



Oregon Recycling Modernization Act Technical Workgroup on Materials Lists

Meeting #6

September 20, 2022



Today's discussion

- Follow-Up Discussion
 - Aerosol containers
 - PET thermoforms
- MRF Panel Discussion
 - Large plastic packaging, nursery packaging and scrap metal
- Scenario Modeling Discussion, Part 1
- Scenario Modeling Discussion, Part 2
- Public input



Discussion Around Outstanding Materials

Technical Workgroup on Materials Lists
September 20, 2022



Aerosol Containers

What we know

- Steel and aluminum have significant environmental benefits if recycled
- Concerns with contents: propellants and product
- HCPA study underway to characterize aerosol “fullness” and contents

Aerosol Containers: Management/Risk table

	Collect commingled on-route	Collect separately via depots	Collect separately via HHW	Collect as garbage
Risk to collection vehicles	Higher	Lower	Lowest*	Higher
Risk to MRFs	Higher	Lower	Lowest*	Lowest
Risk to steel mills	Low	Lowest	Lowest*	Lowest
Safe management of residuals?	Unknown	Best	Best*	Contained in landfill
Metal recycling	High	High*	High*	None (except Marion County)
Convenience to public	High	Moderate (less than on-route)	Low	Highest

*Benefits of depot and HHW collection would be limited due to limited access to this type of service

Aerosol containers

DEQ's current thinking

- Designate as a “Specifically Identified Material” (ORS 459A.917) and encourage PROs to conduct meaningful public outreach regarding safe handling.
- Encourage public to send *non-empty* aerosol containers to HHW infrastructure, where available.
- Designate empty containers as a PRO depot material:
 - Require containers to be safely punctured and drained, with unscreened contents managed as hazardous waste.
 - Consider changes to listing status at a future date, pending new information on risk, proposal from PRO (with full public review including Recycling Council).

PET Thermoforms

What we know

- Thermoforms (currently a non-program material statewide, excluding boutique programs in Metro area), if captured, are mostly being included in PET bottle bales.
 - Thermoform acceptance levels in bales will differ from buyer to buyer.
- Because of look-alike materials, successfully processing thermoforms found in the commingled stream would require use of optical sortation technology (i.e. removal of PVC, PS from the stream).
 - Inclusion of optical sortation would allow PET bottles, tubs and thermoforms to all be successfully processed.
 - A mixed PET bale could become thermoform-rich, especially with more and more PET bottles making their way into the Bottle Bill system.

PET Thermoforms

What we know

- Though there are several domestic buyers of mixed PET bottle/thermoform bales, acceptance levels vary greatly (typically in the 5-10% range).
- From a technical standpoint – PET thermoform products are recyclable. However, only a couple of domestic markets want thermoform-rich bales.
 - Merlin Plastics (owner of Peninsula Plastics) told us that, while they are “successfully” recycling PET thermoforms, it is a difficult and expensive process, largely because of the adhesives/glues used with the labels, which result in additional washing/increased energy/caustic use.
 - Merlin recommended that Oregon NOT accept this material at this time, in order to put pressure on producers to fix that design challenge.

PET Thermoforms

What we know

- The biggest buyers of thermoform-rich bales are located in Mexico. Unfortunately, some of these buyers are not interested in purchasing bales from US MRFs, due to worries around contamination (non-fruit and produce packaging in bales, PVC blister pack, etc.).
- Other facilities are located in significantly-to-severely water-stressed areas of Mexico. With the reclamation process being water-intensive, some facilities have water reclamation technology in place while others do not and those facilities may/will not meet our new standards for “responsible recycling”.
- There are also potential concerns regarding land disposal of contaminants.

PET Thermoforms

DEQ's current thinking

- PET thermoforms, for now, stay off of Oregon's material acceptance lists – both on-route collection and PRO depots.
 - Encourage domestic infrastructure to grow.
 - We encourage producers to make the package more recyclable, including using compatible adhesives and labels.
 - Encourage phase-outs of look-alike PVC blister pack.
 - Materials could be added later via the on-ramps in the Act.



MRF Panel Discussion

Technical Workgroup on Materials Lists
September 20, 2022



Bulky Rigid Plastic Packaging

What we know

- Material is mainly HDPE or PP. Makes sense to recycle.
- Market prices are currently down for mixed bulky rigid material (current R4 price is a cost of ½ cent/pound, compared to the national average of a value of 3.56 cents/pound).
- Decent volume of material to be captured.
- On-route collection of this material would be more convenient, more effective at capturing material compared to depot collection.
- Though it is on some jurisdictions' acceptance lists, much of this material is pulled off the line and landfilled by MRFs.
- Such large containers can be a hazard at the MRF.

Bulky Rigid Plastic Packaging

Questions for MRFs

- How do these materials flow through your MRF?
 - Are they removed in pre-sort area? If so, where do they go?
 - Do any make it to your container sort line? If so, what happens there?
- If you recycle these materials, how do you market them? Mixed bulky rigids? Others?
- What would be the impacts to your MRF if these were added to the uniform statewide collection list, and a DEQ permit required you to achieve high capture rates?

Nursery Packaging

What we know

- Pots and trays, mainly made of HDPE, PP and PS, which vary greatly in size.
 - Typical program rule is anything with a four-inch diameter and bigger.
- Though some pots come green, terra cotta or white in color, an overwhelming majority of this packaging is black, which can be a challenge for optical sorters at MRFs to identify and sort.
- PS packaging is thinner, more flimsy and brittle compared to HDPE and PP. Material can flatten or possibly shatter when collected.
- Many pots and trays show up at the MRF with soil in them.
 - Reclaimers – “not a problem,” but dirt makes pots heavier and potentially more difficult for MRFs to handle.

Nursery Packaging

Questions for MRFs

- How do these materials flow through your MRF?
 - How are they sorted on your container line? Do optical sorters fire effectively on them (including black packaging)?
 - What about flattened materials that end up on the fiber line? How are these removed? And what happens to them?
 - How are materials marketed? Resin-specific bales? “Mixed 3 – 7” bales?
- Thoughts/experience with next-generation optical sorters that can identify and sort black packaging?

Scrap Metal

What we know

- Metal is a high priority material to recycle (for DEQ) given the large environmental benefits.
- Current typical program rule is “smaller than 30 inches and less than 30 lbs” . . . or “don’t accept at all”.
- Some MRFs are fine with scrap metal that size, but other MRFs and collectors have told us that 30 inches is too long and 30 pounds is too heavy.
 - DEQ has asked this group, and others, for size/weight recommendations.
- Scrap metal damages equipment, especially tangles (e.g., wire, chains, etc.).
- Some MRFs don’t want to see scrap metal accepted curbside. They’d rather see it a depot-only material.

Scrap Metal

Questions for MRFs

1. How do these materials flow through your MRF?
 - a. Are they removed in pre-sort area? If so, where do they go?
 - b. Do any make it to your container sort line? If so, what happens there?
 - c. Use of magnets vs. manual labor?

2. **IF** users of the commingled system followed instructions, and “tanglers” (e.g., wire, chains, etc.) and oversized items are kept out, are there size and weight limits below which you could effectively sort scrap metal?



Short Break

The meeting will resume at approximately 10:40a.



Draft Scenarios Model Overview

Jessica Branom-Zwick, Cascadia Consulting Group
Carolina Paez Jimenez, Cascadia Consulting Group
Chris Bell, Bell & Associates
Tim Buwalda, Circular Matters

Recycling Modernization Act
Material Lists Technical Workgroup
September 20, 2022



The background is a solid teal color. On the right side, there are several large, white, abstract shapes that resemble stylized arrows or curved lines pointing towards the right. These shapes are layered, with some appearing behind others, creating a sense of depth and movement.

How to review and provide feedback

Where and how to review



How to provide feedback?

- Three different ways:

1

Engaging in today's meeting

2

Using the online feedback form

3

Sending an email

- Send email to jessica@cascadiaconsulting.com and david.allaway@deq.oregon.gov
- Can send separate email with proprietary data to Jessica

Where to review?

- Online – easiest to download.
Provide feedback through COB
Friday, September 30th

https://cascadiainc-my.sharepoint.com/:f:/g/personal/jessica_cascadiaconsulting_com/EjI5MNCZI3VlrRJBPhAZIN4Bm1-lh09WPw1NHNsT2SUn4A?e=Kugg1C

Feedback Form



	A	B	C	D	E	F	G	H
1	Feedback Form							
2	Please provide your contact information, and your feedback, including additional data to revise inputs.							
3								
4	Reviewer Name	Organization	Contact Email	Phone Number	Model	Sheet/Tab	Table Name or Cell/Range	Reviewer Feedback
5	First Name & Last Name	Example Organization	reviewer@email.com	503-555-5555	05-COST	CollectionTrial	Column Customer Ratio	Example Feedback: "Percentages in grouping 3 & 4 look [high/low]. I can share additional data for rural areas."
6								
7								
8								
9								



Data inputs & sources









Questions



Notes on things that don't match your experience

Feedback Form



1	Feedback Form							
2	Please provide your contact information, and your feedback, including additional data to revise inputs.							
3								
4	Reviewer Name	Organization	Contact Email	Phone Number	Model	Sheet/Tab	Table Name or Cell/Range	Reviewer Feedback
5	First Name & Last Name	Example Organization	<u>reviewer@email.com</u>	503-555-5555	05-COST	CollectionTrial	Column Customer Ratio	Example Feedback: "Percentages in grouping 3 & 4 look [high/low]. I can share additional data for rural areas."
6	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <ul style="list-style-type: none">  01-ORDEQ22-Model-BASE TONS-v02-2022-09-19  02-ORDEQ22-Model-NEW TONS-v07-2022-09-19  03-ORDEQ22-Model-TRANSPORT-v04-2022-09-19  04-ORDEQ22-Model-BALES-v07-2022-09-19  05-ORDEQ22-Model-COST-v08-2022-09-19  06-ORDEQ22-Report-v06-2022-09-19 </div>							
7								
8								
9								



Data inputs & sources



Questions



Notes on things that don't match your experience

ReadMe Tab

the reviewer's
friend

Introduction and Overview

Model Objectives: Calculate the cost of recycling and garbage in Oregon, using inputs from previous modules and unit cost factors.

Guide to cell styles	
Input cell (focus on these)	
Note	
Linked Data	
Calculation	
Output	
Labels	
KeyIndex	
CHECK	

Input cell (focus on these)

Notes regarding inputs

Data linking from elsewhere in the model

Interim calculations within a table

Output of a table for review or used elsewhere

Human-readable labels for items such as MRFs, submaterials, collection streams, etc.

Computer-readable inputs for items such as MRFs, submaterials, collection streams, etc.

Check cells

Step 1. Establish 2021 on-route collection baseline costs

Input Tabs

CollectionLabor

Estimates and inputs used in the COST Module around labor collection costs, capital costs, other operational expenses, annual indirect costs, and full-time equivalent employees (e.g., customers served per FTE, single-family, multifamily, and commercial collection and transfer FTEs).

CollectionCapital

Sample size of data coming from confidential sources:

–Metro is five composite cities with 222,208 customers using a cart and 4,974 commercial customers using a container for recycling

CollectionOps

–Willamette Valley is the composite cost of Eugene, Salem, Marion Urban, and McMinnville with 112,340 residential and 6,899 commercial container customers.

CollectionIndirect

–The rural area is three counties and one coastal city that has 27,018 residential customers and 923 commercial customers. Costs and operations for areas without recycling is the composite of Tillamook County without the City of Tillamook.

CollectionCustomers

–Depot costs are from recycling activities at Tillamook and Lane Counties, Astoria and McMinnville, Rogue Disposal, and 34 depots operated by Waste Connections

Calculation Tab

CollectionTotal

Combines inputs from prior tabs to calculate on-route collection costs per scenario, grouping, sector, and collection frequency.

Collection_FTE_2026

Combines estimated customers and lifts per week from previous tabs to calculate the annual on-route, engagement, and hauler administrative FTEs.



ReadMe

CollectionLabor

CollectionCapital

CollectionOps

CollectionIndirect

CollectionCustomers

CollectionTotal

Collection

Reviewing: cost module example



Guide to cell styles
Input cell (focus on these)
Note
Linked Data
Calculation
Output
Labels
KeyIndex
CHECK

Input cell (focus on these)

Notes regarding inputs

Data linking from elsewhere in the model

Interim calculations within a table

Output of a table for review or used elsewhere

Human-readable labels for items such as MRFs, submaterials, collection streams, etc.

Computer-readable inputs for items such as MRFs, submaterials, collection streams, etc.

Check cells

Grouping_Name	Sector_Name	CollectionStream_Name	Collection_Frequency	OnRoute_Lifts_Per_FTE_Per_Hour	OnRoute_Labor_Cost_Per_Lift	Benefits_Ratio	OnRoute_Benefits_Per_Lift	Labor_Cost_Per_Lift	Average_Lifts_Per_Customer_Per_Week	Weeks_Per_Year	Annual_Labor_Cost_Per_Customer
1 - Metro Area	SF Res. (on-route)	Commingled	Every other week	76	\$ 0.32	49.8%	\$ 0.16	\$ 0.48	0.50	52	\$ 12.40
1 - Metro Area	SF Res. (on-route)	Commingled	Weekly	85	\$ 0.25	46.9%	\$ 0.12	\$ 0.37	1.00	52	\$ 19.16
1 - Metro Area	MF Res. (on-route)	Commingled	Varies by customer ne	12	\$ 2.72	48.9%	\$ 1.33	\$ 4.05	1.74	52	\$ 365.93
1 - Metro Area	Commercial (all garbage,	Commingled	Varies by customer ne	12	\$ 2.72	48.9%	\$ 1.33	\$ 4.05	1.74	52	\$ 365.93
2 - Willamette Valley, etc.	SF Res. (on-route)	Commingled	Every other week	82	\$ 0.22	38.8%	\$ 0.08	\$ 0.30	0.50	52	\$ 7.89
2 - Willamette Valley, etc.	SF Res. (on-route)	Commingled	Weekly	77	\$ 0.29	38.8%	\$ 0.11	\$ 0.40	1.00	52	\$ 20.82
2 - Willamette Valley, etc.	MF Res. (on-route)	Commingled	Varies by customer ne	10	\$ 3.00	41.7%	\$ 1.25	\$ 4.25	1.08	52	\$ 239.54
2 - Willamette Valley, etc.	Commercial (all garbage,	Commingled	Varies by customer ne	10	\$ 3.00	41.7%	\$ 1.25	\$ 4.25	1.08	52	\$ 239.54
3 - Other Areas with Curb:	SF Res. (on-route)	Commingled	Every other week	54	\$ 0.35	33.2%	\$ 0.12	\$ 0.47	0.50	52	\$ 12.15
3 - Other Areas with Curb:	SF Res. (on-route)	Commingled	Weekly	52	\$ 0.25	47.7%	\$ 0.12	\$ 0.37	1.00	52	\$ 19.11
3 - Other Areas with Curb:	MF Res. (on-route)	Commingled	Varies by customer ne	7	\$ 3.93	37.2%	\$ 1.46	\$ 5.39	0.98	52	\$ 275.85
3 - Other Areas with Curb:	Commercial (all garbage,	Commingled	Varies by customer ne	7	\$ 3.93	37.2%	\$ 1.46	\$ 5.39	0.98	52	\$ 275.85



Scenario Modeling: PRO Depots

Technical Workgroup on Materials Lists
September 20, 2022



Four Types of Depots

1. Expanded (existing) multi-material depots
2. Return-to-retail
3. Single-material drop-box
4. New multi-material depots

Glass-only depots

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS/PRO	PRO	OTS	OTS	OTS	OTS/PRO	OTS/PRO	OTS/PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	Not	PRO	PRO	Not	PRO

Depots with different densities (across the state)

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	Not	PRO	PRO	Not	PRO

Depots with different densities (across the state)

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	Not	PRO	PRO	Not	PRO

Depots with medium (S6), long (S13) and short (S17) acceptance lists

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	Not	PRO	PRO	Not	PRO

Four Geographic Groupings

Grouping One: Metro region

Grouping Two: “Willamette Valley” (and similar)

Grouping Three: “Other Curbside”

Grouping Four: Rest of Oregon

Number of Depots: Assumptions

	Low Density	Medium Density	High Density
Every County has at least 1 depot . . .			
. . . plus one additional site for every X people	X = 75,000 (Metro) X = 50,000 (others)	X = 60,000 (Metro) X = 40,000 (others)	X = 45,000 (Metro) X = 30,000 (others)



Number of Depots: Assumptions

	Low Density	Medium Density	High Density
Every County has at least 1 depot . . .			
. . . plus one additional site for every X people	X = 75,000 (Metro) X = 50,000 (others)	X = 60,000 (Metro) X = 40,000 (others)	X = 45,000 (Metro) X = 30,000 (others)
Every city with a population over M has at least 1 depot (can meet County standard also) . . .	M = 20,000 (Metro) M = 10,000 (others)	M = 15,000 (Metro) M = 7,500 (others)	M = 10,000 (Metro) M = 5,000 (others)
. . . plus one additional site for every Y people	Y = 100,000 (Metro) Y = 40,000 (others)	Y = 75,000 (Metro) Y = 35,000 (others)	Y = 50,000 (Metro) Y = 30,000 (others)

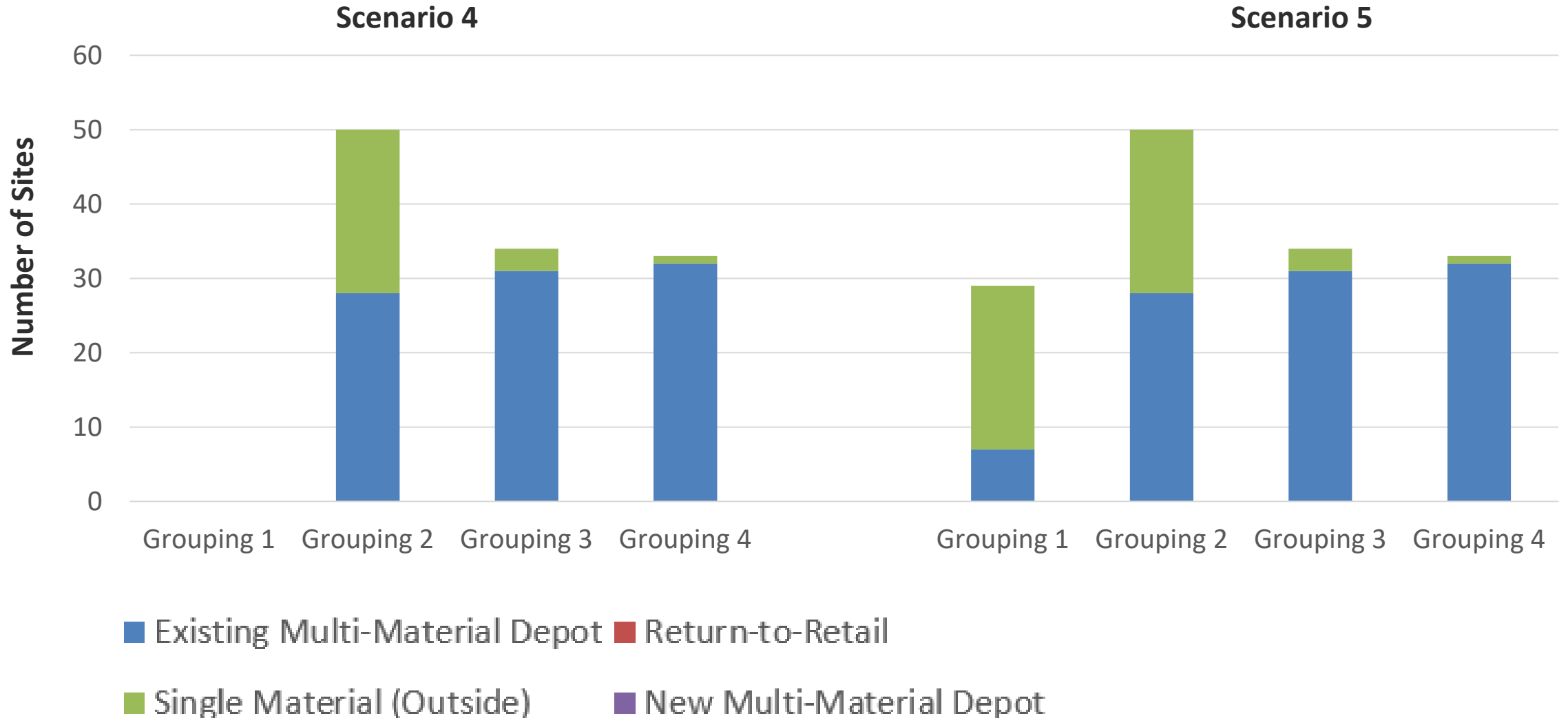
Number of Depots: Assumptions

	Low Density	Medium Density	High Density
Every County has at least 1 depot . . .			
. . . plus one additional site for every X people	X = 75,000 (Metro) X = 50,000 (others)	X = 60,000 (Metro) X = 40,000 (others)	X = 45,000 (Metro) X = 30,000 (others)
Every city with a population over M has at least 1 depot (can meet County standard also) . . .	M = 20,000 (Metro) M = 10,000 (others)	M = 15,000 (Metro) M = 7,500 (others)	M = 10,000 (Metro) M = 5,000 (others)
. . . plus one additional site for every Y people	Y = 100,000 (Metro) Y = 40,000 (others)	Y = 75,000 (Metro) Y = 35,000 (others)	Y = 50,000 (Metro) Y = 30,000 (others)
Opportunity for every Opportunity to Recycle depot to expand?	No	Yes, full depots only	Yes, all depots

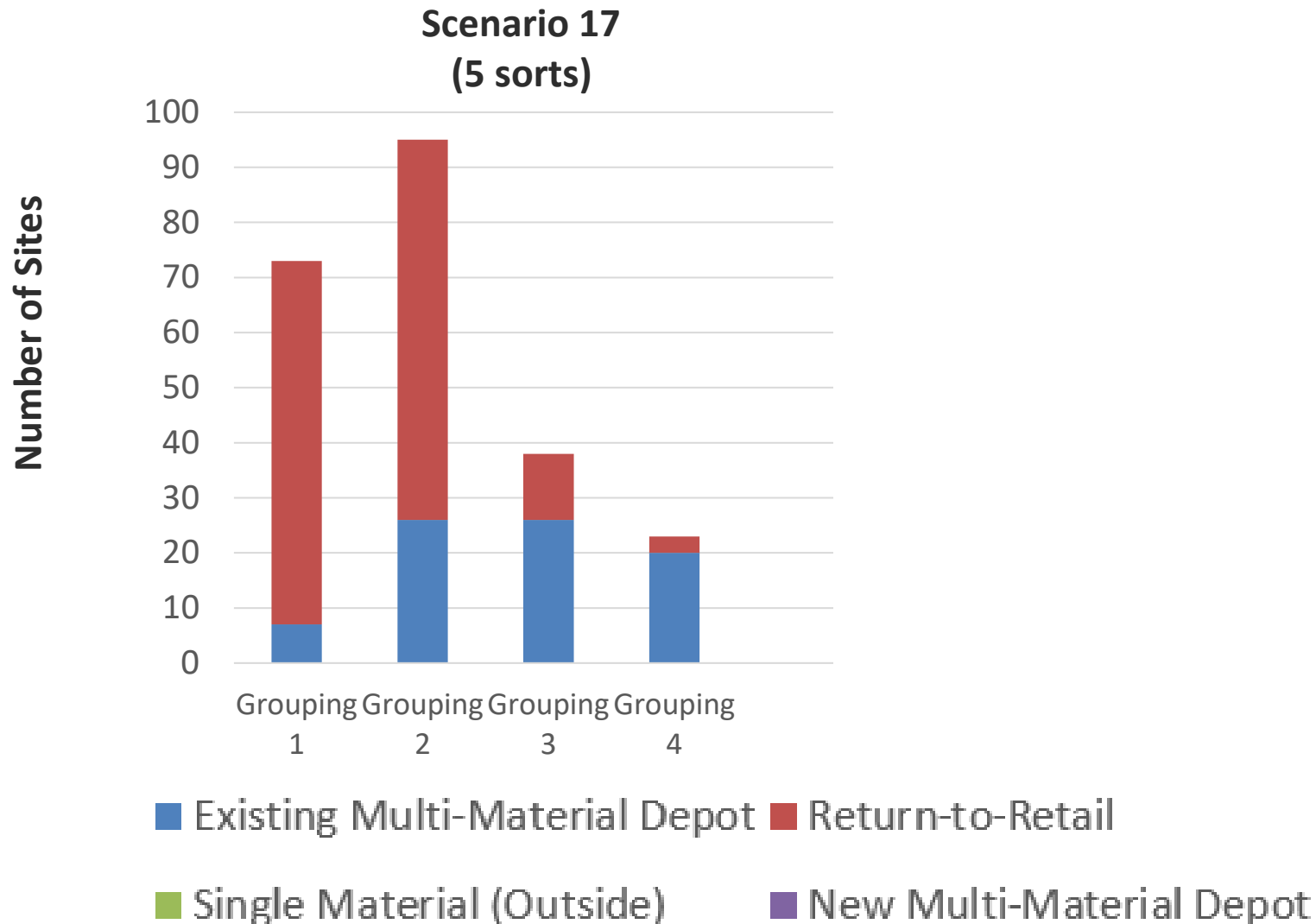
Number of Depots: Assumptions

	Low Density	Medium Density	High Density
Every County has at least 1 depot . . .			
. . . plus one additional site for every X people	X = 75,000 (Metro) X = 50,000 (others)	X = 60,000 (Metro) X = 40,000 (others)	X = 45,000 (Metro) X = 30,000 (others)
Every city with a population over M has at least 1 depot (can meet County standard also) . . .	M = 20,000 (Metro) M = 10,000 (others)	M = 15,000 (Metro) M = 7,500 (others)	M = 10,000 (Metro) M = 5,000 (others)
. . . plus one additional site for every Y people	Y = 100,000 (Metro) Y = 40,000 (others)	Y = 75,000 (Metro) Y = 35,000 (others)	Y = 50,000 (Metro) Y = 30,000 (others)
Opportunity for every Opportunity to Recycle depot to expand?	No	Yes, full depots only	Yes, all depots
Number of Sites:			
Grouping 1 (Metro)	24	29	39
Grouping 2 (“Willamette Valley”)	36	52	58
Grouping 3 (“Other Curbside”)	14	33	47
<u>Grouping 4 (Rest of State)</u>	<u>14</u>	<u>32</u>	<u>38</u>
Total	88	146	182

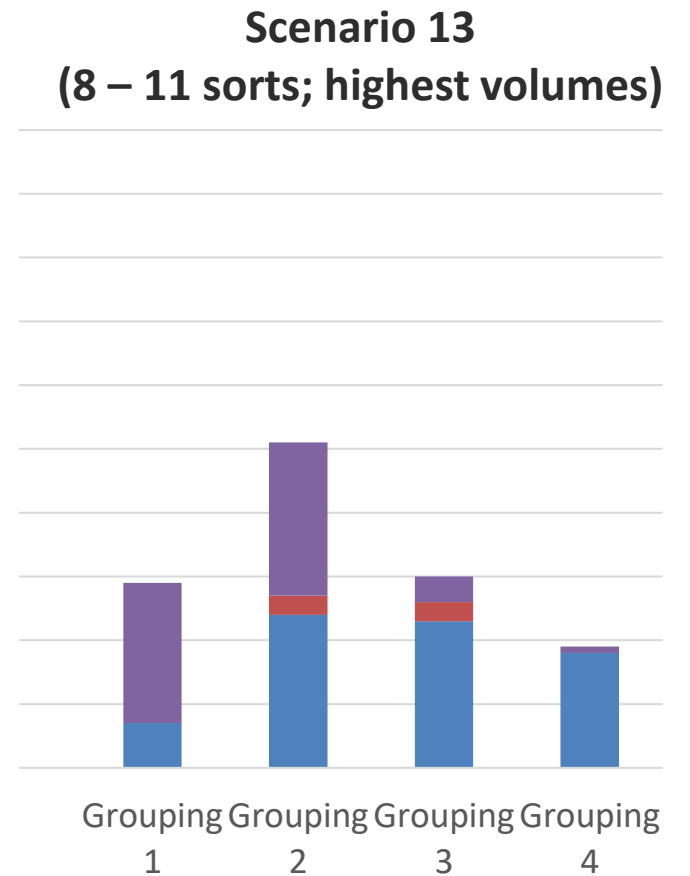
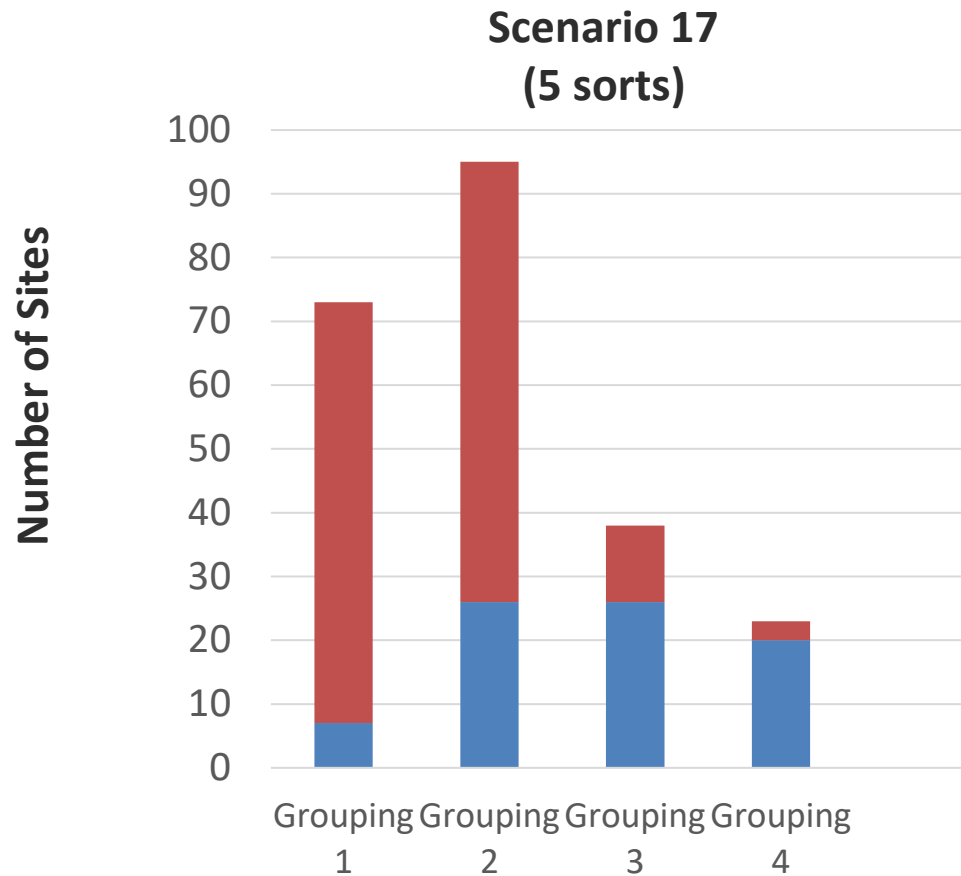
PRO Depot Service: Scenarios 4 and 5 (glass only)



PRO Depot Service: Scenarios 17 (short list), 13 (long list) and 6 (medium list)

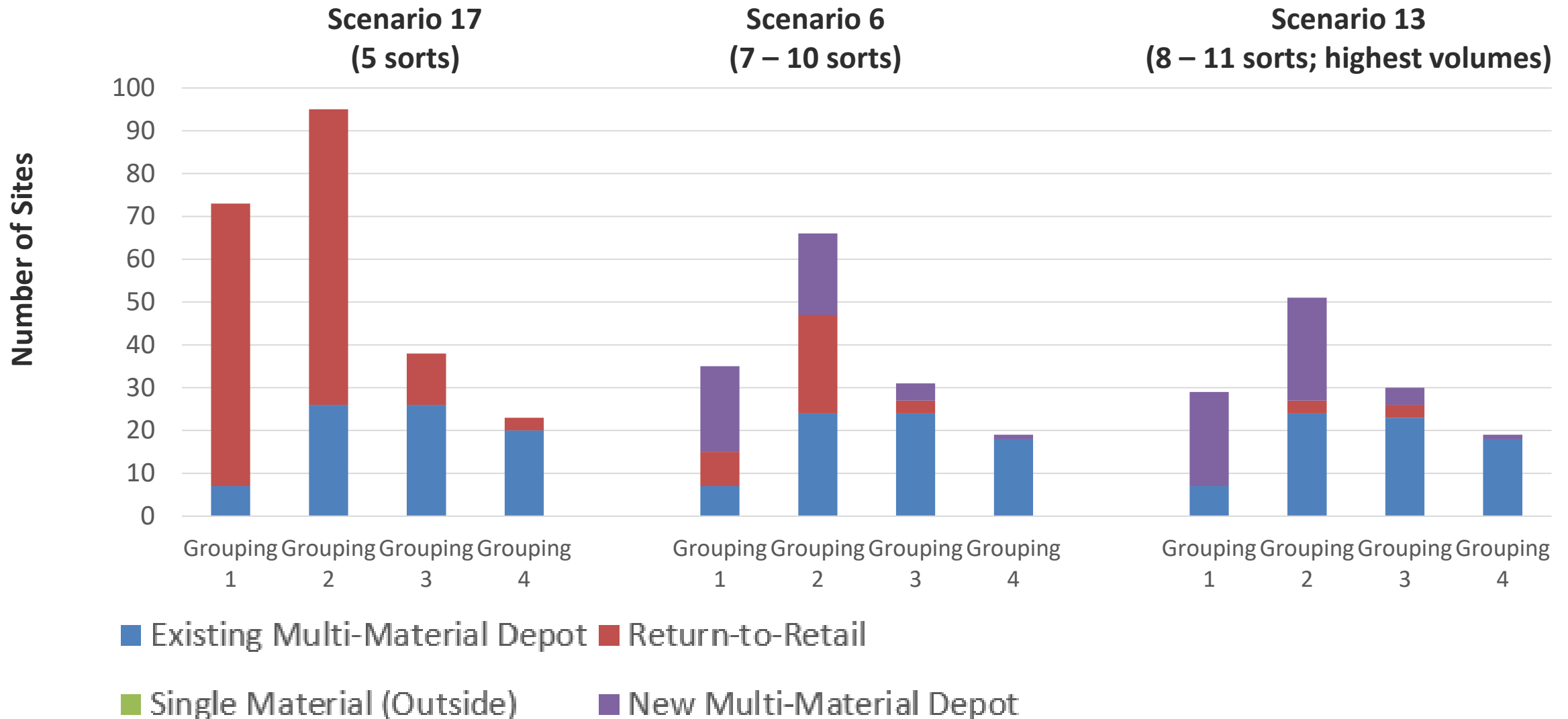


PRO Depot Service: Scenarios 17 (short list), 13 (long list) and 6 (medium list)

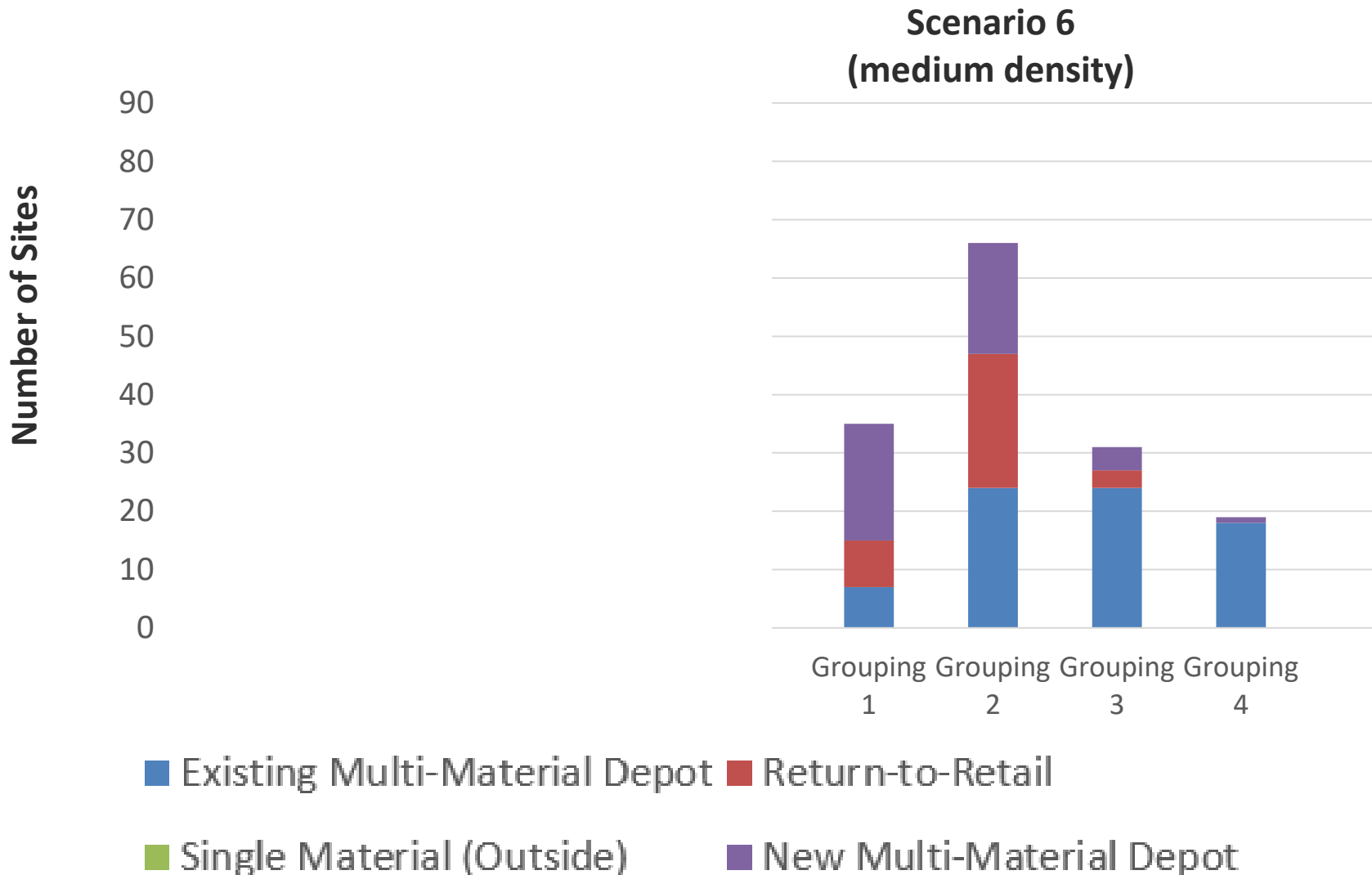


- Existing Multi-Material Depot
- Return-to-Retail
- Single Material (Outside)
- New Multi-Material Depot

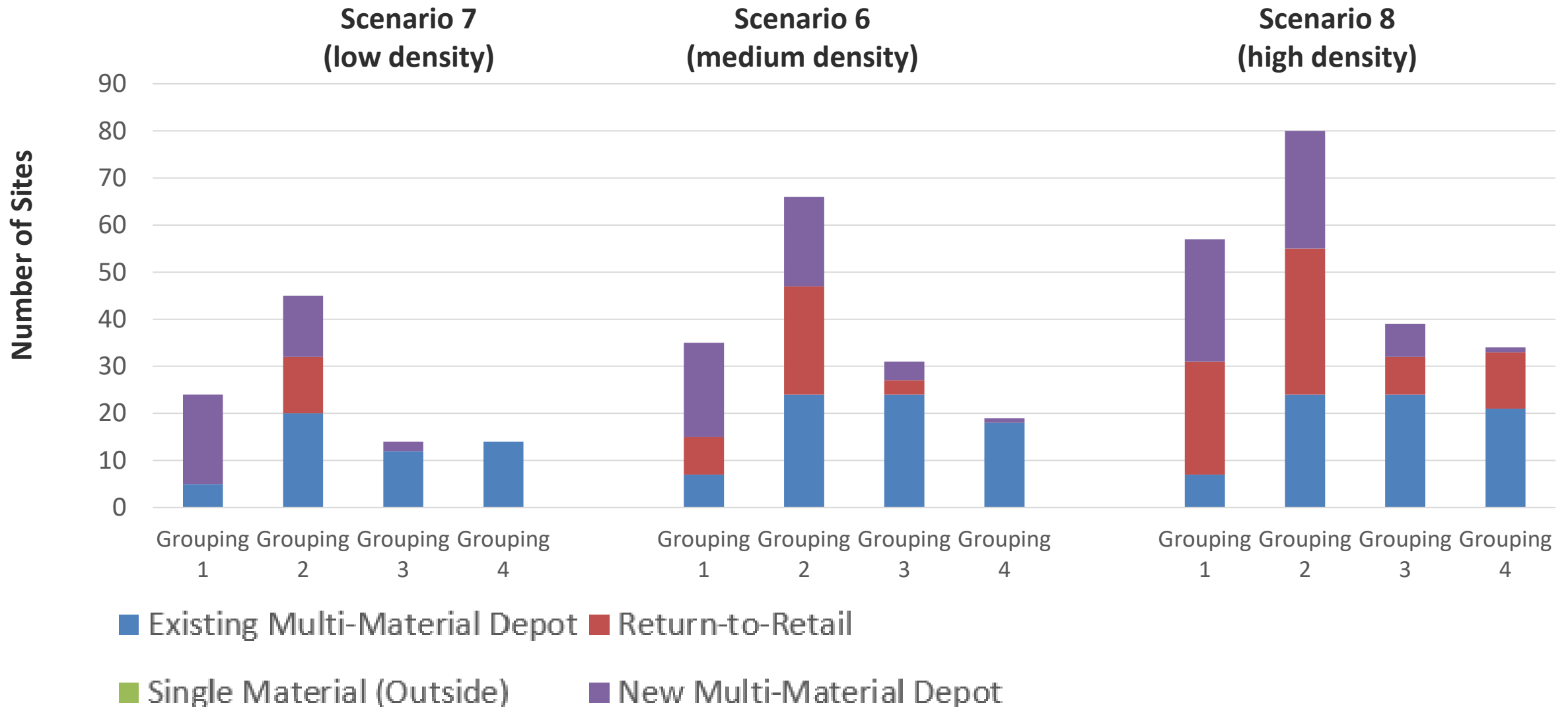
PRO Depot Service: Scenarios 17 (short list), 13 (long list) and 6 (medium list)



PRO Depot Service: Scenarios 6 (medium density), 7 (low density), and 8 (high density)

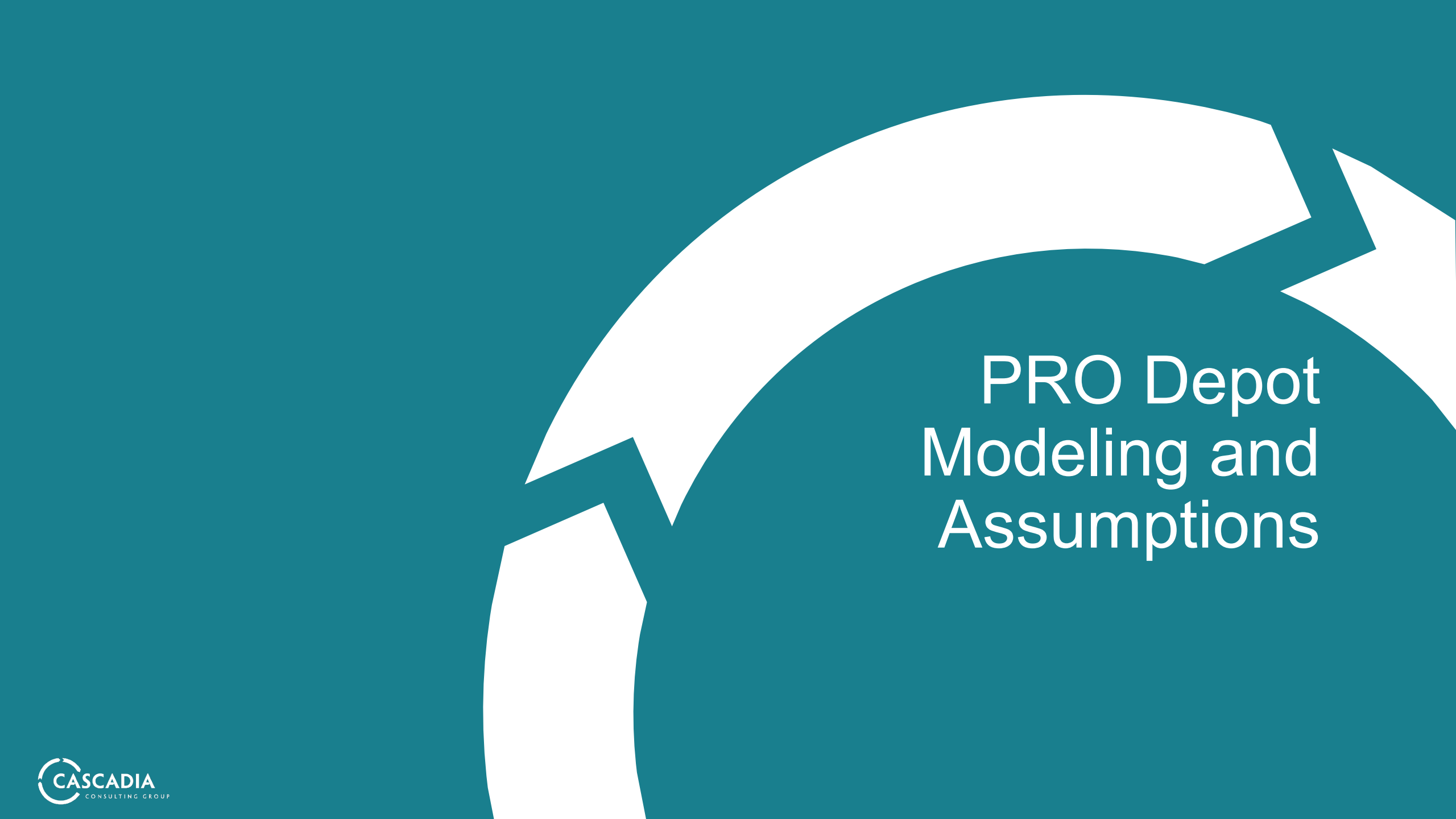


PRO Depot Service: Scenarios 6 (medium density), 7 (low density), and 8 (high density)



Depot capture rates

1. Estimate # of depots/population served for grouping 1 and 2 reference cases (“D”)
2. Calculate # of depots/population for future scenarios (“L”, “M”, “H”)
3. Estimate “adjustment factor” for reference cases: (capture rate @ depots) / (capture rate for on-route collection)
 - Tacoma = ~77%
 - Rogue Disposal = ~84%
4. Modify the “adjustment factor” for future scenarios as average of {(L/D), (M/D), or (H/D)}x and {1.0}x
5. For future scenarios (Groupings 1 and 2) with low, medium, and high density, modeled depot capture rate = (on-route capture rate for a comparable material) x (modified adjustment factor)

The background is a solid teal color. On the right side, there are several large, white, abstract shapes that resemble stylized arrows or curved lines pointing towards the right. These shapes are layered, with some overlapping others, creating a sense of depth and movement.

PRO Depot Modeling and Assumptions

Switch to David's slides on the type and number of depots

PRO Depot Land and Building Costs

Seem reasonable? Any additional data?

Calculation

- Step 1: Obtain lease rates per square foot from lease websites for retail and industrial
- Step 2: Use statewide land cost average to determine land unit cost in each grouping and scenario



Assumptions

	Depot Type	Unit Cost*	Notes
Land Costs	Co-collection at Existing Depots	\$7,200	600 sq. ft at \$1/sq.ft./month
	Return-to-Retail	\$420	20 sq. ft. at \$1.75/sq.ft./month
	Single Material Depot	\$4,200	200 sq. ft at \$1.75/sq.ft./month
	Multi-material Depot	\$12,600	600 sq. ft at \$1.75/sq.ft./month
Building Costs	Co-collection	\$1,155	1 cargo container building
	Return-to-Retail	--	--
	Single Material Depot	\$1,980	1 cargo container building
	Multi-material Depot	\$5,940	3 cargo container building

*Annual cost per site

PRO Depot Operating & Labor Costs



Method

- Used 2022 compensation rates RecycleBC pays to PRO depots, converted to US dollars and short tons
- For aerosols, used a quote to manage as hazardous waste
- For polystyrene foam, added 6 densifiers in the state and added \$1,600/ton to densify foam
- Also added labor costs (not fully loaded)

Inputs

Material	Per Ton Cost
Shredded Paper	\$170
Cartons and Polycoat	\$240
Mixed Plastics	\$240
Foil and Foil Containers	\$240
Aerosol Cans	\$5,000
Film Plastic	\$1,642
Polystyrene Foam	\$3,320
Glass	\$77

Depot Type	Per Hour Cost
Co-collection at Existing Depots	0.25 FTE at \$18.59/hr
Return-to-Retail	0.15 FTE at \$18.59/hr
Single Material Depot	1 FTE at \$18.59/hr
Multi-material Depot	2 FTE at \$22.81/hr

Seem reasonable? Any additional data?



Lunch Break

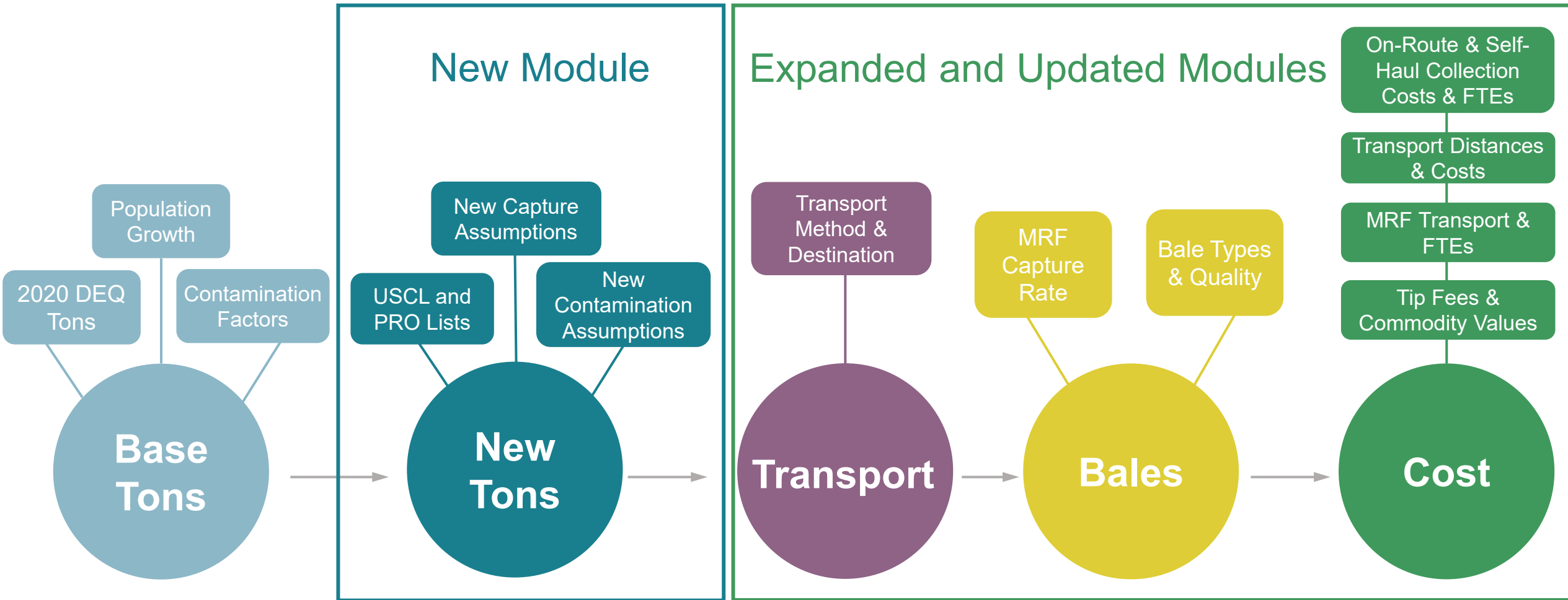
The meeting will resume at approximately 12:20p PDT



The background is a solid teal color. On the right side, there are several large, white, abstract shapes that resemble stylized waves or a jagged arc, creating a sense of movement and depth.

New Capture Rates for USCL and PRO Depots

Scenario Modeling



What's in the scope of the model?



In: recycling and garbage regulated by local governments

Franchised or permitted collection for:

- **Single-family residential**
- **Multifamily residential**
- **Commercial**

Self-haul by the public

- Solid waste / recycling depots

Out: everything else

- C&D debris
- Hazardous waste
- Tires, paint, e-waste, etc.
- Organics
- Motor oil
- Bottle bill recovery
- Commercial recovery not regulated by local government
 - (e.g., compacted cardboard directly marketed by business, industrial plastic scrap recovery)

Geographic Groupings



The model divides Oregon into four geographic groupings based on access to curbside recycling and location.

1. Metro Area

- All areas within the Metro urban growth boundary.

2. Willamette Valley, etc.

- Areas with curbside collection in most of the Willamette Valley, The Oregon Coast south to Lincoln County, Deschutes County, Hood River County, and Wasco County.

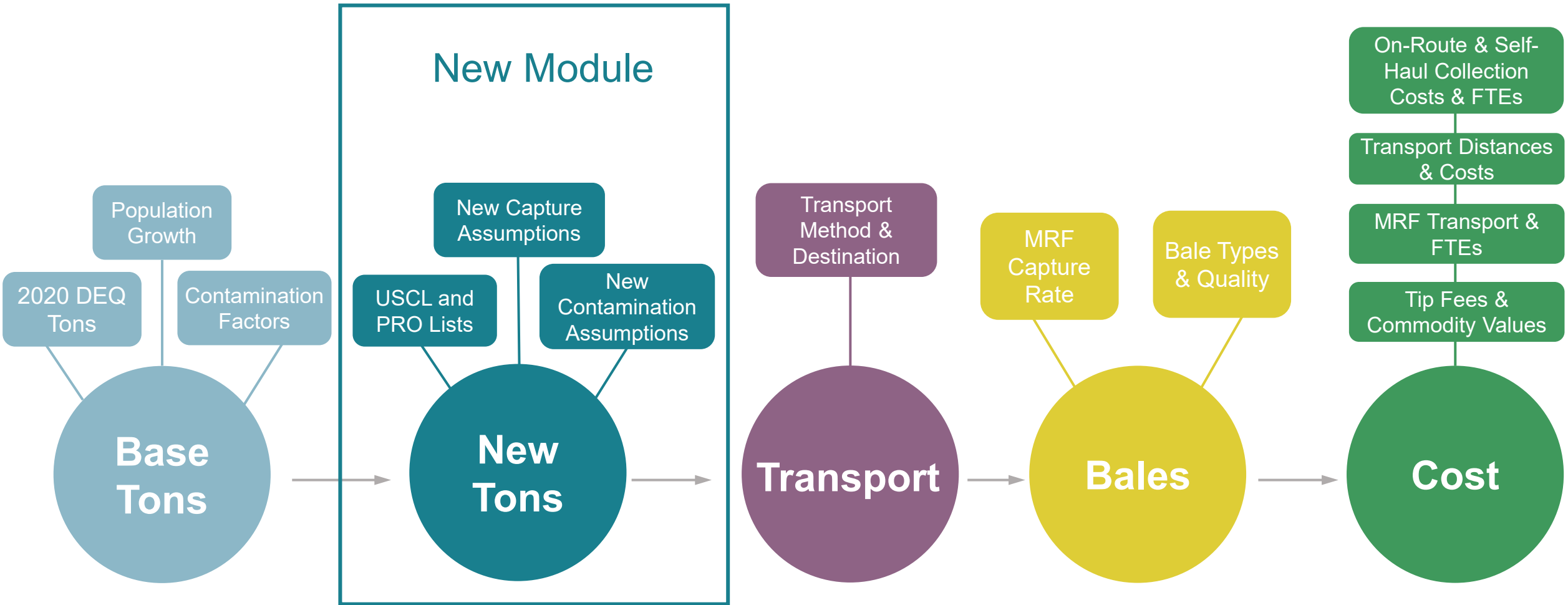
3. Other Areas with Curbside Recycling

- All other areas with curbside collection, including some small towns from areas in Category 2 if they are distant from Portland and other population centers, such as the city of Oakridge in Lane County.

4. Areas Without Curbside Recycling

- All areas without curbside collection or minimal curbside collection — served mainly by depots, if at all.

Scenario Modeling



New Capture Rates for USCL



For materials that Metro currently recycles

- Start with Metro's baseline capture rate for that material
- Adjust to other groupings by comparing baseline capture rates
 - Ratio of the capture rate for steel cans for Metro compared to the affected grouping
 - Except where the other grouping recycles that material better
- Grouping 4 is further reduced because only 30% of customers gain recycling

Example

Grouping	Compared to Metro SF*	Compared to Metro MF*	Compared to Metro COM*
1	100%	100%	100%
2	74%	26%	67%
3	33%	6%	28%
4	10%	2%	9%

*Override with baseline capture rate if the grouping recycles better than Metro

Example for New Capture Rate



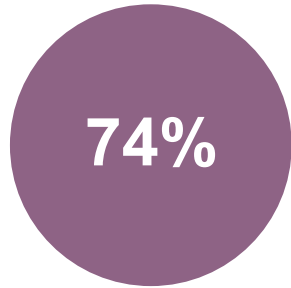
Capture rate for Single-Family in Grouping 2

Seem reasonable??

**Grouping 1
Capture Rate
for HDPE Tubs**



**Grouping 2 recycling
behavior compared to
Grouping 1**



Grouping 1 SF's capture rate for HDPE Tubs is 50%



Grouping 2 SF recycles 74% as well as Grouping 1 SF

Another way to think about it

If Grouping 1 is recycling 50 lbs. out of 100 lbs. of tubs

Then Grouping 2 would recycle 37 lbs. out of 100 lbs. of tubs

New Capture Rates for USCL



For Other Materials

Using a similar material that is already recycled in Metro

- Mainly HPDE tubs (6 oz to 2 gallons)
- Adjust by comparing capture rates for the new and standard materials by Seattle residents

Examples

- PET thermoforms 6 oz to 2 gallons
 - Recycle with the same capture rate (100%) as HDPE tubs 6 oz to 2 gallons
 - Based on Seattle capture rate data for non-bottle PET plastic packaging compared to non-bottle HDPE plastic packaging
- Trays, other clamshells, and other RPCs not accepted curbside
 - Recycle at just over half the capture rate (60%) as HDPE tubs 6 oz to 2 gallons
 - Based on Seattle capture rate data for plastic food service ware compared to non-bottle HDPE packaging

Example Capture Rate for New Materials



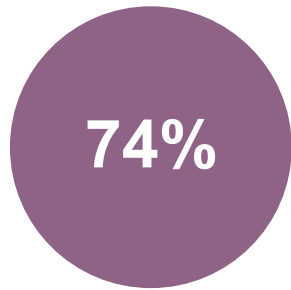
Capture rate for trays, clamshells, and other RPCs not accepted at curbside from Single-Family residents in Grouping 2

Seem reasonable??

**Grouping 1
Capture Rate
for HDPE Tubs**



**Grouping 2 recycling
behavior compared to
Grouping 1**



**Trays recycling
behavior compared
to HDPE Tubs**



Grouping 1 SF's capture rate for HDPE Tubs is 50%



Grouping 2 SF recycles 74% as well as Grouping 1 SF



Estimate people recycle Trays, etc. 60% as well as they recycle HDPE Tubs (Seattle)

Another way to think about it

If Grouping 2 would recycle 37 lbs. out of 100 lbs. of tubs

Then Grouping 2 would recycle 22 lbs. out of 100 lbs. of trays, etc.

New Capture Rates for PRO Depots



Grouping 1: City of Tacoma Data

- After switching to depot-only glass with 1 depot for every 43,000 people, Tacoma kept collecting 77% of tons collected previously curbside collection.

Grouping 2: Rogue Disposal & Recycling Data

- Rogue Disposal and Recycling collects glass using depots only (1 depot for every 25,000 people) and collects an average of 84% of on-route glass per customer compared to on-route service in Eugene and Hillsboro.

Grouping 3: Calculation

- Average of Groupings 2 and 4, shown below

Grouping 4: Estimation

- The grouping-wide capture rate in Grouping 4 was approximately 20% compared to Grouping 1 for steel cans and other [non-deposit] container glass

Density Adjustment

- Doubling depots increases capture rate increases by half (50% higher).
- Halving depots decreases capture rate by half the half (or 25%).

Grouping	High	Regular	Low
1	81%	70%	64%
2	83%	79%	67%
3	51%	48%	42%
4	20%	18%	16%

Example for PRO Depot Capture Rate



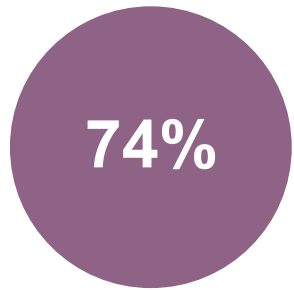
Capture rate for trays, clamshells, and other RPCs not accepted at curbside from Single-Family residents in Grouping 2

Seem reasonable??

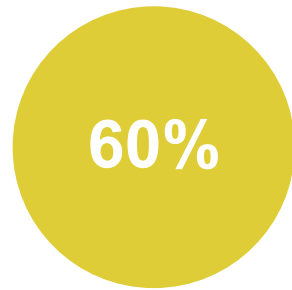
**Grouping 1
Capture Rate
for HDPE Tubs**



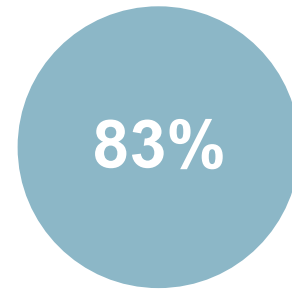
**Grouping 2 recycling
behavior compared
to Grouping 1**



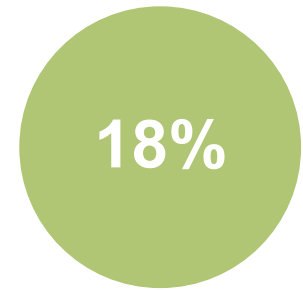
**Trays recycling
behavior compared
to HDPE Tubs**



**Recycling at high
density depots
compared to on-route
in Grouping 2**



**PRO depot
capture rate for
trays, etc. in
Grouping 2 SF**



Grouping 1 SF's capture rate for HDPE Tubs is 50%



Grouping 2 SF recycles 74% as well as Grouping 1 SF



Estimate people recycle Trays, etc. 60% as well as they recycle HDPE Tubs (Seattle)



Estimate high density depots in Grouping 2 capture 83% of what would be collected on-route

Another way to think about it

If Grouping 2 would recycle 22 lbs. out of 100 lbs. of trays at curbside
Then Grouping 2 would recycle 18 lbs. out of 100 lbs. of trays, etc. at PRO depots

The background is a solid teal color. On the right side, there are several large, white, abstract shapes that resemble stylized arrows or curved lines pointing towards the right. These shapes are layered, with some appearing to be in front of others.

Contamination Reduction

Contamination Data Sources



Method	Jurisdiction	Results
Feedback only	Clackamas County, OR	-32% carts receiving second tag
	Chicago, IL	-32% contamination
Campaign-based refusal	Atlanta, GA	-57% contamination
	Lowell & W. Springfield, MA	-30% contamination
	Snohomish County, WA	-64% carts receiving second tag
Ongoing refusal	Greensboro, NC	-87% carts receiving second tag, -98% third tag
	Albuquerque, NM	-84% carts receiving second tag, -96% third tag
Driver-based refusal + simpler list + more	Rogue Disposal & Recycling, OR	-72% “garbage” contamination* -58% overall contamination* -85% tags distributed
Refusal -- unspecified	21 Massachusetts municipalities	-45% to -85% carts tagged (18 cities) -21% to -33% carts tagged (3 cities)
	Sanford, ME	-80% contamination (or more)

* “Garbage” contamination measures materials that Rogue never accepted. Overall, also includes materials previously accepted for recycling but that were removed from the accepted list when Rogue simplified it.

Contamination Reduction in Commingled



Contamination Type	Single-family and Self-haul	Multifamily	Commercial
Film and Foam	75%	50%	15%
Food	75%	50%	15%
Other materials	40%	25%	15%

Baseline contamination rates from studies in Metro:

- Single-family: 13.8% | Self-haul: 13.8%
- Multifamily: 21.1% | Commercial: 13.4%

Sources: recycling contamination studies for single-family (2015 and 2020), multifamily (2017), and commercial (2020) for and in Metro.

- Table reflects most common reduction in commingled materials
- For materials, Metro accepts at baseline and STOPS collecting, reduce by 90% in Metro and 95% elsewhere
- Assume a smaller reduction:
 - When more plastics are on the USCL
 - When the material is accepted at PRO depots
- Assume moving glass from on-the-side to depot only counteracts engagement, so glass contamination does not reduce in glass-depot scenarios

USCL Contamination Rates Outputs

Overall USCL Contamination



	S00	S01	S03	S05	S06	S16
Total	17.6%	10.3%	9.9%	10.6%	10.4%	9.7%
Glass	5,861	3,891	3,891	5,957	3,891	3,891
Block EPS	65	40	40	40	49	40
Polycoat Cups	32	28	278	278	278	278

	S00	S01	S03	S05	S06	S16
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	PRO	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL
Polycoat cartons & cups	Varies	Not	USCL	USCL	USCL	USCL
HDPE, PP, PET pails/cups	Varies	Not	Not	Not	PRO	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	PRO	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	PRO	Not
Block EPS	Not	Not	Not	Not	PRO	Not

The background is a solid teal color. On the right side, there are several large, white, abstract shapes that resemble stylized arrows or curved lines pointing towards the right. These shapes are layered, with some appearing to be behind others, creating a sense of depth and movement.

MRF Upgrades

MRF Upgrade Approach

Upgrades to MRFs

- Continue using existing technology (robots, opticals) already in the system
- Add technology at all MRFs to improve quality (primarily fiber and metal lines)
- Add AI visioning systems to balers for quality control

New CRF line

- Add a new CRF line with new build-out in the Metro area
- Could be stand-alone or added to an existing MRF.

Note: upgrades are modeling concepts for a theoretical future system, not projections or calculations for actual individual MRFs.

MRF Types and Future System



MRFs	Future Concepts
1 MRF in Salem 3 MRFs A in Metro area	Sorts fiber and metal. Transfer all plastic/cartons to new CRF line. <ul style="list-style-type: none"> • Upgrade fiber and metal lines (screens, opticals, robot)
1 MRFs B in Metro Area 1 MRFs C in Metro area	Sorts fiber, metal, and PET. Transfers other plastic/cartons to new CRF line. <ul style="list-style-type: none"> • Continues using existing robots/opticals • Further upgrades fiber lines (screens, opticals) • Upgrade metal with container robot for aluminum • Upgrade MRF C to sort thermoform
2 MRF in Eugene	No upgrades <ul style="list-style-type: none"> • Continues to skim OCC and transfer everything to Metro area
New CRF line somewhere in Metro area	Sorts transferred containers. <ul style="list-style-type: none"> • New facility infrastructure (conveyors, scale, baler, rolling stock) • New equipment (robots, opticals, magnets, eddy current)

All scenarios: add one Quality AI Vision system per baler per MRF

MRF Capital Equipment Unit Costs



Equipment Type	Unit Cost
Container Infeed & Presort	\$ 627,600
New CRF Line with Conveyors, Scale, Baler, Rolling Stock	\$ 3,178,000
Wrap-resistant Screens for Paper	\$ 527,700
Metal Magnets	\$ 75,000
Eddy Current Separator	\$ 90,000
Robot Residue, Coated Paper, or Containers	\$ 407,600
Optical for Containers	\$ 869,000
Optical for Paper	\$ 1,400,000
EPS Densifier	\$ 25,000
Quality AI Vision System	\$ 106,000
Bunkers	\$ 158,900

Costs include installation into MRFs

Sortation costs also include



- **Labor:** hourly rates, number of workers, & shifts
 - Adjusted in scenarios as new technology reduces manual sorting and increases maintenance requirements
- **Operations:** per-ton costs for operations, maintenance, fuel and utilities, and facility
- **Residuals & transfer costs:** per-ton costs for transport and disposal applied to tons transferred and disposed
- **Margin:** profit margin
- **Commodity values:** range of commodity prices from publicly available sources:
 - RecyclingMarkets.net, Resource Recycling, and historical sources

Thank you!

Jessica Branom-Zwick, Cascadia Consulting Group

Carolina Paez Jimenez, Cascadia Consulting Group

Chris Bell, Bell & Associates

Tim Buwalda, Circular Matters



Social Cost Assessment: Examples of Preliminary Results

Technical Workgroup on Materials Lists
September 20, 2022



Disclaimer

Results shown here are preliminary and are subject to change pending further review of the model by Cascadia Consulting Group's team, DEQ, Technical Workgroup members and others.

Expanded polystyrene @ depots

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	Not	PRO	PRO	Not	PRO

Expanded polystyrene @ depots: preliminary cost/benefit assessment

Marginal benefits (environmental) of adding EPS to PRO depot collections

- Waste Impact Calculator impacts with low/high damage cost factors: **\$117K - \$254K** in 2026.
- DEQ's custom analysis (shared @ July 19 Workgroup meeting):
 - Disposal modeled at 50% local (DEQ S16) and 50% distant (DEQ S13)
 - Recycling modeled as drop off, marginal transport, densified off-site, international market (DEQ S7) or domestic end market (DEQ S19)
 - Mid-point damage cost factors: **\$334K** (S19) or **\$368K** (S7) in 2026.

Marginal costs (transactional) of adding EPS to PRO depot collections

- Compare Cascadia's Scenario 12 to Scenario 13
- Preliminary estimate: **\$8.00 million** in 2026.

Polycoated cartons and cups @ USCL

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	Not	PRO	PRO	Not	PRO

Polycoated cartons and cups @ USCL: preliminary cost/benefit assessment

Marginal benefits (environmental) of adding polycoated cartons/cups to commingled collections

- Waste Impact Calculator impacts with low/high damage cost factors: **\$994K - \$3,153K** in 2026.

Marginal costs (transactional) of adding polycoated cartons/cups to commingled collections

- Compare Cascadia's Scenario 02 to Scenario 03
- Preliminary estimate: **\$578K** in 2026.
 - Recycling Collection +\$647K
 - Initial Transfer/Transport +\$26K
 - Processing +\$345K
 - Garbage Collection -\$179K
 - Garbage Transfer/Transport and Tip Fees -\$253K