

Improving Oregon Recycling Systems Infrastructure Research

Alternative Scenario Selection (Phase 2 Task 6)

August 6, 2020

Alternative Recycling Infrastructure Scenario Definitions

This document summarized the four initial alternative recycling infrastructure scenarios analyzed in Phase 2 Task 5 and four additional alternative recycling infrastructure scenarios to be analyzed in Phase 2 Task 6. These scenarios represent a range of infrastructure system alternatives, focusing mainly on variations in the collection and processing infrastructure and to some extent on the accepted materials lists by groupings provided by DEQ — Metro Area; Willamette Valley, etc.; Other Areas with Curbside: and Areas Without Curbside¹. Cascadia limited variations in other system parts so the varying effects of collection and processing elements could be compared more directly. The more elements that are changed in a scenario, the more difficult it is to determine the effects of individual changes.

- **Original Baseline: Pre-Disruption List (S0): Baseline system** with an accepted materials list based on **pre-National Sword lists** based on 2017 recovery data provided by DEQ. For example, outside of Metro, tubs and accepted other steel are accepted.
- **REVISED Baseline: Post-Disruption List (S5): Baseline system** with a **post-National Sword list** of accepted materials, informed by 2018 recovery data provided by DEQ.
- **+ Customer Engagement (S6/A-): Baseline system** with a **post-National Sword list** of accepted materials and **additional contamination reduction** efforts on inbound collection and no improvements in other areas.
- **Engagement + Improved MRFs (S1/A): Single-Stream with Modern MRFs** — Single-stream/glass on side — same list as current and modernized MRFs in Metro Area (paper). Please note that the accepted materials list is reduced compared to the baseline, which was based on pre-National Sword accepted lists. For example, Scenario A models not accepting PET thermoforms, tubs outside of Metro, and accepted other steel outside of Metro.
- **Engagement + MRFs + Expanded Lists (S2/A+): Single-Stream with Modern MRFs and Expanded List** — Single-stream/glass on side — expanded list that varies by grouping and modernized MRFs in Metro Area (paper/containers).
- **Engagement + MRFs + Expanded + Statewide List (S7/A++): Single-Stream with Modern MRFs and Expanded Statewide List** — Single-stream/glass on side — **expanded list** that is **standardized statewide** and modernized MRFs in Metro Area (paper/containers).
- **+Container Recovery Facility (S3/B): Single-Stream with CRF** — Single-stream/glass on side — expanded list and modernized MRFs in Metro Area plus out-of-state CRF.
- **Dual-Stream Collection (S3/C)** — Dual-stream/glass on side everywhere — expanded list, modernize and create dual-stream fiber MRFs in Metro Area; add/upgrade one or two container lines in Metro Area, modernize fiber MRF in Eugene-area.
- **Engagement + MRFs + Expanded + Statewide List + Expanded Collection (S8-10/D): Single-Stream with Modern MRFs, Expanded Statewide List, and Expanded On-Route Collection** — Single-stream/glass on side — expanded list that is standardized statewide and modernized MRFs in Metro Area (paper/containers). **On-route collection is expanded** in Grouping 4 to customers that currently have garbage collection (single-family, multi-family, and commercial) and in Groupings 1, 2, and 3, to additional multifamily customers. Multiple scenario numbers represent the uncertainty with how many customers will have recycling added (high, medium and low estimates).

¹ Grouping descriptions can be found in the “FINAL Phase 2 Task 4 Research Plan” at www.oregon.gov/deq/recycling/Documents/BaseCaseModelingPlan.pdf.

Scenario Summaries

Oregon Baseline	Scenario A-: Base Case with Contamination Reduction	Scenario A: Single-Stream with Modern MRFs	Scenario A+/A++: Single-Stream with Modern MRFs and Expanded List	Scenario D: Single-Stream, Modern MRFs, Expanded List, Expanded Collection	Scenario B: Single-Stream with CRF	Scenario C: Dual-Stream Statewide
<p>ORIGINAL: Base-case using pre-National Sword accepted materials list</p> <p>REVISED: Base-case using post-National Sword accepted materials list</p>	<p>Contamination reduction: direct feedback, refusal to collect, monitoring inbound quality at MRFs</p> <p>On-route material list: reduce compared to original baseline to reflect post-National Sword list</p> <p>On-route collection method: no change</p> <p>Depot list: no change</p> <p>Depot type(s): no change</p> <p>Sortation: no change</p>	<p>Contamination reduction: direct feedback, refusal to collect, monitoring inbound and outbound quality at MRFs</p> <p>On-route material list: reduce compared to original baseline to reflect post-National Sword list</p> <p>On-route collection method: no change</p> <p>Depot list: expand to “emerging” in Metro Area grouping; expand to variable elsewhere</p> <p>Depot type(s): no change</p> <p>Sortation: modernize MRF paper-lines</p>	<p>Contamination reduction: direct feedback, refusal to collect, monitoring inbound and outbound quality at MRFs</p> <p>On-route material list: original: widely expand, vary by grouping / A++: also standardize statewide with expanded list</p> <p>On-route collection method: no change</p> <p>Depot list: original: widely expand in Metro Area grouping; moderately expand elsewhere / A++: also standardize statewide with expanded list</p> <p>Depot type(s): no change</p> <p>Sortation: modernize MRF paper-lines and add/upgrade one or two container lines in Metro Area grouping</p>	<p>Contamination reduction: direct feedback, refusal to collect, monitoring inbound and outbound quality at MRFs</p> <p>On-route material list: widely expand and standardize statewide</p> <p>On-route collection method: no change in method but expanded to all on-route garbage customers in Grouping 4 and to additional multi-family customers in Groupings 1, 2, & 3</p> <p>Depot list: widely expand and standardize statewide</p> <p>Depot type(s): no change</p> <p>Sortation: modernize MRF paper-lines and add/upgrade one or two container lines in Metro Area grouping. Expand capacity to accommodate expanded collection</p>	<p>Contamination reduction: direct feedback, refusal to collect, monitoring inbound and outbound quality at MRFs</p> <p>On-route material list: widely expand except in Other Areas with Curbside grouping</p> <p>On-route collection method: no change</p> <p>Depot list: widely expand in Metro Area and Willamette Valley, etc. groupings</p> <p>Depot type(s): no change</p> <p>Sortation: modernize paper-lines of MRFs in Metro Area and send containers to CRF outside state</p>	<p>Contamination reduction: direct feedback, refusal to collect, monitoring inbound and outbound quality at MRFs</p> <p>On-route material list: widely expand</p> <p>On-route collection method: all on-route collection is dual-stream with glass on side</p> <p>Depot list: widely expand in Metro Area and Willamette Valley, etc. groupings</p> <p>Depot type(s): no change</p> <p>Sortation: modernize paper-lines of MRFs to accept dual-stream paper and add/upgrade one or two container lines in Metro Area grouping — Sort all containers in Metro Area. For non-Metro dual-stream fiber: sort half in Eugene and the other half in Metro Area</p>

The tables below document details for the scenarios and use the following color-coding:

- **Gray**: no change from baseline.
- **Yellow**: change, but the same across scenarios.
- **Red**: change and different across scenarios.

A description of commodity bale grades and typical materials by marketability are presented on page 10.

Customer Engagement: Education and Compliance

Grouping	Oregon Baseline/Revised Baseline	Scenario A-: Base Case with Contamination Reduction	Scenario A: Single-Stream with Modern MRFs	Scenario A+/A++: Single-Stream with Modern MRFs and Expanded List	Scenario D: Single-Stream, Modern MRFs, Expanded List, Expanded Collection	Scenario B: Single-Stream with CRF	Scenario C: Dual-Stream Statewide
Metro Area	Varies	Residential (RES) and commercial (COM) customers: Direct feedback by haulers (with cameras on fully automated trucks and lid-flips on semi-automated trucks); refusal to collect.					
Willamette Valley, etc.							
Other Areas with Curbside							
Areas Without Curbside	Limited	No change			RES and COM customers: Direct feedback by haulers (with cameras on fully automated trucks and lid-flips on semi-automated trucks); refusal to collect.	No change	
At Transfer Station/MRF	None	No change	Haulers: Spot-check QA with refusal/fines on incoming material. MRFs: Third-party bale-breaking and estimating quality on outgoing.				

On-Route Accepted Materials List

Scenario A and A-: Same materials as REVISED baseline. Accepted materials are not standardized within groupings.

A list of the commodity bale grades and typical materials is presented on page 10.

Scenario A+ and Scenario B	OCC	SOP	SCN	SRPN	MP	Cartons	Boxboard	Coated paper	PET bottles	PET thermof	HDPE bottles	HDPE Bulky	PP Bulky	Mixed Bulky	Tubs & Lids	PP containers	3-7s	PS Rigid	PS Foam	Clear Film	Color Film	Alum Cans	Alum Foil	Steel Cans	Scrap metal	Sep. Glass
Metro Area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X
Willamette Valley, etc.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X
Other Areas with Curbside	X	X	X	X	X	X	X		X		X	X	X	X	X	X						X	X	X		X

Scenario A++, Scenario D, and Scenario C	OCC	SOP	SCN	SRPN	MP	Cartons	Boxboard	Coated paper	PET bottles	PET thermof	HDPE bottles	HDPE Bulky	PP Bulky	Mixed Bulky	Tubs & Lids	PP containers	3-7s	PS Rigid	Depot Foam	Clear Film	Color Film	Alum Cans	Alum Foil	Steel Cans	Scrap metal	Sep. Glass
Metro Area, Willamette Valley, etc. and Other Areas with Curbside	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X
Areas Without Curbside (Scenario D only)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X

On-Route, Single-Family Collection Method

Grouping	Oregon Baseline	Scenario A-: Base Case with Contamination Reduction	Scenario A: Single-Stream with Modern MRFs	Scenario A+/A++: Single-Stream with Modern MRFs and Expanded List	Scenario D: Single-Stream, Modern MRFs, Expanded List, Expanded Collection	Scenario B: Single-Stream with CRF	Scenario C: Dual-Stream Statewide
Metro area	Single-stream carts (mostly weekly), glass in tubs on the side.	No change			No change	No change	Dual-stream in two carts with glass on side (effectively weekly by alternating collection of each cart), no change to glass.
Willamette Valley, etc.	Single-stream mainly carts (mostly weekly), glass in tubs on the side.						
Other Areas with Curbside	Single-stream mainly carts split every-other-week (EOW) & weekly, glass on the side.						
Areas Without Curbside	No on-route recycling collection				Expand to customers with on-route garbage collection	No change	

On-Route Multifamily and Commercial Collection Method

Grouping	Oregon Baseline	Scenario A-: Base Case with Contamination Reduction	Scenario A: Single-Stream with Modern MRFs	Scenario A+/A++: Single-Stream with Modern MRFs and Expanded List	Scenario D: Single-Stream, Modern MRFs, Expanded List, Expanded Collection	Scenario B: Single-Stream with CRF	Scenario C: Dual-Stream Statewide
Metro Area Willamette Valley, etc. and Other Areas with Curbside	Single-stream with glass on the side, frequency varies by customer needs.	No change			Expand to include all multifamily on-route garbage customers	No change	Dual-stream in two receptacles, no change to glass.
Areas Without Curbside	No on-route recycling collection	No change			Expand to include all multifamily on-route garbage customers and a portion of commercial on-route garbage customers (commensurate with Other Areas with Curbside)	No change	No change

Depot Accepted Materials List

A list of the commodity bale grades and typical materials is presented on page 10. (A+ indicates that this material is accepted statewide only in the revised Scenario A+.)

Scenario A, A-	OCC	SOP	SCN	SRPN	MP	Cartons	Boxboard	Coated paper	PET bottles	PET thermof	HDPE bottles	HDPE Bulky	PP Bulky	Mixed Bulky	Tubs & Lids	PP containers	3-7s	PS Rigid	PS Foam	Clear Film	Color Film	Alum Cans	Alum Foil	Steel Cans	Scrap metal	Sep. Glass
Metro Area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Willamette Valley, etc.	X	X	X	X	X	X	X		X		X	X	X	X	X	X			X			X	X	X	X	X
Other Areas with Curbside Areas without Curbside	X	X	X	X	X	X	X		X		X	X	X	X	X	X			X			X	X	X	X	X

Scenarios A+, A++, D, B, and C	OCC	SOP	SCN	SRPN	MP	Cartons	Boxboard	Coated paper	PET bottles	PET thermof	HDPE bottles	HDPE Bulky	PP Bulky	Mixed Bulky	Tubs & Lids	PP containers	3-7s	PS Rigid	PS Foam	Clear Film	Color Film	Alum Cans	Alum Foil	Steel Cans	Scrap metal	Sep. Glass
Metro Area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Willamette Valley, etc.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Other Areas with Curbside Areas without Curbside	X	X	X	X	X	X	X		X		X	X	X	X	X	X	A+	A+	X	A+	A+	X	X	X	X	X

Depot Type(s)

Grouping	Oregon Baseline	Scenario A-: Base Case with Contamination Reduction	Scenario A: Single-Stream with Modern MRFs	Scenario A+/A++: Single-Stream with Modern MRFs and Expanded List	Scenario D: Single-Stream, Modern MRFs, Expanded List, Expanded Collection	Scenario B: Single-Stream with CRF	Scenario C: Dual-Stream Statewide
Metro Area	Staffed but passively monitored sites at transfer stations, mainly source-separated.	No change					
Willamette Valley, etc.	Staffed sites at transfer stations, mainly source-separated. Some unstaffed glass depots.						
Other Areas with Curbside							
Areas Without Curbside	Staffed sites at transfer stations, mainly source-separated.						

Consolidation and Transfer Methods

Grouping	Oregon Baseline	Scenario A-: Base Case with Contamination Reduction	Scenario A: Single-Stream with Modern MRFs	Scenario A+/A++: Single-Stream with Modern MRFs and Expanded List	Scenario D: Single-Stream, Modern MRFs, Expanded List, Expanded Collection	Scenario B: Single-Stream with CRF	Scenario C: Dual-Stream Statewide
Metro Area transfer facilities	Mostly direct delivery to MRFs.	No change	Add transfer of containers from non-upgraded-container-line MRFs to MRFs with upgraded container lines.			Add transfer of containers from non-upgraded-container-line MRFs to out-of-state CRF.	No change in method (direct delivery) but send to dual-stream MRFs.
Transfer facilities elsewhere	Consolidated for truck transport (mainly loose or compacted); existing facilities.						Truck transport half of fiber to Metro Area and half to Eugene area. Truck transport all containers to Metro Area.

Sortation Methods

Grouping	Oregon Baseline	Scenario A-: Base Case with Contamination Reduction	Scenario A: Single-Stream with Modern MRFs	Scenario A+/A++: Single-Stream with Modern MRFs and Expanded List	Scenario D: Single-Stream, Modern MRFs, Expanded List, Expanded Collection	Scenario B: Single-Stream with CRF	Scenario C: Dual-Stream Statewide
MRFs in Metro Area	Three Oregon-style MRFs for single-stream (Pioneer, Far West Portland, Far West Hillsboro) One commercial fiber facility expanding to single-stream (EFI) Two small MRFs (KB, WestRock).	No change	Modernized paper side of main MRFs (screens and optical sorters) for single-stream residential and commercial in Metro Area.	Modernized paper side of main MRFs (screens and optical sorters) and modernize container side of one to two MRFs for single-stream residential and commercial in Metro Area. Compared to Scenario A, sortation systems will be further enhanced to handle the additional material types accepted in Scenario A+.	Modernized paper side of main MRFs (screens and optical sorters) and modernize container side of one to two MRFs for single-stream residential and commercial in Metro Area. Expand capacity to accommodate expanded collection	Modernized paper side of main MRFs (screens and optical sorters) for single-stream residential and commercial in Metro Area; send containers to existing CRF outside Oregon for additional sorting.	Convert MRFs to dual-stream: modernized paper-line of main MRFs with optical sorters with separate in-feed for fiber. Modernized container side of one to two MRFs with separate in-feed for containers.
MRFs Outside Metro Area	One largely manual MRF (Garten) in Salem One fiber facility (International Paper) in Eugene.		No change				Garten continues operations as-is (modified in-feeds for dual-stream fiber and containers). One upgraded fiber MRF for residential fiber in Eugene area.
Outside Oregon MRFs	West Vancouver, Idaho. or California MRFs (small portion of material from remote southern and eastern areas).		No change				

Bales and Marketing

Grouping	Oregon Baseline	Scenario A-: Base Case with Contamination Reduction	Scenario A: Single-Stream with Modern MRFs	Scenario A+/A++: Single-Stream with Modern MRFs and Expanded List	Scenario D: Single-Stream, Modern MRFs, Expanded List, Expanded Collection	Scenario B: Single-Stream with CRF	Scenario C: Dual-Stream Statewide
Bale Specs (quality)	Bales meeting market allowances.	Bales meeting specifications set by the Institute of Scrap Recycling Industries, Inc. (ISRI) or Association of Plastic Recyclers (APR). Some specialized bales may also be created.					
Bale grades produced (types)	Not specified by MRFs	Based on incoming materials, avoiding mixed plastics					
Market Locations	Not specified by MRFs	Domestic or markets with modern solid-waste infrastructure (OECD markets)					
End-Processing Methods	Not specified by MRFs	No change (mechanical only)		For mechanical recycling, chemical recycling, and/or energy recovery			

Bales and Materials List

Bales	Materials
OCC	OCC (corrugated cardboard)
SOP	Sorted office paper and sorted white ledger (commercial)
SCN	Sorted clean newsprint (preferably depot; can be dual-stream or single-stream with advanced sorting)
SRPN	Sorted residential paper and news (e.g., newspaper, junk mail, magazines, printing and writing paper; no paperboard or brown grades)
MP	Mixed paper (all paper and paperboard, more marketable from dual-stream)
Cartons	Aseptic and gable-top containers (though generated in small quantities)
Boxboard	Paperboard/old boxboard alone (if not in a mixed paper bale, more marketable from dual-stream)
Coated paper	Polycoated paper (cups, food service papers)
PET bottles	PET #1 (polyethylene terephthalate) bottles and jars

Bales	Materials
PET thermof	PET #1 thermoforms and tubs (PET packages not including bottles or jars)
HDPE bottles	HDPE #2 (high-density polyethylene) natural bottles HDPE #2 colored bottles
HDPE Bulky	HDPE #2 injection bulky rigid plastic
PP Bulky	PP #5 (polypropylene) injection bulky rigid plastic, if source-separated
Mixed Bulky	Mixed bulky rigid plastics (mainly PE and PP)
Tubs & Lids	HDPE #2 and PP #5 tubs and lids
PP containers	PP #5 bottles and jars (mostly deposit collection) PP #5 small rigid plastic (e.g., PP tubs and cups with tofu tubs, dishwasher-safe storage containers, hangers)
3-7s	#3-7 bottles and small rigid plastics
PS Rigid	Solid PS #6 (rigid)
PS Foam	Foam PS #6 (polystyrene) in transport block and shape, if densified at the collection point
Clear Film	PE (polyethylene) clear film (commercial source-separated)
Color Film	PE colored film (commercial source-separated) PE retail mix film (commercial source-separated)
Alum Cans	Aluminum cans
Alum Foil	Aluminum Foil
Steel Cans	Steel cans
Scrap metal	Scrap metal
Sep. Glass	Container glass collected separately