

Capabilities of the Authority's Consultants in the Field of Zero-Waste Planning

The Division of Solid Waste Services, Department of Environmental Protection (DEP) developed, in conjunction with the Authority, the statement of work to develop a master plan for "The Future of Responsible Solid Waste Management in Montgomery County." The Division had reviewed the capabilities of the contractors that had been qualified in the service categories for "Sustainable Materials Management, Circular Economy and Zero Waste" as well as "General Solid Waste, Planning and Recycling," prior to choosing the Authority and its contractors as the appropriate acquisition vehicle through which to obtain the professional assistance needed to support the master planning effort. A draft of the statement of work was shared with the planning subcommittee of the Solid Waste Advisory Committee. The final document was also shared with the Maryland Department of the Environment (MDE), with a commitment to share deliverables with MDE once the contract task is awarded and work progresses. This planning effort is being conducted at the direction of DEP, with the Authority performing a supportive role under the direction of DEP.

The long-range planning effort has three objectives:

- Develop a clear and realistic future vision of Montgomery County's solid waste and recycling program and operations – for 2025, 2030, 2035, 2040 and beyond – with the goal of maximizing waste reduction, reuse/repair, recycling, and sustainable management of materials.
- Develop actionable strategies (with projected costs, timelines, and outcomes) to achieve this goal.
- Identify impacts on existing solid waste management programs, facilities and operations, including new investments, initiatives, changes in methods of operations, and retiring or replacement of existing facilities.

The statement of work requires extensive stakeholder involvement, including County government and Council, business and communication groups, residents and experts in the waste management industry; as well as transparency of the process and products. The Authority solicited proposals from the following consultants: GBB Inc., Geosyntec Consultants, HDR Engineering Inc., Kessler Consulting Inc., MSW Consultants, SCS Engineers.

Each of these firms has substantial experience in solid waste management system planning and analyses, recycling and organics waste management planning and implementation, and sustainable materials management and zero-waste planning; and each was encouraged to team with other consulting firms and experts as appropriate in responding to a given task/statement of work. We have excerpted specific segments (see attachment) from each of the contractors' proposals that focus on the question of their experience in supporting jurisdictions in their solid waste system planning that supports zero-waste principles and goals.

The County, working with the Authority, will review the proposals received inclusive of the updated resumes and team information, including any additional sub-contractors or consultants the contractor has proposed. A consultant team will be selected based on which consultant team provides the best experience, ability and price to perform the scope of services in support of the County's long-range planning objectives identified above.

Geosyntec Consultants

Sustainable Materials Management, Circular Economy and Zero Waste*Development and Implementation of Sustainable Materials Management, Circular Economy and Zero Waste Plans for Municipalities (to Include Community Outreach Experience)*

Geosyntec has earned a reputation for improving every phase of the waste management lifecycle over the past 25 years, delivering step-change innovations that help our clients' "triple bottom line" (social, environmental, and financial metrics) and are sensitive to a sustainable environment. Our approach to developing sustainable solutions is based on:

- Consideration of project impacts and methods to reduce, reuse, or recycle existing building materials and wastes for energy production
- Optimizing designs to incorporate full life-cycle costs
- Utilization of automated and remote data collection
- Tailoring construction specifications to reuse or utilize local materials
- Development of alternative uses and treatment technologies
- Performance of climate variability assessments and incorporating sustainability considerations to develop design criteria

Our staff includes LEED Accredited Professionals (APs) who can assist with implementing environmentally sustainable construction practices. To help our clients meet their sustainability goals, Geosyntec also has Envision™ certified sustainability professionals (ENV SP) on staff who can quantify the project's contribution to this triple bottom line and help the project team achieve higher levels of sustainability, document project sustainability, and submit the project for recognition. Certified by the Institute of Sustainable Infrastructure (ISI), Envision™ is a rating system that provides an objective framework for assessing infrastructure sustainability. The framework helps project managers identify sustainable approaches that can be beneficial to infrastructure projects by dividing them into five categories: quality of life, leadership, resource allocation, natural world, and climate and risk. The rating system is applicable for all civil infrastructure, including waste management and recycling projects.

Specific to Maryland's Zero Waste Plan (ZWP), Geosyntec is completing a study for Frederick County to guide their future waste management strategy (see previous bullet item with regard to public outreach under this project). The ZWP builds on the Maryland Recycling Act (MRA) concepts and offers insight into the goals and priorities of Maryland's policymakers and future legislation. Therefore, Geosyntec performed the study assuming that the County will adopt the ZWP, which aims for incremental improvements in MRA waste and food scraps recycling to 80% and 90%, respectively, by 2040. Based on the ZWP framework,

Geosyntec established targets and improvement goals for the County, focusing on the costs and effects of implementing food waste recovery and composting over the next ten years, acknowledging that the size and distribution of the county population, waste stream, and available options are likely to evolve significantly over a longer time span. This approach affords the County a forward-looking outlook while enabling considerations of options to be grounded in programs and technologies that are commercially available and cost-effective under current assumptions and data.

Experience with Plans that Have Been Implemented and Are Successful Geosyntec has experience helping our clients understand emerging technologies in waste management. Historically, there have been a large number of start-up technologies and companies in the waste management industry that have touted their services as “revolutionary” or “game-changing,” yet ended as failures because they overlooked fundamental economic or technical issues. Geosyntec has helped a number of clients to objectively review new or emerging technologies, including Wicomico and Frederick counties in Maryland. In addition, we understand the non-traditional and highly variable revenue streams (tax credits, renewable fuels credits, commodity revenue sharing, asset valuations, etc.) that can be financial lynchpins for emerging technologies.

Knowledge of Regulations/Legislation in Other States Geosyntec has over 75 offices in 29 States, including several offices in California and the Northeast that are leading promulgators of regulations and guidance pertaining to climate change mitigation and adaptation, sustainability, low-impact development, and waste diversion from landfills. As such, we are well-placed on the leading edge of helping public and private sector clients understand and comply with new regulations and can draw on deep institutional knowledge and experience amongst our national practice leaders. We have a history of cross-office collaboration on projects. For example, in 2008 staff from Geosyntec’s Maryland office (led by Dr. Morris) assisted our Huntington Beach, California office with provision of on-call consulting support to Orange County Waste and Recycling for an internal inventory of the County’s greenhouse gas (GHG) emissions in anticipation of the County’s upcoming need to comply with California Assembly Bill 32 (AB32). Geosyntec’s services included: research and recommendations for GHG emission reporting protocols and regulatory compliance; program planning, analysis, and implementation; and review of in-house procedures followed and calculations performed for GHG emissions baseline data collection, modeling, and reduction.

Experience with Pay-as-You-Throw or Other Zero Waste Incentive Programs for Municipal and Commercial Waste See previous bullet item related to helping Frederick County, Maryland develop a plan to meet the targets for waste diversion and recycling established under the Maryland Zero Waste Plan.

Experience with Life Cycle Analysis, Greenhouse Gas Emissions Calculations and Carbon Footprints Used in System Planning

In addition to providing GHG inventory support services to Orange County, California (see previous bullet item), Geosyntec worked on registration of seven publicly owned and operated landfill projects with the now-defunct Chicago Climate Exchange (CCX), all of which included establishment of county- or municipality-wide baseline GHG emissions inventories for direct emissions, indirect emissions from purchased energy, and indirect emissions from up/downstream supply chains using methodologies developed by the World Resources Institute (WRI). This included public sector clients in Florida, Georgia, Maryland, and Massachusetts. Geosyntec also provided consulting services for development of a GHG baseline inventory for the Denver Federal Center (DFC), Colorado. The facility-wide inventory covered emissions associated with six main GHGs for ten years. The DFC developed and implemented a Sustainability and Environmental Management System (SEMS) to provide a framework for meeting GSA PBS Environmental Policy and environmental performance goals, including those issued in Executive Order 13423. As a deliverable for SEMS, Geosyntec prepared an internal Inventory Work Plan and Protocol (IWPP) that outlined the rules and assumptions for conducting and communicating the GHG inventory. The IWPP addressed the principles of reporting, organizational and operational boundaries, emissions calculation methodologies, baseline selection and recalculation, performance metrics, project-based reductions, and data management procedures.

Experience with Cost/Benefit Analysis Development Used for Plan Development

Geosyntec's experience with performing cost/benefit analyses for development of landfills, transfer stations, MRFs, and other solid waste infrastructure and recycling programs has been outlined in several of the previous bullet items. In many cases, Geosyntec is asked to perform targeted cost/benefit analyses as part of the decision-making process by municipalities or project investors. For example, facing a tipping fee increase of 29% in 2011, the City of St. Augustine, Florida retained Geosyntec to perform a cost/benefit analysis for a number of disposal alternatives, including direct haul, diversion of waste to a different transfer station, and development and operation of a City-owned transfer station. To assess these options, Geosyntec obtained tipping fees and routing requirements for landfills and transfer stations in the region, and performed a pro-forma analysis to review the economics of each option. Our analysis included an evaluation of transfer station considerations such as siting and traffic issues, permitting requirements, design considerations, capital and operational costs, and use of a direct haul option to dispose the City's solid waste to a nearby landfill facility. In another example, Geosyntec performed a market valuation for a proposed landfill in Virginia Beach, Virginia. This required development of a cost/benefit model for scenario analyses to consider the cost to build and operate the landfill, the



Proposal for Consultant Services for On-Call Engineering Services Northeast Maryland Waste Disposal Authority

expected revenue stream, and the timing of the expected cash flow. Geosyntec performed a detailed audit of the regional waste stream, researching historical data on the volume of waste generated and disposed within the market area, the historical population growth in the region to forecast the rate of increase in the waste stream, and historical trends in tipping fees in the area to help forecast future tipping fees. Based on this, Geosyntec was able to develop an accurate model of expected market share versus tipping fee for the proposed facility.

Kessler Consulting

SMM, Circular Economy and Zero Waste Category

Project 1: City of Key West, Florida

- ✓ 3 Years or Newer
- ✓ Similar Size
- ✓ Similar Demographics



Solid Waste and Recycling Implementation Plan

KCI assisted the city in developing a comprehensive Solid Waste Master Plan that **charted a pathway toward zero waste**. Project activities included the following:

- **System-Wide Evaluation** – Prepared comprehensive summary of tonnages, waste flow, services and facilities, and identified initial opportunities for improvement.
- **City Contracts Analysis** – Identified elements of these contracts that warranted change, such as adjusting commercial recycling fees and negotiating a revenue share for recyclables.
- **Waste Composition Study** – Revealed that 71 percent of the waste stream disposed could potentially be recycled or composted.
- **Transfer Station Operational Assessment** – Provided recommendations to improve operational efficiencies such as preventative maintenance schedule improvements, safety concerns, and staffing/operation adjustments.
- **Commercial Waste Generation Study** – Determined the density of waste (pounds per cubic yard) for 14 different commercial sectors.
- **Special Events Recycling** – Provided recommendations for increasing recycling at the 80+ special events held each year in the city. Developed draft ordinance language, recycling guide, and website language and offered program branding assistance.
- **Financial Evaluation** – Recommended changes to ensure the long-term financial viability of the solid waste system.
- **Solid Waste Master Plan** – Based on this information, KCI developed a 3-phase approach to increase recycling beyond the city's rate of 10 percent. The completed Master Plan provides policy, program and facility recommendations.

Throughout development of the Master Plan, KCI continually met with program stakeholders, including conducting three public workshops and meetings with City Commissioners, Chamber of Commerce, Sustainability Board, service providers, reporters, and interested citizens. Maintaining an ongoing dialogue with stakeholders was essential in developing a plan that fit local needs and demographics.

Upon completion of the Master Plan, the City Commission adopted the policy recommendations and directed staff to carry out the Phase 1 recommendations. KCI also assisted in negotiating collection contract changes that enabled implementation of certain Phase 1 recommendations.

The most notable changes were distribution of recycling carts and conversion from twice per week garbage collection and no segregated yard waste collection to weekly garbage and segregated yard waste collection. These changes alone nearly doubled the city's recycling rate!

SMM, Circular Economy and Zero Waste Category

Project 2: Hillsborough County, Florida

- ✓ 3 Years or Newer
- ✓ Similar Size
- ✓ Similar Demographics



Pay-As-You-Throw/Recycling Incentives

In effort to increase diversion, various incentive programs have been developed over the years. One program, Pay-As-You-Throw (PAYT), creates a financial incentive for generators to decrease landfill waste creation by charging more for waste and thereby encouraging alternative options such as recycling and composting.

KCI conducted a project for Hillsborough County, home of KCI's main office, to evaluate the feasibility of implementing a PAYT program to increase recycling participation. We initially researched PAYT in various communities across the nation and in Florida to determine why PAYT is not widespread in Florida, and reported these findings. KCI then developed a detailed plan for a pilot PAYT program, and negotiated the cooperation of cart suppliers and the county's franchise service providers. After county management decided not to implement the pilot program, we instead gauged community support through a series of focus groups and a residential survey.



Project 3: City of Wilmington, North Carolina

Pay-As-You-Throw Rate Study

- ✓ 3 Years or Newer
- ✓ Similar Size
- ✓ Similar Demographics



KCI assisted the City of Wilmington in conducting a rate study that included an estimated cost of services, revenue and expense projection model, fee structure review, and recommendations for the next five years. The city's

Solid Waste Division is funded through an enterprise fund, offers a multi-faceted PAYT program including a bag system in the central business district, and is self-supported through service rates. A dynamic spreadsheet-based rate model using Microsoft Excel was developed to project revenue and expenses over the subsequent five years. The baseline analysis projected a budget shortfall and identified billing issues resulting in a significant shortfall of revenue received by the city. Two fee schedules were modeled to cover cost of services and KCI was requested to perform additional work to review the city's third-party billing system. A report was provided to document the rate model assumptions, methodology, findings, proposed rate structures, suggested enterprise fund balance, and recommendations to help ensure the future stability and health of the enterprise fund.

SMM, Circular Economy and Zero Waste Category

Project 4: City of Fayetteville, Arkansas

- ✓ 3 Years or Newer
- ✓ Similar Size
- ✓ Similar Demographics



Solid Waste Reduction, Diversion, and Recycling Master Plan

KCI assisted the City of Fayetteville in developing a Master Plan to strive to achieve the city's goal of 80 percent waste diversion. Initial project work included a waste composition study; evaluation of the city's collection, processing, and transfer operations; and benchmarking existing programs. Based on the results of this initial work, KCI then identified waste diversion opportunities and strategies to take advantage of these findings. These strategies included new and expanded programs, **innovative policies to achieve zero waste**, productive partnerships, and, for some material streams, development of new facilities.

A key part of the project was obtaining stakeholder input. This was achieved through public meetings, as well as meetings with elected officials, multi-family property managers, local Chamber of Commerce, private sector vendors potentially interested in partnering with the city, and two regional solid waste planning groups. KCI also obtained input by conducting two surveys, one for residents and the other for businesses.



KCI then developed a baseline model with a 10-year planning period. Following review and discussions with city staff, KCI also modeled five different waste diversion scenarios. Based on the modeling results and selection of the scenario that best met the city's objectives, a proposed action plan was developed. The action plan identified policy, program, and facility recommendations and a phased-in approach for implementation.

Findings, results, and recommendations of all work conducted during the project were compiled into a final Solid Waste Reduction, Diversion, and Recycling Master Plan. The plan was then presented to City Council.

Project 5: SWANA/CRRA

- ✓ 3 Years or Newer
- X Similar Size
- X Similar Demographics



Zero Waste Principles and Practices National Certification Course



Kessler Consulting was selected to design and develop a National Zero Waste Principles and Practices Certification Course for the Solid Waste Association of North America (SWANA) in association with the California Resource Recovery Association (CRRA). This course will set the standard for zero waste planning and be used throughout North America to train industry professionals in implementing zero waste programs.

HDR

GENERAL SOLID WASTE AND

RECYCLING SERVICES

As population increases and we continue to generate waste while our waste management infrastructure ages, waste resource planning is an increasingly important issue. The variety of systems and techniques to manage waste resources varies greatly across the country. Whether looking for innovative ways to minimize waste creation, divert waste or design an environmentally friendly traditional landfill or other disposal system, HDR can tailor waste management solutions that integrate methods of management and disposal that suit any community.

HDR has the experience, talent and leadership to provide comprehensive consulting services for sustainable waste resource management solutions. We provide context sensitive solutions and assist our clients in promoting interactive communication with communities and other stakeholders to create collaborative and interdisciplinary approaches to solve waste resource challenges. Working with HDR can result in a long-term waste resource plan with realistic economic goals and solid environmental stewardship combined with workable strategies for waste reduction and diversion.

As we move closer to managing waste as a resource, HDR has become a leader in developing and shaping “zero-waste” planning. This concept recognizes that waste is not inevitable and establishes diversion and prevention goals for manufacturers, residents and businesses tailored to the unique needs of each community. HDR is a leader in evaluating the applicability of emerging technologies and designing sustainable landfill systems and waste-to-energy facilities.

HDR’s solid waste and recycling planning services include:

- “Zero waste” planning
- Staffing and contracting support
- Sustainability and climate considerations
- Risk management and financial review
- Waste facility assessment
- Waste system review and analysis
- Economic modeling and analysis
- Environmental compliance and planning
- Public/stakeholder outreach and education
- Emerging technology assessment
- Strategic planning

KEY SOLID WASTE & RECYCLING PROJECTS

	WASTE GENERATION STUDY	RECYCLING PROGRAM	MATERIAL COLLECTION, PROCESSING AND MARKETING	SOLID WASTE MANAGEMENT PLAN	PUBLIC EDUCATION	VARIABLE RATE PROGRAM	WASTE COLLECTION & ROUTE SYSTEM DEVELOPMENT	WASTE ENTERPRISE FUNDS	CONSTRUCTION & DEMOLITION WASTE RECYCLING	HOUSEHOLD HAZARDOUS WASTE COLLECTION
Hillsborough County Master Plan, Tampa, FL	X	X	X	X	X	X		X	X	X
Solid Waste Master Plan, Sarasota County, FL	X	X	X	X	X		X			
Solid Waste and Recycling Strategic Plan, City of Coral Springs, FL	X	X	X	X	X		X			
Recyclables Composition Study City of Hialeah Department of Public Works Hialeah, FL					X					
NYC Dept. of Sanitation Program Management, NY	X	X	X	X	X				X	
LA Solid Waste Integrated Resources/Zero Waste Master Plan, CA	X	X	X	X	X			X	X	X
Miami-Dade County Solid Waste Management Master Plan, FL	X	X	X	X	X	X	X	X		
Salinas Valley Solid Waste Authority, Solid Waste System Master Plan, CA	X	X	X	X	X				X	
City of Hialeah Solid Waste System Evaluation, FL	X	X	X	X			X	X		
City of Austin Resource Recovery Master Plan, TX	X	X	X	X	X	X		X	X	X
City of Concord Collection Efficiency & Procurement Assistance, NC	X	X		X			X	X		
City of Dallas Local Solid Waste Management Plan, TX	X	X	X	X	X				X	
Denver Solid Waste Master Plan, CO	X	X	X	X	X		X			
Palo Alto Zero Waste Operational Plan, CA	X	X	X	X	X				X	



Hillsborough County Master Plan, Tampa, FL

HDR is currently working with the Hillsborough County Solid Waste Management Division (SWMD) to develop a 20-year Solid Waste Master Plan for the County. The Master Plan will evaluate current and projected needs and goals over the planning period, and will outline specific short-term and long-term strategies for addressing the identified needs and goals.

Specific tasks associated with the master planning efforts include: development of a baseline understanding and needs assessment for the planning period; benchmarking; visioning workshop; evaluation of the remaining capacity at each of the County's solid waste facilities (including waste-to-energy facility, two transfer stations, Class I landfill, four community collection centers, and three yard waste processing sites); identification of viable strategies and scenarios; financial evaluations; Sustainable Return on Investment (SROI) analysis; and development of the final Plan document.



Solid Waste Master Plan, Sarasota County, FL

The goal of this plan was to provide a forward-thinking road map to meet the County's solid waste needs in the near and long-term and in the most economical means possible, while considering the State recycling goal, including the evaluation of the use of sustainable emerging technology.

Initial efforts for this project included the development of a baseline understanding and needs assessment of the solid waste system including current recycling rates for the County, and best practices research to identify new and innovative strategies for waste reduction and recycling. Public outreach and input was another important part of the planning process, including a visioning workshop early in the planning process, followed by public meetings for general feedback on scenarios being considered by the County. The project also included a market assessment to determine possible opportunities for greater diversion and revenue generation, a financial evaluation, and application of HDR's Sustainable Return on Investment (SROI) tool kit. This process takes into account the entire scope of potential costs and benefits related to sustainability measures, while simultaneously incorporating a risk analysis component over the project's life-cycle.



Solid Waste and Recycling Strategic Plan, City of Coral Springs, FL

The City of Coral Springs, FL selected HDR to develop a solid waste and recycling strategic plan. The goal of the plan was to identify the most effective strategies for the City to meet the State of Florida's 75% Recycling Goal over the next ten years. The study was divided into three phases.

Phase I of the project included a waste composition study, development of baseline recycling rates for the City, and best practices research to identify new and innovative strategies for waste reduction and recycling. Phase 1 revealed that the City's current overall recycling rate for FY10 was 10.6%. The City's single family recycling rate was 9.1%; multi-family was 5.7%; and commercial was 22.6%.

Strategies explored in Phase 2 included organics (yard waste and food scraps) recycling for residential and commercial customers; ways to increase recycling participation for curbside recycling (including PAY-T and incentive programs); ways to increase commercial recycling; and strategies for increasing diversion and recycling of C&D debris. Phase 2 also included customer surveys and Focus Group meetings designed to brainstorm strategies and identify potential obstacles; collection procurement assistance; ordinance review and revisions; financial analyses; and implementation planning assistance.

Phase 3 of the study included drafting the final Solid Waste and Recycling Strategic Plan document including recommended strategies and an implementation plan. It also included assistance with education and outreach to address changes in the City's solid waste management system.



Mandatory Commercial Recycling Feasibility Study City of Coral Springs

Based on the results of the recycling strategic plan completed in late 2013, the City of Coral Springs again retained HDR to assist the City in determining the feasibility of implementing a mandatory recycling ordinance for commercial entities in the City.

The prior strategic planning effort revealed that the commercial sector in the City, which generates approximately 20 percent of the waste in the City, was recycling an estimated 23 percent of commercial waste generated. The waste composition study revealed that nearly 80 percent of the commercial waste being disposed could be recycled or composted, with 30 percent of the commercial waste stream being paper. A large percentage of the paper found in the commercial waste stream is cardboard, which has viable recycling markets.

The feasibility study efforts included interviewing the licensed recovered material haulers in the City, who shared their views on opportunities and obstacles to recycling in the commercial sector; facilitating stakeholder meetings, which resulted in consensus that it would be a greater achievement to achieve the 75 percent recycling goal without a mandatory ordinance; and site visits to observe and document opportunities and challenges to recycling, which revealed that a large majority of business are already recycling.

The effort also included review of ordinances, including zoning regulations impacting enclosures. With six years until 2020, it was ultimately recommended to spend the next three years implementing a technical assistance program to promote recycling and assist with logistical issues, and reassess in three years to determine if a mandatory ordinance is necessary.

Recyclables Composition Study City of Hialeah Department of Public Works Hialeah, FL

The City of Hialeah Department of Public Works retained HDR to perform a recyclables composition study. The objective of the study was to provide the City and potential recyclable materials processors with accurate composition data regarding the materials that make up the existing residential, single-stream, curbside recyclables collected within the City. The scope of the project consisted of sampling and sorting recyclables from curbside recyclables program and analyzing the data to determine the types and quantities of materials in the recyclables stream. HDR implemented the following three-phase methodology to determine the composition of the City's residential, curbside recyclables:

- Prepare for sampling to provide data collection that would be statistically sound and efficient, and study results that would meet the City's objectives.
- Collect composition data through on-site sampling and hand sorting.
- Analyze data and provide a report to document findings of the study.

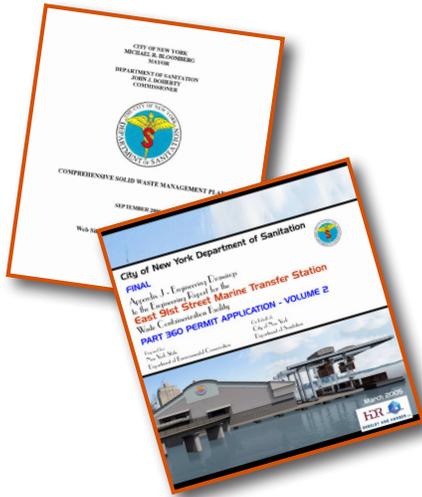
The sampling methodology for this study followed industry-accepted standards for statistical sampling, as outlined in the ASTM Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (D5231-92; re-approved 2008). A target number of 32 samples were needed to determine the annualized percentage of recyclables by material type in the loads arriving at the facility with a 90 percent confidence level and 10 percent confidence interval. Since the City provides residential recycling collection services to households on an every other week basis, it was recommended that sampling be conducted over the course of two weeks, in order to allow HDR to obtain samples from households in both the northern and southern parts of the City. The results of this composition study revealed a very high level of contamination (30.9 percent), which is believed to be largely due to the fact that the city provides recyclables collection using carts, but still uses a manual collection system for garbage. The City is considering changing to cart collection for garbage, which may greatly reduce the level of contamination in the recyclable materials stream.

Solid Waste Management Plan Update Mecklenburg County, NC

Historically, Mecklenburg County handled triennial updates to their State required ten-year Solid Waste Management Plan (SWMP) using internal staff. For the 2012 SWMP update, the County desired to bring in an outside consultant to assist with going beyond what the State requires, to reach further for waste reduction and recycling initiatives in the County. In October of 2011, Mecklenburg County retained HDR to assist the County in the 2012 triennial update to the SWMP. Mecklenburg County desires to not only be an exemplary solid waste management program in North Carolina, but nationally.

This SWMP update included the traditional elements of assessing the current policies, programs and infrastructure, but also added a public outreach and communication element that is more inclusive and intensive than the County has historically endeavored for these SWMP updates. HDR facilitated a three-day charrette in order to get input from the residents and businesses in the County. A steering committee was formed, including members from all seven of the municipalities located in the County, as well as other members from the community. HDR facilitated monthly steering committee meetings.

Once the charrette was complete, HDR incorporated the recommended strategies into a waste diversion model. The model included historical waste disposal and tons recycled, projections of waste for the ten year planning period, diversion estimates by material type for each of the recommended strategies, calculation of recycling rates for short term and long term strategies, program cost estimates, and greenhouse gas (GHG) emission reduction estimates. HDR then drafted the SWMP, including descriptions of current and historical system components, an assessment of those components, and recommendations for increasing waste diversion and recycling in the County for the next ten years, including a 58 percent waste reduction goal on a per capita basis compared to a base year.



New York City Department of Sanitation (DSNY) Program Management and Planning, Citywide, NY

Under its original (1994) and current (2001) Professional Services Agreements with the New York City Department of Sanitation, HDR continues to provide a wide variety of engineering, science, management planning and economic services. HDR was also responsible for the related planning, environmental analysis, cost estimating and economic analysis, facility planning and pre-construction services related to facilities valued over \$750 million. These services include:

- Updating and modifying the City's original October 1992 Comprehensive Solid Waste Management Plan (1992 Plan) for the 1996 Comprehensive Solid Waste Management Plan.
- Developing a new waste transfer infrastructure to access remote disposal locations as a result of the legislatively mandated closure of the Fresh Kills Landfill. Further, HDR prepared the 1998 Draft Solid Waste Management Plan Modification.
- Conducting the 1997 Staten Island Study and the Lower Diversion District Study to assess waste capture and diversion rates, and compare current waste composition samples with the 1990 Waste Composition Study database.
- Developing conceptual site plan for a multi-use Department facility

located on a 25-acre site at Spring Creek on the Brooklyn/Queens border.

- Designing, monitoring and evaluating the results of a pilot test to measure the recovery of recyclables in waste generated in Brooklyn District 8, a low diversion district, by means of mixed waste processing. As part of the analysis, HDR estimated the incremental cost of mixed waste process with and without the Curbside Program in low diversion districts.
- Preparing the Waste Management Plan Modification EIS and the environmental analyses of 17 site-specific export transfer station alternatives, ranging from capacities of 900-tpd to 8,000-tpd. In addition, HDR prepared conceptual designs for the remaining ten alternatives.
- Developing an economic analysis of the Department's Curbside Recycling Program & Export Program.
- Estimating the cost of solid waste export through FY 2002. Twenty-eight scenarios were considered reflecting various combinations of export options from the City's five boroughs.
- Preparing an EIS to support the Department's new Solid Waste Management Plan (SWMP) that included long-term export of the Department-managed waste out of the City by barge or rail.
- Commercial Waste Management Study. HDR prepared a Commercial Waste Management Study to meet the requirements set forth in New York City Local Law 74.
- Preparing the detailed design and associated permit application documents for this 1,200-tpd truck-to-rail transfer station for export of Department-managed MSW, generated on Staten Island from a site at the Fresh Kills landfill.
- Developing an RFP issued by DSNY in March 2012, seeking proposals from developers who would design, construct and operate under a 20-year service contract "new and emerging technologies".



Solid Waste Integrated Resource Plan, Zero Waste Master Plan, City of Los Angeles, CA

The City of Los Angeles is striving to accelerate diversion goals to 70 percent diversion by 2013, to add materials and curbside collection programs, and to convert the City's 700+ collection trucks to clean-burning liquefied natural gas. HDR is assisting the City in developing its Solid Waste Integrated Resources Plan that is envisioned to be the City's 20-year zero solid waste master plan. The process includes a multi-phase approach that involves the following project elements:

Advisory Committees. This plan includes perhaps the most extensive public involvement process ever employed for a solid waste management plan. Our process includes house meetings, stakeholder and advisory committees, multiple public workshops in each Council District, Citywide Conferences and coordinated media and public information program. This phase was completed May 2008 and resulted in more than 250 community involvement sessions and two city-wide programs.

Financial Planning Analysis. This project includes extensive financial planning with robust decision economics to ensure the affordability and the ability to finance recommendations. The team is reviewing and assessing all pertinent information and documents pertaining to the current and projected budgets and long-term financial plans, including projected revenues and expenses. Our team is researching and assessing the cost and viability of options for management of residual materials.

Regulatory/Policy Planning. This project is the development of a sustainable, affordable strategic solid waste resources plan. Our team is reviewing and

documenting the history, key regulatory features, and key policies undertaken by the city in the past while carefully monitoring the current and pending State and Federal regulations and legislation. Through this collection of information, we are evaluating potential impacts on the City's planned programs and facilities.

Innovative Technology. HDR's engineers are thoroughly researching all aspects of these technologies and facilities including operating performance, air emissions, facility availability, energy and residual byproducts, and capital and operating costs. Other than state-of-the-art WTE technologies, HDR is evaluating other emerging conversion technologies that have yet to be proven in the U.S. HDR is committed to learning what alternatives have been established as commercially viable in other parts of the world. During the summer 2008, a group of HDR solid waste professionals accompanied representatives from the City of Los Angeles on a month-long tour of various solid waste conversion facilities around the world. In an effort to bring state-of-the-art emerging conversion technology solution the City of Los Angeles, HDR visited operating solid waste gasification, plasma torch, anaerobic digestion, thermal conversion (WTE), and advanced recycling facilities worldwide.

Strategic Planning. The multi-year program culminates in a long-term strategic plan to guide the City's waste management policies, programs and facility development. The team is assisting the City in the development of a stakeholder input and decision-making process, conducting research and presenting information, facilitating the evaluation of options, and producing a plan that is practical and visionary.

Implementation Plan. The team will produce an action plan detailing the steps which include recycling, reuse and waste reduction, diversion infrastructure, applicable conversion technologies, and residual management utilization to meet the City's solid waste management goals.



Miami-Dade County Solid Waste Management Master Plan, Miami-Dade Public Works & Waste Management Department, Miami, FL

In June, 2009 HDR was retained by Miami-Dade County, Florida to prepare a long-term Solid Waste Master Plan for the Department of Solid Waste Management (DSWM). With a population of over 2.5 million, the DSWM has the daunting task of collecting and disposing of nearly 2 million tons per year of municipal solid waste. The importance and urgency of this study for the County is heightened by their two landfills (South Dade Class I Landfill and North Dade Class III Landfill) both nearing capacity and their three transfer stations (North-East, Central and West) and waste-to-energy plant (Resources Recovery Facility), all built in the late 1970 s and early 1980 s, soon to be in need of repair or replacement.

The stated goal of the Solid Waste Master Plan is to identify and develop activities, programs, facilities and technologies that will provide sustainability, resource conservation, source reduction, recycling, diversion, disposal and collection options for the next generation of County residents.

This maximum 3-year project is divided into two phases. Phase I, which began in early June, 2009 consists of evaluating all aspects of DSWMs facilities and programs and identifying future needs; performing a Waste Composition Study; determining solid waste generation rates and making projections; defining regulatory and policy issues; evaluating the department's financial program and identifying issues; identifying preliminary alternatives; and performing a fatal flaw

analysis. Another significant Phase I task is the establishment and conduct of a citizen Solid Waste Advisory Committee and facilitation of a public input and advisory process.

Specific tasks for Phase II will depend in large measure on the results of the Phase I effort, but in general, will consist of a detailed analysis of alternatives identified in Phase I, including a facilities and programs plan, implementation strategies, and cost projections. The public information and advisory process will continue throughout Phase II, which will culminate with the preparation of the long-term Solid Waste Master Plan.

SUSTAINABLE MATERIAL MANAGEMENT, CIRCULAR ECONOMY AND ZERO WASTE

At HDR, it's our desire to help you build programs to extend the useful life of materials and navigate the challenges of managing waste.

We understand the critical role you play in developing and managing the infrastructure needed to support a circular economy. But every community is different, each a complex system of logistical, social and environmental elements. Because of this, we know that 'textbook' solutions don't always work. We take the time to evaluate these dynamics while fully addressing your needs while achieving the greatest economic, environmental, and social outcomes.

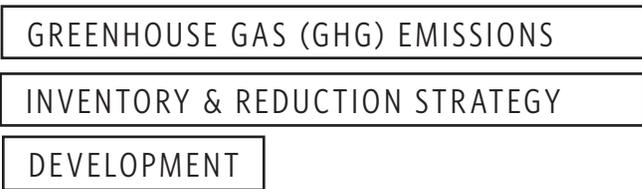
HDR's integrated material recovery and waste management practice allows us to tailor our services to each client, accounting for the unique goals and nuances of each community. We're passionate about helping clients embrace a life-cycle approach in managing processes and systems to keep materials out of landfills. The infrastructure that helps extend the useful life of materials plays a critical role in a much larger, interconnected system designed to make the most of our natural resources. Our goal is to enhance the shared value of these programs by helping our clients eliminate inefficiencies, better serve their communities, and minimize environmental impacts – all while improving economic performance.

HDR has helped many communities plan and implement innovative programs to eliminate waste, maximize material recovery, and responsibly manage residual waste. We have pioneered progressive plans for cities, such as New York and Los Angeles, as well as regional organizations like Lee County, Florida and DeKalb County, Georgia. Our solutions include cost-effective, socially, and environmentally acceptable integration of appropriate technologies to reduce, recycle, reuse, prevent, and divert waste to the greatest extent possible. We're recognized for delivering projects that are based on award-winning work in environmental education, "zero waste" management, and planning and design of facilities that integrate the latest technologies and strategies.

SUSTAINABLE RETURN ON INVESTMENT

How do you choose the right investment in the context of building infrastructure to keep materials out of landfills? Or put a value on nonfinancial benefits of extending the useful life of materials to society and the environment? HDR developed SROI to do just that.

Addressing the need for a triple-bottom line decision making framework, SROI involves identifying, quantifying, monetizing and summing in dollars the value of all relevant incremental costs and benefits over the life of the project. We've used SROI to help our clients make informed decisions about how to invest their capital, evaluate technologies, and compare hauling and waste management alternatives. This methodology not only allows clients to place a financial value on the social and environmental aspects of a project, but more importantly, it helps with prioritizing the overall program by providing an "apples to apples" comparison of projects in dollar terms.



Your GHG inventory provides the foundation for communicating your climate change strategy and measuring progress against goals. HDR has managed GHG inventories of all shapes and sizes – ranging from a single manufacturing location to a city-wide program. No matter the project, our priority is to ensure your data is relevant, complete, consistent, and accurate.

What sets us apart? Our sustainability professionals work hand-in-hand with our air quality experts, delivering results that reflect the latest thinking in sustainability concepts and built on a strong technical foundation. You'll have access to a network of professionals with expertise in a wide range of GHG regulations and accounting standards, keeping up with the latest modeling tools for stationary combustion, transportation, waste disposal, and other emission sources. This technical depth means that we can help you build a robust GHG inventory, accounting for any material Scope 1, 2 and 3 emission sources. Whether needed for regulatory permits or voluntary disclosures, we apply the same rigor and attention to detail in every project.

We can then take that data to develop strategic climate action plans - grounded in science - to identify transformative solutions that will drastically reduce GHG emissions over time. Our goal is to aim higher than just mitigating risk: we want to help you thrive in a low carbon economy. Our inclusive and collaborative approach will provide insight to the specific climate change issues with the greatest potential impact, providing basis for action. We'll help form a comprehensive strategy to address these risks head-on while uncovering new opportunities to improve resiliency, enhance communities and drive growth and innovation in business.

Long Term Disposal Study, Brampton Region of Peel, Ontario, Canada

The Region of Peel is responsible for the collection, transfer, processing and disposal of residential garbage, blue box material, household organic material, leaf and yard waste, white goods and household hazardous waste (HHW). It provides these services through a combination of public and private partnerships utilizing various solid waste management facilities throughout the Region.

HDR has been assisting the Region over the past two years in evaluating its long term disposal options. Our initial assignment was to assess a variety of options being presented to the Region by Algonquin Power, including: 1) extension of the existing agreement; and, 2) expansion of the existing Facility, with the Region purchasing the Facility. As part of this task, HDR staff conducted a condition assessment of the Facility, a review of the operating and maintenance practices, an assessment of the current and proposed capital investment and an assessment of the ability of the Facility to provide a long term reliable disposal option to the Region, as well as an examination of the operating costs and revenues over the proposed extension period.

HDR was also tasked with preparing a long term disposal options alternatives assessment which evaluated the technical, environmental and economic aspects of other potential disposal options available to the Region. HDR activities during this portion of the assignment included: an assessment of the quantity and composition of the materials to be managed over the planning term; establishing the methodology upon which the selection process was to be based; assembling a list of potential waste disposal options; preparing a list of up to five potential system options using the developed screening criteria and the extended list of potential options for additional detailed evaluation, taking into account the life cycle impacts of the options, including economics, energy use, greenhouse gas and other

emissions and risk; and, providing an assessment of critical aspects related to implementation of the screened options, addressing siting and approval considerations, timeliness and a comparison of the advantages and disadvantages of a Region owned versus a supply agreement with a privately owned facility.

HDR has assisted the Region in evaluating two in-Region long term disposal options involving two potential sites for the EfW facility. The Region required technical assistance in evaluating the possible alternatives to identify the relative risks and benefits associated with the use of each site as the home for the future EfW facility.

Shoreway Environmental Center, South Bayside Waste Management Authority, San Carlos, CA

The South Bayside Waste Management Authority (SBWMA) is the owner of the Shoreway Environmental Center (SEC) located in San Carlos California. This 16-acre facility is the hub of solid waste services for the Mid-Peninsula area and includes the collection vehicle fleet, a materials recovery facility (MRF), and a transfer station. In 2011 the SBWMA completed a \$30 M capital remodel of the facility. The primary goal for transformation of the Shoreway Environmental Center was to upgrade the recycling infrastructure required to handle new waste collection services provided to the 500,000 residents and 10,000 businesses in the 12-city service area.

HDR provided LEED/sustainability services, as well as site civil, mechanical, and electrical design services for the SEC, which includes: (1) a new state-of-the-art materials recovery facility for sorting single stream recyclables from residents and businesses; (2) expanded transfer station for more recycling and customer convenience; (3) green building features, such as solar panels and use of natural light; and (4) new environmental education center and demonstration gardens.

The new Shoreway Environmental Center serves as a national model for sustainable building practices and innovative recycling and material handling operations.



City of Austin Resource Recovery Waste Master Plan, Austin, TX

The City of Austin adopted its Zero Waste Strategic Plan in 2009, which set a goal of 20 percent reduction in per capita generation by 2012 and Zero Waste by 2040. HDR assisted the City in developing the Austin Resource Recovery Master Plan. Tasks for the Master Plan included research on best practices for regionalization, public-private partnerships, producer take-back programs, and local market development. In addition, HDR developed a Needs Assessment, which evaluated 30 existing initiatives and 28 new initiatives for increasing the City's diversion rate. Programs evaluated for the Needs Assessment included food scrap diversion, mandatory recycling and composting, construction and demolition debris recycling, enhancements to the litter abatement program, and updates to the City's climate action plan. HDR developed an implementation plan for scheduling new diversion programs and facilities through 2050 for additional diversion. From the implementation plan a funding plan to cover the cost of programs and facilities as they were projected to be developed was created. Modeling of the predicted required rates was conducted with several alternative scenarios analyzed. A draft Master Plan was developed and delivered to the City. HDR supported the City in finalizing the plan, which was produced by the Austin Resource Recovery Department.

MSW CONSULTANTS

3. DESCRIPTION OF KEY PROJECTS

PROJECT SUMMARY TABLE

MSW Consultants provides comprehensive technical and management capabilities for solid waste and recycling system projects for local governments. The table below summarizes the range of waste management, planning, recycling, sustainability and zero-waste consulting projects we have performed in the past five years. This table is intended to demonstrate our broad experience with the areas of expertise needed to successfully perform the *General Solid Waste, Planning and Recycling* and *Sustainable Materials Management, Circular Economy and Zero Waste* categories under this contract. In-depth profiles for selected projects are provided immediately following this table, although we will provide detailed profiles for any of the projects in the list below upon request.

Client	Project	Date	Financial/PAYT/Rate Analysis	Zero Waste & Master Planning	Public Outreach/Surveys	Presentations/Workshops	Collection Optimization	Contracts & Procurement	Recycling Optimization	Waste Characterization \ Audits	Market Research/Analysis	Fleet Management	Litter and Illegal Dumping	Facility Operations
Multiple Clients	LEED Waste Audits	Ongoing		✓						✓				
Confidential Municipal Client, OK	Solid Waste Management Consultant Services	Ongoing					✓	✓				✓		
Montgomery County/NMWDA	Shady Grove Transfer Station Evacuation Plan	Ongoing												✓
City of West Hartford, CT	Solid Waste Master Plan Phase 1	Ongoing		✓				✓						
Town of Enfield, CT	Solid Waste Consulting	Ongoing		✓			✓	✓						
Maryland Department of the Environment/NMWDA	Statewide Waste Composition Study	Ongoing								✓				
Grand Teton National Park	Zero Waste Plan	Ongoing		✓			✓							
Confidential Private Client	Northeast Business Development Research and Strategy Development	Ongoing						✓			✓			

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Missouri Department of Natural Resources	Statewide Waste Composition Study	Ongoing								✓				
Howard County/NMWDA	Landfill Traffic Study	Ongoing												✓
City of Ft. Pierce, FL	Refuse Collection System Evaluation	2017					✓							
City of Georgetown, KY	Solid Waste Optimization and Rate Study	2017	✓		✓	✓	✓					✓		
New York Department of Environmental Conservation/Parsons	Economic Analysis of Waste Plastics-to-Oil Sourcing in New York State	2017	✓								✓			
Louisville Metro Government, KY	Comprehensive Solid Waste System Analysis	2017	✓	✓	✓	✓	✓		✓	✓				
Progressive Waste Solutions, FL	City of Miami: Single Stream Recycling Composition Analysis	2017							✓					
Pennsylvania Department of Environmental Protection, PA	Recycling and Composting Technical Assistance Provider	2016	✓				✓		✓					
Confidential Municipality, Kingdom of Saudi Arabia (KSA),	Municipal Solid Waste Compost Plant Recommissioning Evaluation	2016						✓						✓
Rhode Island Resource Recovery Corporation, RI	Statewide Waste Characterization Study	2016								✓				
Marriott International, PA	Hotel Waste Composition Study	2016		✓						✓				
Liberty County, Georgia, GA	Solid Waste System Optimization and Rate Study Updates (2006-2016)	2016	✓				✓	✓						✓
Philadelphia International Airport, PA	Recycling Procurement	2016						✓	✓					
City of Gainesville, FL	PAYT Recycling Program Evaluation	2016							✓			✓		

3. DESCRIPTION OF KEY PROJECTS

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City of Alamosa, CO	Solid Waste Cost-of-Service & Curbside Recycling Feasibility Study	2016	✓	✓					✓					
Central Connecticut Solid Waste Authority	Disposal and Recyclables Processing Procurement Assistance	2016						✓						
Connecticut Department of Environmental Protection, CT	Connecticut Statewide Waste Characterization Study	2016				✓				✓				
Hennepin County, MN	Residential Waste Audit and Recycling Potential Analysis	2016							✓	✓				
Town of Front Royal, VA	Solid Waste Collection Systems Evaluation	2016					✓					✓		
Centre County Recycling and Refuse Authority (CCRRA), PA	Single Stream Recycling Feasibility Evaluation and Rate Study	2016				✓			✓					
Winchester Municipal Utilities, KY	Tip Fee Analysis	2016	✓											
Plainfield Township, PA	Curbside Recycling Evaluation	2016							✓					
City of San Jose, CA	Citywide Illegal Dumping Analysis	2015											✓	
National Parks Conservation Association, DC	Waste System Audits in Support of Subaru Zero Waste Project	2015								✓				
City of Columbia, MO	Solid Waste Collection Cost-of-Service and Rate Recommendation	2015	✓			✓	✓							
Borough of State College, PA	Refuse Services Evaluation and Rate Study	2015	✓				✓							
City of Philadelphia, PA	Philadelphia Schools Recycling Technical Assistance	2015		✓					✓					
Confidential Client, NY	Disposal Market Study	2015									✓			

3. DESCRIPTION OF KEY PROJECTS

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City of Phoenix, AZ	Residential Waste Characterization Study	2015								✓				
City of Philadelphia/ReCommunity Recycling, PA	Single Stream Recycling Characterization Study	2015							✓					
City of Muskogee, OK	Solid Waste Collection System Evaluation and Cost/Rate Study	2015					✓							
Confidential Client, FL	Waste Plastics Composition Analysis	2015								✓				
Cushman & Wakefield, NY	NY Life Insurance Company Waste Audit	2015								✓				
Progressive Waste Solutions, FL	Hillsborough County: Back-end Recycling Composition Study	2015							✓					
Sims Recycling/New York City Department of Sanitation, NY	Residential Waste and Recycling Characterization Study	2014								✓				
Confidential Client, Northeast, MA	Waste and Recycling Services Evaluation and Procurement	2014						✓						
Confidential Client, CA	Theme Park Waste Characterization Study	2014								✓				
CalRecycle, CA	2014 Statewide Disposal Facility Waste Characterization Study	2014								✓				
Howard County, MD	Solid Waste Management Plan 2014-2024	2014		✓										
Cambria County Solid Waste Management Authority (CCSWMA), PA	RFP for Recyclables Processing	2014						✓	✓					
Raleigh-Durham Airport Authority, NC	Solid Waste Handling Practices Study	2014		✓										
Lexington-Fayette Urban County Government, KY	Countywide Waste Stream Analysis	2014								✓				

3. DESCRIPTION OF KEY PROJECTS

Client	Project	Date	Financial/PAYT/Rate Analysis	Zero Waste & Master Planning	Public Outreach/Surveys	Presentations/Workshops	Collection Optimization	Contracts & Procurement	Recycling Optimization	Waste Characterization \Audits	Market Research/Analysis	Fleet Management	Litter and Illegal Dumping	Facility Operations
Montgomery County/NMWDA	Waste-by-Rail Negotiation Assistance	2014	✓					✓						
Wildlife Conservation Society, NY	Bronx Zoo Waste Characterization Study	2014								✓				
Ramsey/Washington Counties, MN	Two-County Waste Composition Study	2014												
City of Philadelphia, PA	Big Belly Litter Can Usage Audit	2014								✓			✓	
City of Allentown, PA	RFP for E-Scrap Collection	2014						✓						
New York City Department of Sanitation, NY	Residential Organics, Litter Basket and School Waste Stream Audits	2014								✓			✓	
City of Boston, MA	Food Waste Disposer Evaluation	2014								✓				
Covanta Energy, MA	Desktop Waste Composition Analysis	2013								✓	✓			
Upper Nazareth Township, PA	Recycling Program Optimization	2013							✓					
City of Boston, MA	Residential Capture Rate and Waste/Recycling Composition Analysis	2013								✓				
Covanta Energy, MA	Southwest Houston Waste Composition Analysis	2013								✓				
Carroll Township, PA	Yard Waste Composting and Commercial Recycling Program Assistance	2013							✓					
Covanta Energy, MA	Midwest Dirty MRF Waste Composition Analysis	2013								✓				
Marple Township, PA	Compost Facility Feasibility Study	2013		✓										
Robesonia-Wernersville-Womelsdorf COG, PA	Recycling Education	2013							✓					
New York City Transit Authority, NY	Comprehensive Waste Stream Audit and Recycling Processor Evaluation	2013								✓				

3. DESCRIPTION OF KEY PROJECTS

Client	Project	Date	Financial/PAYT/Rate Analysis	Zero Waste & Master Planning	Public Outreach/Surveys	Presentations/Workshops	Collection Optimization	Contracts & Procurement	Recycling Optimization	Waste Characterization \Audits	Market Research/Analysis	Fleet Management	Litter and Illegal Dumping	Facility Operations
City of Philadelphia, PA	Residential Food Waste Evaluation	2013							✓	✓				
City of Philadelphia, PA	Recyclables Processing Composition Audit	2013	✓						✓		✓			
Washington Sewer and Sanitary Commission (WSSC), MD	Waste and Recycling Services Evaluation and Waste Audits	2013								✓				
Winchester Municipal Utilities, KY	Solid Waste Collection Service Optimization and Rate Study	2013	✓	✓	✓	✓	✓		✓					
Minnesota Pollution Control Agency (MPCA), MN	Statistical Analysis of Statewide Waste Characterization Data	2013								✓				
City of Milwaukee/InSinkErator, WI	Residential Food Waste & Back Yard Composting Evaluation	2013								✓				
City of San Diego, CA	Waste Characterization Study	2013								✓				
MassDEP/Wheelabrator, MA	WTE Facility Waste Characterization Studies	2013								✓				
Keep Pennsylvania Beautiful, PA	Illegal Dumping Cost Survey	2013											✓	
Borough of Dickson City, PA	Residential Collection Optimization and Recycling Study	2013							✓					
Philadelphia International Airport, PA	Comprehensive Recycling and Waste Assessment	2013								✓				
MassDEP/Covanta Energy, MA	WTE Facility Waste Characterization Studies	2013								✓				
Reclay StewardEdge/American Beverage Association, FL	Public Space Recycling Pilot Test Assistance	2012								✓			✓	
City of Scranton, PA	Evaluation of Residential & Commercial Recycling Collection Programs	2012							✓					
City of Palo Alto, CA	Waste Characterization & MRF Efficiency Study	2012								✓				

3. DESCRIPTION OF KEY PROJECTS

Client	Project	Date	Financial/PAYT/Rate Analysis	Zero Waste & Master Planning	Public Outreach/Surveys	Presentations/Workshops	Collection Optimization	Contracts & Procurement	Recycling Optimization	Waste Characterization \Audits	Market Research/Analysis	Fleet Management	Litter and Illegal Dumping	Facility Operations
City of Atlantic Beach, FL	Solid Waste Financial Analysis	2012	✓											
City of North Port, FL	Transfer Station Feasibility Study	2012				✓			✓		✓			
Town of Simsbury, CT	Evaluation of Curbside Recycling Collection	2012							✓					
North Lebanon Township, PA	Reconfiguration and Expansion of a Yard Waste Composting Facility	2012												✓
Borough of State College (RTA), PA	Educational Program Development for Restaurant Recycling and Composting Program	2012							✓					
Borough of Clarks Summit, PA	Development of Commercial Recycling Program	2012							✓					
Vermont Department of Environmental Conservation, VT	Statewide Waste Composition Study	2012								✓				
Howard County, MD	Waste Composition Analysis of Residential Food Scrap Collection Pilot Program	2012					✓							
County Solid Waste Departments, PA	Municipal Waste Management Plans	2012		✓										
Borough of West Reading, PA	Yard Waste Recycling Analysis	2012							✓					

SCS Engineers

3.5 AREA V: SMM, CIRCULAR ECONOMY & ZERO WASTE

The concept of zero waste views waste as a resource rather than trash that requires disposal in a landfill or incinerator. A zero waste strategy seeks to manage waste materials in order to capture their most productive level and requires an understanding of the natural and financial capital investments needed as well as the benefits that will be realized from various management options. Zero waste programs benefit the economy, environment, and public health.

SCS has strong qualifications in all phases of integrated waste management and is prepared to provide a fresh look at the solid waste programs for NMWDA member jurisdictions. We recently developed the Zero Waste Plan for Prince George's County which outlined economic incentives, extended producer responsibility and product stewardship opportunities, and greenhouse gas emissions savings from various zero waste programs.

Our approach to sustainable material management includes a blending of seasoned solid waste professionals who have nationwide expertise with sustainability, innovative waste diversion programs, and assessment of new technologies; along with solid waste professionals who are familiar with the solid waste management landscape of the region and who know the workings of local solid waste management program.

3.5.1 Key Projects

Comparative Evaluation for Assessing the Non-Residential System Benefit Charge - Montgomery County, MD

In 1992, the Montgomery County Council adopted a bill that established a solid waste service charge known as a systems benefit charge. The purpose of the systems benefit charge was to provide a more specific and equitable method of collecting funds to cover the County's cost of providing solid waste management services.

Each nonresidential property is assigned to a waste generator category for the purposes of assessing the System Benefit Charge. The waste generator categories are based on the quantity of waste generated per occupied square foot of the property and are assigned as follows:

- Low Generator (0 to 2 pounds of waste/sf/year);
- Medium Low Generator (> 2 to 4 pounds of waste/sf/year);
- Medium Generator (> 4 to 6 pounds of waste/sf/year);
- Medium High Generator (>6 to 8 pounds of waste/sf/year);
- High Generator (>8 pounds of waste/sf/year).

SCS evaluated the improvement in equity that might be attained through various alternate methods of assessing the Nonresidential Systems Benefit Charge. Four types of systems

were evaluated. These are distinguished by the nature of the data and information required to implement each. Briefly, we have

- **Variations of the Current System** – Continue to estimate waste generation based on land use and gross floor area; however, the boundaries of the waste generator categories would be modified. These systems would not utilize truck-based data.
- **Waste Capacity Systems** – Utilize truck-based data systems to acquire information about the waste capacity each property maintains for assessing the system benefit charge.
- **Truckload Quantity Systems** – Utilize truck-based data systems to acquire information about the waste capacity each property maintains to apportion the weight of the corresponding truckload among those properties that contributed to the truckload. The corresponding weight estimates would then be used for assessing the system benefit charge.
- **Gold Standard Systems** – This ideal system utilizes a truck-based data system capable for measuring and recording the actual weight of waste collected from every waste collection container during every pickup.

The project procured and utilized an on-board scale system to measure refuse generated by individual nonresidential properties. Accordingly, a cooperative hauler was engaged and a commercially available on-board scale system was procured.

Zero Waste Strategic Plan, Prince George’s County, MD

Prince George’s County contracted with SCS to develop a Zero Waste Strategic Plan. Working closely with County staff, SCS identified and analyzed the program options for increasing diversion from each waste generator sector, commercial, residential (both single-family and multi-family, and institutional). Opportunities to improve existing programs were identified, as well as new options for increasing diversion and reducing the toxicity of waste in the County.



To foster a sense of collaboration, County staff helped identify various groups and individuals interested in the County’s actions on zero waste. These stakeholder groups were contacted and interviewed by SCS to obtain their input on the programs and policies the County should pursue in order to achieve zero waste, which included:

- Development of a decentralized composting infrastructure;
- Creation of a C&D diversion ordinance;
- Support for statewide container deposit legislation;
- Providing incentive for waste reduction and recycling;
- Training and education for local businesses;

- Technical assistance to multi-family properties.

In December 2016, SCS presented the Zero Waste concept and process at two public meetings. Public comments will be accepted and reviewed until Spring 2017 at which time the Zero Waste Plan will be finalized. SCS will help establish and coordinate a Green Team to prioritize and implement initiatives identified by the Zero Waste Plan.

Policy Analysis for a Pay as You Throw (PAYT) Program for City of Virginia Beach, Virginia

The City of Virginia Beach is the largest city in Virginia, with a population of nearly 450,000. The City self-performs residential solid waste collection for approximately 124,000 customers. Solid waste services include weekly automated residential household pickup, weekly manual yard waste collection, and scheduled bulky waste pickup. The City has a contract with a private company to collect and process single stream recyclables on an every other week basis.

SCS was tasked with prepare two policy papers to educate the City Council on Pay as You Throw (PAYT) and Zero Waste initiatives and the potential implications for adopting such initiatives in the City. PAYT is an approach to billing municipal solid waste services whereby residents are billed based in part on how much waste they dispose. The PAYT approach is in contrast to the more conventional flat rate fee used by many municipalities where the total costs for solid waste collection, disposal, and recycling are apportioned uniformly in the property tax bill regardless of the amount of waste disposed or recycled by individual residents.

The purpose of the PAYT policy position paper was to discuss the types of PAYT programs available to the City, the advantages and disadvantages of each, and the applicability of a PAYT program to the City's solid waste management system.

PAYT programs have been deployed successfully throughout the country. The approach is considered a more equitable method for billing solid waste services. Because the City has a successful automated solid waste collection system, a volume based, variable size container PAYT program would be more suitable for the City. The benefits of PAYT programs have included reductions of up to 15 percent in the quantity of waste requiring disposal through source reduction, recycling, and increased diversion of yard waste for mulching and/or composting, and reduction in disposal costs. Some additional expenses can be expected, such as administrative support, container purchases, changes to the City's billing system, public notification, additional yard waste management costs (e.g., collection, transfer, and processing), and possible increased recycling costs. However, these additional costs would likely be less than the anticipated disposal savings.

GBB

3 – Descriptions of Key Projects

bringing in economic and demographic data along with local and industry generation factors. The outcomes were used to identify any service gaps for recycling and disposal over the next 20 years.

The data, analysis, and projections were used to complete another required portion of the SWMP process: analysis of needed capacity and estimation of the adequacy of available facilities. The Project Team then identified what resources, programs, facilities, regulatory changes, and other developments are needed to transition from 2015 to the year 2035. The draft and final plan were then completed for submission to the Virginia Department of Environmental Quality.

Integrated Solid Waste Management Plan

(Maui County, Hawaii)

GBB was the lead on the project team that was hired to develop the Integrated Solid Waste Management Plan (ISWMP) for Maui County that is required by the State of Hawaii. The ISWMP considered the following solid waste management practices and processing methods in their order of priority: (1) source reduction; (2) recycling and bioconversion, including composting; and (3) landfilling and incineration. GBB evaluated solid waste and recycling collection, as well.

By 2000, the State had hoped to be at 50 percent diversion but, instead, had a recycling ethic that had not yet rooted into the community; user fees (e.g., pay-as-you-throw) were rare; and the inherent costs of operating a recycling business on an island were high. As a consequence, local recycling markets were underdeveloped. These and other issues were taken into account in the development of the ISWMP. The Mayor appointed members to an advisory panel, the Solid Waste Resource Advisory Committee (SWRAC), and the ISWMP was built through that panel.

Prior to the first ISWMP draft, GBB led a tour for 17 people from the County on an eight-day tour of West Coast solid waste facilities. The tour group was made up of citizens from the SWRAC, members of Maui County Mayor Charmaine Tavares' administration, and staff members of the Hawaii Department of Environmental Management.



The group landed in Portland, Oregon, and visited the Metro Regional District's facilities. It then went to nearby Marion County to tour Covanta's waste-to-energy facility and the County's ash monofill. The group then flew to San Francisco to visit the City contractor's MRF, transfer station, education room, citizens' drop-off facility, and C&D MRF. The group was fortunate to spend several hours talking with the City's staff and listening to Robert Hailey's zero waste program strategies.

3 – Descriptions of Key Projects

Next, the group went to UC Davis to discuss alternative disposal options and then to nearby Vacaville to see San Francisco’s food waste being composted. Finally, the tour ended in Monterey, CA at the Monterey Regional Waste District’s facility with its Last Chance Mercantile, C&D MRF, wood grinding operation, HHW facility, and a chance to talk with the managers who operate this public facility in a business style.

One week after the tour, the members of the SWRAC met with an expanded knowledge base from which to build on the solid waste management plan in development for the County of Maui.

The draft Plan was completed and made available to the public. The major recommendations of the draft Plan included:

- Providing single-stream curbside recycling collection and weekly trash collection;
- Providing residential curbside collection of white goods, bulky waste and household hazardous waste;
- Developing MRFs to process recyclables and C&D waste;
- Implementing a landfill gas collection system and generating electricity from it;
- Increasing environmental education;
- Developing a transfer facility and convenience/recycling center;
- Consolidating certain base yards and developing a centrally located solid waste campus;
- Initiating C&D waste recycling programs; and
- Investigating technologies to convert waste to electricity.

A series of public hearings were held before the final Plan was submitted to the Hawaii Department of Health and approved.

The County of Maui Integrated Solid Waste Management Plan and briefing made to the Council members, prepared by GBB, are available on the County’s website at: www.co.maui.hi.us/index.aspx?NID=881



Strategic Planning and Stakeholder Research

(Mojave Desert and Mountain Recycling Authority, California)

The Mojave Desert and Mountain Recycling Authority is a California Joint Powers Authority (JPA), consisting of nine communities in the state’s San Bernardino County high desert and mountain region. The JPA financed and manages the operations contract for the highly automated Victor Valley Material

3 – Descriptions of Key Projects

Recovery Facility (MRF). The MRF today receives and processes an average of 130 tons per day, five days per week, of single stream paper and containers and recyclable-rich commercial waste loads. The JPA has two strategies regarding process residue:



- Reducing residue rates from existing deliveries to optimize MRF operations;
- Increasing recovery for recycling by expanding the recyclable-rich and organics-dense waste load deliveries to the MRF and/or a composting facility.

In August 2008, the JPA contracted with GBB to prepare the Victor Valley Resource Management Strategy (Resource Management Strategy). Working with RRT Design and Construction, Inc., GBB prepared a coordinated forward-looking strategy to guide the JPA's future program and facilities decisions. The Resource Management Strategy focused on the Town of Apple Valley and the City of Victorville, the two largest JPA member communities with respective populations of 70,000 and 107,000, which have a combined total of more than 130,000 tons per year of material entering the JPA's recycling system and the Victorville Landfill. The Resource Management Strategy is underpinned by a visual characterization of nearly 300 waste loads delivered to the Victorville Landfill in the fall of 2008.

The waste characterization indicated that as much as 80% of loads of residential and commercial waste landfilled could be processed for recycling and composting in a combination of manual and automated sorting facility. Loads sufficiently dry and containing primarily non-bulky materials were judged eligible for processing and recovery.

The Resource Management Strategy provided a conceptual design and cost that identified projected capital and operations costs that would be incurred to construct a new pre-processing system to separate out materials for recycling and composting from eligible loads. Based on the waste composition analysis, residue from a proposed system was estimated. This residue would be rich in combustible materials, sufficient to send to an energy recovery market.

Furthermore, the Resource Management Strategy sets the stage for JPA programs to address the December 2008 California Scoping Plan's mandates and priorities. The Scoping Plan, a roadmap for statewide greenhouse gas emission reduction efforts, specifically calls out mandatory commercial recycling, expanded organics composting, and inclusion of anaerobic digestion as renewable energy.

The Resource Management Strategy assessed three cement manufacturers, located in the high desert region, for their potential to replace a portion of their coal fuel with residue from the MRF and potentially from other waste quantities generated in the region. Cement kilns are large consumers of

3 – Descriptions of Key Projects

fossil fuels, operate on a continuous basis, and collectively are California’s largest source of greenhouse gas emissions. Further processing requirements were also identified for size reduction and screening to remove non-combustible materials and produce a feasible refuse-derived fuel (RDF). A conceptual design system to process residue and supply RDF to a cement kiln was developed, as were estimated capital and operating costs to implement the RDF production system. The Resource Management Strategy, by including separate collection of yard waste, food waste, and soiled paper, as well as the alternative to collect these materials in waste loads and recover them in a pre-processing system, successfully addressed the California Public Resources Code requirement that “all feasible source reduction, recycling, and composting measures” are implemented prior to approving any new “transformation” facility. This planning effort also provided a basis for greenhouse gas reduction analysis consistent with statewide initiatives to reduce landfill disposal.

The JPA is implementing improvements to its MRF recommended by the Strategy, for reducing MRF residue. Also, the JPA is monitoring two food waste composting pilot projects being conducted at two regional facilities, while promoting the use of the commercial scale composting facility to commercial landscapers and other generators of commercial yard waste.

Stakeholder research was an integral part of this project. In order to obtain an in-depth understanding of generators’ current perceptions and attitudes about the current collection system as well as recycling and waste reduction, GBB conducted the following research designed to obtain input from key stakeholders: residents, business leaders, elected officials, environmental leaders, school representatives, and waste industry officials:

- A focus group with 11 residents of Apple Valley and Victorville, October 21, 2008
- A focus group with solid waste managers from seven Apple Valley and Victorville businesses and organizations, October 22, 2008
- Stakeholder interviews with 11 opinion leaders from Apple Valley and Victorville, including two city council members, a business leader, a property manager for a large development, two chamber of commerce directors, one environmental leader, three waste industry officials and one school representative, October 20-23, 2008
- Review of public education and outreach materials, including websites, from Apple Valley, Victorville and the JPA
- Interviews with solid waste managers in both jurisdictions

GBB analyzed the data from the research and provided a set of recommendations for the JPR. The research pointed to the need for a “back to basics” recycling campaign to clear up confusion about recycling guidelines, the need for better inter-jurisdictional cooperation on recycling, opportunities to use technology to promote recycling, and improvements to public education materials.

3 – Descriptions of Key Projects

Solid Waste Management Plan Update

(Wasatch Integrated Waste Management District, Utah)

GBB was selected to prepare an Update to the Solid Waste Management Plan for Davis and Morgan Counties, Utah, which are within the Wasatch Integrated Waste Management District. This substantial update to the original Plan of 1993 includes solid waste projections, a review and assessment of the existing solid waste management system and its costs, an assessment of public information tools and programs, an evaluation of options to increase waste reduction and recycling and to apply best management practices that have been successful in other communities, and a recommended implementation program and schedule. The plan update process was guided by an advisory group of the District Board.

3.2.4 - Biosolids and Organics Management

Regional Composting Operation Business Plan Development

(City of Plano, Texas)

GBB assisted the City of Plano, Texas (pop. 220,000) by developing a business plan for a regional composting operation being developed by the City. This addressed feedstock the importation of organic materials from four independent cities in addition to Plano. The quantity of organic material was projected to peak at 90,000 tons per year. The plan identified \$2.5 million in capital investment and almost \$2 million per year in operations costs for the initial five years. The business plan also identified independent product markets and reviewed the competitive market to determine pricing for the products including both bulk and bagged products. Revenues were projected for the initial five years and a risk analysis preformed. The City of Plano implemented the business plan.

Financial and Operational Audit of the Maui EKO Systems Contract

(Maui County, Hawaii)

The County of Maui (County) issued a request for proposals for a consultant to perform a financial and operations performance audit of the County co-composting operation. The County selected the consultant team led by GBB with the accounting firm of Levin & Hu and O2Compost to perform a Financial and Operational Audit of the co-composting project managed under contract by EKO Systems, Inc.

The County delivered 25,000 tons of biosolids to be processed by EKO Systems, Inc., into usable products. Also, the County and its residents delivered 35,000 tons of green waste which was shredded