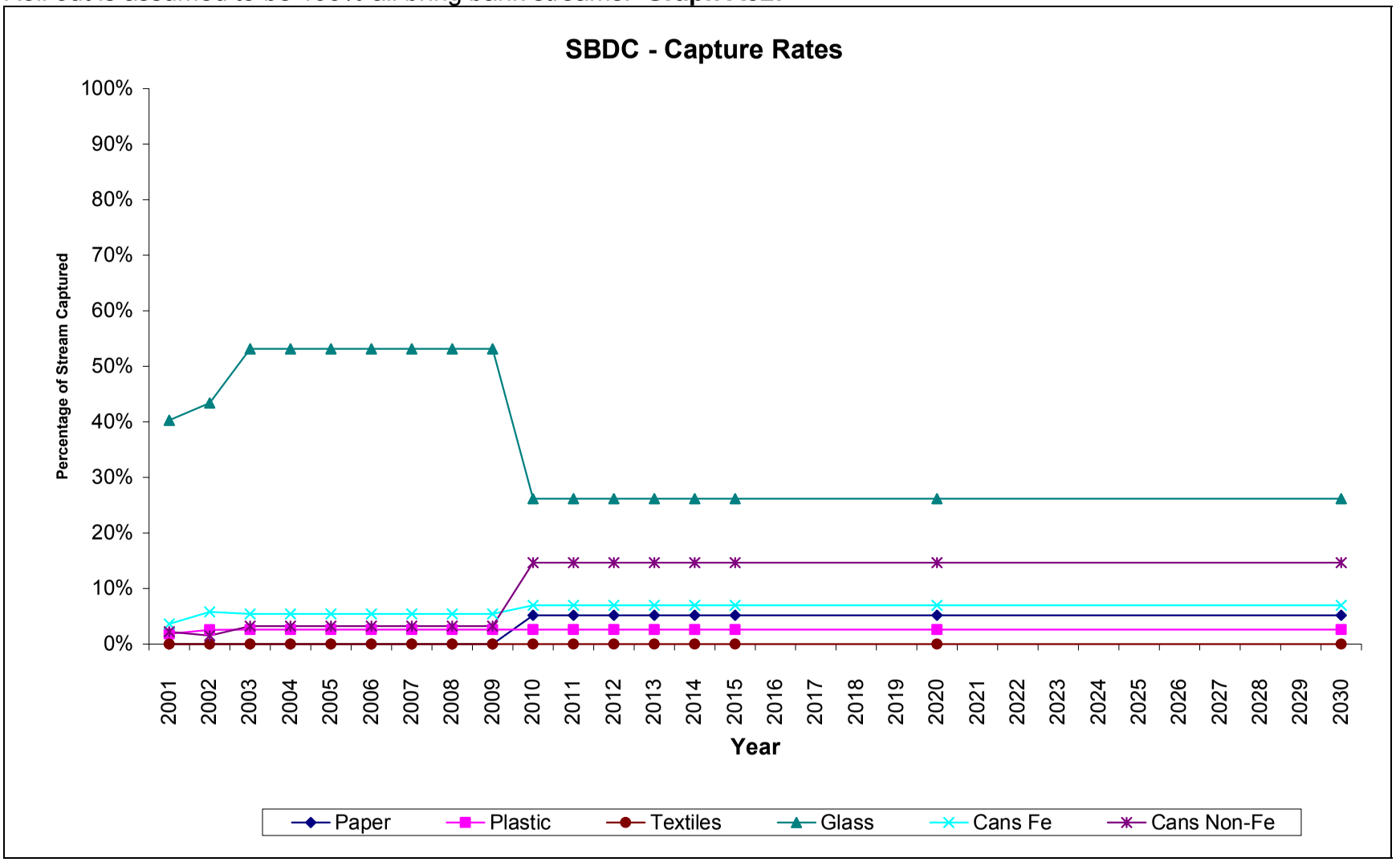
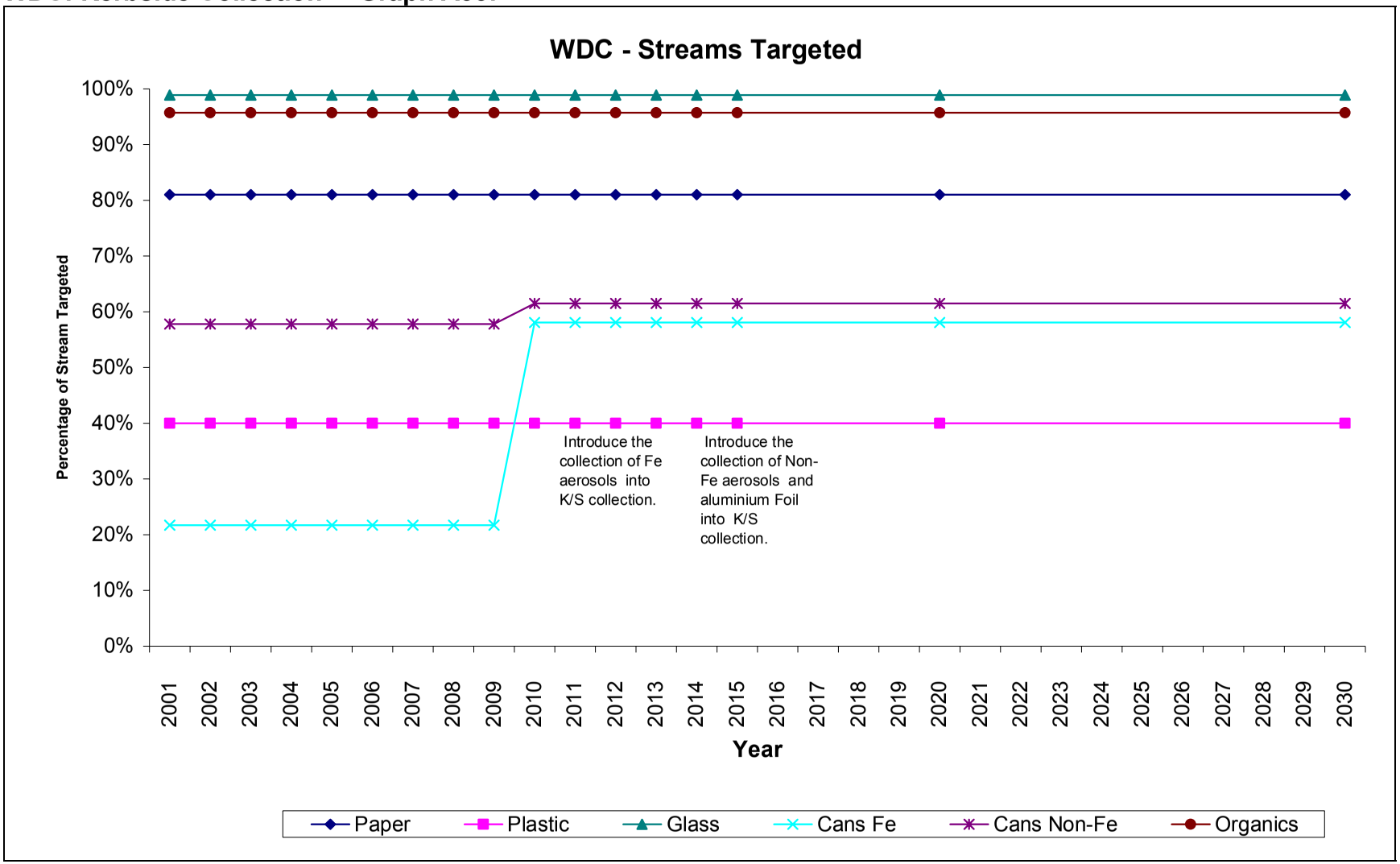
Year
Paper
Plastic
Textiles
Glass
Cans Fe
Cans Non-Fe

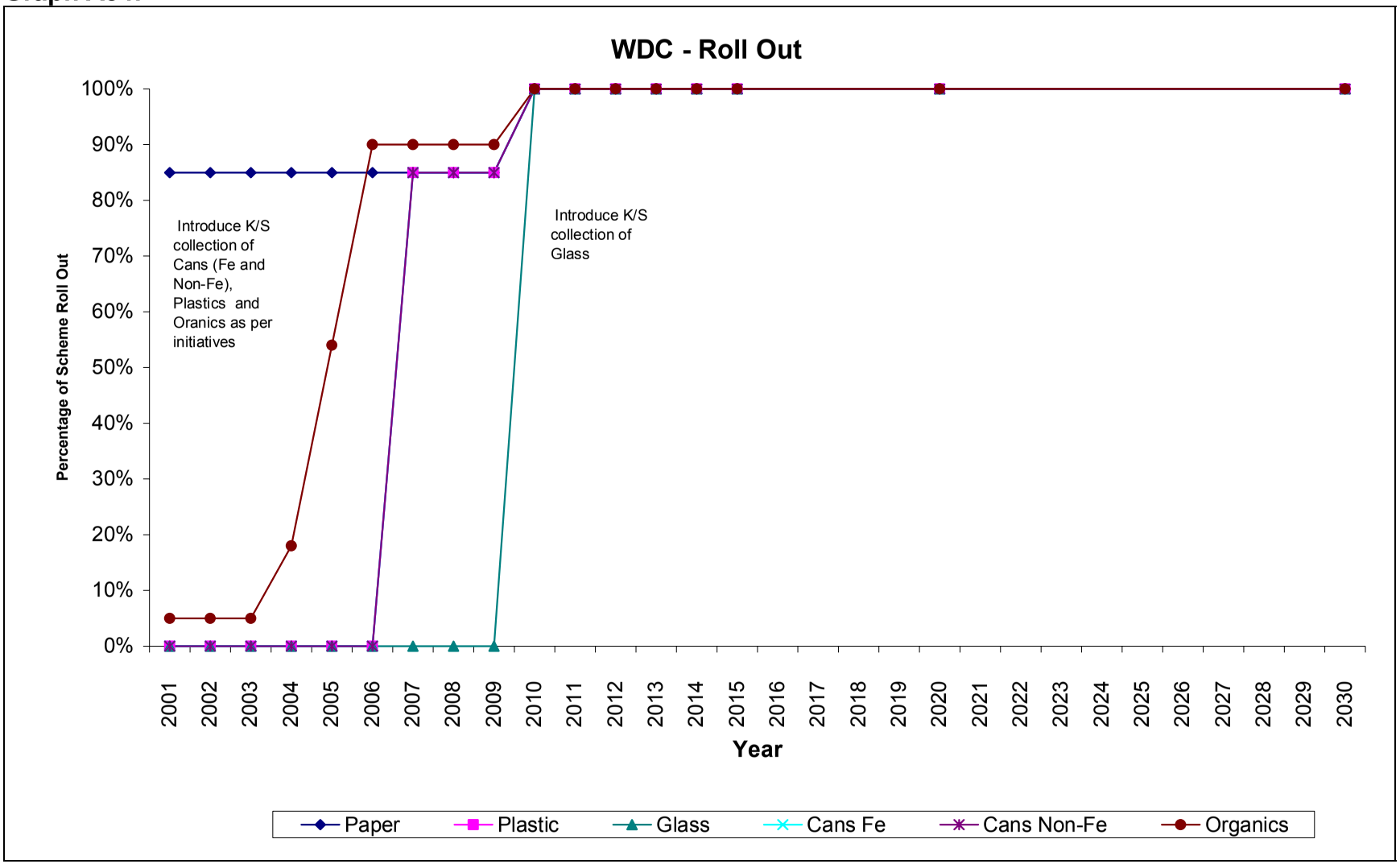
Roll out is assumed to be 100% all bring bank streams. **Graph A32:**



WDC: Kerbside Collection Graph A33:



Graph A34:


WDC - Roll Out
Percentage of Scheme Roll Out
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Introduce K/S collection of Cans (Fe and Non-Fe), Plastics and Oranics as per initiatives
Introduce K/S collection of Glass
2001
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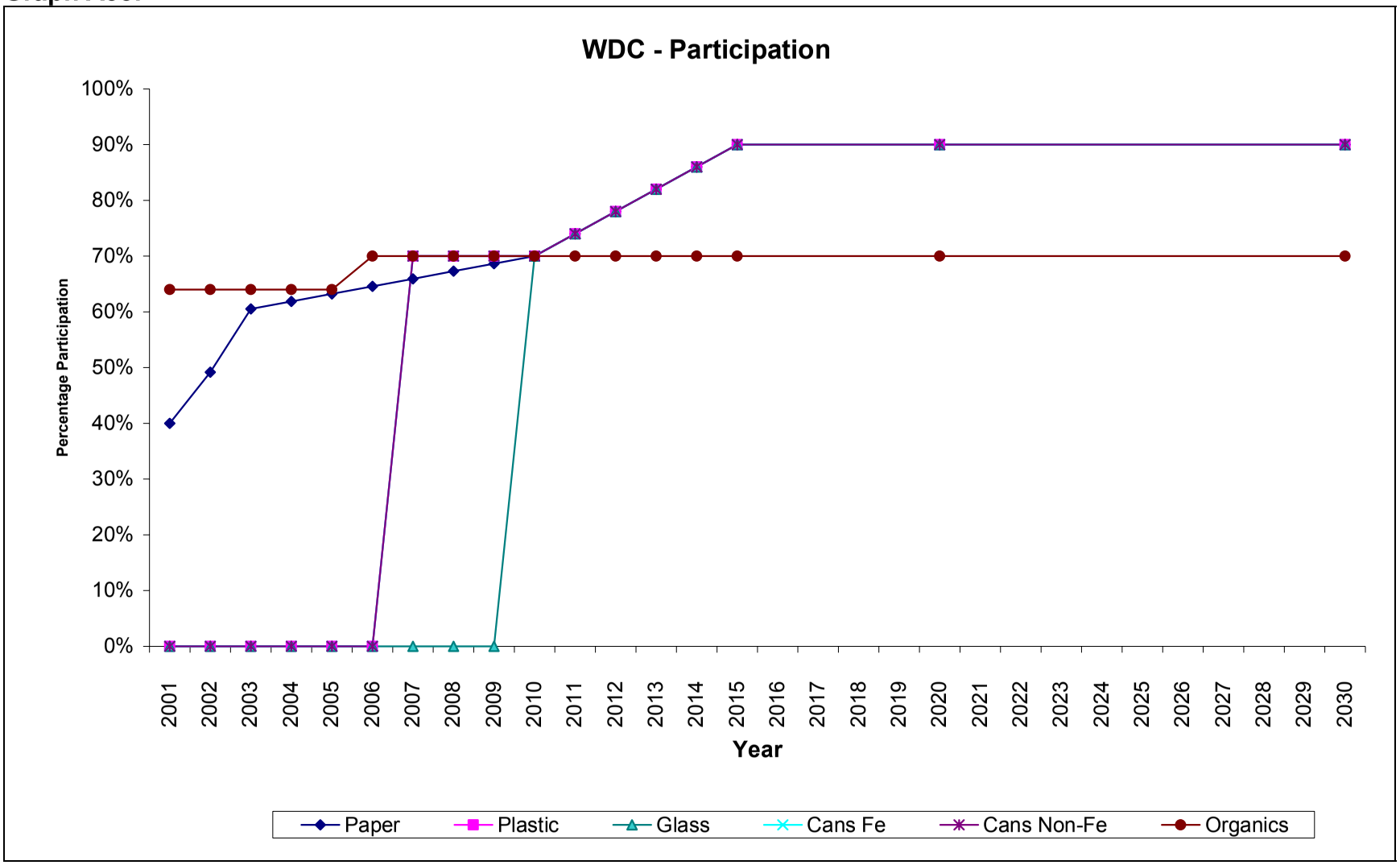
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A35:


WDC - Participation
Percentage Participation
100%
90%
80%
70%
60%
50%
40%
30%
20%
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2001
2002
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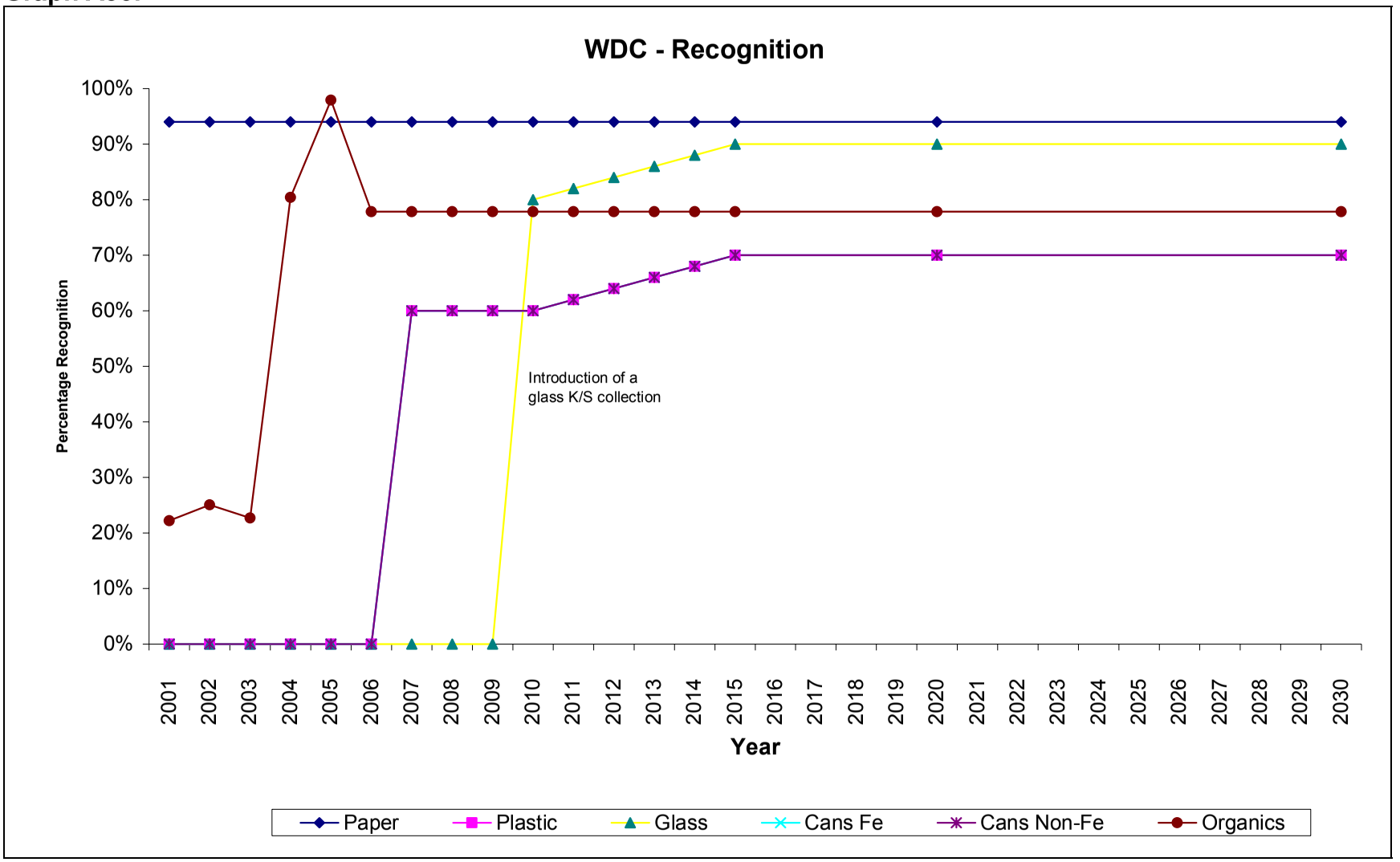
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A36:


WDC - Recognition
Percentage Recognition
100%
90%
80%
70%
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10%
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Introduction of a glass K/S collection
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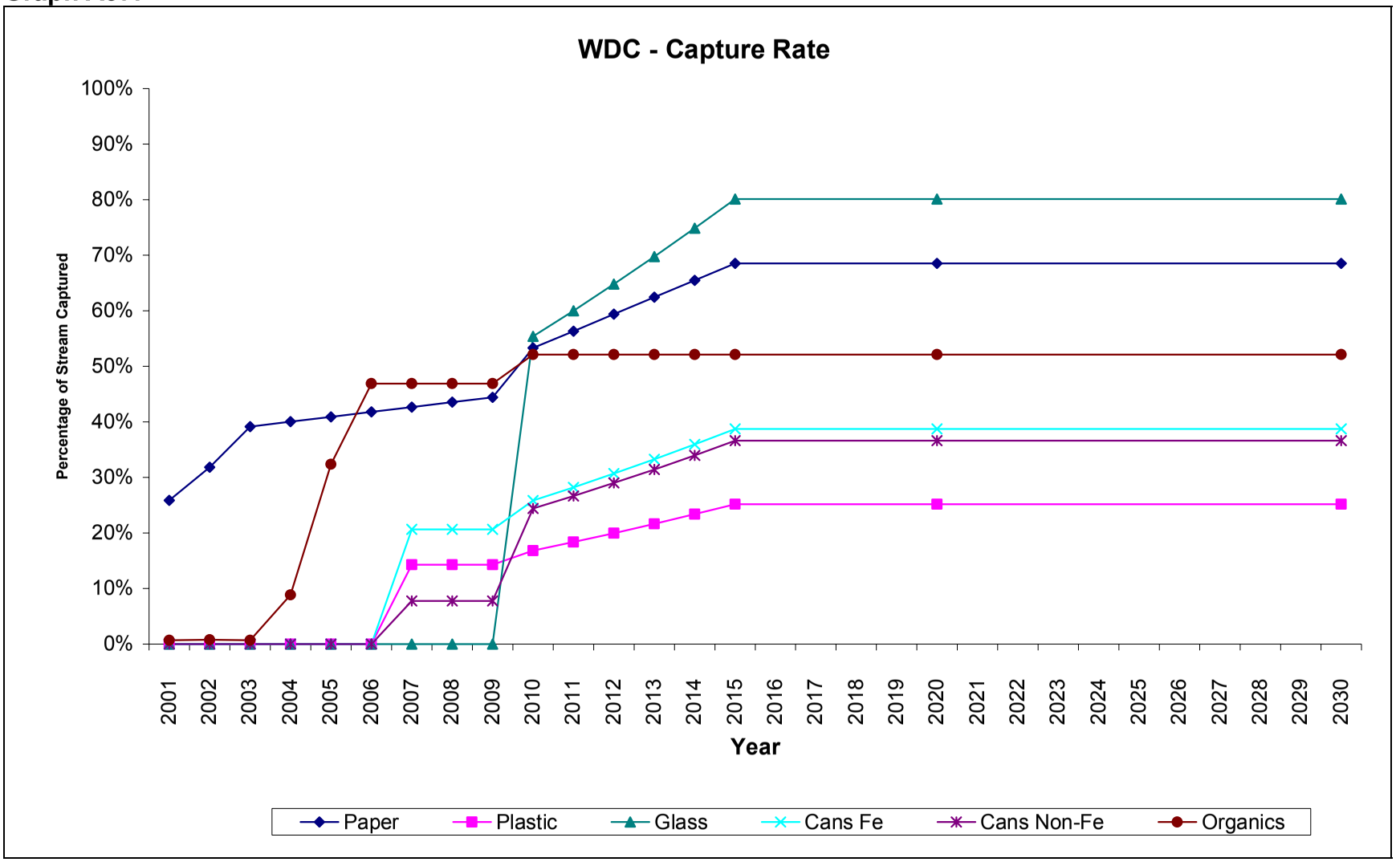
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Graph A37:


WDC - Capture Rate
Percentage of Stream Captured
100%
90%
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70%
60%
50%
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30%
20%
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0%
2001
2002
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2028
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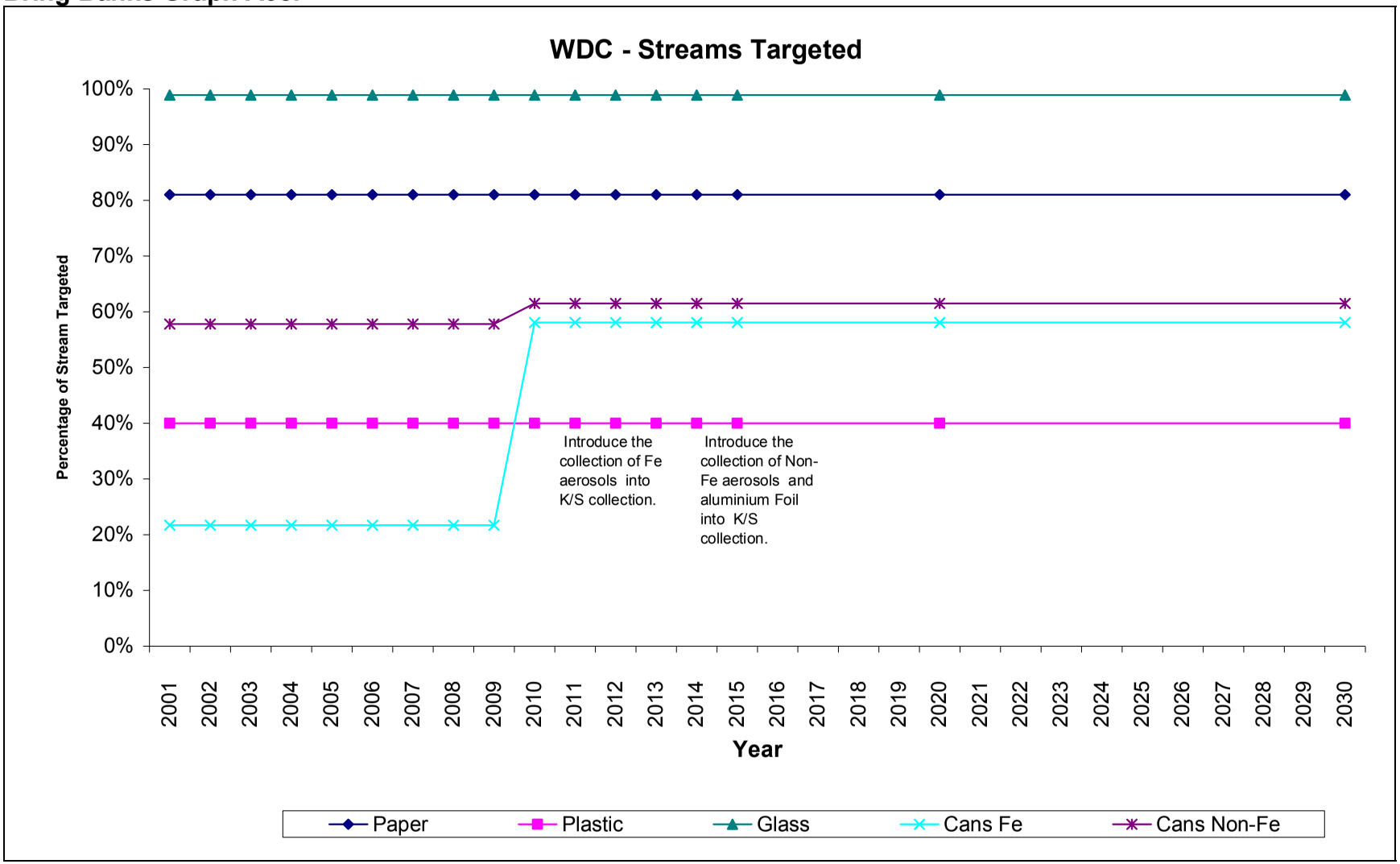
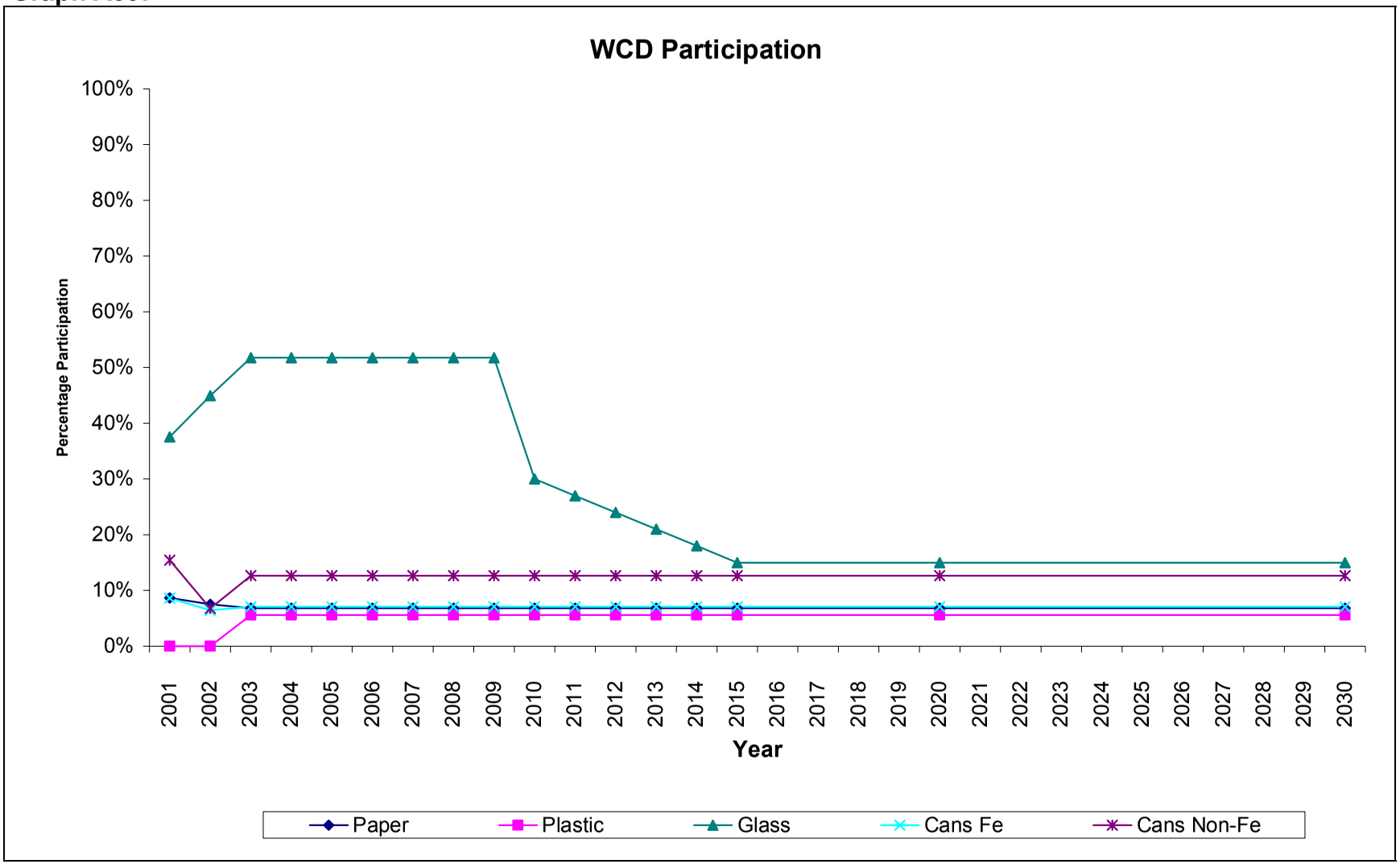
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

Bring Banks Graph A38:



Graph A39:


WCD Participation
Percentage Participation
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2001
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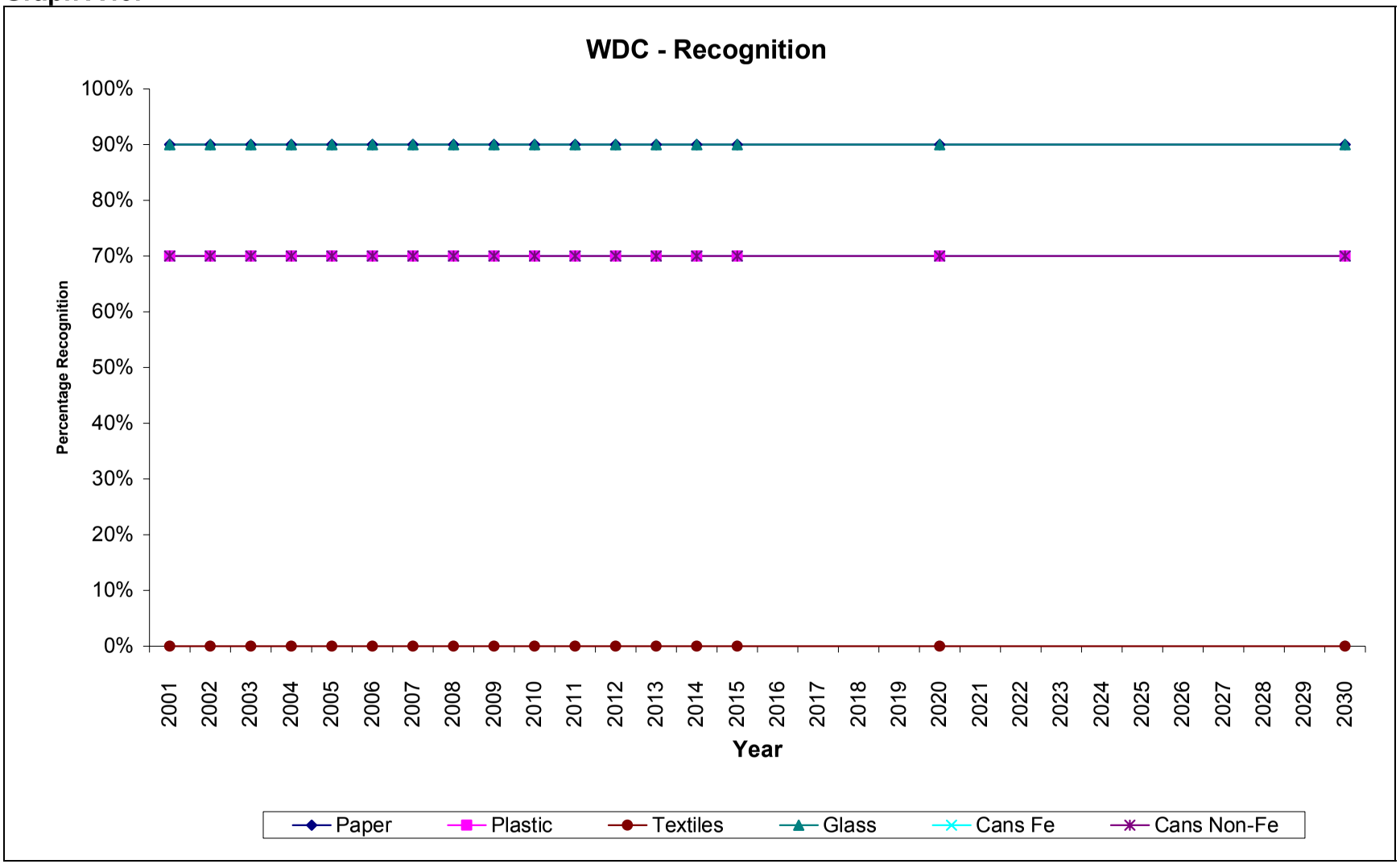
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe

Graph A40:


WDC - Recognition
Percentage Recognition
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2001
2002
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2022
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2024
2025
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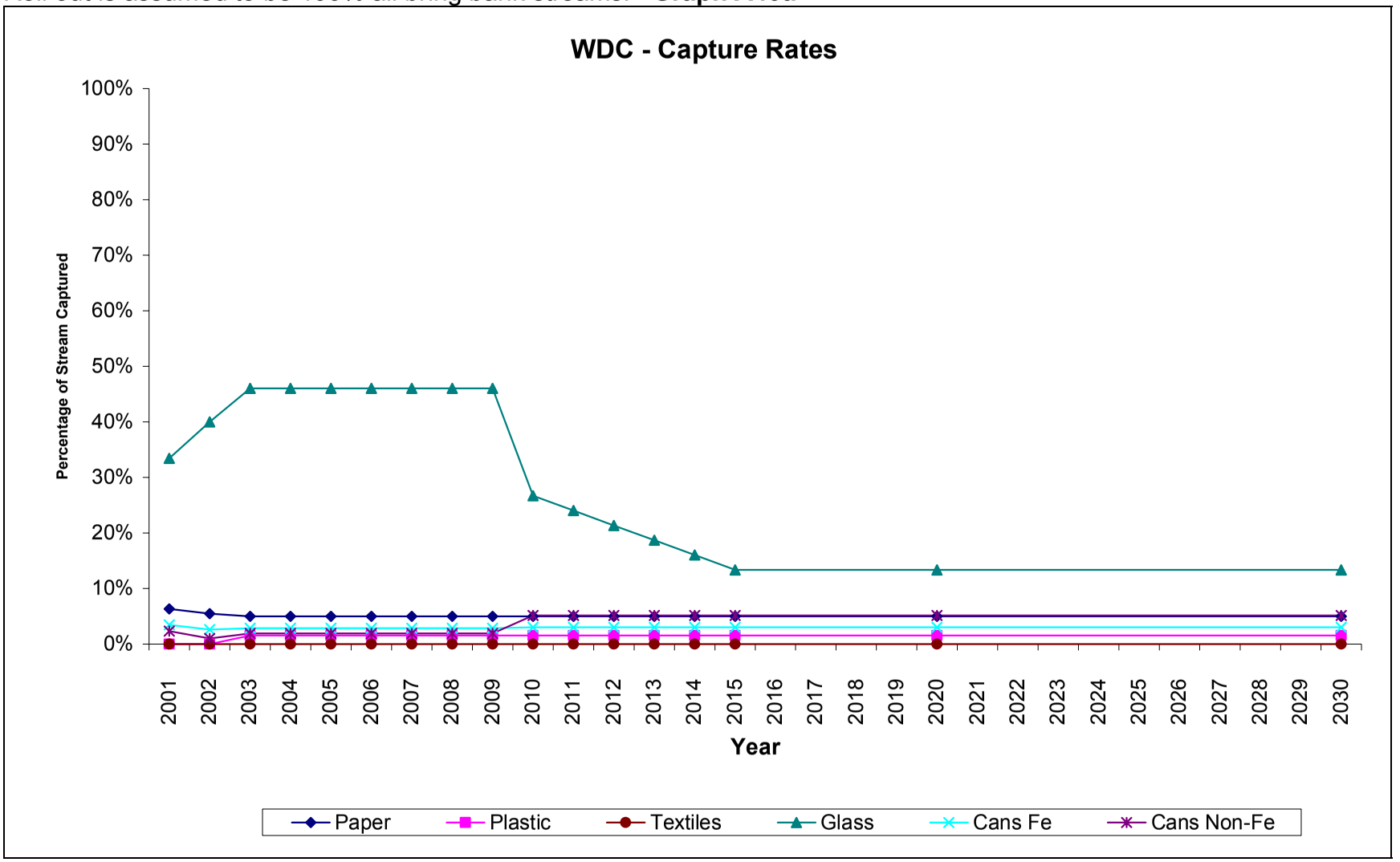
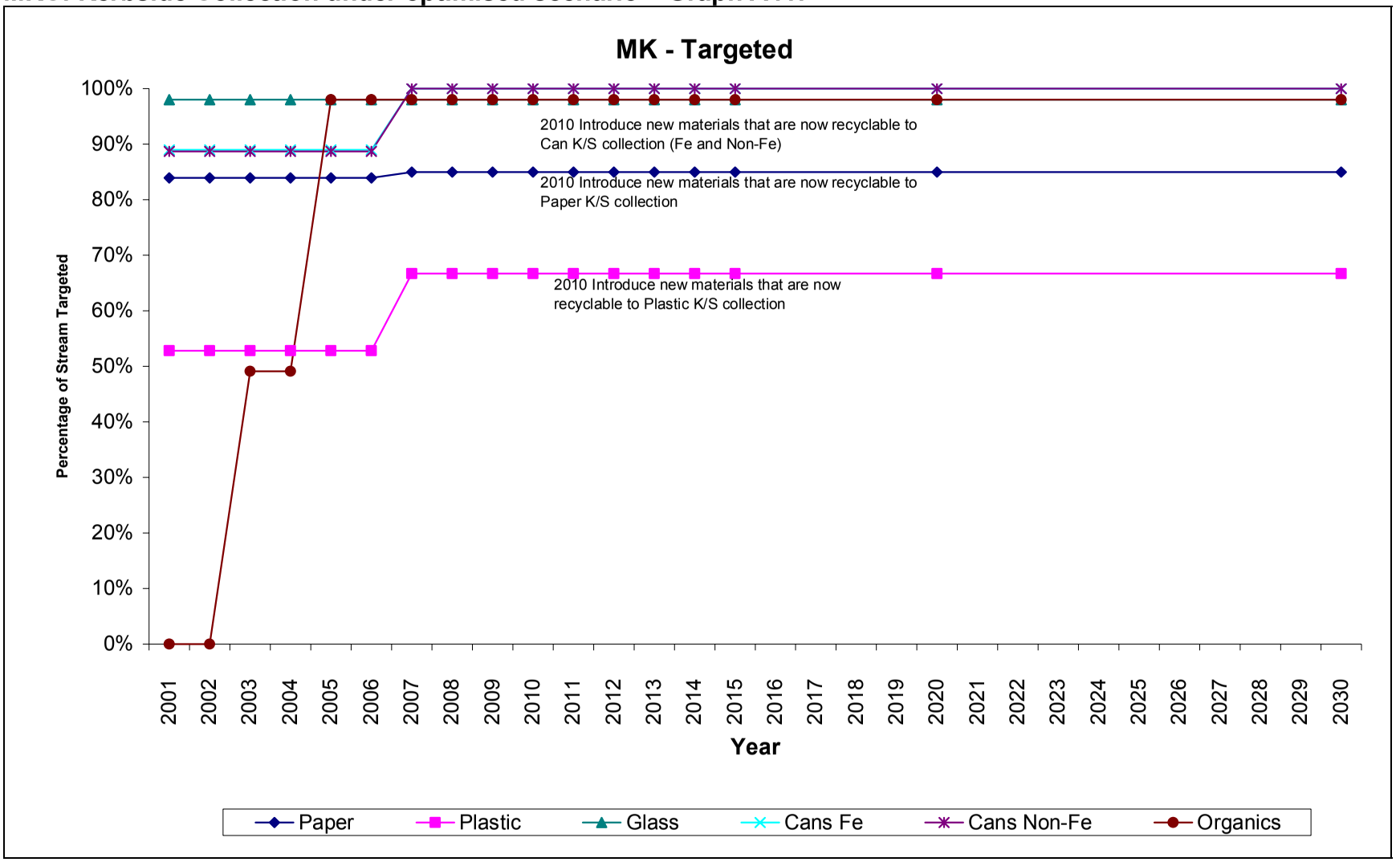
2030
Year
Paper
Plastic
Textiles
Glass
Cans Fe
Cans Non-Fe

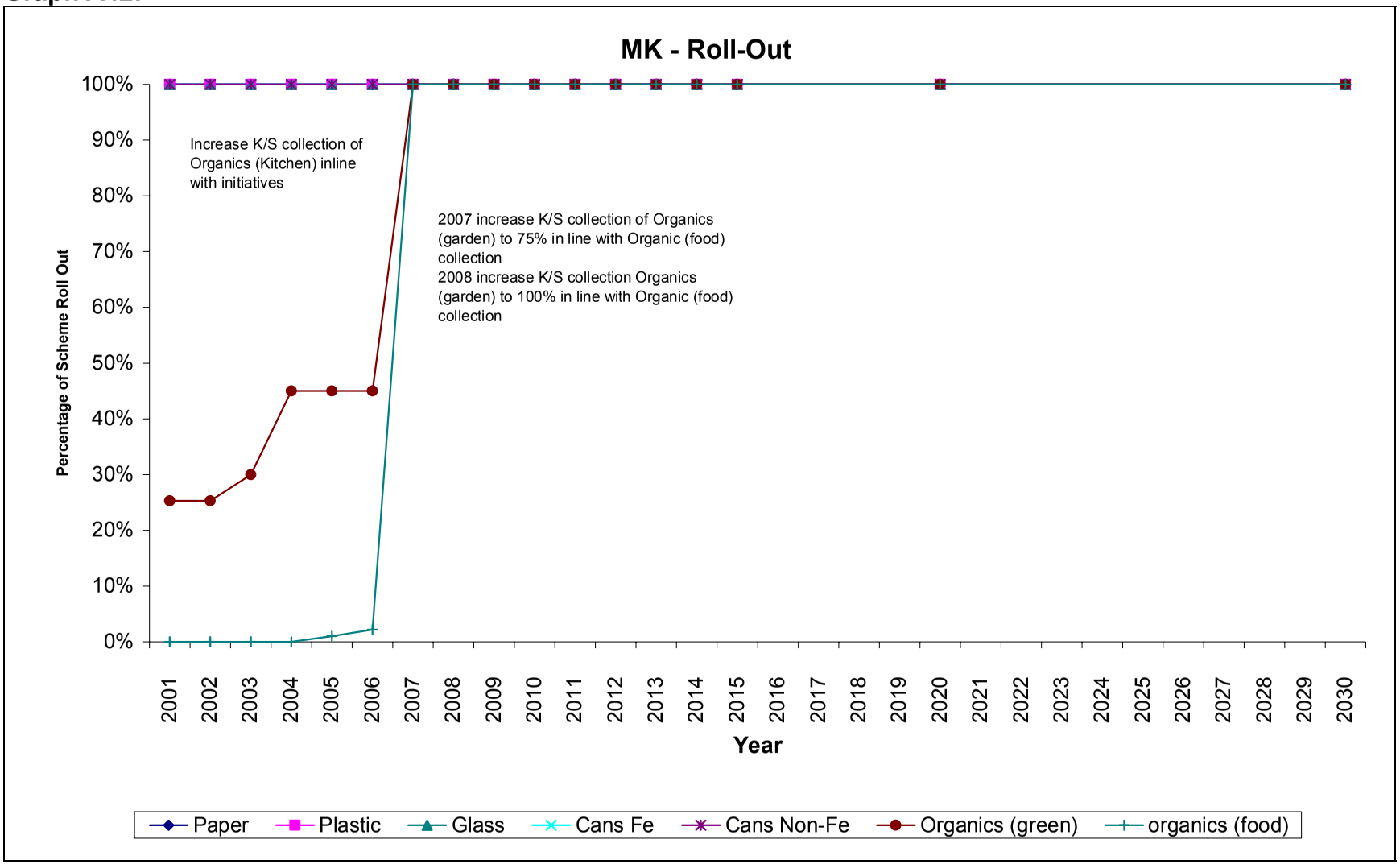
Roll out is assumed to be 100% all bring bank streams. **Graph A40a**



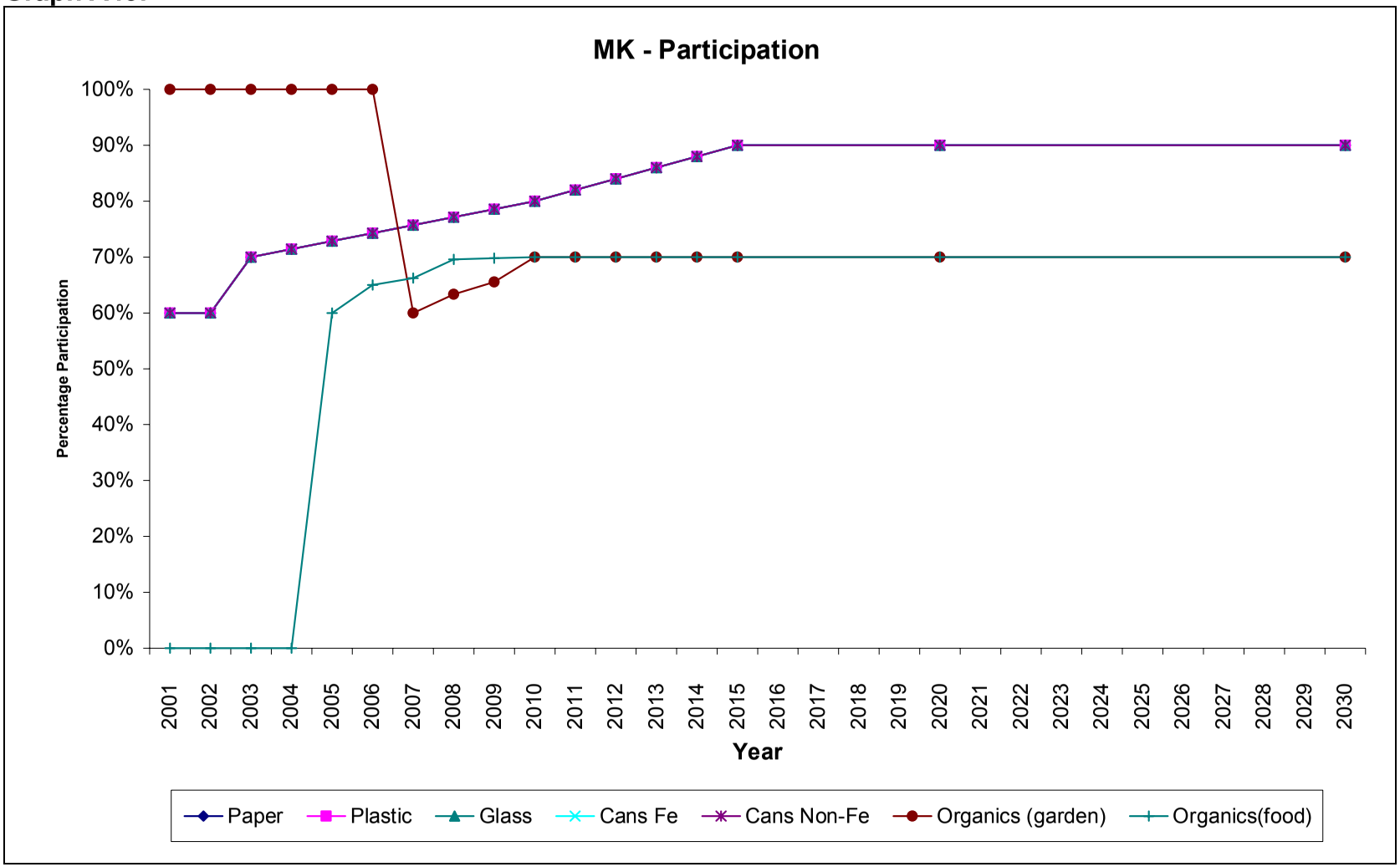
MKC: Kerbside Collection under optimised scenario Graph A41:



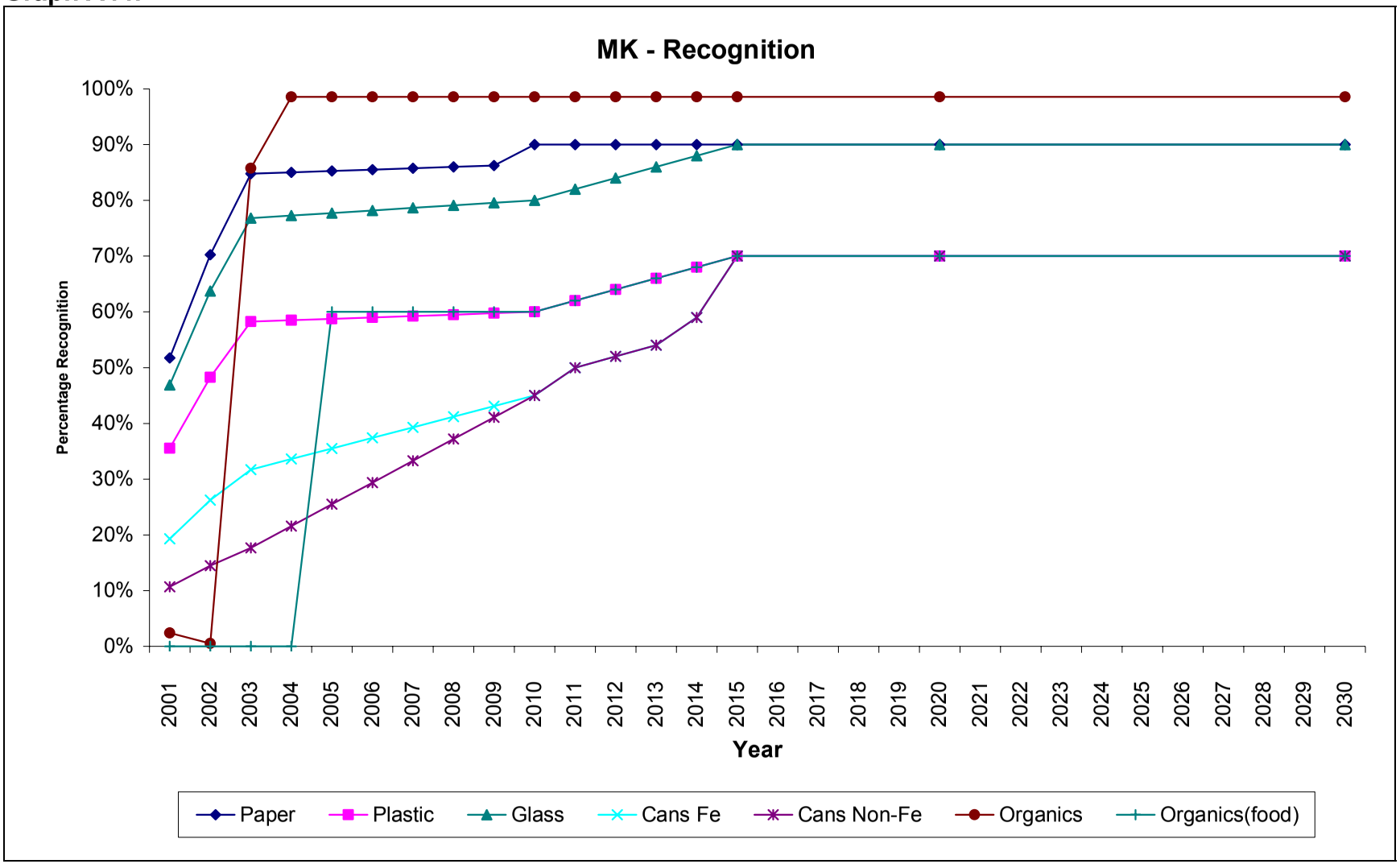
Graph A42:


MK - Roll-Out
Percentage of Scheme Roll Out
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Increase K/S collection of Organics (Kitchen) inline with initiatives
2007 increase K/S collection of Organics (garden) to 75% in line with Organic (food) collection
2008 increase K/S collection Organics (garden) to 100% in line with Organic (food) collection
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics (green)
organics (food)

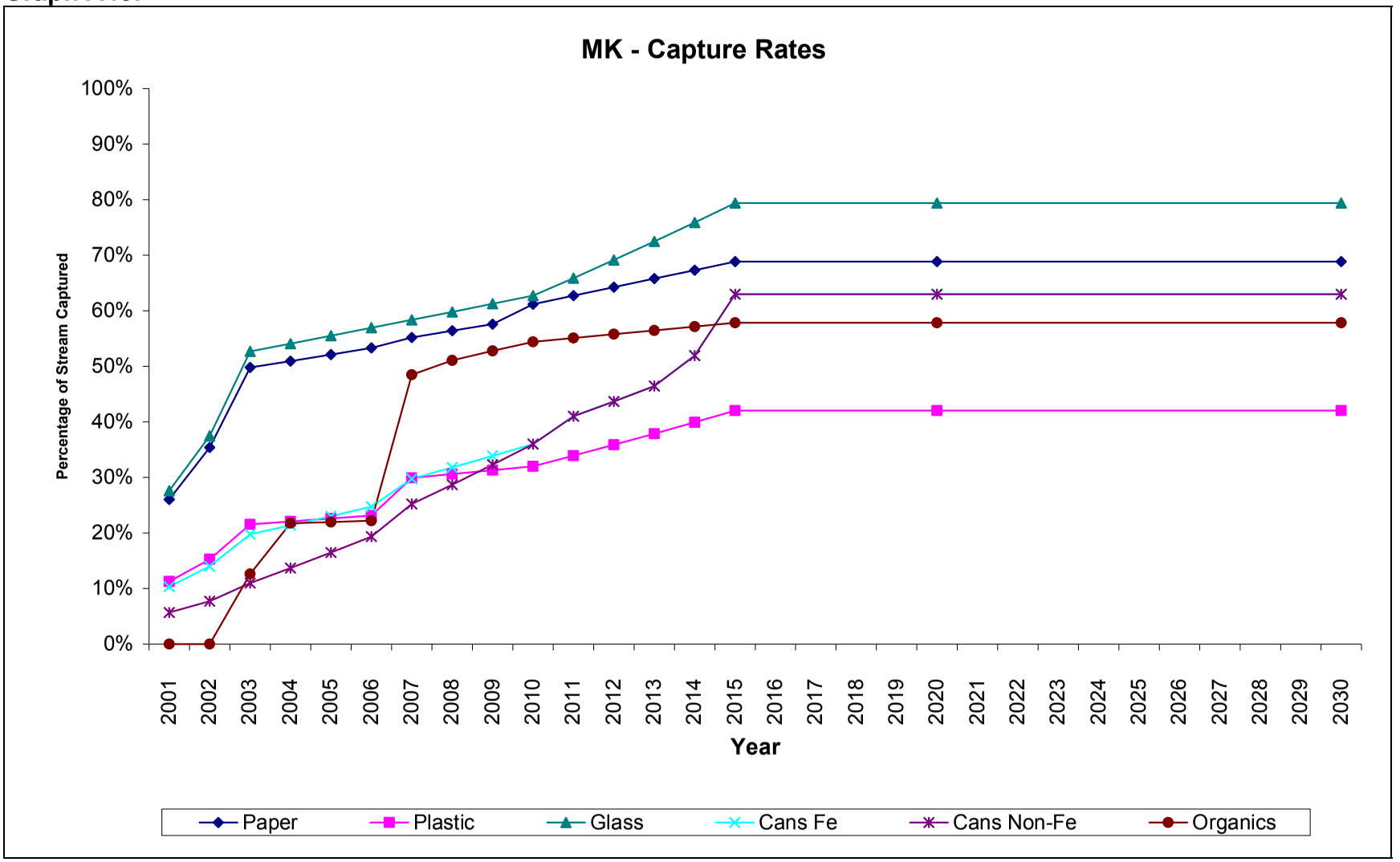
Graph A43:


MK - Participation
Percentage Participation
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics (garden)
Organics(food)

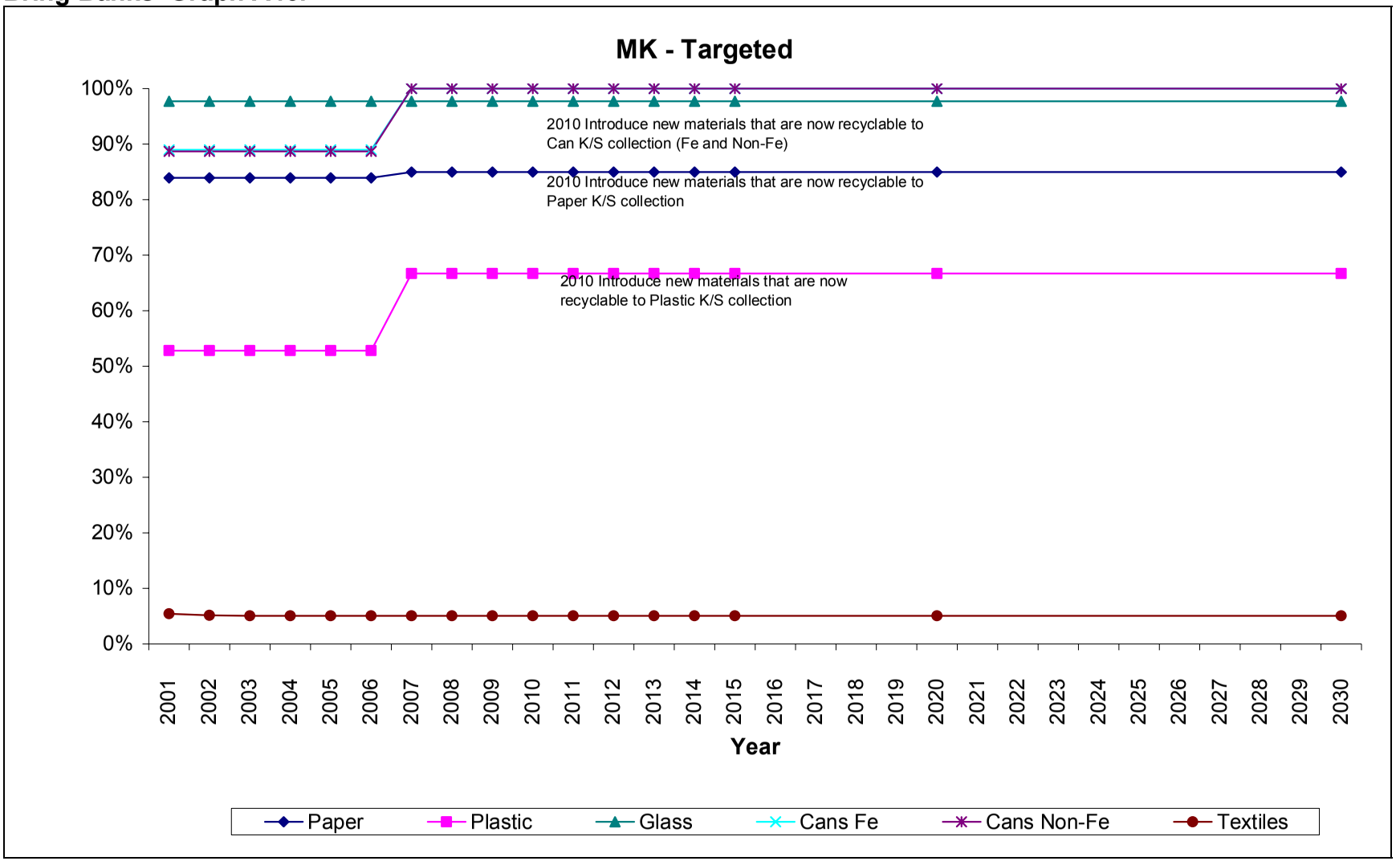
Graph A44:


MK - Recognition
Percentage Recognition
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics
Organics(food)

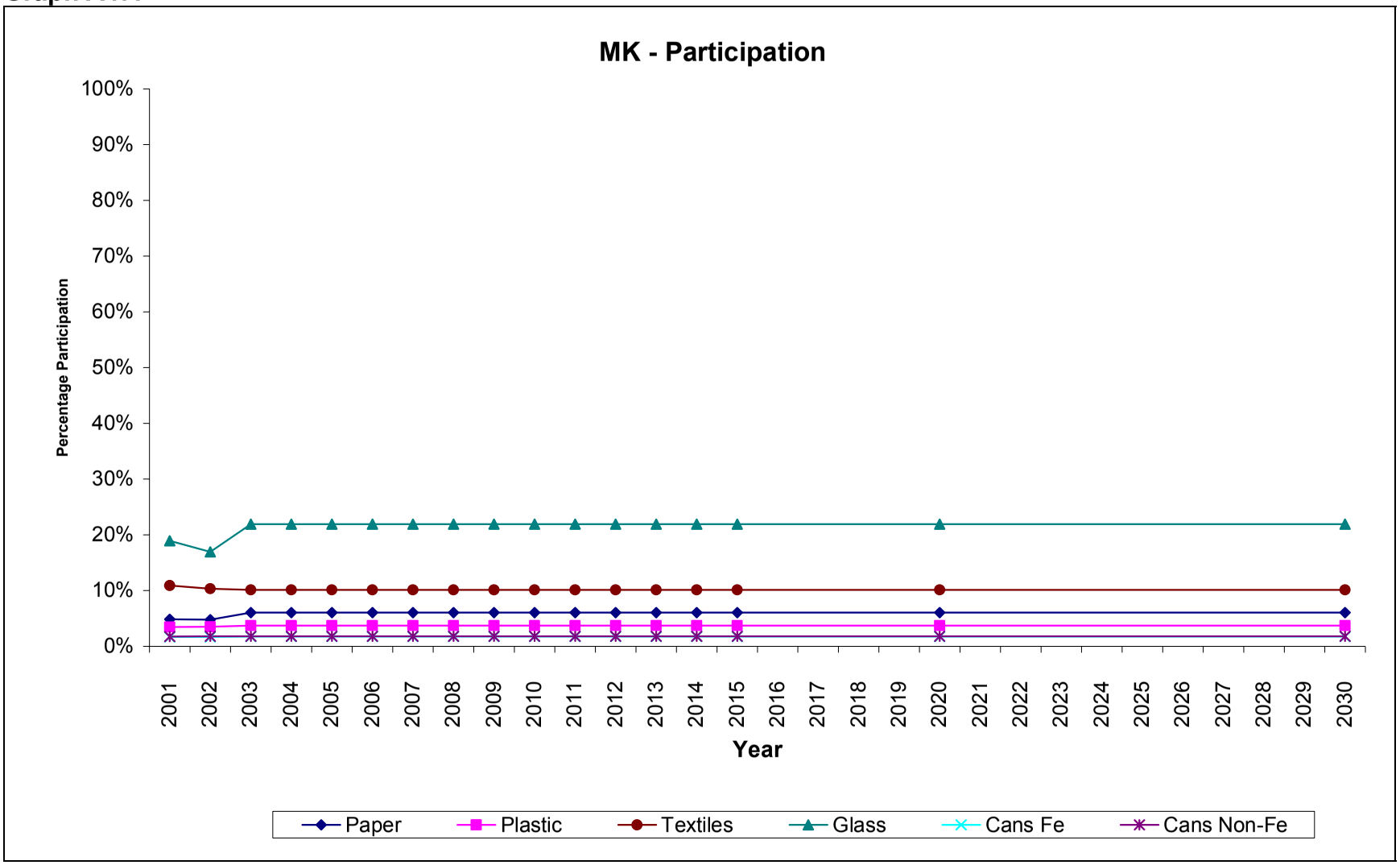
Graph A45:


MK - Capture Rates
Percentage of Stream Captured
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Glass
Cans Fe
Cans Non-Fe
Organics

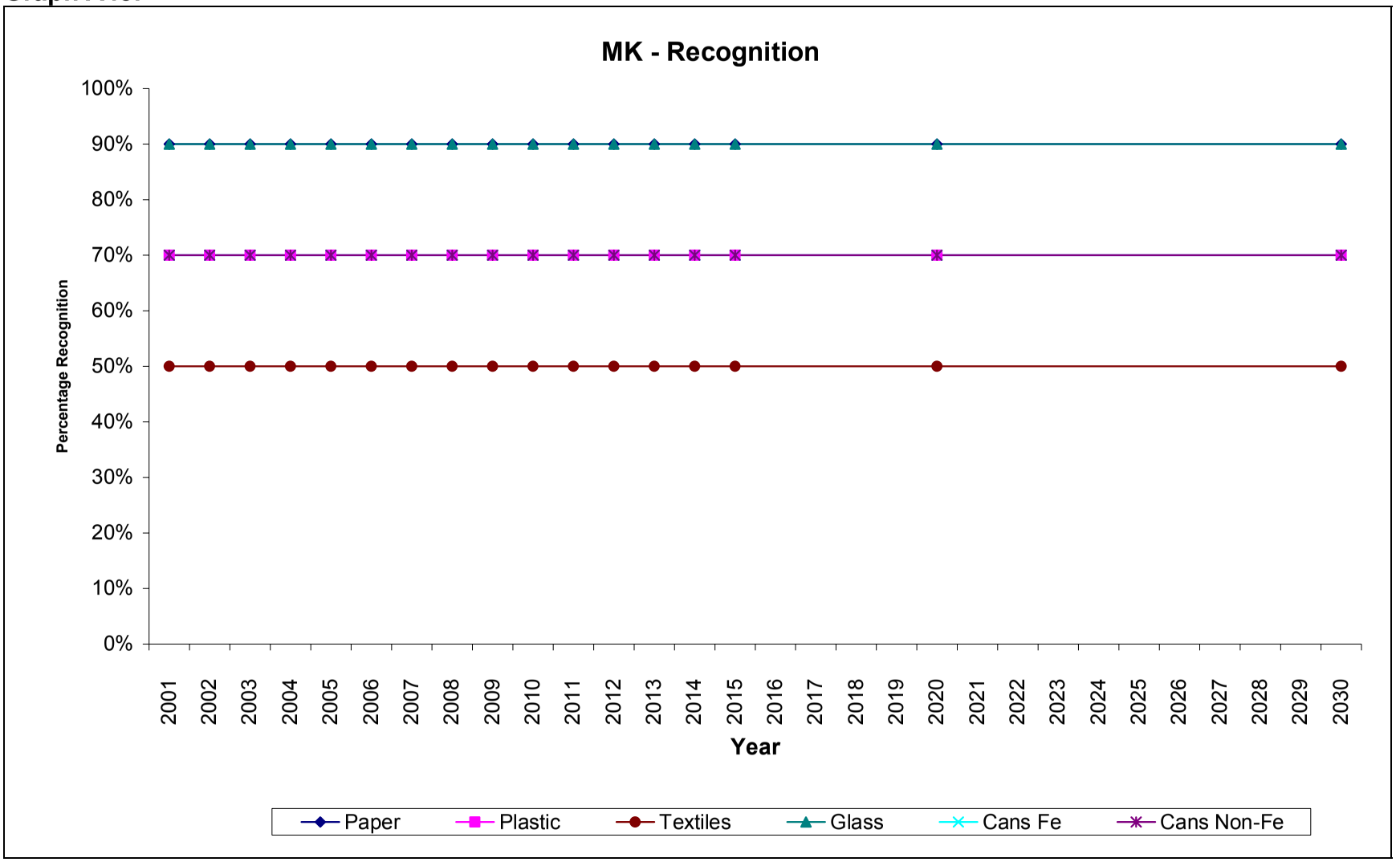
Bring Banks Graph A46:



Graph A47:


MK - Participation
Percentage Participation
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Textiles
Glass
Cans Fe
Cans Non-Fe

Graph A48:


MK - Recognition
Percentage Recognition
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2001
2002
2003
2004
2005
2006
2007
2008
2009
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2011
2012
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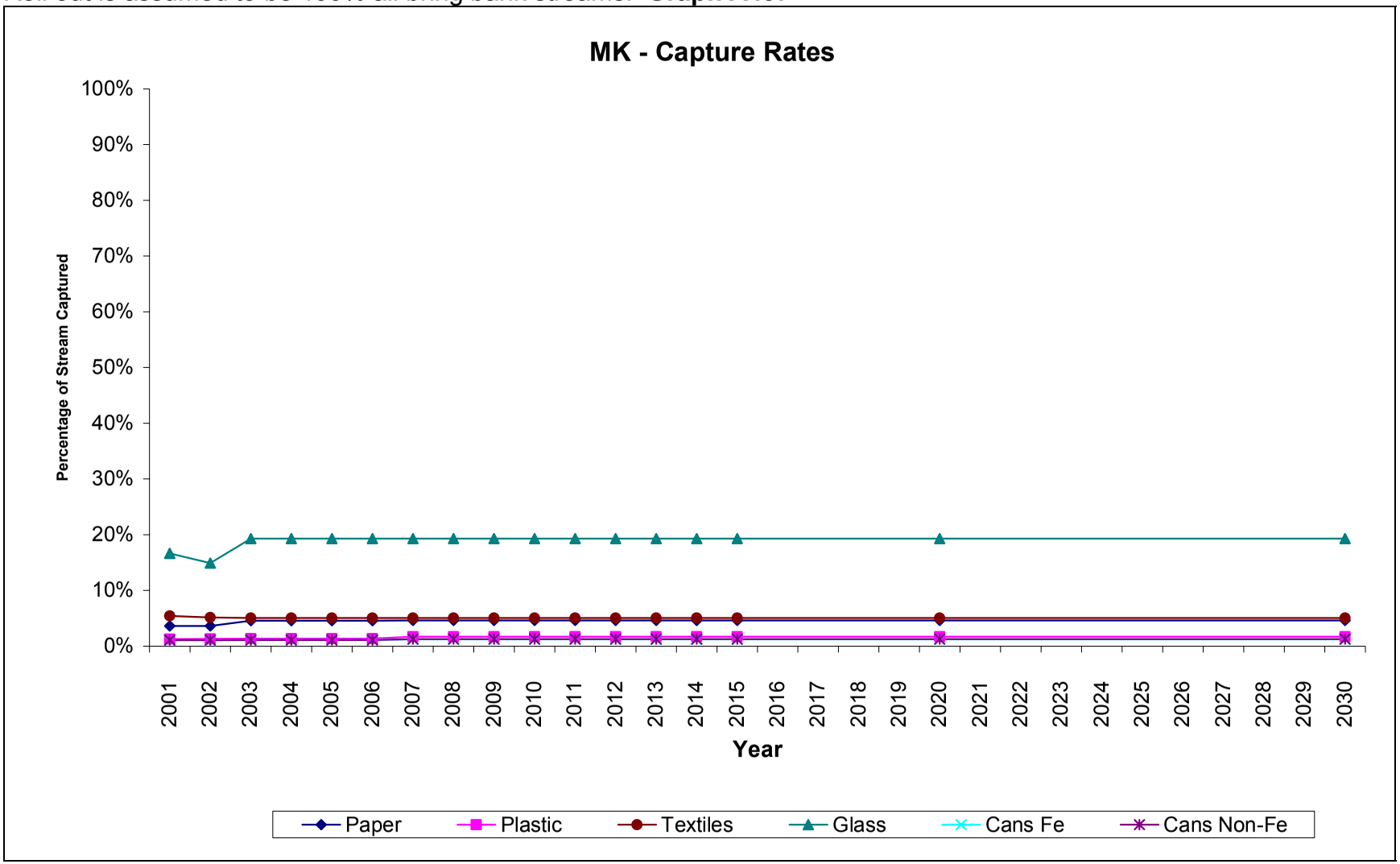
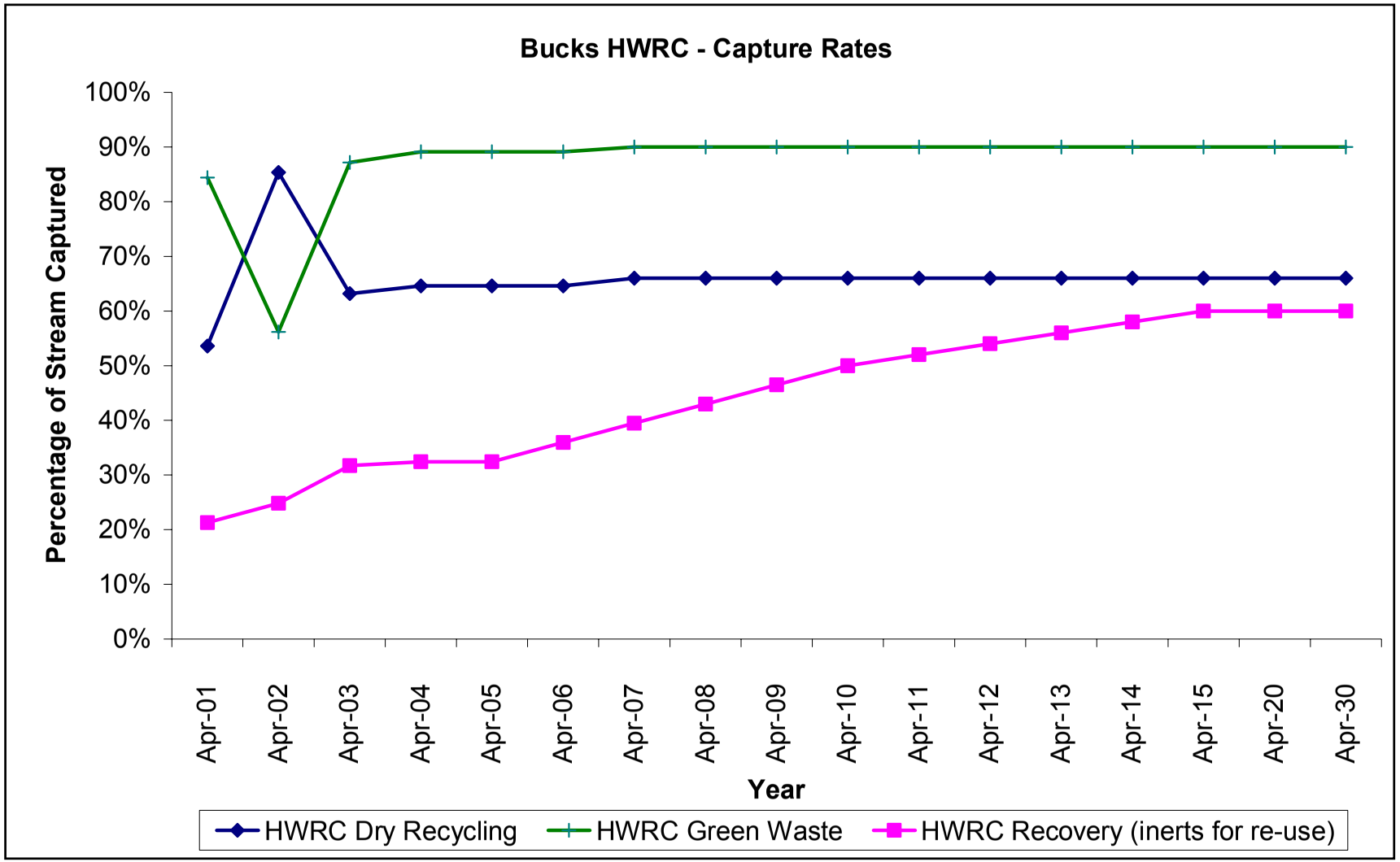
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year
Paper
Plastic
Textiles
Glass
Cans Fe
Cans Non-Fe

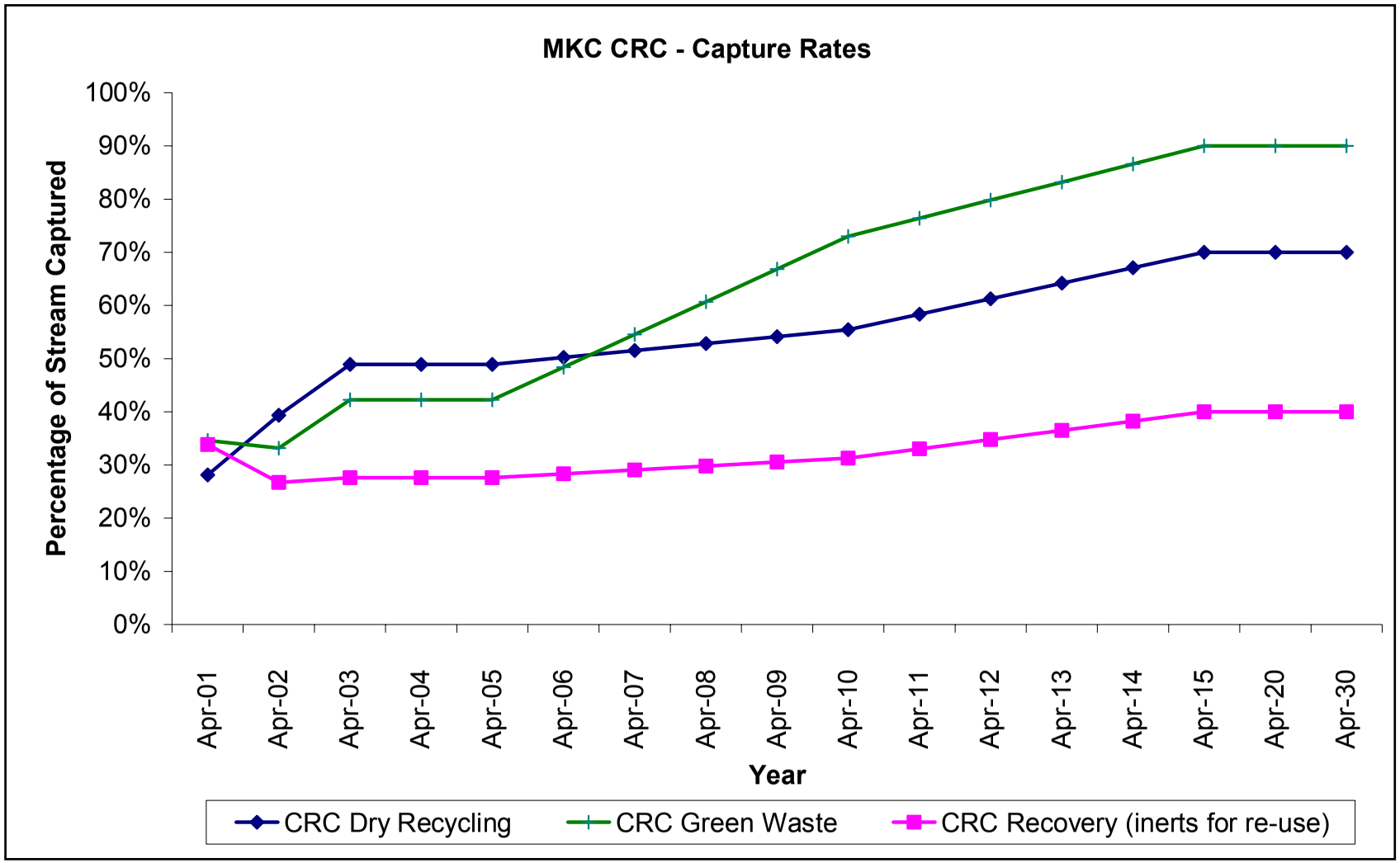
Roll out is assumed to be 100% all bring bank streams. **Graph A49:**



HWRC's/CRC's Graph A50:

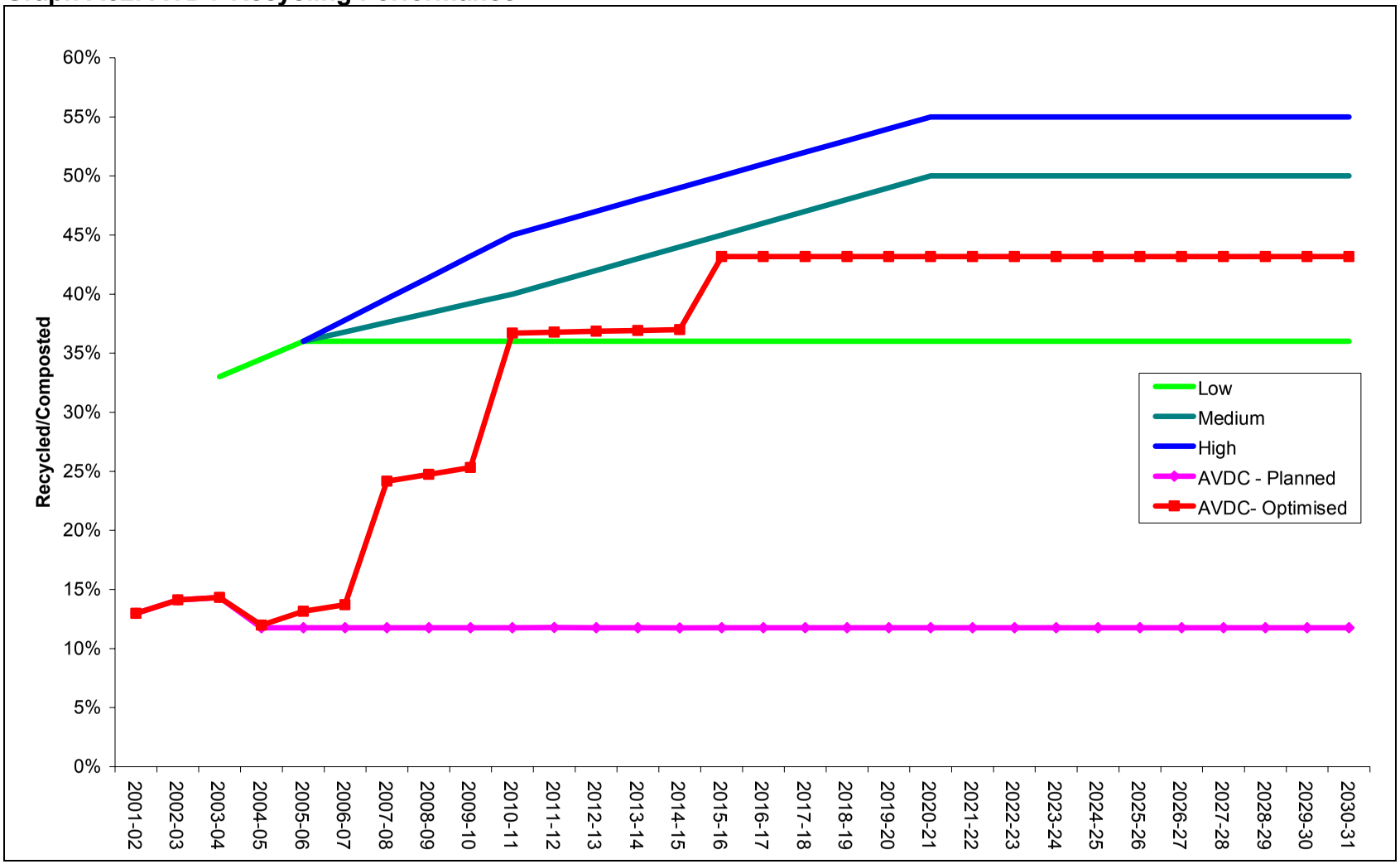


Graph A51:

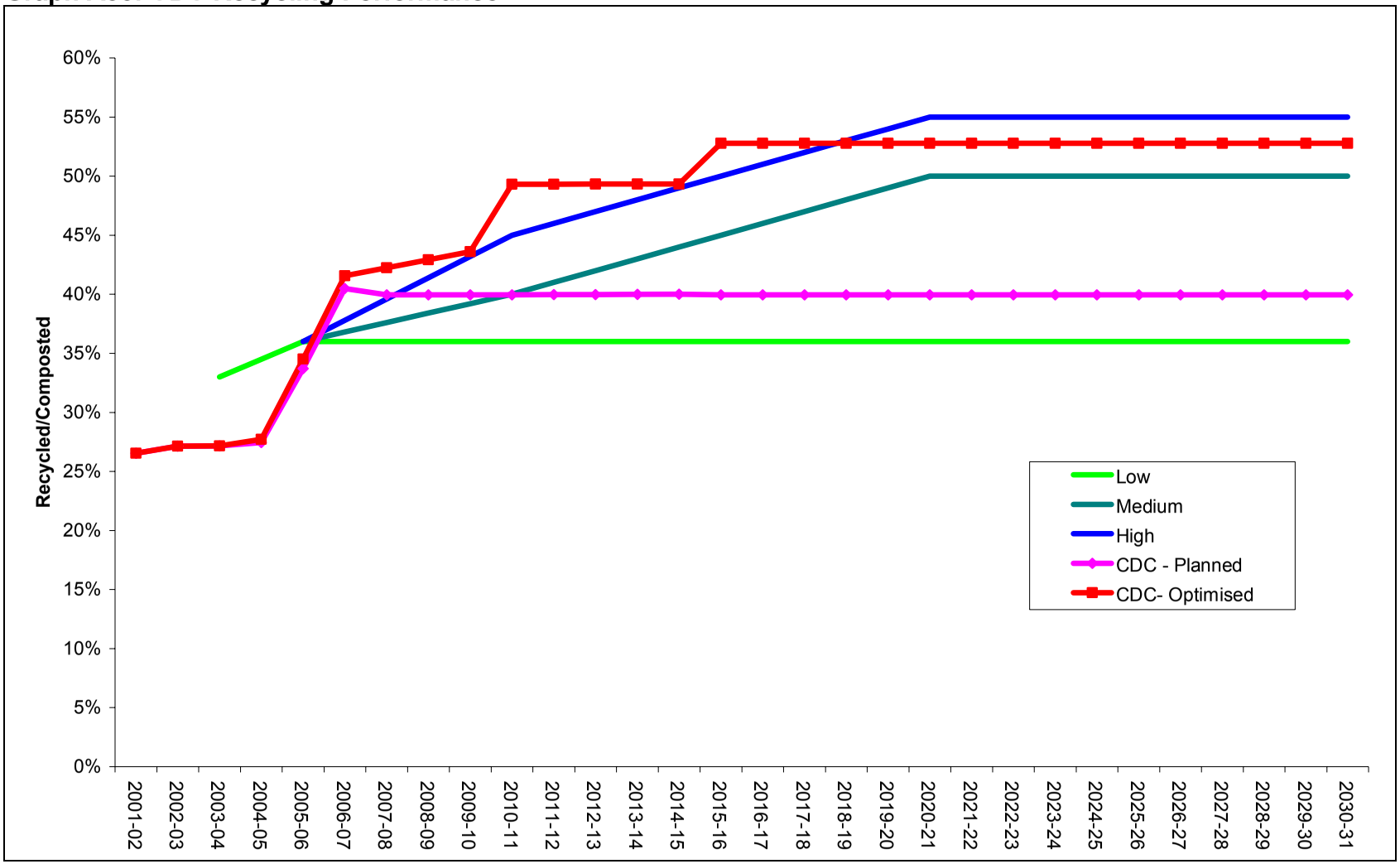

MKC CRC - Capture Rates
Percentage of Stream Captured
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Apr-01
Apr-02
Apr-03
Apr-04
Apr-05
Apr-06
Apr-07
Apr-08
Apr-09
Apr-10
Apr-11
Apr-12
Apr-13
Apr-14
Apr-15
Apr-20
Apr-30
Year
CRC Dry Recycling
CRC Green Waste
CRC Recovery (inerts for re-use)

Appendix III: District Recycling Performance

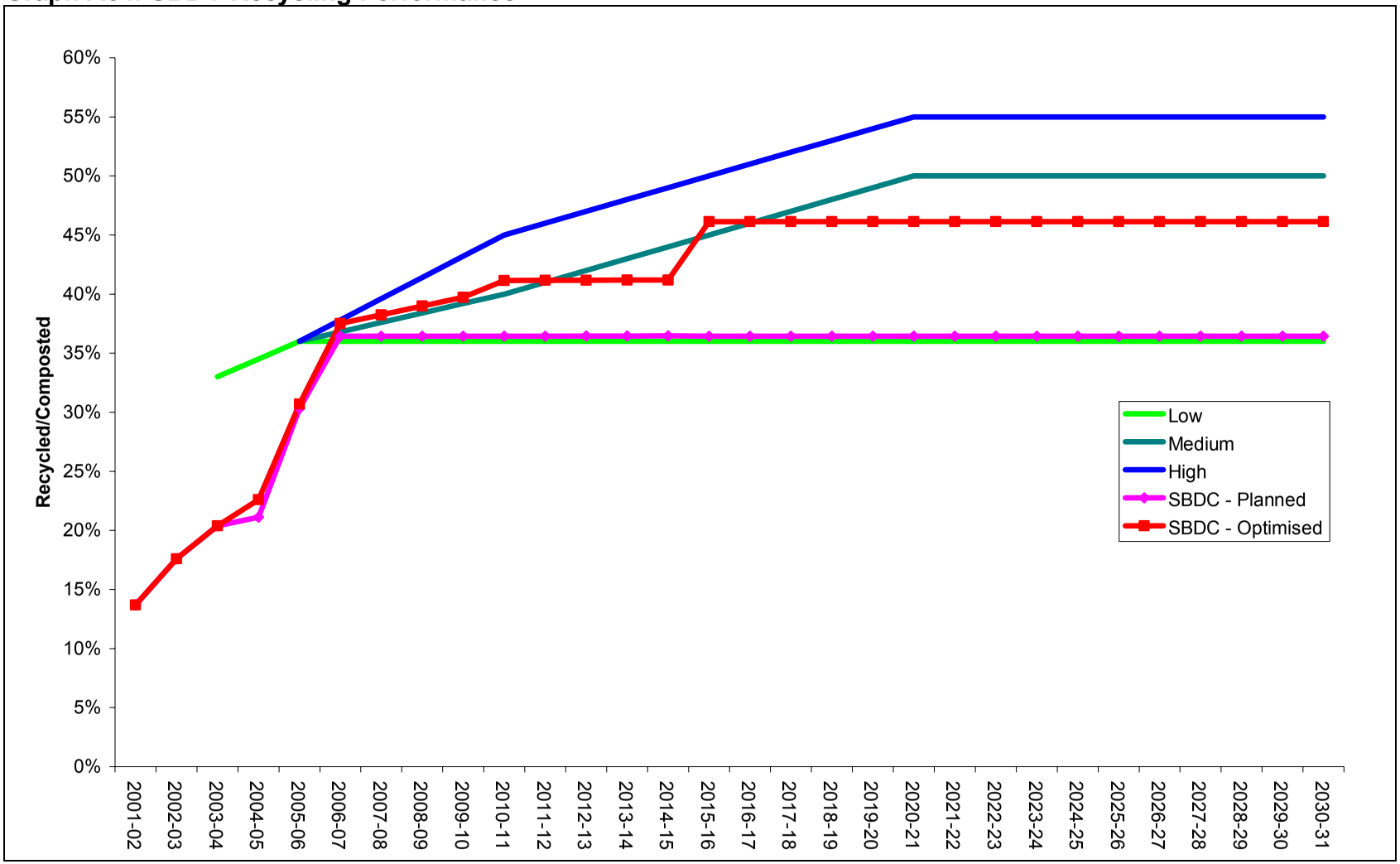
Graph A52: AVDC Recycling Performance



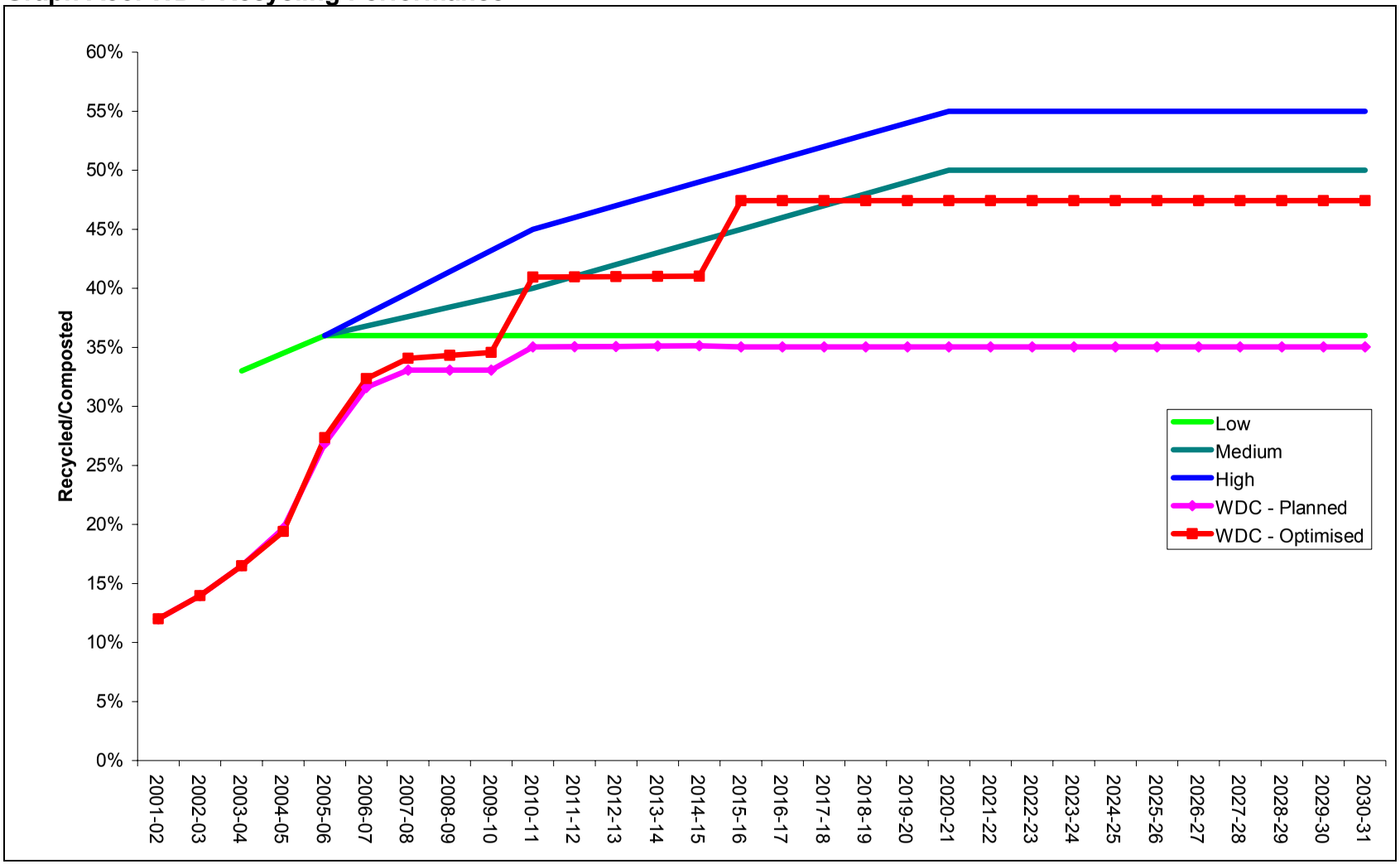
Graph A53: CDC Recycling Performance



Graph A54: SBDC Recycling Performance

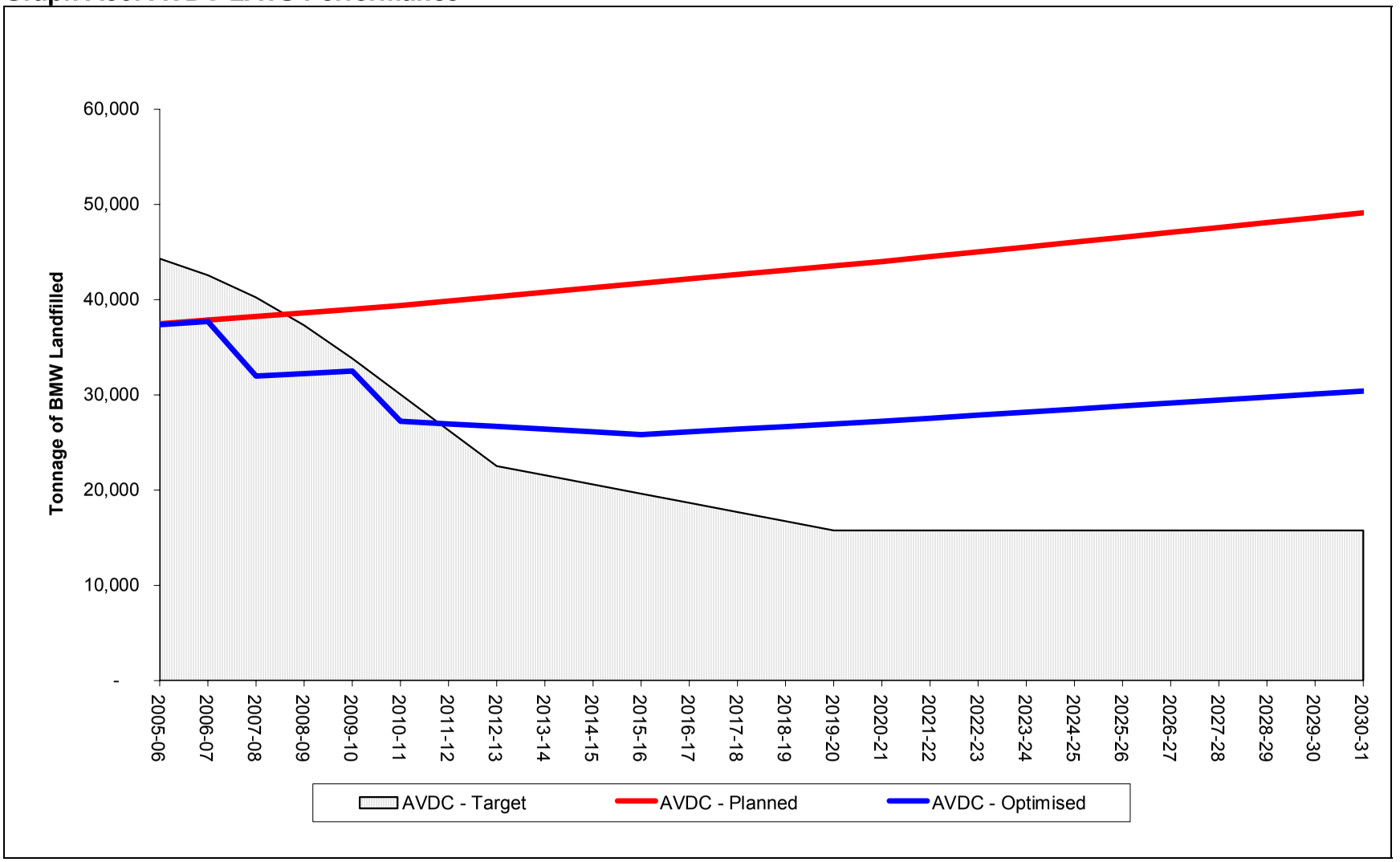


Graph A55: WDC Recycling Performance

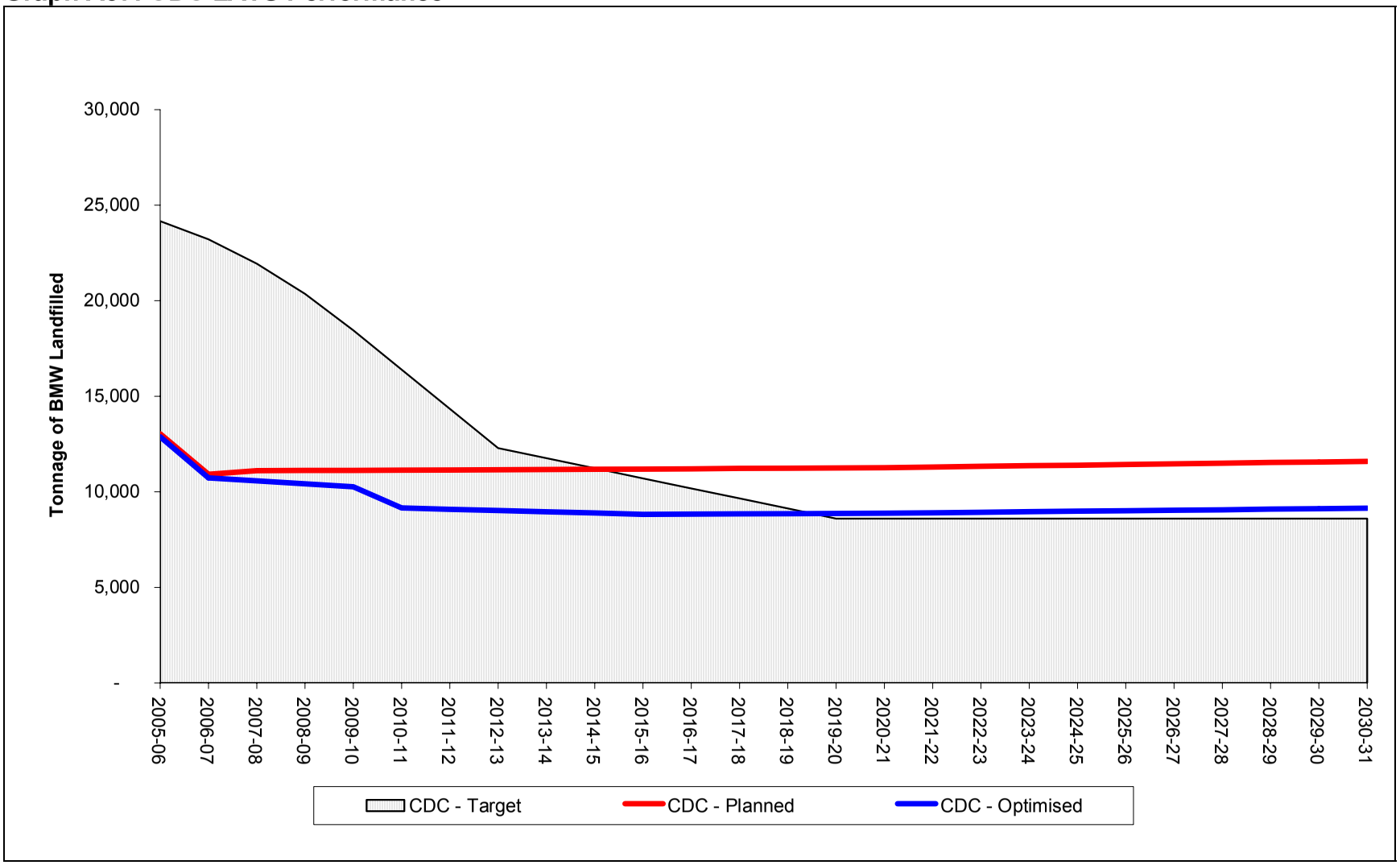


Appendix IV: District LATS Performance

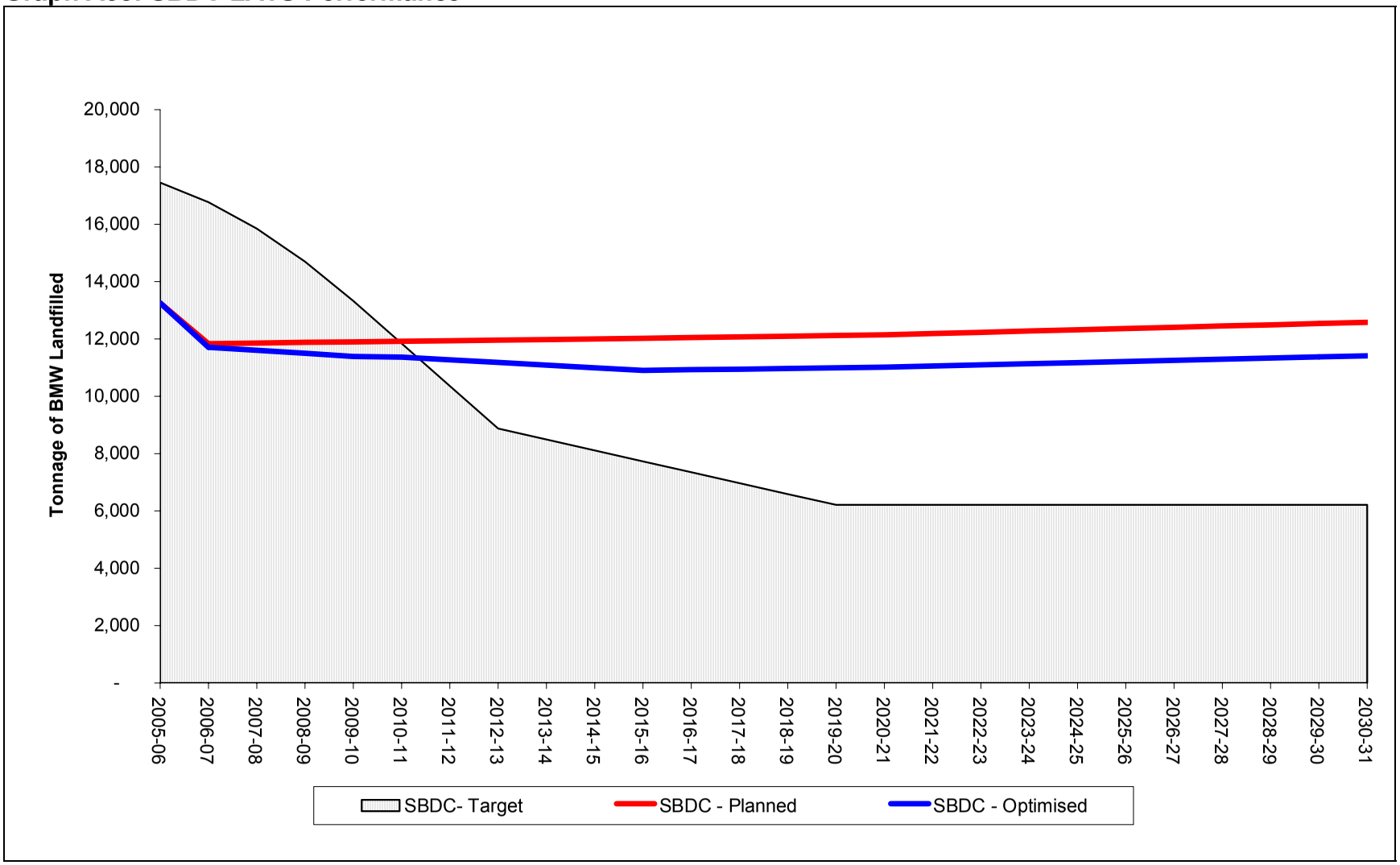
Graph A56: AVDC LATS Performance



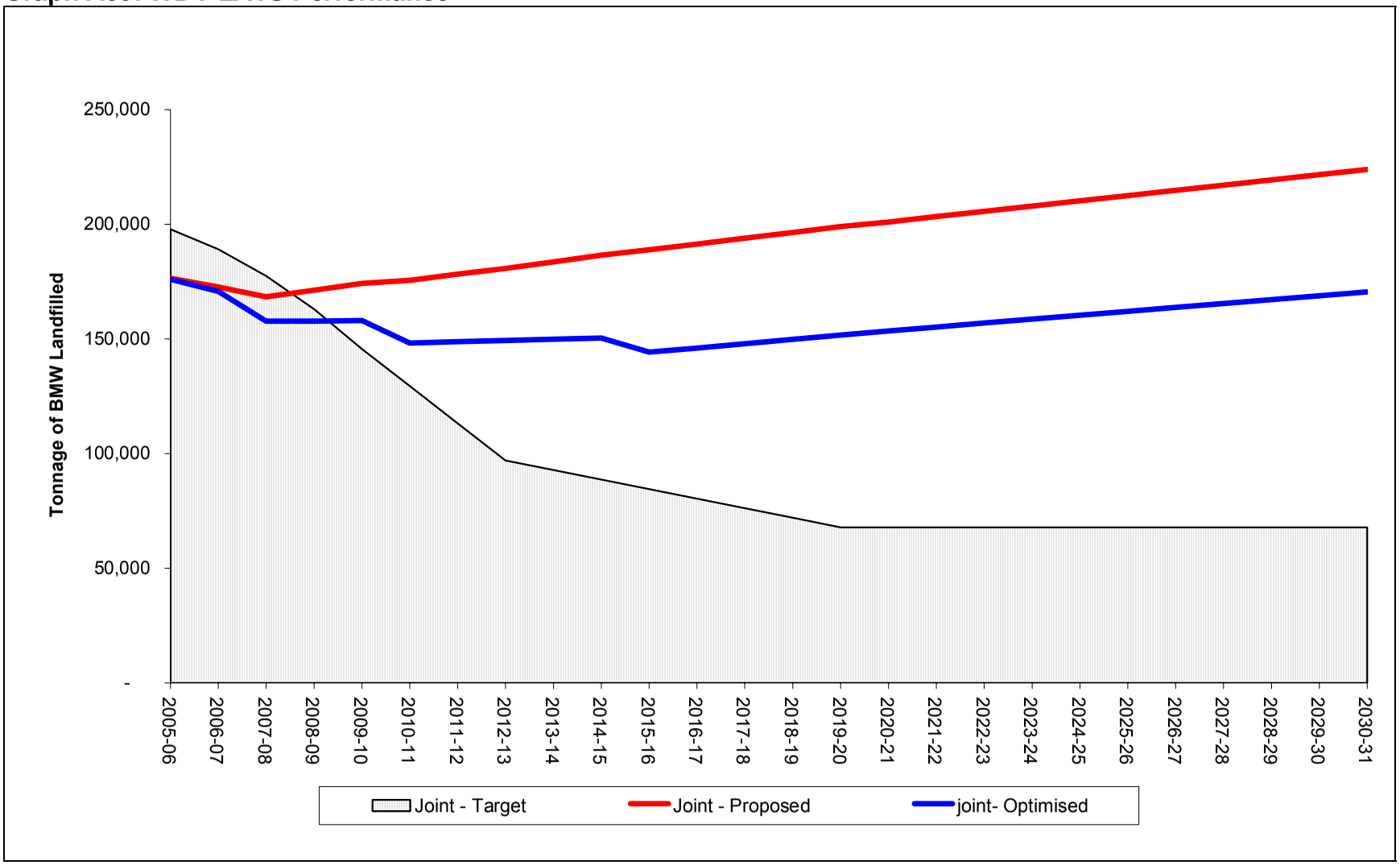
Graph A57: CDC LATS Performance



Graph A58: SBDC LATS Performance



Graph A59: WDC LATS Performance



Appendix V: Summary of Technologies

GWC - Windrow Composting
Windrow composting involves stacking raw organic materials, generally source separated green wastes, into long piles that are turned regularly with a front end loader, bucket loader or special compost turner. This type of compost usually only accommodates green waste and generally produces a compost to PAS100 standards (Publicly Available Specification 100, developed with the Waste and Resources Action Programme, a standard of compost quality) .

IVC – In-vessel Composting
In-vessel facilities are enclosed and so are able to compost a wider variety of waste due to increased control over environmental conditions and pests. This approach allows some kitchen waste and other putrescible materials to be composted into a good soil conditioner. IVC systems may be ABPR compliant.

MBT - Mechanical Biological Treatment
Residual waste is treated through a Mechanical Biological Treatment system, which dries the waste, degrading some organics, and then extracts out some recyclables (metals and possibly glass), compostable organics, and a refuse derived fuel (RDF) for energy recovery. The RDF is combusted and energy potentially recovered in an Advanced Thermal Treatment process, such as **FBG (fluids bed gasification)**, gasification, pyrolysis either locally or in existing facilities, which may or may not be local, for example, in cement kilns. The market for existing facilities is extremely fragile and fragmented and chance of obtaining a long-term contract is minimal. The compostable organics can be treated in an In-vessel composting facility, which also serves the kerbside collected organics. Without IVC the MBT plant would not be ABPR compliant.

MT - Mechanical Treatment and Anaerobic Digestion (AD)
Treating residual waste through a Mechanical Treatment system can:

- Remove bulky objects;
- Reduce the particle sizes of the waste;
- Extract out some recyclables i.e. metals;
- Produce a refuse derived fuel for energy recovery in an ATT or FBG facility, or co-fired in an existing facility, such as a cement kiln; and,
- Produce waste derived compostable organics for treatment in the AD facility.

The waste derived compostable organics are treated in an Anaerobic Digestion facility, which is part of the integrated system with the mechanical treatment. The AD process produces a waste derived compostable digestate suitable for land spreading. It also produces a methane rich biogas, which is combusted for electricity production on site. The AD process is compliant with the Animal By-Products Regulations (ABPR), and hence is suitable for processing non-source segregated organics.

ATT - Advanced Thermal Treatment
Residual waste is treated through an Advanced Thermal Treatment process, such as gasification or pyrolysis. This usually benefits from a pre-sorting/ screening process to remove bulky objects or shred the waste and to remove metals. These systems can be built on a modular scale, with a number of modules at a single site, or single modules built at multiple sites.

An ATT facility can also be configured to treat RDF. These also include pyrolysis and gasification. The output specification differs slightly from an ATT plant taking mixed MSW, as detailed in Appendix IV.

EfW - Energy from Waste
Energy from waste is the application of sound proven combustion engineering principles to a variety of technologies which reduce the volume and quantity, and sanitise the municipal waste fraction, after recycling and composting has taken place, in order to recover energy from the input material.

There are a variety of different technologies, for example, moving grate and mass burn, which can produce energy from waste by burning mixed MSW material, after an initial screening/ sorting process which remove large and oversize contraries. Metals are extracted after combustion has taken place, and bottom ash produced can be used as an aggregate. Fly ash produced is deemed hazardous, and whilst some markets exist for its use, it is generally landfilled.

FBG – Fluidised Bed Gasifier
A variation on traditional mass burn type EfW technology, this is a method of incineration in which combustion takes place on a fire bed composed of inert particles such as sand or ash. When air is blown through the bed, the material behaves as a fluid. This form of gasification is particularly suited to treating RDF input from **MBT** or **MT** processes, because it can cope with the higher calorific value.

AC – Autoclave
Treat residual waste through a series of interconnected steam conditioning autoclaves, These are pressure vessels that are similar to those used in hospitals to sterilise surgical instruments but are much larger and have unique patented characteristics. Unsorted household bagged waste is introduced directly into the vessels and steam and pressure is applied at over 140 degrees centigrade. A combination of the steam pressure, the rotation of the vessels and the internal helices results in the organic fraction of the waste being broken down into a fibrous lignocellulosic biomass; and the inorganics being sterilised and steam cleaned.