Background

Sustainability goals for the DC Department of Public Works (DCDPW) are part of a broader plan for *Sustainable DC* established by Mayor Gray.

Among the goals directed at current waste management operations by Mayor Gray's *Sustainable DC* Plan is zero waste in 2032 that includes an 80% diversion rate of the collected materials from disposal options.

The inherent definition of sustainability is the wise and efficient use of natural and financial assets by current generations to assure viability for those in the future.

The DC Department of Public Works (DCDPW) is developing a Strategy Roadmap that is a planning tool to achieve that sustainability.

The Strategy Roadmap (SR) is evaluating alternative integrated solid waste management scenarios (including the current state) that can maximize the embedded value of DPW assets and management processes to meet *Sustainable DC* goals; develop an evaluation strategy and framework to quantitatively compare the investments necessary for each of these alternatives; and to evaluate the results.

DPW Operational System Components

Both DPW and private hauling companies carry out collection/transfer phase activities primarily within the DC geographic and natural capital scope. A simplified matrix of these dual features of the DC system is as follows:

	Intra-borders	**Regional**
DPW/DC Government	Collection; Diversion (Water, Reuse), Sorting, Transfer	Sorting; Recycling, Fuel, Landfill
Private Haulers	Collection; Diversion (Reuse), Sorting, Transfer	Sorting, Recycling, Fuel, Landfill

Volume/Flow Throughput Process Phases

The DPW system for material processing is comprised of four main operational activity phases:

Generation - Residual material discarded by DC homes, businesses, and government entities; litter and street accumulation
Collection - Vehicles and processes used to accumulate, transport, and deposit discarded materials for further management
Diversion - Sorting, separation, and transfer of materials for a variety of follow-on options that can include, reuse, bio-reuse (compost), recycling, refining (energy production), or other options
Disposition - final disposal of discarded material with no further use intended

The following chart depicts the foundational mapping of the phases of the DPW processes to the *Sustainable DC* goals, thereby identifying the potential gains and contributions that process improvements in those phases could contribute to the Plan, and the Air, land, and water assets potentially affected (A/L/W).

*Sustainable DC***/DPW Goal Map**

DPW Phase	**DC Sustainability Goal**	**Best or Available Practice Options**	**Natural Capital Capacity Affected (DC and Regional)**
Phase I: Residual Material Generation	15% Reduction in Residual Material (RM) Generation Recast Materials as Reusable 20% reuse of Construction/Demolition Material Styrofoam Elimination	a. Bans b. Content Regulations c. FAR	DC A/L/W Regional A/L/W Banked Capacity/ Credits
Phase II: Collection	Reduce Greenhouse Gases by 50% (truck fuel)	a. Combined Collections b. Fuel Switch c. Shrink distances	DC A/L/W Regional A/L/W Banked Capacity/ Credits
Phase III: Diversion	80% Diversion of RM from landfills 50% reduction in GHG (methane leakage) 50% increase in renewable energy Ensure Capacity/Capability for Population Growth Grow DC Economy	a. DC-based Energy Refining b. Increased regional Energy Refining b. DC-based increased recycling c. Increased Regional recycling	DC A/L/W Regional A/L/W Banked Capacity/ Credits
Phase IV: Final Disposition	Zero RM to Landfill	See Phase III	DC A/L/W Regional A/L/W Banked Capacity/Credits

Using research, workshop discussions and reviews, and subject matter expert input, planned scenarios will be based on the following core concepts:

Baseline" Scenario comprised of air, land, water and cost elements of the current system (including both internal/DC and regional system elements such as landfills, transfer stations, collection processes), and "throw" rates.

A source reduction in "throw rate" equal to the planned Sustainable DC goal of 15% will be included in the Generation phase of each alternative scenario

"Alternative" scenarios will use a matrix format to assess location, technology, and process options that best implement the overarching strategic goals for economic and sustainability optimization aligned with Sustainable DC goals and will include:

- 80% total diversion rate to optimized recycling and recovery practices using assets in the DC tax base
- 80% total diversion rate to optimized recycling and recovery practices using assets in the metropolitan area
- 80% total diversion rate to optimized energy refining and/or production with assets in the DC tax base
- 80% total diversion rate to optimized energy refining and/or production with assets in the metropolitan area

The scenarios will also take into account District sustainability/economic goals including (but not limited to) job creation, renewable energy, water savings, greenhouse gas reductions, density, and population increase

Implementation options evaluated will compare financial and natural capital consumption (e.g., emissions, process water, acreage) by best available, commercially viable technologies meeting agreed criteria

Scenario revisions or additions, including composite options that recombine one or more goal-structured capabilities among the modular process phases, will respond to scoping inputs received though public and stakeholder meetings

As a result of the system analysis and workshop activities, a scenario design has been developed as depicted in the following chart:

Alternative Scenarios Matrix

Scenario/Process Activity	**Phase 1 Load Production**	**Phase 2 Load Collection**	**Phase 3 Load Diversion**	**Phase 4 Load Disposition**
Baseline	Baseline	Baseline	Baseline	Baseline
Optimization A1	15% Source Reduction	TBD	80% Diversion through Recycling with DC Built and Natural Infrastructure	Landfill Minimization/Elimination
Optimization A2	15% Source Reduction	TBD	80% Diversion through Recycling with Regional Built and Natural Infrastructure	Landfill Minimization/Elimination

Optimization B1	15% Source Reduction	TBD	80% Diversion through Refining with DC Built and Natural Infrastructure	Landfill Minimization/Elimination
Optimization B2	15% Source Reduction	TBD	80% Diversion through Refining with Regional Built and Natural Infrastructure	Landfill Minimization/Elimination

We are using a *Capacity to Capability* analytic method. *Capacity to Capability* analysis enables client decision-makers to build capability-based, sustainable system design strategies by first identifying and measuring capital asset capacity needed to meet capability goals. It then develops scenario options that efficiently reduce or minimize capacity needed to generate the highest levels of system performance at the lowest capital use rates

. Natural Capital Asset Management (NCAM)

By focusing on the measurable volumes of natural, physical, and financial capital that are, or might be used to avoid, reduce, or handle materials managed by the residuals/waste system, this evaluation quantitatively identifies needed technology and processes capable of providing system-wide capability for handling residual materials at the lowest asset capacity use levels.

As part of its analysis, we will use Natural Capital Asset Management (NCAM) to provide the framework for completing this work.

NCAM is a relational database tool that has been developed to allow for the comparison of alternative solutions to complex problems and give decision-makers information they need to select solutions which uses the lowest or most efficient volumes of capital assets to achieve the greatest system capability performance, as well as consider other key capital factors.

Anticipated Natural Capital Asset Use Categories in DPW Systems

Air Asset Capacity (RMM)	**Land Asset Capacity (OPS, RMM)**	**Water Asset Capacity (OPS, RMM)**
Criteria Pollutants	Built Infrastructure (Stationary, Transport)	Process
Greenhouse Gases	Storage	NPDES
Hazardous Pollutants	Safety/Setback	Sanitary/Sewer
	Fill/Burial	