

Note: Additional documents may be included as attachments. If supporting documents are attached, please reference the attachment in the project proposal. If appropriate, flag specific related information in the attachment for easy reading. Even when attachments are included, each numbered section below must be addressed in your response.

1 Project Title / Sequence Number

Solid Waste Division Route Optimization Solution/ 2012-014

2 Submitted by

Refuse Superintendent, Environmental Utilities Department

3 Problem Definition

3.1 Describe the problem, need, or issue including its scale and scope.

With the growth of the City, the division has realized the inefficiency of having to manually re-route already established commercial and residential routes. Primary concerns are the time demands of the process, the inability to effectively input variables and project the resource requirements of future growth. Therefore, the Solid Waste Division is seeking an automated, computerized solid waste route optimization solution to develop balanced collection routes, reduce drive time and costs (fuel, labor, etc.) improve customer service and project resources to address future growth.

3.2 How is the business function currently accomplished?

Currently the division works with the Environmental Utilities (EU) Engineering GIS mapping group to manually create, update and print residential routes. This process excludes any automated, computerized system recommendations (optimization suggestions) reasons, variables or constraints, with the exception of proprietary knowledge regarding how many houses can be served by each driver.

Commercial routing is currently a manual process in which routes are printed from excel spreadsheets created by supervisors relying again on proprietary knowledge.

3.3 How does the problem, need, or issue constrain the department or City?

The current manual way of routing commercial, residential and recycling vehicles is inefficient and does not utilize industry software tools that can assist the division in determining the most efficient route paths and safe collection methods. We would like to evaluate our routes and make business decisions based on the following:

- productive vs. non-productive time
- a fixed number of routes
- load restrictions and vehicle capacities (weight, yardage, location etc.)
- time of service restrictions
- trips to intermediate facilities
- clustering
- breaks
- safety controls
- side-of-street detail
- travel speeds
- multiple frequency service
- turn restrictions, and,

- vehicle start and finish locations

However, it is nearly impossible to incorporate all of this functionality, manually, when creating or expanding our routes. Currently, we rely on proprietary knowledge, some statistical data and the divisions long standing archaic performance measures which are based on manual routing. Manually creating and generating routes, as well as, relying on the refuse truck drivers (RTD's) to determine the direction of their path has worked relatively well in the past, however, it has its limitations.

In addition, it is very difficult to make changes or add to our existing routes all while keeping them balanced. We need a computerized routing system that will allow us to run, "what if" scenarios to determine the most efficient and effective solution to routing issues.

4 Solutions

4.1 What is the recommended solution and why does it best address the business need?

The division recommends the purchase of RouteSmart software. We have looked into solutions that utilize our current ESRI ArcGIS platform because this is the platform standard for the City. RouteSmart is an already built, out of the box solution that appears to satisfy all of our requirements. In addition, it is most used routing software in the Solid Waste industry and the only solution that we could find that makes business sense for us. Lastly, as well as being a useful tool for Solid Waste, RouteSmart can be utilized by other department/division managers within the City to perform similar routing analysis, some examples of other users are meter readers, street sweepers & vactors.

4.2 What alternatives were considered and why was each not recommended? Include pros and cons of each

Research - We researched other refuse agencies looking for software alternatives and could not find any that utilized routing software other than RouteSmart. Utilizing a robust, sophisticated routing application that is not specific to Solid Waste is more likely to produce ineffective results because it does not take into consideration the constraints specific to the industry such as identifying when vehicles are full and weight restrictions.

Manual Restructuring - We considered attempting to manually restructure all of our routes, but quickly realized that this was a huge task that would take up an enormous amount of staff time and the results may not be the most efficient method. With routing software, we can easily change variables and constraints and quickly get a results set.

Other Software - We could only find a few other routing software packages that utilize the current ESRI ArcGIS platform. Purchasing a package that does not utilize our current platform would be very costly and require extensive training. ESRI ArcGIS can also be used to perform routing but the City GIS currently does not contain the data that would be used to perform route optimization. The recommended solution also automates the optimization process and provides additional routing tools that out-of-the-box ArcGIS does not.

4.3 What would happen if you did nothing?

Staff would continue to perform the required functions as they currently do and will continually look for manual ways to improve performance.

All answers below should address the recommended solution described in Section 4.1 above.

5 Project Description

5.1 Outline the proposed project including objectives, scope, and assumptions.

Objective –

The objective of this project is to acquire a software package that will be utilized by the division to standardize route planning operations, create efficiencies, limit the amount of time spent on manual routing and rerouting and reduce operating costs. The system will be used to optimize routes and route paths based on a variety of vehicle, customer and driving requirements. In addition, the software will aid the division in maximizing the use of labor and vehicle resources.

Scope –

The routing software solution will be able to minimize travel time, optimize route paths, and optimize routes based on a variety of vehicle types, driving time and customer requirements.

It is expected that the vendor will do the following:

Work interactively with City staff to compile and manipulate customer data into required formats.

Train key personnel to effectively utilize and employ the software.

Provide future optimization, as needed, and provide technical assistance during regular business hours.

Provide a comprehensive routing system that includes, at minimum, a balanced routing system, which equitably balances route driver workload over eight hours per day, up to seven days per week, improves collection efficiency and provides printable maps with directions of the new routes on an as needed basis.

Software will support the following:

- Daily and weekly route balancing
- Vehicle capacity
- Time of service restrictions
- Intermediate facilities
- Safety Controls
- Side-of-street detail
- Variable at-stop service times
- Travel speeds
- Turn Restrictions
- One way streets
- “What If” Scenario Routing
- Map and Reporting Outputs
- Multi-Day Routing
- Cost Analysis

Assumptions –

Key personnel in Solid Waste management will be trained to employ, update and utilize the routing system

Budget to purchase the software has already been approved and an out of the box solution will be utilized

EU Engineering (mapping) will provide support

5.2 What other departments or divisions are involved in this project? Explain the nature and extent of their involvement.

This project will have minimal impact on departments other than EU. Within EU, the most impact will be to the engineering (mapping) group. How much this group is impacted will depend on internal business decisions.

There is a potential that other divisions, such as public works streets department, will find value in utilizing this program for street sweeping routes.

5.3 If the project can be phased over more than one year, describe how it would be done.

This project cannot be phased

6 Benefits

6.1 Hard savings/revenues of the proposed project

Hard Savings			Revenue		
Budget Item	One-Time Savings	Annual Savings	Source	One-Time Revenue	Annual Revenue
Fuel (10% of total fuel)	\$	\$81,750.00		\$	\$
Vehicle Rent (2 trucks)	\$	\$72,000.00		\$	\$
Vehicle Replacement (two trucks)	\$	\$100,000.00		\$	\$
	\$	\$		\$	\$
	\$	\$		\$	\$
	\$	\$		\$	\$
Improve Business Process Staff Hours Savings					
Tasks	Hours or FTE Savings	Annual Savings			
Maintaining current staffing levels as the city grows.	2.5 FTE	\$227,500.00	2.5 Refuse Truck Driver Positions		
Time spent yearly analyzing and altering current routes	80 hours per year	\$3856	Sr Refuse Truck Driver		
Time spent yearly analyzing and altering current routes	80 hours per year	\$5338	Refuse Supervisor		
Manually updating current routes	1 hr. per week	\$2206	Billing Technician		
Time spent yearly analyzing and altering current routes	80 hours per year	\$6336	Refuse Superintendent		
Total:		\$245,236			\$
Phased Implementation Savings (if possible)			Phased Implementation Revenues (if possible)		
Phase 1		\$			\$

Phase 2		\$			\$
Phase 3		\$			\$
Phase 4		\$			\$
Total:		\$			\$

6.2 Describe expected savings.

In most cases RouteSmart Technologies has realized 8-15% increase in efficiency. The City of Durham was able to reduce from 26 to 18 refuse routes and Waste Industries realized an 8% increase. At a conservative 10%, the potential exists for the division to save approximately \$499,000 (2.5 RTD, 2 refuse trucks, other staff time and \$82,000 fuel) annually through reducing the need for additional RTD's, vehicles and fuel. The immediate impact would be a reduction in overtime, maximization of our current labor force, and fewer miles driven, resulting in labor savings of over \$91,000 and potential fuel savings of approximately \$82,000 each year in the first two years. Daily the division runs (12) residential routes, (4) green waste routes, (8) frontloader routes and (1) two-man, rearloader route. If we could realize a 10% increase in efficiencies the possibility exists to eliminate 2.5 routes, **saving the division approximately \$499,000 over the next few years.**

6.3 Describe expected increased revenues.

No significant increase in revenues is expected.

6.4 Describe expected improved efficiencies to current business processes and customers.

We expect with routing software we can reduce our routes by approximately 10%. If this is achieved there will be a significant saving in expenses, resulting is static, rather than increased rates for customers.

6.5 Describe any other benefits to the department, City, customer and/or community.

If implementation is successful, the software can be used by other City departments to improve their operations.

7 Cost Estimates

7.1 Hard costs/Staff hours (phased implementation if possible)

Budget Item	Hard Costs			Staff Hours (IT and Other Departments) Hours or FTEs		
	Implementatio n	Ongo ing	Funding Source	Tasks	Implementation	Ongoing
Software	\$75,000	\$8,800	Solid Waste Operations	IT Dept (list)		
Hardware	\$	\$		1. Server Provisioning	6 hr	

Training	\$Included in initial software cost	\$		2. Implementation Support	24 hr	
Consulting Svs	\$	\$		3.Server Maintenance		4 hr
Other (list)	\$	\$		IT Dept Subtotal:	30 hr	4 hr
Virtual Server (IT)	\$555	\$	Indirects	Other Dept (list)		
Storage/backups/data center costs	\$300	\$	Indirects	1. EU GIS (training)	80 hr	
				2. EU GIS		*200 hrs/per/yr
				3.		
				4.		
				Other Dept Subtotal:	120 hrs	204 hrs/per/yr
				* EU GIS ongoing is consistent with how much support they currently provide SW. No additional staff hours are expected.		
TOTAL	\$75,855	\$8800		TOTAL		
Phased Implementation (if possible)						
Phase 1	\$	\$				
Phase 2	\$	\$				
Phase 3	\$	\$				
Phase 4	\$	\$				
TOTAL:	\$	\$				

7.2 Describe other non-quantifiable impacts if applicable.

8 Cost/Benefit Analysis

8.1 Describe and quantify how the projected benefits outweigh the estimated costs.

The division could realize a savings of approximately \$255,000 (\$82,000 fuel yearly & (1) RTD position \$91,000 at minimum) in fuel and labor costs within the first two years of installation, which will cover the purchase price and staff time that will be involved with the installation and maintenance of the program. In addition, we will have a system that allows the division to run a variety of scenarios for future expansion. We will be moving away from a trial and error system of best guess, to a streamlined electronic system that utilizes algorithms to solve our routing issues.

9 Risks of Recommended Solution

9.1 Potential risks

Risk	Description
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	Risk	Description
1	Performance	Does not perform as expected
2	Initial Implementation	May take more dedicated staff time than expected
3	Program Maintenance	System may end up needing to be maintained by the EU GIS group
4		
5		
6		

9.2 Describe the mitigation plan for each risk.

1. Although this application uses many complicated algorithms to plan optimal routes, it is possible that even after it is customized it will fail to fully accommodate the needs of our collection service. We researched this company and we contacted others using the program and found that there is very little risk the software will not provide value to us. The number of entities that purchased and continue to use this program is evidence that it provides value in this industry.

2. Currently, the expectation is that the Solid Waste Superintendent will be heavily involved in the implementation of and training on this program. We are assuming no more than 160 hours of the managers time for training and implementation. If the need exists the division will dedicate additional staff to the project.

3. Heavily involve EU mapping group in the RFP process as well as the implementation process. This will allow us to make internal business decisions regarding installation and ongoing maintenance of the software prior to the purchase.

10 Timing

10.1 What are the required start and completion dates?

We would like to begin the process as soon as possible and complete it by the end of FY 13.

10.2 What factors and constraints determine these dates?

We have an immediate need to make adjustments to our current routes. Before adding additional vehicles, drivers and routes during the next budget cycle, we would like to evaluate our resources and use them in the most efficient way possible. Making adjustments to our routes with or without software will take several hours of dedicated staff time and we would prefer to dedicate this time to a permanent solution.

11 Alignment with Goals

11.1 How does this project align with the City's organizational goals?

Fiscal Responsibility – Keeping our rates low will ensure sustainability of City services.

Economic Vitality – Procuring a system that will create efficiencies within the organization will assist us in keeping our residential and commercial rates low. Low rates will attract businesses and residents.

Sustainable/Green City – Routing software will allow us to create more efficient routes and as a result reduce the amount of vehicle fuel consumption.

11.2 How does this project align with your department’s strategic plan or business plan goals?

The Solid Waste Division has a goal to set new standards based on a study of efficiencies and needs as well as driver input. This goal is significant to our mission of providing “...exceptional, cost efficient solid waste and recycling collection services.” The goal of this project is to procure a tool that will enable us to create efficiencies and as a result set new standards.

11.3 How does this project align with your department’s core services?

Our core service is providing residential, commercial and recycling solid waste collection for the City of Roseville. The primary goal of this project is to procure a software program that will provide us with the automated tools necessary to efficiently route our commercial, residential and recycle drivers.

12 Evaluation

12.1 What does success look like for this project?

Success for this project will result in procuring a sophisticated, easy to use routing system that the division can utilize to create more efficient routes and provide an algorithmic automated solution that takes into consideration our specific routing constraints and will allow us to continually evaluate the way we are doing business.

12.2 What will you measure to ensure that this project is progressing according to plan?

We will require a timeline for each phase of implementation and monitor the progress according to the planned schedule.

12.3 What will you measure in a post-implementation review?

We will measure whether or not the timeline was adhered to
We will measure efficiencies gained over time
We will measure the trainee’s proficiency in utilizing the system – ease of use.
Vendor responsiveness