



Technical Memorandum #3

System Definition and Future Program Refinement/Rate Assessment

Rapid City Planning Area
Rapid City, South Dakota

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1.0 Summary

The purpose of Technical Memorandum #3 is to present the system definition for the City of Rapid City's (City) solid waste management system that has been developed based on the evaluation of environmental, technical, and economic factors, decisions, and features and the integration of those features discussed in Technical Memoranda #1 and #2. In addition, the system definition involved refinement of program alternatives as well as a market analysis. This technical memorandum also includes a rate structure review, which includes opinions of probable costs for key features, an analysis of solid waste user tipping fees and rates, and financial management considerations.

2.0 Background

Technical Memorandum #3 builds on the Rapid City Needs Assessment (HDR, October 2009), which summarized current and projected system needs in terms of capacity and defined the operational issues and program changes to be addressed in the next 20 years. The Needs Assessment provided the foundations for long-term planning by identifying the planning area and various demographic and geographic data sources, presenting current waste management practices and disposal of solid waste generated in the City and surrounding communities, summarizing waste generation and compositional data, and presenting waste quantity and traffic projections. Technical Memorandum #3 also builds on the Operations Assessment & Program Options Analysis (HDR, November 2009), which assessed the existing City programs in terms of operational methods and program management as well as examined future program options for waste reduction, recycling, energy recovery, and management of special wastes by various means and techniques.

3.0 System Definition and Future Program Refinement

The system definition and future program refinement focused on consolidating a wide array of program alternatives into a cohesive strategy. In this refinement, the system definition addressed the need for additional land, requirements for future development, and the organization of program features into a functionally efficient strategy.

In the Needs Assessment (HDR, October 2009) and initial evaluations, it was recognized that the City currently has a comprehensive and integrated solid waste program, including a wide array of waste management programs that place the City well ahead of most communities across the U.S. Such programs were developed conceptually in the 1992 Rapid City Solid Waste Management Plan (1992 Plan) and have been implemented over the past 17 years with the support of the City Councils and Mayors since that plan was developed. Based on this fact, many of the program alternatives that were identified represent enhancements and refinements to existing programs in order to increase material recovery, reduce the amount of waste disposed in the landfill, and improve the operations, safety, and efficiency of existing facilities and functions.

Guiding principles in the definition and evaluation of program alternatives were environmental stewardship and the U.S. Environmental Protection Agency's (USEPA) integrated three-tier hierarchical approach to municipal solid waste (MSW) management. The hierarchy favors source reduction to reduce the volume and toxicity of waste and to increase the useful life of manufactured products. Recycling, which includes composting, is the next preferred waste management approach to divert waste from landfills and combustors. The third tier of the hierarchy consists of combustion and landfilling. Combustion is used to reduce the volume of waste being disposed and to recover energy from this process. The goal of this approach is to use a combination of all of these methods to safely and effectively handle the MSW stream with the least adverse impact on human health and the environment. USEPA believes that each community should choose a mix of alternatives that most effectively meets its needs, looking first to source reduction and second to recycling as preferences to combustion and landfilling. The City already embraces this hierarchy with program elements that include source reduction, recycling, and composting. Future programs will consider resource conservation, reduction, and reuse; volume reduction; and elements often associated with "Zero Waste" management

philosophies and strategies. Zero waste strategies maximize recycling, minimize waste, reduce consumption, and encourage the development of products that are made to be reused, repaired, or recycled back into nature or the marketplace.

Approximately 83 percent of the MSW and up to 70 percent of the construction and demolition (C&D) waste handled by the City's Solid Waste Operations Complex, which includes solid waste management activities and facilities at the Rapid City Landfill site, are still disposed in the landfill. Opportunities exist for additional resource conservation, reduction, and reuse as well as additional recycling and composting to reduce the amount of waste being disposed in the landfill and improving materials recovery revenues. Landfilling will still be needed, but the life expectancy of the existing and future landfills can be extended through additional and enhanced material recovery programs and resource recovery (combustion).

3.1 Program Alternatives Definition and Evaluation

The definition and evaluation of program alternatives were undertaken through a series of face-to-face meetings between the City and HDR, review of various technical memoranda, visits and on-site reviews of the Solid Waste Operations Complex, data and document evaluations, and research into select topics, as discussed in Technical Memorandum #2.

Based on the array of program alternatives identified and possible solutions, the City and HDR personnel met to consolidate findings (in Technical Memorandum #1 – Needs Assessment and Technical Memorandum #2 – Operations Assessment & Program Options Analysis) and select the preferred waste management practices, alternatives, and strategies for incorporation into the 2010 Rapid City Solid Waste Management Plan (2010 Plan). The outcome of those meetings and the refinement of prior evaluations is presented in Section 3.2, System Definition. Environmental stewardship and integrated MSW management continued to be the guiding principles that the City followed to evaluate and define future system needs. This evaluation of selected system alternatives includes consideration of the following:

- Pre-disposal material recovery strategies
- Volume change (volume requirements) implications on landfill capacity requirements
- General land and on-site space requirements for waste management programs and future site areas to be set aside for these programs
- Timing and need for additional land acquisition
- Identification of staffing, equipment, and facility needs

A key finding of Technical Memorandum #2 was that additional pre-disposal material recovery opportunities existed. This included opportunities for additional resource conservation, reduction, and reuse as well as additional recycling and composting opportunities. Key elements to achieve success with such programs included the need for additional education at all levels, greater participation in existing recycling and composting programs, and provisions for dealing with special wastes to prevent them from ending up in the landfill. A key recommendation included the addition of a Source Reduction Leader (staff position) to expand public outreach and education to a wide range of waste generators and to support material recovery strategies. Implementation of many of the recommended pre-disposal material recovery/source reduction program enhancements are contingent upon a commitment by the City to establish, fully fund, and support such a program leader.

Source reduction and recycling are encouraged for the following reasons:

- To protect the environment
- To conserve landfill space for future disposal
- To conserve resources
- To conserve energy

Environmental protection occurs with the increased awareness of what is in the waste, what can cause environmental problems, and better ways to use or reuse items that had been landfilled in the past. Conservation of resources is most applicable for items made of petroleum, such as plastics and asphalt, but can apply to any natural resource from the earth that is finite. As resources are consumed, it is often necessary to import from distant places or drill deeper for local resources. Conservation of resources is

also considered in the energy conservation resulting from recycling. With the recycling of items such as aluminum, steel, and fiber, less energy is consumed in the remanufacture of these items. In addition, less energy consumption means less air emissions due to lower generation of energy. Conservation of landfill space is a key reason for waste reduction and recycling. The City, in adopting the 1992 Plan, made a community commitment to be a steward of the earth by reducing the waste being landfilled.

With the City's implementation of the 1992 Plan, the current Rapid City Landfill has an estimated remaining (permitted) MSW disposal capacity of approximately 44 years as of 2006 (that is, a closure year of 2050). The adjacent Rapid City Solid Waste Division-owned land (also known as the Johnson Property) is anticipated to significantly increase this life expectancy if the property can be fully developed and utilized. A key recommendation is that the City pursue zoning, permitting, and other actions necessary to secure the long-term viability of both City properties for solid waste management. It is also recommended that monitoring efforts track the capacity and management of the current disposal site to ensure that existing space is optimized. If technologies such as waste-to-energy can be established as economically viable, the City-owned land may be one location available for such facility construction. The implementation of such technology would also significantly increase the life of the existing landfill.

Additional land acquisition to the west and south is also recommended to increase the distance between the Solid Waste Operations Complex and future neighbors. A key concern that serves as the basis for recommendations on preserving the City-owned property for solid waste management, presented in Technical Memorandum #2, Appendix A9, is the following:

If residential and commercial development is allowed to move closer and encroach on the City's existing and future landfill and solid waste facilities, the neighbors' expectations, complaints, and opposition to expansion will likely increase and nuisance conditions that are considered to be managed in an acceptable manner by today's standards may not be tolerated in the future (e.g., the standard performance expectation will increase (get more stringent)).

Also as the quantities of waste managed and the size of the disposal site increases, the Solid Waste Operations Complex could be further challenged to meet these higher expectations and as such require higher costs for compliance. Future neighbors could further challenge the very existence of constructing future solid waste facilities.

Additional recommendations centered on opportunities to improve safety, services, and efficiency. These recommendations focused on the existing scale facility that could be enhanced if the facility is relocated (on-site) and if a central citizens' waste handling facility (citizen campus) could be established. The existing scale facility configuration and operations are inadequate to handle current and future peaks in vehicle traffic (transaction) volume. Additionally, the volume of residential vehicles result in two working faces at the landfill (for safety and segregation of citizens from professional haulers) and requires residential vehicles to be dispatched to numerous locations on the Solid Waste Operations Complex based on the types of material being delivered or compost being picked up. A central citizen campus could accommodate waste drop-off, recycling, and compost pick-up; could be configured for maximum flexibility and improved efficiency; and could include space for future programs such as special waste or household hazardous waste management, if ultimately implemented.

3.2 System Definition

The recommended system definition, presented below, was developed as a result of meetings between the City and HDR for the purpose of refining initial system strategies into a preferred strategy for incorporation into the 2010 Plan. The foundation for these discussions and recommendations was Technical Memorandum #1 – Needs Assessment and Technical Memorandum #2 – Operations Assessment & Program Options Analysis, and environmental stewardship, as well as input obtained at public meetings on June 18, 2009, and November 18, 2009. As noted above, the City currently has a comprehensive and integrated solid waste program, including a wide array of waste management programs. As such, the components of the system definition generally assume that existing programs will continue and that the system definition serves to enhance, expand, refine, or otherwise build upon these existing programs. Refinements of options leading to the system definition included discussions of such

topics as advantages and disadvantages, general costs, compatibility with existing facilities/programs, and land resource impacts. The programs presented below include both short- and long-term system strategies. As part of the evaluations leading to the system definition, consideration was given to such factors as the following:

- Priority
- Schedule
- Cost
- Actions necessary for or preceding implementation

A matrix with these factors for each recommendation is included in Appendix A. The recommended programs and system enhancements are listed below. Most of these recommendations will be further refined in the 2010 Plan. Following the identification of these program elements, a preliminary cost was assigned to each program to allow for the preparation of general economic evaluations.

3.2.1 Source Reduction (Conserve, Reduce, Reuse)

Recommendations for source reduction are as follows:

1. Continue to encourage, support, and fund existing waste reduction and recycling programs operated by the City.
2. Establish a Source Reduction Leader (staff position) to aid in implementing further source reduction and recycling components of the 2010 Plan, including the following programs:
 - Enhance existing K-12 education programs, including providing assistance in developing environmental stewardship curriculum related to solid waste management and resource conservation.
 - Promote programs to reduce yard waste collection and management.
 - Expand educational outreach programs to residents and businesses on source reduction, conservation, and recycling.
 - Expand educational outreach programs to residents and businesses through attendance and participation in public forums and local conventions.
 - Promote alternatives to the use of film plastic bags and single-use beverage containers (e.g., water bottles).
 - Expand educational outreach programs to the general public on the safe and proper management of special wastes (e.g., electronics, household hazardous waste, and household medical and pharmaceutical wastes).
3. Continue to support private waste reduction and recycling programs, such as charitable organizations and thrift stores, through the City website and informational outreach programs targeting alternatives to waste disposal.
4. Expand staff participation in educational programs through attendance and participation in solid waste industry conferences.
5. Continue to work with private industry to try to develop a reuse center, either at the Solid Waste Operations Complex or at an alternate location.
6. Further evaluate the need for special waste diversion programs (for items such as electronics).
7. Further evaluate the need for a City-sponsored household hazardous waste diversion program.

3.2.2 Recycling/Composting

Recommendations for recycling/composting are as follows:

1. Enhance the current volume-based waste collection program by providing additional price-based incentives to encourage recycling.

2. Consider adopting a policy that requires private waste haulers who use the Solid Waste Operations Complex to offer recycling services as a condition of using the Complex. Under such a policy, waste haulers would be required to offer recycling services to residential, multi-family, and commercial customers not served by the City's curbside collection program.
3. Consider a pilot program to test the viability and logistics of accepting targeted loads of wet organic waste as a further means of improving efficiency and minimizing rejects from the City's MSW Co-Composting operation. As part of the pilot program assessment, the City may wish to consider financial incentives (e.g., favorable rate) for those who would deliver source-separated wet organic wastes to the Material Recovery Facility (MRF).
4. Pursue arrangements with local federal and state departments, such as the National Park Service and Ellsworth Air Force Base, to ensure that waste reduction and recycling programs are in place and are targeting waste minimization.
5. Evaluate the inclusion of fiber (papers and cardboard) recovery in the City's recycling operations.
6. Monitor delivery patterns for fiber at the MRF, and if the delivery patterns remain high, evaluate sorting and processing line modifications.
7. Evaluate alternative strategies to eliminate or minimize alley collection of recyclables, solid waste, and yard waste.
8. Use the (recommended) staff position of Source Reduction Leader to undertake additional educational efforts to promote and encourage the use of existing and new recycling programs, including options to enhance marketing of recyclables and MSW co-compost product.
9. Purchase a larger-capacity trommel screen, with larger and longer screen interval, to improve processing of yard waste compost for better size control and greater higher grades of material production.
10. Evaluate restricting the acceptance of large quantities of yard waste from for-profit landscape maintenance firms at the City's three drop-off sites for recyclables and yard waste.
11. Identify and evaluate program options to reduce plastic content in the MSW co-composting process infeed.
12. Evaluate options to recover ferrous and aluminum containers from the rejects from the MSW co-composting operation.

3.2.3 Waste Reduction/Energy Recovery

Recommendations for waste reduction/energy recovery are as follows:

1. Continue to pursue economically viable options to use or sell landfill gas (or the energy component) that will be available from the active gas collection system at the Rapid City Landfill.
2. Pursue long-term options to develop an economically feasible waste reduction/energy recovery program.

3.2.4 Disposal (Landfilling)

Recommendations for disposal (landfilling) are as follows:

1. Evaluate options to develop a citizen campus that would consolidate waste loads from residents and self-haulers, minimize the need for such customers to unload at the working face of the landfill (i.e., eliminate the second working face), and allow citizens a single destination point for items such as waste, recyclables, and tires drop off, as well as compost pick-up.
2. Continue to use alternate daily cover materials to minimize the quantity of soil needed for daily cover.
3. Perform periodic (annual or bi-annual) landfill surveys to evaluate air space utilization, including compaction and soil usage.

4. Pursue obtaining zoning approval and designation of Rapid City Solid Waste Division-owned land to the south (also known as the Johnson Property) as a landfill and solid waste management site.
 - Identify this land in subsequent Rapid City Landfill and Solid Waste Operations Complex permit renewals as part of the permitted solid waste management site.
 - Pursue purchasing additional buffer areas surrounding the Solid Waste Operations Complex and Johnson Property, especially to the south and west.
 - Obtain all zoning and land-use approvals available or necessary to ensure the future use of the Johnson Property for solid waste management.
 - Pursue land-use plans and zoning rules to prevent conflicting development adjacent to the Solid Waste Operations Complex and future solid waste program area boundaries.
5. Monitor compliance with South Dakota Law 34A-6-53, and pursue the legislative approval required for a large-scale solid waste facility (construction and operation) well before the Rapid City Landfill (and/or combustion facility) reaches the 200,000-tons-per-year disposal threshold requiring a solid waste permit or permit renewals.

3.2.5 Other

Other recommendations are as follows:

1. Relocate and reconfigure the scale facilities at the Solid Waste Operations Complex. Such reconfiguration should include:
 - Incorporating a second scale
 - Moving the location of the scale facility
 - Incorporating an automated card reader system for commercial vehicles
2. Consider greater use of flat-rate charges for all residential vehicles at the Solid Waste Operations Complex.
3. Prior to or concurrent with the next permit renewal cycle, consider enhancements in written procedures and staff training related to the topics presented in Technical Memorandum #2 – Operations Assessment & Program Options Analysis.
4. Evaluate the feasibility of a long-term strategy for leachate management through recirculation and land application (i.e., surface irrigation) within the lined landfill areas.
5. Continue to monitor collection and disposal rates to ensure that adequate funds are always available for future expenditures.

Many of these recommendations are for evaluations and studies that may lead to additional program changes and facilities. The implementation schedule and costs related to these programs would be developed as part of the associated feasibility studies.

3.3 Market Analysis

For programs deriving revenue from the sale of recycled materials (waste resource) and energy recovered from waste (landfill gas or waste conversion/combustion technologies), a key factor is the availability of a market for the resources recovered or produced. To support this effort, a preliminary evaluation was conducted of current markets for the following:

- Pre-disposal recovered (recycled) materials
- Compost, currently produced by the City
- Energy

While a detailed marketing plan was not developed, the goal was to identify additional marketing strategies to be incorporated into the 2010 Plan. The development of long-term markets and a sound market plan for solid-waste-derived resources, which represent the greatest potential for sustainable revenue, will require a long-term commitment to education, research, product marketing, and promotion,

and possibly the establishment of mutually beneficial sales/purchase agreements. For example, with a waste-to-energy system, the development of a long-term, secure market is vital to securing financing and making commitment to significant capital investments; for pre-disposal recovered (recycled) materials and compost, the optimization of revenues may well be tied to perseverance in defining and refining marketing strategies. For many of the same reasons that a Source Reduction Leader (staff position) was recommended to aid in implementing further source reduction and recycling programs, this same Source Reduction Leader could be an asset in the development of expanded markets and revenue sources for the pre-disposal recovered materials and compost streams.

Developing large-scale markets may require implementing a variety of institutional changes to allow or encourage market development. For example, integrating compost specifications into state and municipal standard construction specifications may begin with demonstration projects of initially limited size or may involve statutory mandates such as requiring the use of City compost on City projects that require compost. Market development for compost could include working with private industry to integrate compost-based systems such as erosion filter socks into standard construction specifications. These markets will likely require a persistent effort to promote and educate and demonstrate the value of the product and in turn capture that value through derived revenue.

3.3.1 Pre-Disposal Recovered (Recycled) Materials

The City has been and is anticipated to continue to sell pre-disposal recovered materials from its recycling and waste diversion program. An evaluation of revenues from past marketing efforts reveals that the City brokers and transports the loose scrap metals, aluminum, batteries, electric motors, and wire directly to the two local metals recyclers: Ace Steel & Recycling (Ace) and Pacific Steel & Recycling (Pacific Steel). All baled materials have historically been brokered through Ace with newspaper consistently shipped to a mill in the state of Washington. Market destinations for cardboard, plastics, shredder steel, and steel cans have varied more in 2009 than in historic years. This is likely due to the brokers exploring more markets to achieve better material revenues in the current recessionary market conditions. In 2009, the City also used Pacific Steel as a broker for baled shredder steel. The average per-ton revenues received by the City for various commodities over the past 3 years are presented in Table 1. These prices are net of broker fees and transportation.

Table 1 – Average Net Revenue, Per Ton for Recovered Materials

Recycled Materials	2007	2008	2009
Baled Cardboard	\$84	\$78	\$37
Baled Newspaper	\$72	\$96	\$47
Baled HDPE – Clear	\$607	\$658	\$331
Baled HDPE – Mixed	\$427	\$378	\$180
Baled PET	\$223	\$269	\$118
Baled Aluminum Cans	\$1,501	\$1,421	\$959
Baled Steel Cans	\$114	\$246	\$44
Baled Shredder Steel	\$102	\$179	\$92
Mixed Metals, Batteries, & Aluminum Scrap	\$128	\$245	\$131
Recycled Materials Revenue	2007	2008	2009*
Total Recyclables Revenues	\$411,999	\$553,196	\$332,495
Total Recyclables Tons	3,030	3,037	3,700
Average Revenue Per Ton	\$136/ton	\$182/ton	\$90/ton

Note:

*Recyclable revenues and tonnage data through November 2009.

Table 1 illustrates how the price of marketed commodities has changed over a relatively short time, most notably since the fourth quarter of 2008 when prices significantly declined in the global markets. The current down-market conditions should not be used as a prediction of future value of recyclable resources, just as the market highs experienced in early 2008 should also not be used to forecast revenue. Nationally, market prices for recyclable materials have begun to improve with modest recovery in the fourth quarter of 2009. In reviewing the City's 2009 sale revenues through October 2009, recent market improvements have occurred for cardboard (increases of +\$30/ton), newspaper (+\$10/ton), PET (+10/ton), and shredder steel (+\$15 to +\$30/ton). Assuming that these price increases continue through December, the 2009 average net revenue shown in Table 1 will also increase for each commodity.

The City has observed that in 2009, during the economic recession, there was a significant decrease in corrugated cardboard material prices and a significant increase in the quantity of corrugated cardboard being delivered to the MRF. Table 1, above, shows that there were more tons recycled and processed through the first 11 months of 2009 than were processed in the previous 2 years. As market prices continue to improve, the City should monitor cardboard deliveries to the MRF to identify if deliveries begin to decrease. If quantities decrease as the market value increases, this would be considered a good indication that private recycling handles significant quantities of certain recyclables when material market prices are favorable, but the City program will receive these recyclables when market prices are low.

The City already bales most materials; source-separated baled materials typically gain higher market prices than mixed or loose materials. The City should monitor incoming local and regional industries to identify end users of recyclable materials in closer proximity to the City.

The City currently receives periodic loads of commingled containers delivered from Gillette, Wyoming; Gillette in return receives and back-hauls MSW co-compost. No tipping fee is charged for either material. The recyclable materials are processed through the MRF, with the market revenues retained by the City. To increase recyclables revenue, the City should explore additional regional partnerships with other communities for recycling and uses of the MSW co-compost.

3.3.2 Compost

The City produces two types of compost:

- Yard waste compost
- MSW co-compost

Compost produced from yard waste is sold to the public in three different sizes: wood chips, 3/4-inch compost similar to fine mulch, and 3/8-inch compost. The City sells or uses almost all of the yard waste compost produced annually. The Rapid City Parks Division uses yard waste compost in public parks and garden areas throughout the City. Over the winter months, yard waste processing and composting continues in order to provide adequate compost for the spring and summer demand. Current City pricing is \$10 per ton for wood chips, \$15 per ton for 3/4-inch compost, and \$20 per ton for 3/8-inch compost. In 2008, the City derived revenues of \$58,800 based on sales of 4,122 tons (average of \$14.26 per ton). Through November 2009, the City received revenues of \$60,272 for 5,075 tons of yard waste compost leaving the site (average of \$11.88 per ton). Over 1,000 tons of this compost was used by the Rapid City Parks Division at no charge. If sold, the Rapid City Solid Waste Division would have derived additional revenues of \$15,000 to \$20,000. Opportunities to increase compost revenue include further processing the yard waste compost to produce more of the higher value 3/8-inch compost; this material also has the greatest demand. This may include purchase of new screening equipment and/or putting the over-sized materials from the screening process back into the active compost pile for additional composting. A larger trommel screen and longer screen interval would allow for better size control and should allow the City to produce more of the higher value compost, thus increasing revenues. As yard waste compost continues to sell, the pricing structure should be monitored for possible price adjustments to increase revenue while still being competitive.

MSW co-compost is currently made available to the public free of charge. In 2008, approximately 30 percent of MSW co-compost produced was used by the public. The Rapid City Public Works Department is also beginning to use some compost products. As noted above, recently, some MSW co-compost has been hauled to Gillette, Wyoming, through an arrangement where Gillette brings commingled recycled containers to the MRF for processing and recycling and hauls MSW co-compost back to Gillette.

MSW co-compost may contain small fragments of plastic. This has made it more difficult to gain public and commercial acceptance. The City's demonstration gardens near the MRF help visually demonstrate the benefits of the MSW co-compost. However, currently no consistent markets have been established for sale of the MSW co-compost in large volumes. From a national perspective, sales of MSW co-compost by other programs have been reported to range from free to \$4 to \$8 per cubic yard. Programs in West Yellowstone, Montana, and Nantucket, Massachusetts, have been successful in selling MSW compost for as much as \$15 and \$25 per cubic yard, respectively.

Continued marketing efforts and options for the MSW co-compost material that should be explored include further development of large-volume users such as the Rapid City Parks Division, City public works projects, agriculture, the South Dakota Department of Transportation, land restoration, nurseries, and green building developments (i.e., Leadership in Energy and Environmental Design (LEED)). The pursuit of large-volume markets should be considered with the goal of generating revenue from MSW co-compost sales. Potential users will need assistance in education, training, and use/application of MSW co-compost products. The (recommended) Source Reduction Leader could help in further developing these markets, encourage continued use by the Rapid City Parks Division and Rapid City Public Works Department, educate and promote the use of both yard waste compost and MSW co-compost to the general public, and inform potential users of the benefits of compost products at local conventions, trade shows, home shows, and other public events. Local media (newspaper and television) should continue to be used to further promote the compost success stories and agricultural uses.

3.3.3 Energy

Two program options exist for the recovery and sale of energy derived from waste; these are not mutually exclusive and include the following:

- Energy from landfill gas (anaerobic digestion in the landfill)
- Energy from thermal or further biological destruction of the waste (combustion or related waste reduction technologies)

The City is currently obligated under the Clean Air Act to install a landfill gas recovery and thermal destruction system. To satisfy this obligation, the City will be installing an active gas collection system by 2011 and as such will have a source of energy that can be sold for either direct use or converted to an alternate form such as electricity or pipeline quality gas.

Landfill-gas-to-energy was conceptually evaluated in the Rapid City Landfill Gas Study, prepared by Wenck Associates, Inc., February 2009 – Final. This report provided a general assessment of the feasibility of four landfill gas management alternatives, including preliminary review of economic feasibility based on assumed markets and market revenues. The positive cash flow associated with the alternatives suggests that the City should further pursue local markets in proximity of the Rapid City Landfill.

As part of the evaluation of options to sell waste- and landfill-gas-derived energy to local markets, the City has contacted the following four energy firms:

- Black Hills Power
- Montana-Dakota Utilities Co.
- Basin Electric
- MidAmerican Energy Holdings Company

The quoted market prices for energy production from landfill gas ranged from 2 to 5 cents per kWh by Black Hills Power and Basin Electric, respectively. The City will continue to develop relations with these firms. The City will be sending letters of interest to area utility companies to solicit their opinion as to the viability of and their willingness to participate in any future waste-to-energy (WTE) endeavor. A WTE fact sheet will be included with the letters and is attached as Appendix B. There has been no specific interest currently expressed for a WTE project from these utilities. The state of South Dakota has established an objective of 10 percent renewable and recycled energy by 2015, but this goal is voluntary (that is, it has not been mandated). Regulations of greenhouse gas emissions may make WTE more favorable since WTE plant emissions are lower than the combination of landfill and generating equivalent electricity from a fossil fuel power plant. Energy from waste is considered renewable power in many states; federal legislation has been under development. Classification of WTE as renewable power at the state or federal level and the establishment of renewable portfolio requirements are anticipated to make energy from waste more desirable to utility companies. For example, Minnesota has a renewable portfolio requirement of 25 percent by year 2025. As a result, the current value of electricity generated from WTE can be as high as 6.5 cents per kWh. Other biomass facilities have power purchase agreements for 10 cents per kWh.

In October 2009, legislation was introduced in the U.S. Congress to enact a financial subsidy for natural gas derived from landfill gas (Biogas Production Incentive Act). If passed, the Biogas Production Incentive Act will offer either a production tax credit or investment tax credit for processed landfill gas that is placed into the natural gas market. This tax benefit for direct use of landfill gas is similar to benefits that already exist for electrical projects using landfill gas. Such legislation could improve the economic viability and create options for a landfill-gas-to-energy project for the Rapid City Landfill.

4.0 Rate Assessment Review

The rate assessment review included the preparation of an opinion of probable cost and the evaluation of user tipping fees and rates.

4.1 Refined Opinion of Probable Costs

The final costs of any program will be defined in the final implementation process and refined over time as the actual program evolves. For purposes of the 2010 Plan, HDR worked with the City to prepare conceptual estimates of general construction and program implementation costs for the selected system and programs. Additionally, through meetings with the City, a conceptual schedule for expenditures for each program/system component was established. The projected costs and schedule for expenditures (both initial capital and annual costs) are summarized in Table 2. A detailed cost opinion for the recommended citizen campus is included in Appendix C. Certain programs and components can only be established or implemented with full funding and support of the City Council (see prerequisites for recommendations in Appendix A). As such, the programs, projected costs, and schedule of expenditures may ultimately be influenced or determined by decisions beyond the scope of the planning efforts.

The system components presented in Table 2 have been developed based on the concept of environmental stewardship and generally follow USEPA's "integrated, three-tier hierarchical approach to MSW management" of source reduction, recycling/composting, and combustion/landfilling. This defined system is further described in Section 3.2, above. An item number was assigned to each component to provide a distinct reference number and consistency with the system definition in Section 3.2.

Table 2 – System Components Conceptual Schedule and Expenditures

Item	Description	Schedule		Estimated Cost	Budget Category	Cost Center
		Start	Complete			
Source Reduction						
1.1	Enhance Education Programs	Existing	Ongoing	\$10,000/yr	Existing	Collection, Landfill, MRF
1.2	Hire Source Reduction Leader	2010	Ongoing	\$50,000/yr	Salary & Wages plus Benefits	MRF
*	Enhance K-12 Education	2011	Ongoing	\$20,000/yr	Existing;	MRF
*	Promote Yard Waste “Don’t Bag It” Program	2012	Ongoing	\$5,000/yr	Source Reduction	Collection
*	Expand Educational Outreach – Partnerships	2011	Ongoing	\$5,000/yr	Leader activity	MRF
*	Expand Educational Outreach – Public Forums/Local Conventions	2011	Ongoing	\$5,000/yr	Travel & Training	MRF
*	Promote Alternatives to Film Plastic Bags & Beverage Containers	2011	Ongoing	\$2,000/yr	Professional Services	MRF
*	Expand Education Programs for Special Waste Management	2010	2013	City	Existing	Landfill
1.3	Continue to Support Private Waste Reduction/Recycling	Existing	Ongoing	\$0		Landfill, MRF
1.4	Expand Staff Participation in Solid Waste Industry Conferences	2011	Ongoing	\$5,000/yr	Travel & Training	Landfill, MRF
1.5	Develop Reuse Center	2010	Ongoing	\$0/yr	Use existing building; cost neutral	Landfill
1.6	Evaluate Need for Special Waste Diversion Program	2010	2011	City	Existing Consultant Services	Landfill
1.7	Evaluate Need for City Household Hazardous Waste Diversion Program (at Solid Waste Operations Complex)	2010	2011	City	Existing Consultant Services	Landfill
Recycling/Composting						
2.1	Enhance Volume-Based Collection w/ Price Incentives	2010	2011	\$0	Revenue	Collection, Landfill, MRF
2.2	Consider Recycling Collection Policy for Private Haulers	2010	2011	\$0	Source Reduction Leader	MRF
2.3	Consider Pilot Program Targeting Wet Organic Wastes (restaurants and cafeterias)	2012	2013	\$10,000/yr	Consultant Services	MRF

Item	Description	Schedule		Estimated Cost	Budget Category	Cost Center
		Start	Complete			
2.4	Pursue Recycling Programs with Federal and State Agencies (e.g., National Park Service, Ellsworth Air Force Base)	2010	2011	\$0	Source Reduction Leader	MRF
2.5	Evaluate Fiber Recovery in City's Recycling Operations	2011	2012	City	Existing Consultant Services	Collection, MRF
2.6	Evaluate Fiber Process Line Addition	2011	2011	City	Existing Consultant Services; Capital Outlay	MRF
2.7	Minimize Alley Collection	2010	2011	City	Existing Professional Services	Collection
2.8	Expand Educational Efforts to Promote & Encourage Recycling	2010	Ongoing	City	Existing Professional Services; Source Reduction Leader	Collection, Landfill, MRF
2.9	Purchase Larger-Capacity Trommel Screen for Yard Waste Compost Process	2010	2011	\$200,000	Capital Outlay	Landfill
2.10	Evaluate Restricting Use of Yard Waste Drop-off Sites by For-Profit Landscape Firms	2011	2011	\$0	Professional Services (Enforcement)	Collection
2.11	Evaluate Options to Reduce Plastic Content in MSW Co-Compost Infeed	2012	2012	\$20,000	Consultant Services	MRF
2.12	Evaluate Recovery of Metal Containers from MSW Co-Composting Drum Rejects	2010	2012	\$50,000	Consultant Services	MRF
*	Modify System for Metals Recovery	2013	2013	\$200,000	Capital cost to be refined based on evaluation	MRF
Waste Reduction/Energy Recovery						
3.1	Pursue Use/Selling of Landfill Gas to Energy	2010	2012 Market Dependent	\$100,000	Consultant Services	Landfill
*	Develop Landfill Gas to Energy	2012	Market Dependent	\$3,000,000 plus \$1,000,000 by Grants & Revenue	Capital Outlay	Landfill
3.2	Pursue Long-Term Development/Feasibility of WTE Project	2012	Market Dependent	\$100,000	Consultant Services	Landfill

Item	Description	Schedule		Estimated Cost	Budget Category	Cost Center
		Start	Complete			
Disposal (Landfilling)						
4.1	Develop Citizen Campus at Solid Waste Operations Complex	2010	2012	\$608,000	Consultant Services	Landfill
*	Construct Citizen Campus		2012	\$3,683,000	Capital Outlay	Landfill
4.2	Continue to Use Alternate Daily Cover	Existing	Ongoing	\$25,000/yr	Existing	Landfill
4.3	Perform Annual Landfill Surveys to Evaluate Air Space	2009	Ongoing	\$15,000/yr	Professional Services	Landfill
4.4	Obtain Zoning Approval for City-owned Property to South (Johnson Property) & Include in Solid Waste Permit	2011	2013	\$100,000-\$250,000	Consultant Services	Landfill
*	Purchase Additional Buffer Area (Property)	2012	2015	Land Market Value	Capital Outlay	Landfill
*	Obtain Zoning/Land Use Designation for Property (HI)	2010	2011	\$5,000/yr	Professional Services	Landfill
*	Pursue Land Use Plans and Zoning Rules to Prevent Adjacent Development that Conflicts with Solid Waste Operations	2010	2011	\$5,000/yr	Professional Services	Landfill
4.5	Monitor Compliance with SD Law 34A-6-53 and Pursue Legislative Approval for Large-Scale Facility >200,000 tpy	2010	Ongoing	City Internal	--	Landfill
Other Programs						
5.1	Relocate and Reconfigure Scale Facilities and Add Scale and Auto Card Reader	Same as 6.4.1		Include with Citizen Campus	Consultant Services; Capital Outlay	Landfill
5.2	Consider Greater Use of Flat Rates for Residential Vehicles and Compost Sales	2010	2011	City Internal	Revenue	Landfill
5.3	Enhance Landfill Written Procedures and Training	2010	2013	\$2,000/yr	Travel & Training	Landfill
5.4	Evaluate Long-Term Strategy for Leachate Recirculation/Management	2012	2012	\$0	Existing Consultant Services	Landfill
5.5	Monitor Collection and Disposal Rates for Adequate Funds	2010	Ongoing	City Internal		Collection, Landfill, MRF

The cost opinion and schedule of expenditures in Table 2 are assumed in the rate assessment below. With increased recycling through the MRF, an additional operator is anticipated to be necessary at the MRF to handle the greater throughput. The new citizen campus may also require staffing to monitor citizen drop-off and compost sales. This activity is anticipated to be handled by existing personnel because the second working face at the landfill will be eliminated.

4.2 Municipal Solid Waste User Tipping Fee and Rate Analysis

An initial aspect of the system definition evaluation and solid waste program recommendation was a review of the City's current rate study model used to estimate rate structures. Based on this review, HDR concluded that the rate study model provides a useful tool for projecting future collection and user tipping fees and rates. The model is separated into three cost centers: Solid Waste Collection (7101), Waste Disposal – Landfill Operations (7102), and Solid Waste MRF/Compost (7103). An average, monthly, per-account collection services fee is calculated from all three cost centers for collection, disposal, and recycling. Based on the number of 35-, 65-, and 95-gallon household accounts, the City determines the rate for each size of container. The tipping fee (rate) for the Landfill Operations and MRF/Compost is calculated from their respective cost centers. Each cost center requires annual updating for changes in the City's annual budgeting, equipment/capital outlay, and regulatory changes and requirements.

The City maintains an enterprise fund for each cost center. The enterprise funds are used for periodic equipment purchases and replacements, remediation, construction required by regulatory agencies (e.g., landfill gas collection system), fuel surcharges, and other anticipated or unexpected (non-budgeted) events.

The City's rate study model uses the following inputs:

- Expense budgets
- Estimated amortized capital outlay
- Material sales revenues
- Current household accounts and revenue tonnages (i.e., tonnages charged a tipping fee) at the Solid Waste Operations Complex

Cost projections use an escalation rate for all operating expenses and a population growth rate for increases in material revenues, collection accounts, and revenue tonnage. HDR provided the City with recommendations for updating the rate study model to reflect the population and waste generation projections in the Needs Assessment. HDR also provided cost opinions for certain elements of the recommended programs and enhancements in the 2010 Plan. In addition, HDR assisted the City in integrating these expenses into the cost centers of the rate study model (see Appendix D). The output of the rate study model is an assessment of required average collection services fee per household account and required tipping fee at the Solid Waste Operations Complex.

The equipment component, or amortized capital outlay component, of the rate study model included a list of equipment under each cost center (collection, landfill, and MRF/compost) with a purchase price, estimated trade-in value, equipment life, financing interest rate (typically 6 percent), and number of units. This equipment list allows the City to incorporate new and updated pieces of equipment into the rate projections, thus providing for adequate funds to purchase new equipment or replace existing equipment. The equipment capital outlay analysis also allows the equipment purchase prices to be updated for current purchase-year costs. Equipment purchases have been financed and purchased outright. The capital outlay amortization in the rate study model includes both the annual payments from financing and capital replacement funds to adequately fund existing and future equipment needs.

Not all program elements generate revenues, but rather derive benefits from resource conservation, preserving landfill capacity, and reducing future liability that may result from the toxic characteristics of the waste. Where possible, waste diversion was quantified to estimate the increase in material revenues and reduction in waste landfilled as shown in the system revenues and diversion estimates in Appendix D. This assessment assumes that as waste quantities are reduced or recycled, the quantities delivered to the MRF and landfill for disposal also decrease (i.e., revenue tonnages). Key assumptions used in this evaluation include the following:

- Effective source reduction education programs reduce MSW generation by 1 to 2 percent. Assuming 1 percent reduction of the MSW generation in the Rapid City Planning Area, source reduction programs are projected to remove approximately 1,000 tons per year from disposal.

- Enhanced promotion of existing recycling programs and public outreach through the Source Reduction Leader increases the City’s curbside recycling volumes initially by 5 percent¹ for the first 2 years, increasing to 10 and 15 percent in subsequent years. This is anticipated to increase the amount of containers recycled by 70 to 220 tons annually.
- Volume-based collection rate structures (i.e., pay-as-you-throw) increase the percentage of residential MSW diverted by an additional 5 percent² in a traditional curbside recycling program. The City already has a volume-based rate structure in place for collection services. By further enhancing the volume-based rates through price incentives that encourage greater recycling, the City’s program is anticipated to increase diversion. Assuming that recycled commingled containers are approximately 20 percent of the collected weight in a traditional curbside program, the City’s diversion of residential MSW is anticipated to increase by an additional 1 percent (i.e., 20 percent of 5 percent = 1 percent). This could result in an additional 600 tons diverted annually.
- Implementation of a recycling collection policy for private haulers within the Rapid City Planning Area is expected to generate voluntary participation of 5 to 15 percent of the non-Rapid City population, collecting an additional 300 to 950 tons of commingled containers annually.
- The proposed Reuse Center is expected to be used by 5 to 10 percent of the population on an annual basis, with projected diversion of 300 to 600 tons annually.

Based on the system implementation schedule and estimates of recycling/diversion effectiveness, revenues from the sale of recyclables and compost are expected to increase. Table 3 summarizes the material revenue potential over the next 6 years. The programs in the 2010 Plan are anticipated to increase annual recyclable revenues by over \$100,000 depending on market pricing; as participation increases, the revenues are also expected to increase, as shown in Table 3. Greater source reduction and recycling are estimated to initially divert an additional 2,300 tons after programs implementation with increased diversion potential in subsequent years. Appendix D presents further detail on diversion and revenue assumptions.

Table 3 – Material Revenue Potential

	2010	2011	2012	2013	2014	2015
Revenues w/out 2010 Plan Programs						
Sale of Yard Waste Compost	\$54,700	\$55,400	\$56,000	\$56,700	\$57,300	\$58,000
Sale of Recyclables	\$318,700	\$336,900	\$372,300	\$407,900	\$443,900	\$446,000
Sale of MSW Co-Compost	\$0	\$0	\$0	\$0	\$0	\$0
Subtotal	\$373,400	\$392,300	\$428,300	\$464,600	\$501,200	\$504,000
Additional Revenue Potential w/ 2010 Plan Programs						
Sale of Yard Waste Compost	\$0	\$10,600	\$10,800	\$10,900	\$11,100	\$11,100
Sale of Recyclables	\$6,400	\$102,200	\$113,700	\$161,700	\$186,300	\$228,600
Sale of MSW Co-Compost	\$0	\$0	\$25,000	\$25,000	\$25,000	\$25,000
Subtotal	\$6,400	\$112,800	\$149,500	\$197,600	\$222,400	\$264,700
Total Revenue Potential	\$379,800	\$505,100	\$577,800	\$662,200	\$723,600	\$768,700

¹ In 2006, City of Omaha achieved 5.6 percent increase in recycling quantities after a 4-month educational campaign.

² Skumatz Economic Research Associates, Inc., “Pay As You Throw (PAYT) In the U.S.: 2006 Update and Analysis”, December 2006.

The City has enacted an ordinance (Chapter 8.08: Garbage and Refuse) that has set monthly collection rates through year 2013 and tipping fees at the Solid Waste Operations Complex through 2011. The state environmental fee and sales tax are included in the rates shown in Table 4.

Table 4 – Monthly Collection Rate and Tipping Fee Set by Ordinance

Tipping Fees	2010	2011	2012	2013
Tipping fee per ton ⁽¹⁾	\$60.42	\$62.54	⁽³⁾	⁽³⁾
Monthly Collection Rates⁽²⁾				
35-gallon refuse container	\$16.02	\$16.29	\$16.29	\$16.29
65-gallon refuse container	\$18.02	\$18.29	\$18.29	\$18.29
95-gallon refuse container	\$20.02	\$20.29	\$20.29	\$20.29

Notes:

- (1) Ordinance rate of \$56 per ton and \$58 per ton plus state environmental fee and 6% sales tax. Pricing incentives exist for source-separated materials such as recyclables, mixed metals, yard waste, manure, wood and pallets, asphalt, and concrete.
- (2) Monthly collection rates include all collection (garbage, recycling, yard waste, and drop-offs), recycling processing (MRF/MSW co-composting), and disposal (landfill and yard waste composting). Rates shown as set by ordinance plus the state environmental fee and 6% sales tax.
- (3) Not listed in ordinance.

Based on key system components described above, Table 5 was prepared to summarize estimates of future rate projections, assuming all programs identified in Table 2 are implemented. When compared to the tipping fee set by ordinance, no change is required for year 2010. Because most 2010 Plan programs will not be implemented until 2011 or later, an average required tipping fee over the 5-year period of 2011 to 2015 is calculated to be \$63.42 per ton. This average tipping fee is approximately one dollar more than the tipping fee set by ordinance for year 2011. With the Rapid City Solid Waste Division's good financial health and availability of enterprise funds, if needed, and modest adjustments to the tipping fee starting in year 2012, the Rapid City Solid Waste Division can implement the 2010 Plan with minimal impact on future rates at the Solid Waste Operations Complex. Other communities within the Rapid City Planning Area may experience increases in their solid waste management costs as recycling programs and services are implemented that currently do not exist. Recycling services to be offered in these communities are expected to be on a voluntary participation basis (i.e., subscription service); as such, the individual or business subscribing to the recycling service recognizes the cost as an environmental benefit and the "right thing to do."

Table 5 – Rate Forecasts

	2010	2011	2012	2013	2014	2015
Existing Rate Per Ordinance						
Landfill	\$22.22	\$23.01				
MRF	\$33.78	\$34.99				
Subtotal	\$56.00	\$58.00	1.1 (3)	1.2 (3)	1.3 (3)	1.4 (3)
Environmental Fee	\$1.00	\$1.00				
Sales Tax (6%)	\$3.42	\$3.54				
Total Tipping Fee Per Ton	\$60.42	\$62.54				
Tipping Fee Projections at the Solid Waste Operations Complex with 2010 Plan Programs⁽¹⁾	\$59.23	\$64.23	\$66.06	\$64.83	\$64.67	\$57.33
	2010	2011	2012	2013	2014	2015
Average, Monthly Cost Per Household Account⁽²⁾						
Collection	\$9.84	\$9.98	\$10.55	\$10.71	\$10.87	\$11.11
Disposal (Landfill)	\$3.85	\$4.26	\$4.37	\$4.32	\$4.33	\$4.40
Recycling (MRF)	\$2.54	\$2.59	\$2.57	\$2.56	\$2.57	\$1.93
Projected Average Monthly Rate	\$16.23	\$16.83	\$17.48	\$17.60	\$17.78	\$17.44

Notes:

- (1) Tipping fee projections include state environmental fee and 6% sales tax and are net of estimated material revenue potential (see Table 3). Material revenues assume implementation of all 2010 Plan programs.
- (2) Average monthly cost includes all existing and proposed 2010 Plan program costs minus anticipated/ potential revenues divided by total number of household accounts. Rate includes state environmental fee and 6% sales tax.
- (3) Not listed in ordinance.

Table 5 also includes the projected average collection, disposal, and recycling rates for the City's household accounts, inclusive of environmental fees and sales tax. The current monthly rates set by ordinance, as shown in Table 4, appear to be adequate for the average monthly rate forecasts. Assuming implementation of the various 2010 Plan program components, the City will determine how these average rates translate to the rate structure for volume-based collection services. In order to implement volume-based price incentives and encourage greater recycling prior to year 2013, the City will need to revise the collection rates set in the current ordinance. Depending on the size of refuse container, the household accounts could see their rates decrease, increase, or stay nearly the same. Further detail of the rate forecasts are provided in Appendix E.

Table 6 was originally included in the Needs Assessment and compares current and estimated rates at the Solid Waste Operations Complex with competing facilities in economic proximity to the Rapid City Planning Area.

Table 6 – Regional Tipping Fees in 2009

Landfills or Transfer Station	Tipping Fee ⁽¹⁾ (\$/ton)	Distance from Rapid City ⁽²⁾ (miles)	Permitted Annual Tonnage ⁽³⁾
Custer/Fall River County Landfill, SD ⁽⁴⁾	\$45.00	80	<24,999
Belle Fourche Landfill, SD ⁽⁵⁾	\$40.44	61	<150,000
Kadoka Transfer Station, SD ⁽⁶⁾	\$35/truck load	96	
Pierre Landfill, SD ⁽⁷⁾	\$38.46	173	<150,000
Gillette, WY	\$60.00	141	
SWANN Landfill, Chadron, NE ⁽⁸⁾	NA	102	
Rapid City Landfill⁽⁹⁾	\$54.00	0	<200,000

Notes:

- (1) Source: Phone calls to facility operators. 2009 tip fees do not include state fees or any applicable taxes.
- (2) Approximate distance from Rapid City to nearest disposal facility (MapQuest).
- (3) Source: South Dakota Department of Environment and Natural Resources.
- (4) Tip fee shown is for construction debris. Household garbage is \$10/pickup load, contaminated soil is \$8/ton, tires are \$4 - \$20 each.
- (5) Tip fee shown is for garbage. Construction debris is \$10/ton, contaminated soil is \$5/ton, tires are \$4 - \$10 each.
- (6) No scale on-site. Tires are \$10 - \$30 each, animal pit is \$30/truckload.
- (7) Tip fee shown is for garbage. Construction debris is \$24.89/ton.
- (8) No tipping fee since all waste is delivered through the solid waste agency and billed separately.
- (9) Includes MRF processing, MSW co-composting, Yard Waste composting, and Landfill. State environmental fee and sales tax is additional. Tip fees for other materials include concrete at \$10/ton, contaminated soil at \$4.50/ton, asphalt shingles at \$16/ton, wood shingles and pallets at \$20/ton, and tires at \$185/ton.

With the state environmental fee and sales tax, the City's 2009 tipping fee is \$58.30 per ton. By ordinance, the effective rate increases as of April 1, 2010, and April 1, 2011. These rates are shown in Table 4 above, inclusive of the state environmental fee and sales tax. Modest revenue balancing is anticipated in year 2012 to pay the additional net costs of implementing all of the 2010 Plan programs. The tipping fees at the neighboring facilities of Belle Forche Landfill and Custer/Fall River County Landfill are currently lower than the City's 2009 and projected tipping fees. This may have the potential to induce movement of waste generated in Custer and Meade counties to these facilities; however, convenience, haul distance, and related costs will continue to influence the haulers' decisions of disposal facility.

5.0 Key Findings and Conclusions

This System Definition and Future Program Refinement/Rate Assessment (Technical Memorandum #3) provides basic recommendations and is designed to serve as a foundation document for the 2010 Rapid City Solid Waste Management Plan. The objective of this Technical Memorandum #3 was to prepare a system definition based on the evaluation of environmental, technical, and economic factors, decisions, features and the integration of the features discussed in Technical Memoranda #1 and #2. Additionally, Technical Memorandum #3 was developed to support decisions on the need for additional land, future development requirements, and the organization of identified features into a functionally efficient strategy.

Guiding principles in the definition and evaluation of program alternatives were environmental stewardship and the USEPA integrated, three-tier hierarchical approach to MSW management. USEPA's hierarchical approach is comprised of the following components: source reduction, recycling/composting, and combustion and landfilling. The City already embraces this hierarchy with program elements that include source reduction, recycling, and composting. In adopting the 1992 Plan, the City made a community commitment to environmental stewardship by reducing the waste being landfilled. Further source reduction and recycling/composting are encouraged to advance environmental stewardship of:

- Protecting the environment
- Conserving landfill space for future disposal
- Conserving resources
- Conserving energy

The recommended system definition was developed as a result of meetings between the City and HDR for the purpose of refining initial system strategies into a preferred strategy for incorporation into the 2010 Plan. The foundation for these discussions and recommendations was Technical Memorandum #1 – Needs Assessment and Technical Memorandum #2 – Operations Assessment & Program Options Analysis, and environmental stewardship, as well as input obtained at public meetings on June 18, 2009, and November 18, 2009. The components of the system definition generally assume that the City's existing programs and integrated solid waste system will continue and that the system definition serves to enhance, expand, refine, or otherwise build upon these existing programs to further increase source reduction, recycling/composting, and resource recovery while reducing landfilling. Key findings and program recommendations include the following:

- Additional pre-disposal material recovery opportunities exist for resource conservation, reduction, and reuse; recycling; and composting.
- To achieve success with such programs, there is a need for additional education at all levels, greater participation in existing recycling and composting programs, and provisions for dealing with special wastes to prevent them from ending up in the landfill.
- A Source Reduction Leader (additional staff position) is recommended to expand public outreach and education to a wide range of waste generators, support material recovery strategies, and aid in implementing the source reduction and recycling components of the 2010 Plan.
- The City's volume-based waste collection program can be enhanced by providing additional price-based incentives to encourage recycling.
- Programs targeting wet organic wastes, reducing plastic content in the co-composting process infeed, and recovering ferrous and aluminum containers from the co-compost rejects should be considered as means of improving efficiency and minimizing rejects from the City's MSW Co-Composting operation.
- By implementing the 1992 Plan, the City has extended the disposal capacity of the current Rapid City Landfill to approximately year 2050. The adjacent City-owned Johnson Property is anticipated to significantly increase the life expectancy for landfill disposal capacity if it can be fully developed and utilized. The City should pursue zoning, permitting, and other actions necessary to secure the long-term viability of both City properties for solid waste management.
- Additional land acquisition to the west and south of the Solid Waste Operations Complex is recommended to provide a reasonable (and long-term) distance to future neighbors.
- Safety, services, and efficiency could be improved if the existing scale facility is enhanced and relocated (on-site) and a central citizens' waste handling facility (citizen campus) is established. A central citizen campus could accommodate waste drop-off, recycling, and compost pick-up; could be configured for maximum flexibility and improved efficiency; and could include space for future programs such as special waste or household hazardous waste management, if ultimately implemented.
- Implementation of technologies such as waste-to-energy would significantly increase the life of the existing landfill and generate renewable energy. The City should pursue long-term options to develop an economically feasible waste reduction/energy recovery program.

The development of long-term markets for solid-waste-derived resources will require a long-term commitment to education, research, product marketing and promotion, and possibly the establishment of mutually beneficial sales/purchase agreements. Marketing of yard waste compost and MSW co-compost were areas identified for improvement. For many of the same reasons that a Source Reduction Leader was recommended to aid in implementing further source reduction and recycling components, this same Source Reduction Leader could be an asset in the development of expanded markets and revenue sources for pre-disposal recovered materials and compost products.

Based on key system components in the 2010 Plan, schedule, and cost opinions, the average tipping fee required over the 5-year period from year 2011 to 2015 is estimated to be \$63.42 per ton, inclusive of state environmental fee and sales tax. Implemented programs are expected to increase revenues through greater recovery of recyclables and increased compost sales. These anticipated potential revenues are considered in the rate estimates presented above. When compared to the rates established by ordinance for years 2010 and 2011, no rate change is required until subsequent years.

With the Rapid City Solid Waste Division's enterprise funds and budgeting process, modest adjustments to the tipping fee starting in year 2012 should balance the revenues and pay the additional net costs of implementing all of the 2010 Plan programs. The City can implement the 2010 Plan with minimal impact on future rates at the Solid Waste Operations Complex. The household monthly rates established by ordinance also appear to be adequate for implementation of 2010 Plan programs. However, in order to implement further volume-based price incentives and encourage greater recycling prior to year 2013, the City will need to revise the monthly rates set in the current ordinance. Depending on the size of refuse container, the household accounts could see their rates decrease, increase, or stay nearly the same.

The final costs of any program will be defined in the final implementation process and refined over time as the actual program evolves. Some of the recommended evaluations and studies may lead to additional program changes and facilities. The implementation schedule and costs related to these programs would be developed as part of the associated feasibility studies. Certain programs and components can only be established or implemented with full funding and support of the City Council. As such, the programs, projected costs, and schedule of expenditures may ultimately be influenced or determined by decisions beyond the scope of these planning efforts.

Appendix A
Recommendation Matrix

Appendix A - Recommendation Matrix

Priority	Item	Description	Date Start	Complete	Estimated Cost	Pre-Requisite
E	1.1	Continuing Education & Programs	Existing	on going	\$10,000/yr	None
A	1.2	Hire Source Reduction Leader	2010	on going	\$50,000/yr	Budget Approval with Recycling/Waste Revenue/Funding Source
B	*	Enhance K-12 Education	2011	on going	\$20,000/yr	Within existing budget; 1.2
B/C	*	Yard Waste - Don't Bag It Program	2012	on going	\$5,000/yr	Within existing budget; 1.2
B	*	Expand Educational Outreach - Explore Partnerships	2011	on going	\$5,000/yr	Within existing budget; 1.2
M	*	Expand Educational Outreach - Public Forums/Local Conventions	2011	on going	\$5,000/yr	1.2
E/B	*	Promote alternatives to Film Plastic Bags & beverage containers	2011	on going	\$2,000/yr	Budget Approval - Professional Services; 1.2
M	*	Expand education programs for Special Waste Management	2010	2013	City	None/1.2
E	1.3	Continue Support Private Waste Reduction/Recycling	Existing	on going	\$0	1.2/None
M	1.4	Staff Participation in Solid Waste Industry Conferences	2011	on going	\$5,000/yr	Budget Approval - Training
B	1.5	Re Use Center Development	2010	on going	\$0/yr	Supply of Existing Building at Solid Waste Operations Complex; Council Approval of Contract
M	1.6	Evaluate need for Special Waste Diversion Program	2010	2011	City	None/1.2
M	1.7	Evaluate need for City HHW Diversion Program (at SW complex)	2010	2011	City	None/1.2
A	2.1	Enhance Volume Based Collection w/ Price Incentives	2010	2011	\$0	City Municipal Code, Chapter 8.08.070 modification; City Council Approval
A	2.2	Recycling Collection Policy of private haulers	2010	2011	\$0	Ordinance/City Council; 1.2
A	2.3	Pilot program targeting wet organic waste (restaurants & cafeterias)	2012	2013	\$10,000/yr	Budget Approval - Consultant Services; 1.2
A	2.4	Federal and State agencies to implement Recycling Programs (e.g. National Park Service, Ellsworth AFB)	2010	2011	\$0	Ordinance/City Council; 2.2
B/C	2.5	Evaluate Fiber Recovery in City's recycling operations	2011	2012	City	None
A	2.6	Evaluate Fiber Process Line addition	2011	2011	City	Monitor source separated fiber deliveries & markets
M	2.7	Minimize alley collection by switching to curbside, except where topographically constrained	2010	2011	City	Ordinance/Education
E	2.8	Expand educational efforts to promote & encourage existing/new recycling programs	2010	on going	City	1.2
M	2.9	Consider larger capacity trommel screen purchase for yard waste compost processing	2010	2011	\$200,000	Budget Approval of Capital Outlay
C	2.1	Evaluate restricting for-profit use of yardwaste drop sites	2011	2011	\$0	Enforcement/Ordinance
A/B	2.11	Evaluate options to reduce plastic content in MSW compost infeed	2012	2012	\$20,000	National Culture; 1.2 / 2.2 / 2.8
M	2.12	Evaluate/implement recovery of metal containers from co-composting drum rejects	2010	2012	\$50,000	Budget Approval
		System Modifications for Metals Recovery	2013	2013	\$200,000	2.12 If evaluation shows feasible; Budget Approval

Appendix A - Recommendation Matrix

Priority	Item	Description	Date Start	Complete	Estimated Cost	Pre-Requisite
A	3.1	Pursue use/selling of LFG to energy	2010	2012 Market Dependant	\$100,000	ID Markets; City Council Action & Approval
		Develop LFG to energy	2012	Market Dependant	(\$4.2M-\$1.2M Rev. & Grants) \$3M Paid	Consultant Services/Design; City Council Action & Approval
B	3.2	Pursue long-term development/feasibility of WTE project	2012	Market Dependant	\$100,000	ID Markets; 10 Feasibility Steps (1M#2); Council Action & Approval
M	4.1	Develop Citizen Campus at Solid Waste Complex	2010	2012	\$608,000	City Council Action & Approval
		Construct Citizen Campus at Solid Waste Complex	2012	2012	\$3,683,000	City Council Action & Approval
E	4.2	Continue to use ADC	Existing	on going	\$25,000/yr	None
M	4.3	Perform Annual LF Surveys to evaluate air space	2009	on going	\$15,000/yr	None- Alternatives to improve density may require permit modifications (or new SD DNR Permit)
M	4.4	Obtain Zoning Approval for City-owned property to south (Johnson Property) & inclusion in SW Permit	2011	2013	\$100k-\$250k	Council Approval - Permit Renewal Modifications Required or New SD DNR Permit
B	*	Purchase additional buffer area (property)	2012	2015	Land Market Value	City Council Approval
M/A	*	Obtain zoning/land-use designation for property (HI)	2010	2011	\$5,000/yr	City Council Approval; Public Notice
B	*	Pursue land-use plans and zoning rules to prevent adjacent developments that conflict with solid waste operations.	2010	2011	\$5,000/yr	City Council Approval; Zoning rules changes; Legal
M	4.5	Monitor compliance with South Dakota Law 34A-6-53 and pursue legislative approval for large-scale facility	2010	ongoing	City Internal	Tracking disposal quantities
M	5.1	Relocate and reconfigure scale facilities, add scale and auto card reader	Same as 4.1		Incl. w/ 4.1	City Council Action & Approval; 4.1
M	5.2	Greater use of flat rates for residential vehicles and compost sales	2010	2011	City Internal	City Council Approval
M	5.3	Enhance landfill written procedures and training	2010	2013	City Internal	Budget Approval - Training; Complete prior to or concurrent with next permit renewal
M	5.4	Evaluate long-term strategy for leachate recirculation/management	2012	2012	\$0	Long-Term Management; Evaluate prior to or concurrent with next permit renewal
M	5.5	Monitor collection & disposal rates for adequate funds	2010	on going	City Internal	None

Legend	
M	Considered Essential - <u>M</u> ust be Implemented
A	Considered top priority - Priority <u>A</u>
B	Considered important to the overall program - Priority <u>B</u>
C	Considered a desirable component of the overall program - Priority <u>C</u>
E	Is part of the <u>E</u> xisting Program and important to maintain in the future

Appendix B
Waste-to-Energy Fact Sheet

WTE Fact Sheet

Overview and Background

Rapid City is developing a long-term solid waste management plan. As a part of this effort they have hired HDR Engineering, Inc, a nationally recognized expert in the area of solid waste management, waste-to-energy, and power generation and distribution to assist them in the evaluation of alternatives. One of the waste (volume and toxicity) reduction alternatives being evaluated is waste combustion with energy recovery. Combustion recovers essentially all of the energy resource remaining in the waste

To be successful in developing a waste reduction (waste to energy) and energy recovery project a reliable long-term market for the energy is required. Utility companies are a potential outlet for energy sales and may also be a viable partner (in terms of ownership and operation). Utility companies may also benefit from such a partnership as a result of State or Federal renewable (energy) portfolio standards(RPS)/Greenhouse Gas/Carbon Credits/Other.

Because Utility companies have a 24-hour per day, 7-day per week demand for energy they match up well with the typical power production from a waste to energy facility

In Europe and Japan waste to energy is the primary disposal means for municipal solid waste. In 2004, there were 89 waste to energy plants operating in 27 of the United States (ref. Keep America Beautiful).

Green Power

Greenhouse gas emissions from WTE are lower than the combination of landfilling the waste plus generating equivalent electricity from a fossil fuel power plant - even if the landfill has landfill gas fired power generation.

Considered renewable power in many states – federal legislation is under development.

In contrast to other green power, WTE is base loaded and dispatchable. Capacity factors of 90 percent and higher have been demonstrated.

Facility General Facts and Figures

WTE represents a “New Revenue” to Utility companies, fuel is a revenue source not a cost – Tipping fees are charged for waste disposal, based on economics

WTE Facility Life - exceeds 30 years

Net Power Output – 630 kWh/ton

Solid waste has roughly half the energy content of coal and is a low sulfur fuel. Rapid City generates approximately 70,000 tons per year of waste that could be burned to produce energy (roughly 6 MW).

Capacity Factor – 85% to +90%

Most WTE facilities also recover metals

Residue is generally tested and landfilled as inert materials

WTE Fact Sheet

Environmentally Friendly

Solid Waste Association of North America, January 2002 report on EPA and DOE findings concluded WTE was one of the cleanest sources of power in the world

WTE does not impact or prevent recycling

Expected WTE Emission Limits (New coal plant limits in parentheses for comparison)

SO₂ - 0.036 lb/MMBtu (0.095)

HCl - 0.014 lb/MMBtu (0.0008)

PM - 0.003 lb/MMBtu (0.018)

Lead - 10 ug/dscm (N/A)

Dioxins – 13 ng/dscm (N/A)

Mercury - 143 E-6 lb/MW hr (18 E-6)

NO_x - 0.15 lb/MMBtu (0.07)

CO - 0.05 lb/MMBtu (0.16)

Principle Emission Control Technologies

Construction and Operation are subject to New Source Performance Standards (NSPS)

Acid Gases (HCl & SO₂)

- Spray Dryer & Lime Injection

Particulate

- Fabric Filter (Baghouse)

Heavy Metals & Dioxins

- Temperature Controls / Fabric Filter

Mercury

- Carbon Injection

NO_x

- Ammonia Injection

Appendix C
Citizen Campus Cost Opinion

Project:	Citizen Campus - Rapid City SD
Estimator:	Mike Coleman
Technology	Storage Bunkers and Bins
Date:	11/2009
Estimate Basis:	Conceptual Layout - No Design
Costs:	2009 \$
Location:	Rapid City, SD

CITIZEN CAMPUS ALTERNATIVE COST SUMMARY

I. SITE ACQUISITION - Not Included		\$0
II. SITEWORK		\$3,068,790
	SUBTOTAL BUILDING CONSTRUCTION AND SITE	\$3,068,790
	DESIGN/ENGINEERING (8%)	\$245,500
	PERMITTING (3%)	\$92,100
	SURVEYING AND SOILS REPORT	\$25,000
	CONSTRUCTION OBSERVATION AND TESTING (8%)	\$245,500
	CONTINGENCY (20%)	\$613,800
	TOTAL CAPITAL COST	\$4,290,690
	ANNUAL AMORTIZED CAPITAL COST BUILDING AND SITE (A/P, i = 6%; n = 20yrs)	\$374,000

Project:	Citizen Campus - Rapid City SD
Estimator:	Mike Coleman
Technology	Storage Bunkers and Bins
Date:	11/2009
Estimate Basis:	Conceptual Layout - No Design
Costs:	2009 \$
Location:	Rapid City, SD

SITE ACQUISITION

Item	Quantity	Units	Unit Price	Item Cost	Total
I.	0	\$/Ac		\$0	
Subtotal I					\$0

II. SITEWORK

Item	Quantity	Units	Unit Price	Item Cost	Total
Mobilization	1	LS	\$85,000	\$85,000	
Site Preparation	1	LS	\$75,000	\$75,000	
Submittals, Env. Protection	1	LS	\$32,000	\$32,000	
Clearing	1	LS	\$10,000	\$10,000	
Misc. Demo and Removals	1	LS	\$20,000	\$20,000	
Remove Roadway Surfacing	9,140	SQYD	\$5	\$45,700	
Remove Building	3	EACH	\$15,000	\$45,000	
Site Grading & Earthwork	1	LS	\$120,000	\$120,000	
Site Utilities	1	LS	\$60,000	\$60,000	
Drainage Structures	1	LS	\$50,000	\$50,000	
Surfacing	23,065	SQYD	\$64	\$1,476,160	
Fencing	1,790	FT	\$17	\$30,430	
Fence Gates	3	EACH	\$5,000	\$15,000	
Concrete Divider Walls	720	FT	\$200	\$144,000	
Landscaping - Allowance	1	LS	\$50,000	\$50,000	
Permanent Signing and Pavement Striping	1	LS	\$10,000	\$10,000	
Office Building Facility	2,400	SQFT	\$225	\$540,000	
Scale House Facility	180	SQFT	\$425	\$76,500	
Scales	2	EACH	\$70,000	\$140,000	
Bollards and Highway Barriers	1	LS	\$4,000	\$4,000	
Silt Fence and Erosion Controls	1	LS	\$10,000	\$10,000	
Traffic Controls and Flagging	1	LS	\$30,000	\$30,000	
					\$3,068,790
Subtotal II					\$3,068,790

Notes:

- (1) No Unforeseen Demolition or Removals Required.
- (2) General Earthwork includes moving soil, backfill, embankment, etc. Site is partially over a filled valley.
- (3) Roadway does not include offsite Improvements.
- (4) Utilities assumes adequate utilities available adjacent to or on-site.
- (5) All Structures except scalehouse are metal building.
- (6) Assumes stable soil with load bearing capacity.
- (7) 8' concrete containment walls along sides and back of bunker area.
- (8) Exclude roll-off containers/bins, storage containers, etc.
- (9) Buildings include painting, window covers, tile, etc, but exclude furniture.
- (10) Costs exclude mobile and fixed equipment, e.g. compost bins, skid loader, transfer tractor/trailer, sweepers, etc.
- (11) Reuse Facility not included in estimate.
- (12) Optional 3rd Scale not included in estimate.

Appendix D
Solid Waste Management Plan Program Costs, Revenues, and
Diversion Potential

SOLID WASTE MANAGEMENT PLAN - SYSTEM DEFINITION - EXPENSES

612 SOLID WASTE ENTERPRISE FUND 7101 WASTE COLLECTION

City Budget Code	DESCRIPTION	Budget Cost	% Allocation to Cost Center	Annual COSTS INCREASED					
				2010	2011	2012	2013	2014	2015
				3.6% per year					
4110	SALARY & WAGES	\$0	0%	\$0	\$0	\$0	\$0	\$0	\$0
Salary&Wages	SUB-TOTAL			\$0	\$0	\$0	\$0	\$0	\$0
4223	CONSULTANT								
6.2.5	Evaluate Fiber Recovery-City	\$0	50%	\$0	\$0	\$0	\$0	\$0	\$0
4225	OTHER PROF SVCS			\$0	\$0	\$0	\$0	\$0	\$0
Prof. Services	SUB-TOTAL			\$0	\$0	\$0	\$0	\$0	\$0
4225	Promotional Activities								
6.1.4	YW - Don't Bag It	\$0/yr	100%	\$0	\$0	\$0	\$0	\$0	\$0
6.2.1	Volume Base Price Incentive-City	\$0	50%	\$0	\$0	\$0	\$0	\$0	\$0
6.2.7	Minimize Alley Collection - Education	\$0	100%	\$0	\$0	\$0	\$0	\$0	\$0
6.2.8	Enhance Educational Efforts	\$0/yr	0%	\$0	\$0	\$0	\$0	\$0	\$0
	SUB-TOTAL			\$0	\$0	\$0	\$0	\$0	\$0
	Drop-Site Mods to Restrict Use by For-Profits								
6.2.9	Landscapers	\$0	100%	\$0	\$0	\$0	\$0	\$0	\$0
	Auto Trash Containers	\$0/yr	100%	Add'l container purchase included in existing budget under MISC SUPPLIES					
Capital Outlay	SUB-TOTAL			\$0	\$0	\$0	\$0	\$0	\$0
BUDGET ADDITIONS				\$0	\$0	\$0	\$0	\$0	\$0
ESTIMATED AVERAGE COST PER ACCT PER MONTH				\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

SOLID WASTE MANAGEMENT PLAN - SYSTEM DEFINITION - EXPENSES

615 SOLID WASTE ENTERPRISE FUND 7102 WASTE DISPOSAL - LANDFILL OPERATIONS

City Budget Code	DESCRIPTION	Budget Cost	% Allocation to Cost Center	YEAR					
				2010	2011	2012	2013	2014	2015
4110	SALARY & WAGES	\$0	0%	\$0	\$0	\$0	\$0	\$0	\$0
Salary&Wages	SUB-TOTAL			\$0	\$0	\$0	\$0	\$0	\$0
4223	CONSULTANT								
6.1.12	Evaluate Special Waste Diver-City	\$0	100%	\$0	\$0	\$0	\$0	\$0	\$0
6.1.13	Evaluate HHW Diver Program-City	\$0	100%	\$0	\$0	\$0	\$0	\$0	\$0
6.3.1	LFG to Energy Design	\$100,000	100%	\$0	\$100,000	\$0	\$0	\$0	\$0
6.3.2	WTE Feasibility	\$100,000	100%	\$0	\$0	\$100,000	\$0	\$0	\$0
6.4.1	Citizen Campus Engineering	\$608,100	100%	\$212,835	\$212,835	\$182,430	\$0	\$0	\$0
6.4.4	Solid Waste Permitting (Johnson Prop.)	\$200,000	100%	\$0	\$50,000	\$50,000	\$100,000	\$0	\$0
6.5.4	Evaluate Leachate Treatment (NA)	\$0	100%	\$0	\$0	\$0	\$0	\$0	\$0
4225	OTHER PROF SVCS								
6.1.10	ReUse Center Development	\$0/yr	100%	\$0	\$0	\$0	\$0	\$0	\$0
6.4.3	Annual LF Surveys	\$15,000/yr	100%	\$15,000	\$15,540	\$16,099	\$16,679	\$17,279	\$17,902
6.4.6	Property Zoning	\$5,000	100%	\$5,000	\$5,000	\$0	\$0	\$0	\$0
6.4.7	Land Use/Zoning Rules	\$5,000	100%	\$5,000	\$5,000	\$0	\$0	\$0	\$0
Prof. Services	SUB-TOTAL			\$237,835	\$388,375	\$348,529	\$116,679	\$17,279	\$17,902
4225	Promotional Activities	Existing budget anticipated to handle additional promotional materials with aide of Source Reduction Leader							
6.1.11	Expand Education Special Waste Management	\$0	100%	\$0	\$0	\$0	\$0	\$0	\$0
6.2.1	Volume Base Price Incentive-City	\$0	25%	\$0	\$0	\$0	\$0	\$0	\$0
6.2.8	Enhance Educational Efforts	\$0/yr	0%	\$0	\$0	\$0	\$0	\$0	\$0
	SUB-TOTAL			\$0	\$0	\$0	\$0	\$0	\$0
4251	RPR ROLLING STOCK	Citizen Campus rolling stock RPR & haul; offset by no 2nd working face							
Repair&Maint	SUB-TOTAL			\$0	\$0	\$0	\$0	\$0	\$0
Supplies&Mat'ls	SUB-TOTAL			\$0	\$0	\$0	\$0	\$0	\$0

SOLID WASTE MANAGEMENT PLAN - SYSTEM DEFINITION - EXPENSES

4270	TRVL, TRNG								
6.1.8	Solid Waste Industry Conferences	\$5,000/yr	50%	\$0	\$2,500	\$2,590	\$2,683	\$2,780	\$2,880
6.5.3	Enhance LF procedures/Training	\$2,000/yr	100%	\$2,000	\$2,072	\$2,147	\$0	\$0	\$0
Travel&Train'g	SUB-TOTAL			\$2,000	\$4,572	\$4,737	\$2,683	\$2,780	\$2,880
6.3.1	LFG to Energy Facility	estimate in rate study budget		\$0	\$0	\$0	\$0	\$0	\$0
	LFG to Energy Grants/Revenue*	estimate in rate study budget		\$0	\$0	\$0	\$0	\$0	\$0
6.4.1	Citizen Campus	\$302,925	100%	\$0	\$0	\$302,925	\$302,925	\$302,925	\$302,925
6.4.5	Buffer Area/Land Purchase	\$82,250	100%	\$0	\$82,250	\$82,250	\$82,250	\$82,250	\$82,250
6.1.10	ReUse Center Development	Use existing building		\$0	\$0	\$0	\$0	\$0	\$0
in rate study budget	New Compost Screening Equip	\$15,542	100%	\$0	\$0	\$0	\$0	\$0	\$0
in rate study budget	Windrow Turner - Mass Pile	\$30,112	100%	\$0	\$0	\$0	\$0	\$0	\$0
Capital Outlay	SUB-TOTAL			\$0	\$82,250	\$385,175	\$385,175	\$385,175	\$385,175
BUDGET ADDITIONS				\$239,835	\$475,197	\$738,441	\$504,537	\$405,234	\$405,956
	REVENUE TONNAGE			110,335	111,549	112,776	114,017	115,271	116,539
	ADD'L COST PER REVENUE TON	At Landfill		\$2.17	\$4.26	\$6.55	\$4.43	\$3.52	\$3.48
	MRF/LANDFILL TONNAGE PER HOUSEHOLD			0.84	0.84	0.84	0.84	0.84	0.84
	ADD'L MONTHLY DISPOSAL COST PER CITY HH ACCOUNT	At Household		\$0.15	\$0.30	\$0.46	\$0.31	\$0.25	\$0.24

* Assume grants and revenues will completely fund LFG-to-Energy Facility.

SOLID WASTE MANAGEMENT PLAN - SYSTEM DEFINITION - EXPENSES

616 SOLID WASTE ENTERPRISE FUND 7103 SOLID WASTE MRF/COMPOST

City Budget Code	DESCRIPTION	Budget Cost	% Allocation to Cost Center	YEAR					
				2010	2011	2012	2013	2014	2015
4110	SALARY & WAGES								
6.1.2	Hire Source Reduction Leader	\$50,000/yr	100%	\$0	\$0	\$0	\$0	\$0	\$0
Salary&Wages	SUB-TOTAL	In rate study budget		\$0	\$0	\$0	\$0	\$0	\$0
4120	SOC SECURITY		6.2%	\$0	\$0	\$0	\$0	\$0	\$0
4121	MEDICARE		1.45%	\$0	\$0	\$0	\$0	\$0	\$0
4130	RETIREMENT		6.7%	\$0	\$0	\$0	\$0	\$0	\$0
4131	SCT 125			\$0	\$0	\$0	\$0	\$0	\$0
4140	WORK COMP		4.0%	\$0	\$0	\$0	\$0	\$0	\$0
4150	<u>GROUP HEALTH</u>		15.5%	\$0	\$0	\$0	\$0	\$0	\$0
4153	DENTAL			\$0	\$0	\$0	\$0	\$0	\$0
4155	GROUP LIFE		0.14%	\$0	\$0	\$0	\$0	\$0	\$0
4170	UNEMPLOYMENT		0.7%	\$0	\$0	\$0	\$0	\$0	\$0
Benefits	SUB-TOTAL			\$0	\$0	\$0	\$0	\$0	\$0
4223	CONSULTANT								
6.2.5	Evaluate Fiber Recovery-City	\$0	50%	\$0	\$0	\$0	\$0	\$0	\$0
6.2.6	Evaluate Fiber Process Line-City	\$0	100%	\$0	\$0	\$0	\$0	\$0	\$0
6.2.10	Evaluate Reducing Plastic Content	\$20,000	100%	\$0	\$0	\$20,000	\$0	\$0	\$0
6.2.11	Evaluate Metals Recovery(MRF/compost)	\$50,000	100%	\$0	\$50,000	\$0	\$0	\$0	\$0
4225	OTHER PROF SVCS								
6.2.2	Recycling Collection Policy	\$0	100%	\$0	\$0	\$0	\$0	\$0	\$0
6.2.3	Organic Waste Pilot Program	\$10,000	100%	\$0	\$10,000	\$10,000	\$0	\$0	\$0
Prof. Services	SUB-TOTAL			\$0	\$60,000	\$30,000	\$0	\$0	\$0
4225	Promotional Activities								
	Promote Alternate to Film Plastic & Beverage Containers	\$2,000/yr	100%	\$0	\$2,000	\$2,072	\$2,147	\$2,224	\$2,304
6.2.1	Volume Base Price Incentive-City	\$0	25%	\$0	\$0	\$0	\$0	\$0	\$0
6.2.8	Enhance Educational Efforts	\$2,000/yr	100%	\$2,000	\$2,072	\$2,147	\$2,224	\$2,304	\$2,387
	SUB-TOTAL			\$2,000	\$4,072	\$4,219	\$4,370	\$4,528	\$4,691
4270	TRVL, TRNG								
6.1.7	Public Forums/Local Conventions	\$5,000/yr	100%	\$0	\$5,000	\$5,180	\$5,366	\$5,560	\$5,760
6.1.8	Solid Waste Industry Conferences	\$5,000/yr	50%	\$0	\$2,500	\$2,590	\$2,683	\$2,780	\$2,880

SOLID WASTE MANAGEMENT PLAN - SYSTEM DEFINITION - EXPENSES

Travel&Train'g	SUB-TOTAL			\$0	\$7,500	\$7,770	\$8,050	\$8,340	\$8,640
6.2.11	Metals Recovery System	\$25,635	100%	\$0	\$0	\$0	\$25,635	\$25,635	\$25,635
	Auto Recycling Containers	\$0/yr	100%	Add'l container purchase included under COLLECTION					
Capital Outlay	SUB-TOTAL			\$0	\$0	\$0	\$25,635	\$25,635	\$25,635

BUDGET ADDITIONS				\$2,000	\$71,572	\$41,989	\$38,056	\$38,503	\$38,966
REVENUE TONNAGE				110,335	111,549	112,776	114,017	115,271	116,539
ESTIMATED COST PER REVENUE TON		At MRF		\$0.02	\$0.64	\$0.37	\$0.33	\$0.33	\$0.33
MRF/LANDFILL TONNAGE PER HOUSEHOLD				0.96	0.96	0.96	0.96	0.96	0.96
ADD'L MONTHLY RECYCLING COST PER		At							
CITY HH ACCOUNT		Household		\$0.00	\$0.05	\$0.03	\$0.03	\$0.03	\$0.03

TOTAL TIP FEE		YEAR	2010	2011	2012	2013	2014	2015
Existing Rate Projection								
	Landfill		\$25.25	\$26.89	\$26.73	\$27.51	\$28.12	\$28.75
	MRF		\$31.60	\$31.12	\$31.04	\$30.90	\$31.00	\$23.10
		Subtotal	\$56.86	\$58.01	\$57.78	\$58.40	\$59.12	\$51.85
Solid Waste Management Plan Programs								
	Landfill		\$2.17	\$4.26	\$6.55	\$4.43	\$3.52	\$3.48
	MRF		\$0.02	\$0.64	\$0.37	\$0.33	\$0.33	\$0.33
		Subtotal	\$2.19	\$4.90	\$6.92	\$4.76	\$3.85	\$3.82
Total Tip Fee at Solid Waste Operations Complex Before Revenue Tonnage Adjustment			\$59.05	\$62.91	\$64.70	\$63.16	\$62.97	\$55.67

SOLID WASTE MANAGEMENT PLAN - SYSTEM DEFINITION - EXPENSES

EQUIPMENT/CAPITAL OUTLAY AMORTIZATION

#	ANNUAL PAYMENT	ITEM	PURCHASE PRICE	TRADE IN	TERMS YEARS	INTEREST RATE	NUMBER UNITS	ANNUAL COST
SOLID WASTE COLLECTION								
6.2.9	\$0	Drop-Sites Modifications	\$0	\$0	20	6%	3	\$0
LANDFILL DISPOSAL								
	(\$15,542)	SCREENING EQUIPMENT	\$200,000	\$40,000	15	6%	1	\$15,542
	(\$30,112)	YARD WASTE TURNER, MASS PILE	\$350,000	\$40,000	15	6%	1	\$30,112
6.4.5	(\$822)	Buffer Area	\$10,000	0	20	6%	100	\$82,250
6.4.1	(\$302,925)	Citizen Campus	\$3,683,000	\$0	20	6%	1	\$302,925
6.3.1	(\$168,036)	LFG to Energy Facility	grants & cash \$3,043,000	\$1,000,000	20	6%	1	\$168,036
	\$0	Leachate Treatment System	\$0	\$0	20	6%	1	\$0
MRF OPERATIONS								
6.2.11	(\$25,635)	Magnet/Conveyor/Misc. Equip (Estimate)	\$200,000	0	10	6%	1	\$25,635

SOLID WASTE MANAGEMENT PLAN - SYSTEM DEFINITION - DIVERSION & REVENUES

TOTAL PROJECTED REDUCTION IN DISPOSAL/REVENUE TONNAGES											
	2009	2010	2011	2012	2013	2014	2015	2016	2017		
Source Reduction	-	278	1,272	1,286	1,588	1,605	1,623	1,641	1,659		
Increased Recycling	-	68	1,022	1,034	1,348	1,433	1,759	1,778	1,798		
Total Add'l Tons Diverted from Landfill	-	346	2,295	2,320	2,935	3,038	3,381	3,419	3,456		
SUMMARY:											
BASELINE RECYCLABLES											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Baseline City Recycling Collection, Tons	1,170	1,325	1,340	1,354	1,369	1,384	1,399	1,415	1,430	1,446	1,462
Drop-Sites & Exist. Other, Tons	1,860	1,712	2,660	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Baseline Recyclable Sales, Tons	3,030	3,037	4,000	3,354	3,369	3,384	3,399	3,415	3,430	3,446	3,462
SALE OF RECYCLABLES -- PROJECTIONS w/ PLAN IMPLEMENTATION											
Recyclables Tons	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Baseline Recycling, Tons	3,030	3,037	4,000	3,354	3,369	3,384	3,399	3,415	3,430	3,446	3,462
Add'l Recycling, Tons			-	68	1,022	1,034	1,348	1,433	1,759	1,778	1,798
Total Potential Recyclable Sales, Tons			4,000	3,422	4,392	4,418	4,747	4,848	5,189	5,224	5,260
Average Net Price (\$/ton)	\$136	\$182	\$90	\$95	\$100	\$110	\$120	\$130	\$130	\$130	\$130
Recyclables Revenues											
Baseline Revenues			\$359,500	\$318,700	\$336,900	\$372,300	\$407,900	\$443,900	\$446,000	\$448,000	\$450,100
Increased Revenues			\$0	\$6,400	\$102,200	\$113,700	\$161,700	\$186,300	\$228,600	\$231,100	\$233,700
Total Potential Recyclable Revenues, \$			\$359,500	\$325,100	\$439,100	\$486,000	\$569,600	\$630,200	\$674,600	\$679,100	\$683,800
SALE OF YARD WASTE COMPOST -- PROJECTIONS w/ PLAN IMPLEMENTATION											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Compost Sales, Tons	2,797	4,122	5,075	4,210	4,260	4,310	4,360	4,410	4,460	4,510	4,560
Average Sale Price (\$/ton)	\$12.13	\$14.27	\$11.88	\$13.00	\$15.50	\$15.50	\$15.50	\$15.50	\$15.50	\$15.50	\$15.50
YW Compost Revenues	\$33,937	\$58,806	\$60,272	\$54,730	\$66,030	\$66,805	\$67,580	\$68,355	\$69,130	\$69,905	\$70,680
SALE OF MSW COMPOST -- PROJECTIONS w/ PLAN IMPLEMENTATION											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
MSW Compost Sales, Tons	0	-	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
Average Sale Price (\$/ton)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2.00	\$2.00	\$2.00	\$2.00	\$2.00	\$2.00
MSW Compost Revenues*	\$0	\$0	\$0	\$0	\$0	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000
* The \$2/ton average sales is based on a price of \$3/cy or \$4/ton of MSW Compost with 50% of compost produced being sold.											

SOLID WASTE MANAGEMENT PLAN - SYSTEM DEFINITION - DIVERSION & REVENUES

CALCULATIONS & ASSUMPTIONS

612 SOLID WASTE ENTERPRISE FUND 7101 WASTE COLLECTION

Annual growth in waste quantities = 1.1%

LINE ITEM	DESCRIPTION	Actual		Estimate	Projections							
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
SALE OF RECYCLABLES		Included under MRF/Compost cost center										

615 SOLID WASTE ENTERPRISE FUND 7102 WASTE DISPOSAL - LANDFILL OPERATIONS

LINE ITEM	DESCRIPTION	Actual		Estimate	Projections							
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2016
EDUCATION/SOURCE REDUCTION LEADER												
6.1.2, 6.2.8	1. EDUCATION - SOURCE REDUCTION POTENTIAL											
	Planning Area Population	107,618	108,802	109,999	111,209	112,432	113,669	114,919	116,183	117,461	118,753	120,059
	MSW Generation (lb/capita/day)			4.83	4.83	4.83	4.83	4.83	4.83	4.83	4.83	4.83
	MSW Generation, Tons	94,789	93,968	96,961	98,028	99,106	100,196	101,298	102,413	103,539	104,678	105,829
	Source Reduction Potential* (%)			0%	0%	1%	1%	1%	1%	1%	1%	1%
	Source Reduction Potential, Tons			-	-	991	1,002	1,013	1,024	1,035	1,047	1,058
* Public Outreach through Source Reduction Leader. Typical source reduction/education programs reduce MSW generation 1% - 2%.												
6.1.2	2. MARKETING - SALE OF YARD WASTE COMPOST											
	Yard Waste/Organics Tons	18,316	18,899	18,590	19,300	19,510	19,720	19,940	20,160	20,380	20,600	20,830
	Potential Increase in Sales*	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Compost Sales, Tons	2,797	4,122	5,075	4,210	4,260	4,310	4,360	4,410	4,460	4,510	4,560
	Average Sale Price (\$/ton)**	\$12.13	\$14.27	\$11.88	\$13.00	\$15.50	\$15.50	\$15.50	\$15.50	\$15.50	\$15.50	\$15.50
	YW Compost Revenues	\$33,937	\$58,806	\$60,272	\$54,730	\$66,030	\$66,805	\$67,580	\$68,355	\$69,130	\$69,905	\$70,680

* Majority of yard waste compost is sold or used by other City departments.

Revenue sales of compost may increase through public outreach by Source Reduction Leader.

** Assume higher quality of compost produced from proposed new screening equipment will result in higher average sale price.

SOLID WASTE MANAGEMENT PLAN - SYSTEM DEFINITION - DIVERSION & REVENUES

616 SOLID WASTE ENTERPRISE FUND												
7103 SOLID WASTE MRF/COMPOST												
LINE ITEM	DESCRIPTION	Actual		Estimate	Projections							
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
EDUCATION/SOURCE REDUCTION LEADER												
6.1.2, 6.2.8	1. EDUCATION - CITY RECYCLABLES COLLECTION INCREASE											
	City Accounts (end of year)	18,058	18,268	18,469	18,672	18,877	19,085	19,295	19,507	19,722	19,939	20,158
	Baseline City Recycling Collection, Tons	1,170	1,325	1,340	1,354	1,369	1,384	1,399	1,415	1,430	1,446	1,462
	lbs/account/year	130	145	145								
	Recycling Increase*	0%	0%	0%	5%	10%	10%	10%	15%	15%	15%	15%
	Add'l Recycling Collection, Tons			-	68	137	138	140	212	215	217	219
* Enhanced Education & Public Outreach through Source Reduction Leader.												
In 2006, Omaha achieved 5.6% increase in recycling volume after a 4-month educational campaign.												
6.2.1	2. PRICE INCENTIVES OF VOLUME-BASED RATES - CITY RECYCLABLES COLLECTION INCREASE											
	Rapid City Population	63,997	64,701	65,413	66,132	66,860	67,595	68,339	69,090	69,850	70,619	71,396
	MSW Generation, Tons			57,660	58,294	58,935	59,583	60,239	60,901	61,571	62,249	62,933
	Price Incentive Diversion	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%
	Add'l Recycling Collection, Tons			-	-	589	596	602	609	616	622	629
6.1.2	3. MARKETING - SALE OF MSW COMPOST											
	MSW Composted, Tons	3,898	12,417	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
	MSW Compost Produced, Tons			12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500
	Average Sale Price (\$/ton)**	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2.00	\$2.00	\$2.00	\$2.00	\$2.00	\$2.00
	MSW Compost Revenues	\$0	\$0	\$0	\$0	\$0	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000
* Public Outreach through Source Reduction Leader & Development of Large Volume Users.												
** The \$2/ton average sales is based on a price of \$3/cy or \$4/ton of MSW Compost with 50% of compost produced being sold.												
6.2.2	RECYCLING COLLECTION POLICY - INCREASED PLANNING AREA RECYCLING											
	Planning Area Population (excluding Rapid City)	43,621	44,101	44,586	45,076	45,572	46,074	46,580	47,093	47,611	48,134	48,664
	Planning Area Participation**		0%	0%	0%	5%	5%	10%	10%	15%	15%	15%
	lbs/set-out/participant		containers only	-	-	5	5	5	5	5	5	5
	Planning Area Recycling, Tons			-	-	296	299	606	612	928	939	949
** Recycling collection policy for private haulers to offer recycling on subscription based service.												
6.1.10	RE-USE CENTER DEVELOPMENT - DIVERSION POTENTIAL											
	Planning Area Population	107,618	108,802	109,999	111,209	112,432	113,669	114,919	116,183	117,461	118,753	120,059
	Participation	0%	0%	0%	5%	5%	5%	10%	10%	10%	10%	10%
	lbs/participant/year				100	100	100	100	100	100	100	100
	Potential Diversion, Tons				278	281	284	575	581	587	594	600

Appendix E
Rate Study Model Summary

SOLID WASTE RATE STUDY - 2009 Rapid City Solid Waste Management Plan Update

Tipping Fee Rate

YEAR	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Existing Rate Projections¹											
Landfill	\$25.25	\$26.89	\$26.73	\$27.51	\$28.12	\$28.75	\$29.39	\$30.24	\$30.92	\$31.61	\$32.32
MRF	\$31.60	\$31.12	\$31.04	\$30.90	\$31.00	\$23.10	\$23.81	\$24.53	\$25.59	\$26.32	\$27.06
Subtotal	\$56.86	\$58.01	\$57.78	\$58.40	\$59.12	\$51.85	\$53.19	\$54.77	\$56.51	\$57.93	\$59.39
Solid Waste Management Plan Programs											
Landfill	\$2.17	\$4.26	\$6.55	\$4.43	\$3.52	\$3.48	\$3.57	\$3.66	\$3.75	\$3.84	\$3.94
MRF	\$0.02	\$0.64	\$0.37	\$0.33	\$0.33	\$0.33	\$0.34	\$0.35	\$0.36	\$0.37	\$0.38
Subtotal	\$2.19	\$4.90	\$6.92	\$4.76	\$3.85	\$3.82	\$3.91	\$4.01	\$4.11	\$4.21	\$4.31
System Diversion Impact to Revenue Tonnage											
Landfill	\$0.09	\$0.65	\$0.70	\$0.84	\$0.86	\$0.96	\$0.98	\$1.01	\$1.04	\$1.06	\$1.08
MRF	\$0.10	\$0.67	\$0.66	\$0.83	\$0.85	\$0.70	\$0.72	\$0.74	\$0.78	\$0.80	\$0.82
Subtotal	\$0.19	\$1.32	\$1.36	\$1.67	\$1.70	\$1.66	\$1.71	\$1.76	\$1.81	\$1.86	\$1.90
Total Tip Fee Projections at Solid Waste Operations Complex											
	\$59.23	\$64.23	\$66.06	\$64.83	\$64.67	\$57.33	\$58.81	\$60.54	\$62.43	\$63.99	\$65.60
Average Tip Fee (2010 - 2020)		\$62.52									
Note: 1. Existing rate projections is net of all potential material revenues with implementation of solid waste management plan programs.											

Average, Monthly Cost Per Household Account

YEAR	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Existing Rate Projections¹											
Collection	\$9.84	\$9.98	\$10.55	\$10.71	\$10.87	\$11.11	\$11.35	\$11.91	\$12.10	\$12.29	\$12.49
Disposal (Landfill)	\$3.69	\$3.91	\$3.87	\$3.96	\$4.02	\$4.09	\$4.16	\$4.25	\$4.32	\$4.40	\$4.47
Recycling (MRF)	\$2.53	\$2.49	\$2.48	\$2.47	\$2.48	\$1.85	\$1.90	\$1.96	\$2.05	\$2.11	\$2.17
Subtotal	\$16.06	\$16.39	\$16.89	\$17.13	\$17.37	\$17.04	\$17.41	\$18.13	\$18.47	\$18.79	\$19.12
Solid Waste Management Plan Programs & Diversion											
Collection	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Disposal (Landfill)	\$0.16	\$0.34	\$0.51	\$0.37	\$0.31	\$0.31	\$0.32	\$0.33	\$0.33	\$0.34	\$0.35
Recycling (MRF)	\$0.01	\$0.10	\$0.08	\$0.09	\$0.09	\$0.08	\$0.09	\$0.09	\$0.09	\$0.09	\$0.10
Subtotal	\$0.17	\$0.45	\$0.59	\$0.46	\$0.40	\$0.39	\$0.40	\$0.41	\$0.43	\$0.44	\$0.45
Average Monthly Rate											
	\$16.23	\$16.83	\$17.48	\$17.60	\$17.78	\$17.44	\$17.81	\$18.54	\$18.90	\$19.23	\$19.57
Note: 1. Existing rate projections is net of all potential material revenues with implementation of solid waste management plan programs.											

SOLID WASTE MANAGEMENT PLAN REVENUE POTENTIAL

YEAR	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Revenues w/out SWMP Programs											
Sale of Yard Waste Compost	\$54,700	\$55,400	\$56,000	\$56,700	\$57,300	\$58,000	\$58,600	\$59,300	\$60,000	\$60,700	\$61,400
Sale of Recyclables	\$318,700	\$336,900	\$372,300	\$407,900	\$443,900	\$446,000	\$448,000	\$450,100	\$455,100	\$460,100	\$465,200
Sale of MSW Compost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Subtotal	\$373,400	\$392,300	\$428,300	\$464,600	\$501,200	\$504,000	\$506,600	\$509,400	\$515,100	\$520,800	\$526,600
Additional Revenue Potential w/ SWMP Programs											
Sale of Yard Waste Compost	\$0	\$10,600	\$10,800	\$10,900	\$11,100	\$11,100	\$11,300	\$11,400	\$11,500	\$11,600	\$11,700
Sale of Recyclables	\$6,400	\$102,200	\$113,700	\$161,700	\$186,300	\$228,600	\$231,100	\$233,700	\$236,300	\$238,900	\$241,500
Sale of MSW Compost	\$0	\$0	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000
Subtotal	\$6,400	\$112,800	\$149,500	\$197,600	\$222,400	\$264,700	\$267,400	\$270,100	\$272,800	\$275,500	\$278,200
Total Revenue Potential	\$379,800	\$505,100	\$577,800	\$662,200	\$723,600	\$768,700	\$774,000	\$779,500	\$787,900	\$796,300	\$804,800