USING A COMPUTERIZED WORK AND ASSET MANAGEMENT SYSTEM (WAMS) INTEGRATED WITH GIS TO MANAGE WASTEWATER COLLECTION ASSETS, WORK, AND CUSTOMER SERVICE

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February 15, 2007

Wastewater Collection Customer Service Is Measured by a Combination of Response Time, Service Reliability and Completing the Entire Job

It is common to establish customer service goals with standards for customer service delivery expectations with regard to the time it takes for the City to respond to a customer back-up call. Customer service involves more than response time and should also consider providing reliable service. Service reliability can be measured by the number of distinct customers experiencing more than two back-ups during a distinct period of time. Another aspect of customer service is completing all the work associated with the problem, such as installing a needed cleanout or covering the hole dug on the customer's property. Our current Work and Asset Management System (WAMS) provides all the information needed to comprehensively manage customer service provided from all perspectives. It also provides the tools we need to remedy the underlying problems and improve service.

Prior to knowing the actual elapsed time between receiving a customer back-up call and when the wastewater crew responded, the City of Corpus Christi established a goal of responding within 2 ½ hours. Using our the WAMS, we determined that this goal was not actually being achieved for the majority of customer calls. The average was

closer to 4 hours, as determined by the difference in the actual time the customer call was received and when the work was put in progress. The goal to respond to a customer's back-up call was therefore changed from 2½ hours to 4 hours.

WAMS Also Identifies Impacts of Rainfall on Customer Service

Rainfall data is correlated to back-up calls. This information is used to analyze the impact of inflow and infiltration on our efforts to improve the wastewater collection infrastructure for use in developing our capital improvement strategies. Our analysis of the statistical relationship between average monthly response times to monthly rainfall totals determined an almost perfect correlation coefficient (0.94) between rainfall and response time. For those months with high rainfall the response time was significantly higher than our goal.

During periods of heavy rainfall, most systems experience a significant increase in back-up service calls. The cause of many of these calls is inflow and infiltration. Therefore during these periods our approach is to first send a trouble truck to "triage" the call by looking at cleanouts and associated manholes. If the problem is clearly caused by inflow and infiltration, other back-up calls will be handled first.

Exhibit 1
Monthly Rainfall in Inches

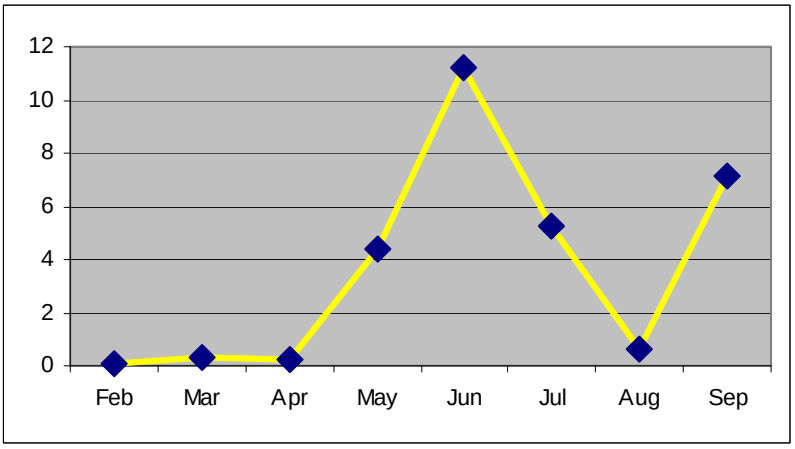
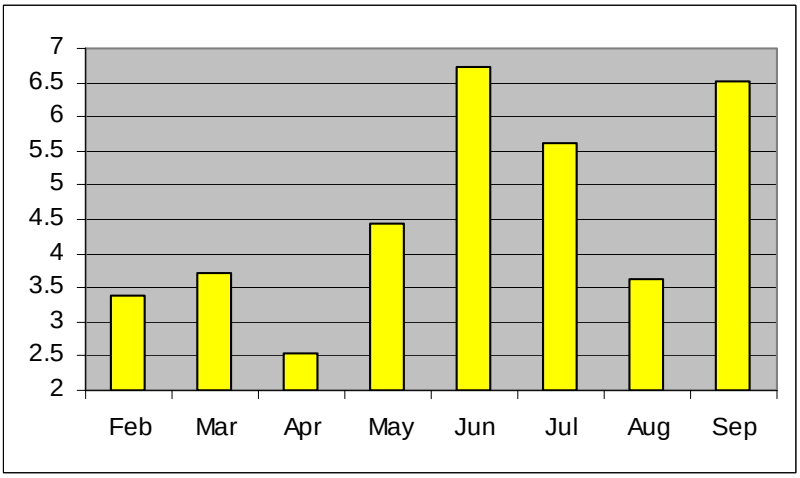


Exhibit 2
Average Response Time to Wastewater Back-up Service Calls



A Key is Considering Customers as an "Asset" To Be Managed

In the wastewater collection system we consider each customer to represent an "asset" of the City to be managed, although the customer's premise is not a City asset in the traditional sense like a wastewater main or a street. For our computerized work and asset management system, each customer's premise is assigned a distinct location code. This location code is the same identifying number used in our utility billing system and is

the number used city-wide for all city departments using our system. Using each customer's distinct location code, we determined that during a one-year period 10% of all customers reported at least one back-up call for service. Duplicate calls for service from the same location were not counted, thereby providing more accurate statistics on the level of continuous wastewater service provided by the City. We therefore established the standard of providing at least 90% of all customers with continuous wastewater service and are tracking changes over time as a measure of our success.

Of the 10% of customers experiencing at least one wastewater back-up, 1.4% reported more than two back-ups. These locations are then analyzed to identify the most severe problems, and a work plan was developed to systematically address the underlying causes of the problem. The City has just under 80,000 wastewater accounts with approximately 100 reporting more than 6 back-up problems during a one-year period. These locations were then used to focus systematic repair efforts, with the underlying service goal to increase the percentage of customers experiencing continuous wastewater service.

Carefully Designed Failure Coding Is Essential For Analysis and Mapping

By using a carefully designed set of failure reporting codes we can analyze the nature of the problems found. Using a coding scheme with drop-down menu choices rather than a narrative description of the problems found, we are able to do systematic and reliable analysis of problems found and work performed. Our reporting structure includes a failure class to record the general category of what was being worked on, a problem code to describe what was driving the work, cause codes and remedy codes. For example, in the case of a manhole overflow the cause code might be "grease" and the

remedy code might be “chemicals added.” We can produce maps of the manhole overflows caused by grease and overlay other known associated layers such as restaurants, multi-family dwellings, or surcharged location to look for trends or opportunities for enforcement or public outreach.

Exhibit 3
Failure Hierarchy for Cleanouts

CLEANOUT FAILURE CLASS		
Problem	**Cause**	**Remedy**
Broken	Miscellaneous	City Repaired
		Contractor Repaired
Locate	Miscellaneous	Trace/Probe
New Cleanout Installation	No Cleanout	City Installed
		Contractor Installed

Exhibit 4
Failure Hierarchy for Wastewater Service Lines

Problem	**Cause**	**Remedy**
Broken Service Line	City department hit	City Repaired
	Contractor hit	Contractor repaired
	Unknown	
	Bad Connection	
Clogged Service Line	Belly in line	City repaired
		Contractor repaired
	Debris	Jet
		Rodded service
	Grease	Jet
		Jetted and chemical
		Rodded service
	Inflow or infiltration	Repair
	Private problem	Notify
	Roots in line	Chemical
		Cut roots
		Chemicals and cut roots

Exhibit 5
Failure Hierarchy for Wastewater Collection Mains

Problem	**Cause**	**Remedy**
Broken Force Main	City Hit	Repair
	Contractor Hit	Repair
	Corrosion	Replace
Broken Gravity Main	City Hit	
	Contractor Hit	
Dropped Tap	Unknown	City repair
		Contractor repair
Grease	Commercial	Chemical
		Chemical and vacuum
		Vacuum
	Residential	
Bad connection		
Debris		
Inflow or infiltration		

Mapping Work Orders and System Problems

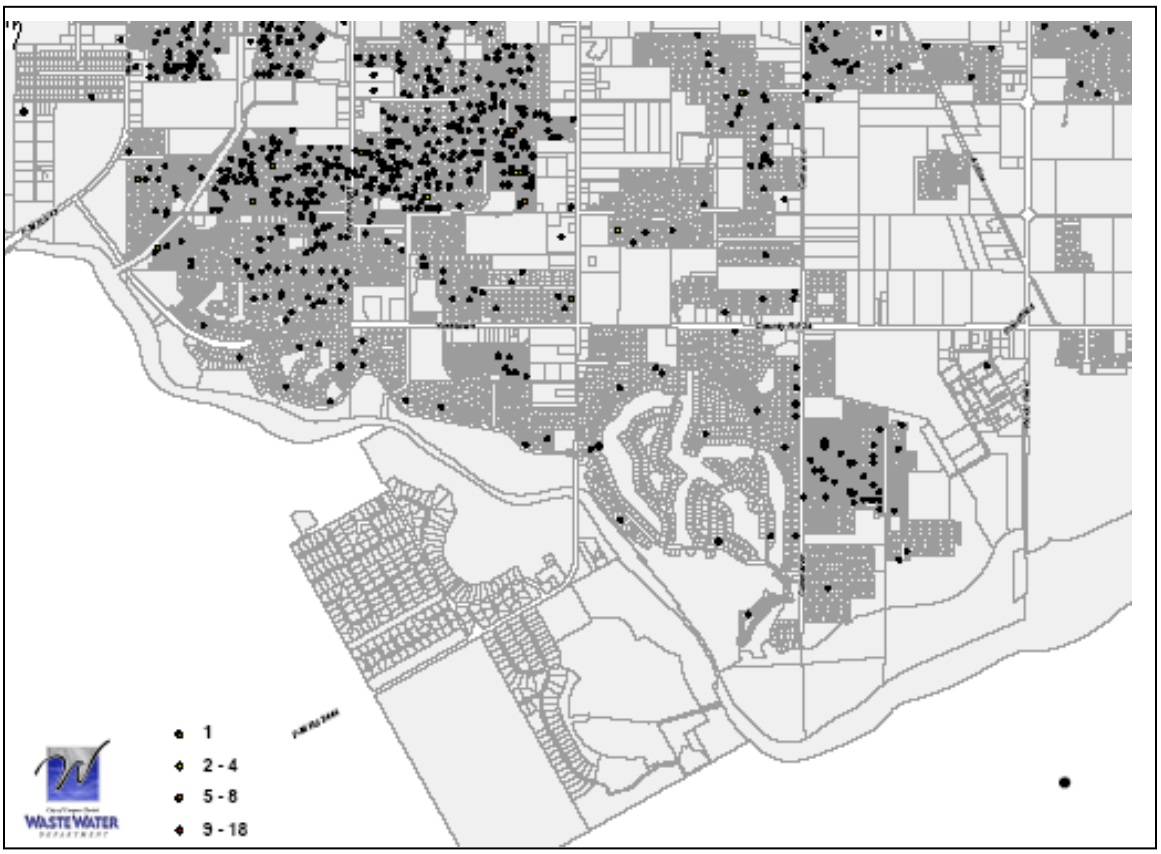
The system provides the ability to map all customer calls for service and the location of the call is mapped either to a specific utility customer or to a specific wastewater main segment. WAMS provides a history of all customer calls by type, department, and activity. It also provides history of all collection system work performed at any specific location and a database of system component characteristics including pipe size, pipe type and depth.

We routinely produce maps of service areas identifying line segments with the most frequent service interruptions, or draw upon the failure coding hierarchy to isolate particular problems or issues.

Any WAMS user may run a query and export the returned values or work orders into a table and e-mail it to the GIS technician. The technician may then easily map the work orders because every work order has a location. GIS locations existed long before WAMS. They are the pipes, manholes, platted properties, streets, and other layers that most utilities have in place. Each asset's associated attributes also are viewed in WAMS and used in management decisions such as pipe depth, size, type, and date installed. Management may also request the technician to run a query directly using "views" that are predefined tables that "view" into the master tables in the WAMS.

Exhibit 6

Example of Mapping Back-up Calls Received



Using Aerial Photography to Pre-Plan Work from the Office Improves Efficiency

The County, in coordination with the City and other entities, developed a database updated every two years of low level aerial photography. The photos were taken at oblique angels from four different angles and from directly above. Any potential job site may then be analyzed prior to initial field investigations. The perfect example for collection system work is the need to repair a main segment in the rear easement. The extent of work to be preformed can then be further identified and planned such as access points through yards, structures over the easement, trees and fences to be removed. A simple example is that of a manhole reported to have a broken collar. The photos are

used to identify the exact location of the manhole to determine if it is in the street, sidewalk, or grass.

Exhibit 7
Example of Aerial Photography

Summary and Conclusion

Management of Corpus Christi's Wastewater Collection has improved customer service and the underlying collection system infrastructure by systematically using a computerized work and asset management system that is interfaced with the City's Geographical Information System. The first step was determining exactly what is meant by "customer service" and then determining how to measure the service level. A key tool is using a GIS-integrated work and asset management system to provide a roadmap to improving the collection system asset infrastructure. Our computerized work and asset management system is going beyond our initial more rudimentary aspects of work order tracking and labor utilization, and has become an invaluable tool for asset management in the Wastewater Collection System.

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