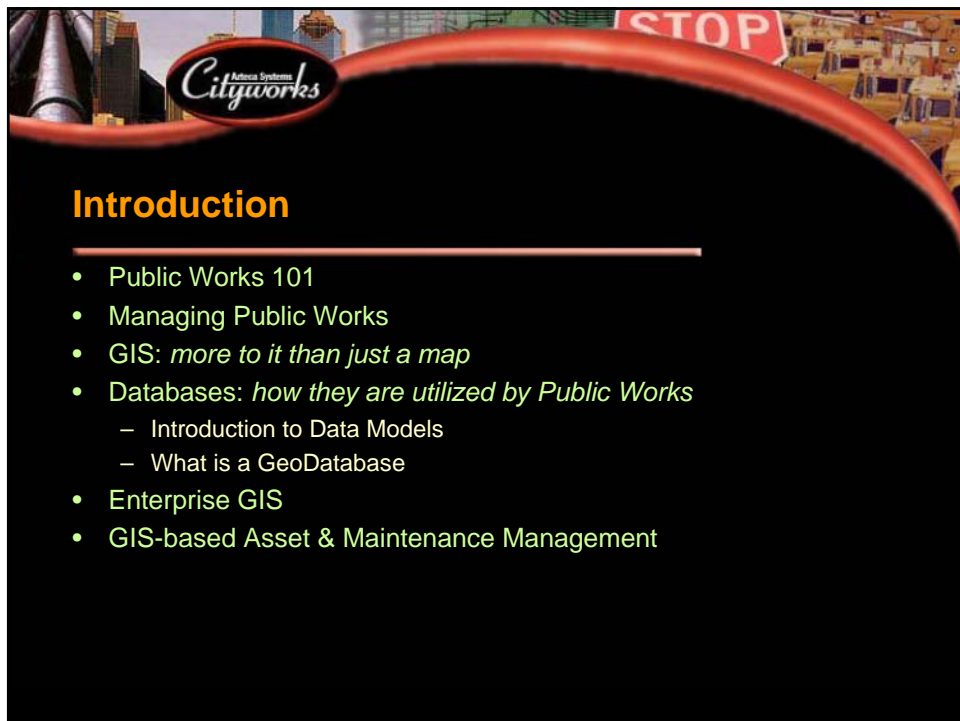


Managing Public Works Using GIS

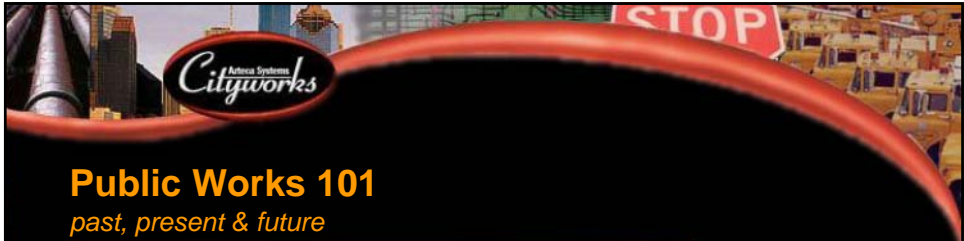
Enterprise GIS-based Asset and Maintenance Management

Tom Palizzi
Azteca Systems



Introduction

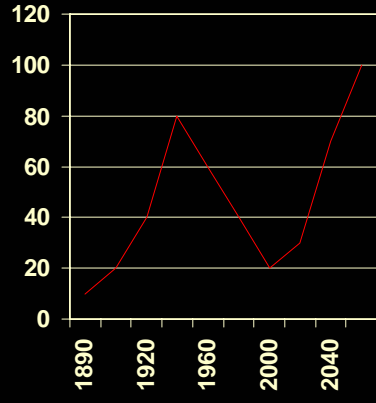
- Public Works 101
- Managing Public Works
- GIS: *more to it than just a map*
- Databases: *how they are utilized by Public Works*
 - Introduction to Data Models
 - What is a GeoDatabase
- Enterprise GIS
- GIS-based Asset & Maintenance Management



Public Works 101

past, present & future

- Past
 - Old practice
 - Dates back to the 1800's
 - "If it ain't broke, don't fix it"
- Present
 - Discovering Technology
- Future
 - Failing US infrastructure
 - Big demand for money towards capitol improvement / replacement



Year	Value
1890	10
1920	40
1960	80
2000	20
2040	100



Public Works 101

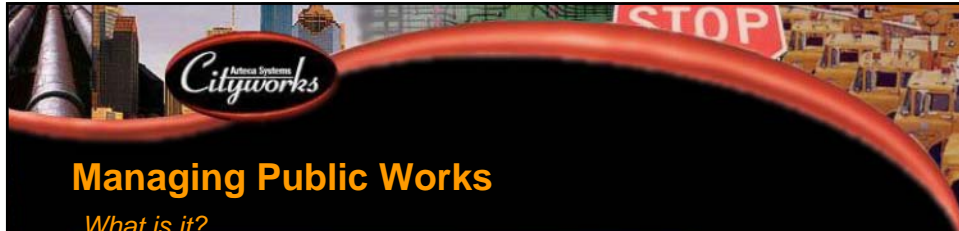
Management

- Asset Management
- Work Management
 - Reactive
 - Preventative
 - Tests & Inspections
- Reporting
- Meeting regulatory requirements
 - GASB 34
 - NPDES
 - CMOM








-
- Public Works 101**
Users
- **User level (PW staff)**
 - Application = business process
 - Modeling work flow
 - View , access
 - Limited data editing
 - automated
 - Use of data in day-to-day operations
 - Use of mapping to support location quality of data
 - **Power User (GIS-guys)**
 - Create/maintain data
 - Extend application
 - Integrate with other applications
 - Financials / Billing
 - Customer Information System
 - Use of mapping in related presentations



Managing Public Works

What is it?

- Asset Management
- Maintenance Management System
- Performance Modeling
- Financial Management
- Personnel
- Equipment
- Materials


Managing Public Works

Why?

- Understand maintenance history
 - Per asset
 - Per system
- Financial impacts
 - Current & historical impacts
 - Future costs of improvement
 - Future costs of replacement
- Regulatory
 - GASB 34
 - NPDES
 - CMOM





Managing Public Works

Why?

- Customer Expectations
 - Safe roads
 - Fresh water
 - When you flush ...
- Things wear out
 - Need maintenance
- Things break ...







Managing Public Works

GIS in Public Works

- Infrastructure inventory
 - Model of real-world infrastructure system
 - Represents “networked” system
 - Water/Wastewater
 - Streets/Traffic










Managing Public Works


Innovations

- Performance modeling
 - Long term planning and preventative maintenance
- Resource allocation
 - Scheduling
 - Routing
- Automated Vehicle Location
 - Work optimization
 - Logistics


GIS: more than just a map

- Database technology
 - CAD is merely line work – *dumb features*
- Map is really ...
 - a view to the database
 - a “by-product” of the database
- 80% of work is tied to geographic location
- GIS is an intelligent, spatial database
- Perfect tool for Public Works
 - Points: hydrants, manholes, poles (signs), trees, ...
 - Lines: streets, pipes, wires, ...
 - Polygons: ponds, buildings (treatment plants), ...



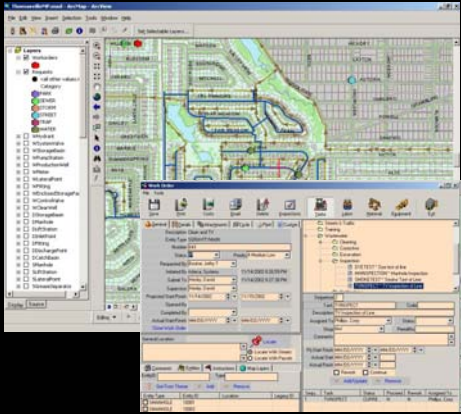
GIS: more than just a map
A GIS application work for Public works?


- Public Works often the reason for GIS
 - Many agencies acquired GIS to map infrastructure
 - DPW often financed initial GIS procurement
 - ROI? – often times PW has not seen benefits
- Problems:
 - Spatial data development consumes resources and funding
 - Agency not adept at application development
 - Public Works user not technologist



GIS: more than just a map
Benefits to Public Works

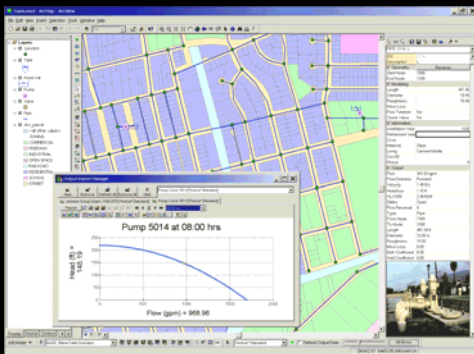

- Leverage spatial data investment
 - GIS database *is* the asset inventory
- Scalable, open, shared (enterprise) database
- Utilize inherent spatial tools of GIS
 - System trace
 - Valve isolation
 - Vehicle Routing
 - Intuitive planning/scheduling
 - Visual data management






GIS: more than just a map
Extensible

- Base system for Enterprise
- Useable by agency & constituents
- Third party applications
 - Hydraulic Modeling
 - Demographics
 - Routing & Scheduling
 - Planning & Design
 - Visualization

Databases: how are they utilized

- What is a GeoDatabase?
- Introduction to Data Models
- ArcGIS GeoDatabase
- Supported standards
- Cityworks data models

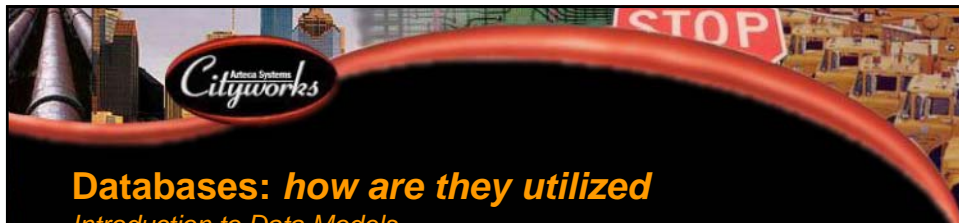


Databases: how are they utilized

What is a Geodatabase?

- Object-oriented data model
- Features (asset inventory) is stored in a spatial database
 - Oracle, Microsoft SQL/Server, Informix
- *Smart features*
 - behave like the real-world objects they represent

A container for asset data

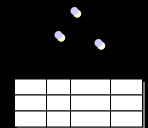


Databases: how are they utilized

Introduction to Data Models

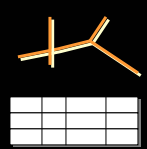
- Method for modeling your environment in a data base

hydrants



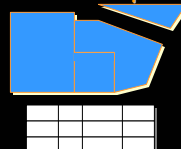
- Must connect to hydrant laterals
- Have associated valves
- Are tied to maintenance records
- Capture address from parcel

water mains



- Service drops must connect at a tap fitting
- PVC used only for sizes under 6 inches
- No runs longer than 4000 feet without a valve
- All features be within R-O-W

detention pond



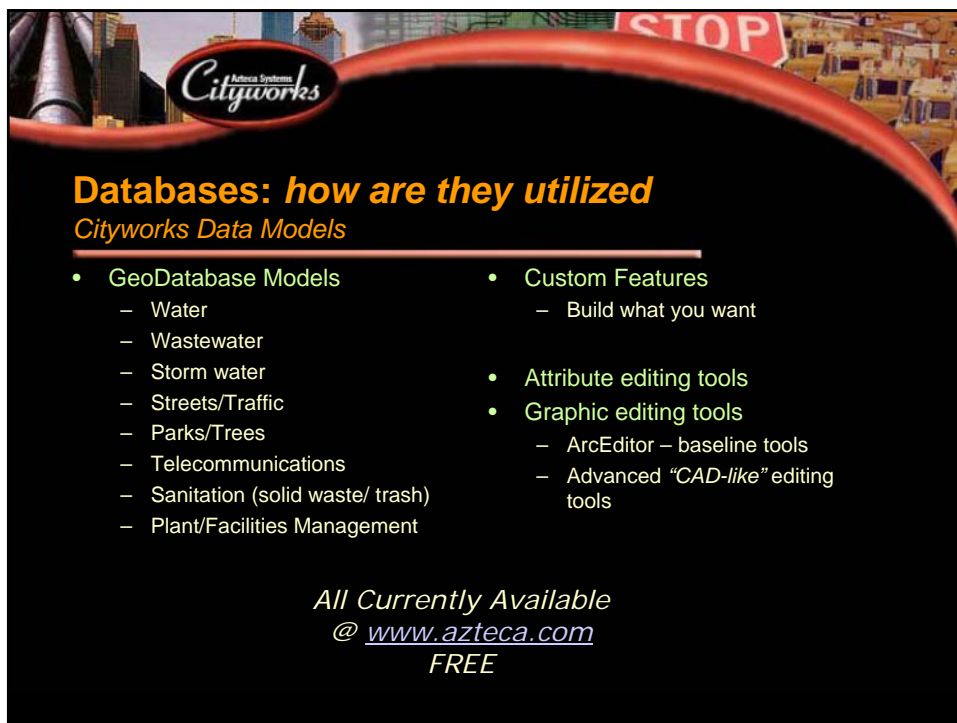
- Areas must be connected to stream
- Landuse type should be municipal services
- Areas containing wetlands should be restricted



Databases: how are they utilized
ArcGIS® GeoDatabase Models

- Industry Standard Data Models
 - Water Facilities
 - Conservation
 - Defense
 - Energy Facilities
 - Forestry
 - Hydrology
 - Parcel
 - Transportation
 - And more ...


*All Currently Available
 @ www.esri.com
 FREE*



Databases: how are they utilized
Cityworks Data Models

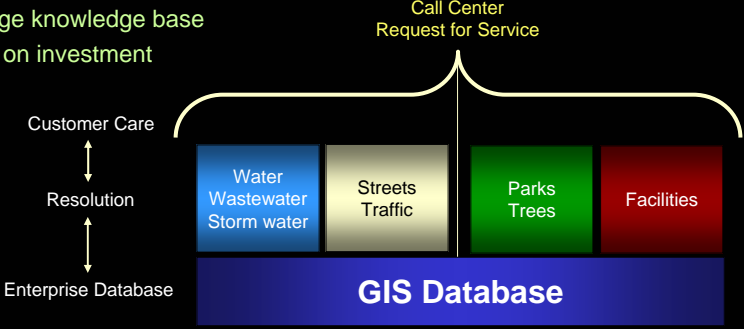
<ul style="list-style-type: none"> • GeoDatabase Models <ul style="list-style-type: none"> – Water – Wastewater – Storm water – Streets/Traffic – Parks/Trees – Telecommunications – Sanitation (solid waste/ trash) – Plant/Facilities Management 	<ul style="list-style-type: none"> • Custom Features <ul style="list-style-type: none"> – Build what you want • Attribute editing tools • Graphic editing tools <ul style="list-style-type: none"> – ArcEditor – baseline tools – Advanced “CAD-like” editing tools
--	---

*All Currently Available
 @ www.azteca.com
 FREE*


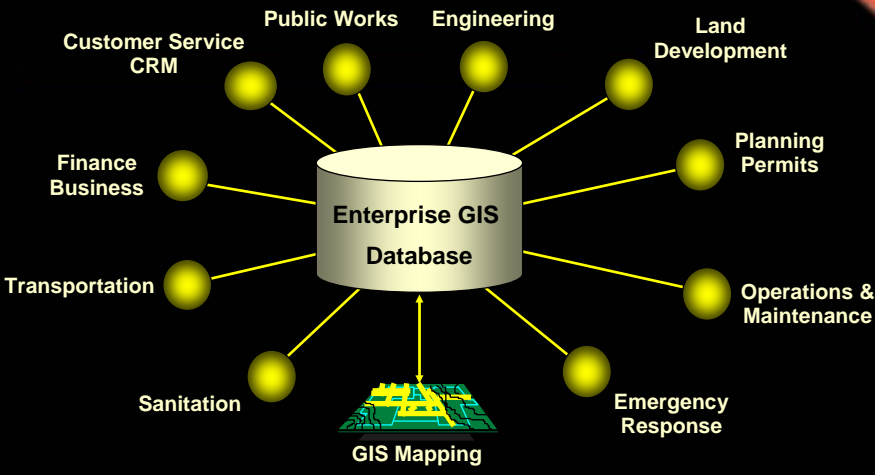


Enterprise GIS

- Share common data among users
 - Share a common geography
- Leverage knowledge base
- Return on investment



The diagram illustrates the data flow for Enterprise GIS. At the bottom is the **GIS Database**, which contains four main categories: **Water Wastewater Storm water** (blue), **Streets Traffic** (grey), **Parks Trees** (green), and **Facilities** (red). Above this database is the **Resolution** process, which is linked to **Customer Care** and **Enterprise Database** via bidirectional arrows. A bracket above the database categories points to a **Call Center Request for Service**.

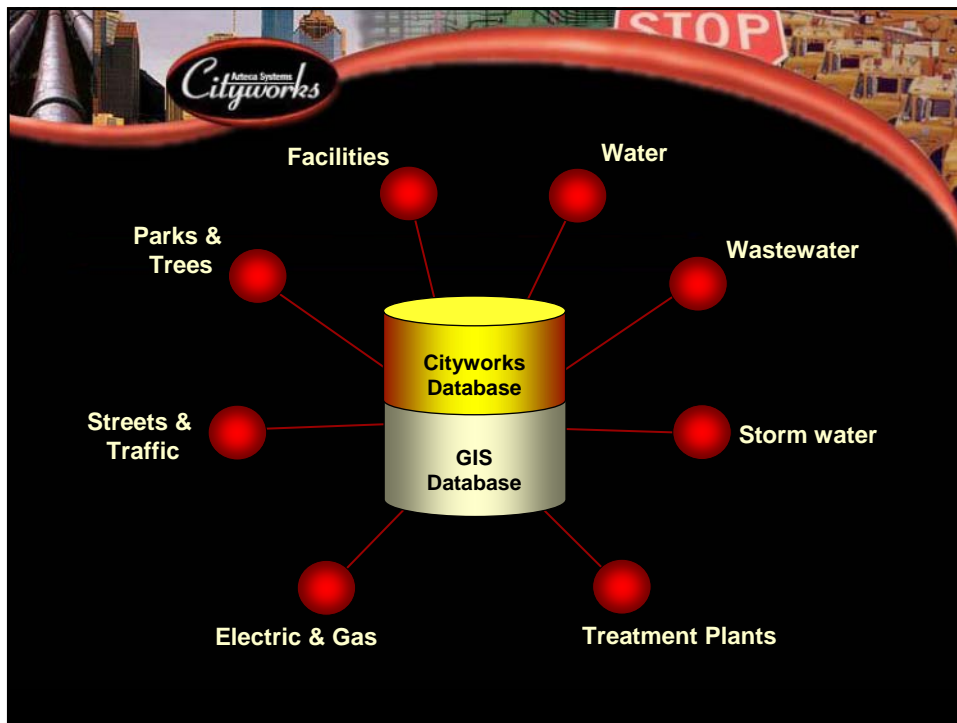



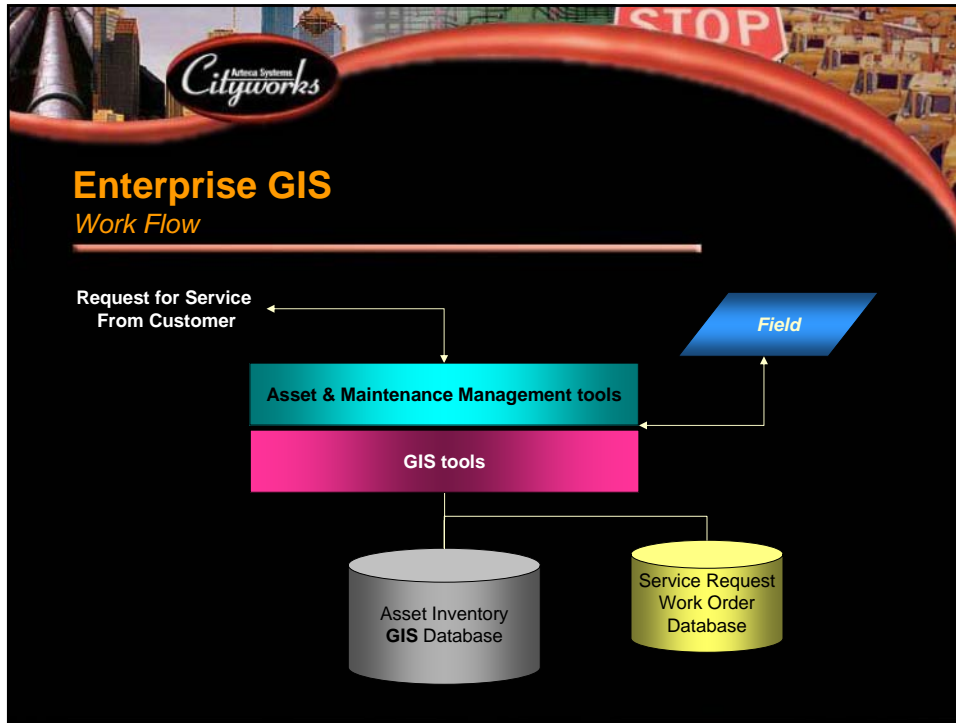
The diagram shows the **Enterprise GIS Database** as a central hub. It is connected to several city departments and services, each represented by a yellow sphere: **Customer Service CRM**, **Public Works**, **Engineering**, **Land Development**, **Finance Business**, **Planning Permits**, **Transportation**, **Operations & Maintenance**, **Sanitation**, and **Emergency Response**. At the bottom, **GIS Mapping** is shown with a map icon, connected to the central database.



Enterprise GIS

- Scalable across *Enterprise*
 - Department
 - Division
 - Organization
- Open system design
- Departmental control
- Fully integrated with ESRI® technology
- Interoperability among related applications
 - Call Center
 - Permitting
 - Utility Billing
- Extension products expand functionality
- Supports leading relational databases
 - Oracle®
 - Microsoft® SQL/Server





GIS-Based Asset/Maintenance Management

- CMMS & EAM
 - Asset Management
 - Maintenance management
- Enterprise GIS-based system
 - GeoDatabase is the asset database (**UNIQUE**)
- GIS data-based (GeoDatabase) application
 - Application based on the GIS data, **NOT** the GIS tools!

The screenshot shows the Cityworks GIS application interface. It features a map view with a street grid and a red "STOP" sign. Overlaid on the map are several windows: a "Work Order" form with fields for "Requested By", "Requested Date", "Scale To", "Requested Priority", "Requested Work Order", "Assigned To", "Assigned Date", "Status", and "Comments"; a "Properties" window showing details for a selected feature; and a "Layers" window on the left. The interface is complex and typical of a professional GIS application.



GIS-based System

Functionality:

- Asset Management
- Service Request
- Work Orders
 - Asset-based
 - Address-based
- Tests & Inspections
- Activities & Tasks
- Administration tools (Designer)

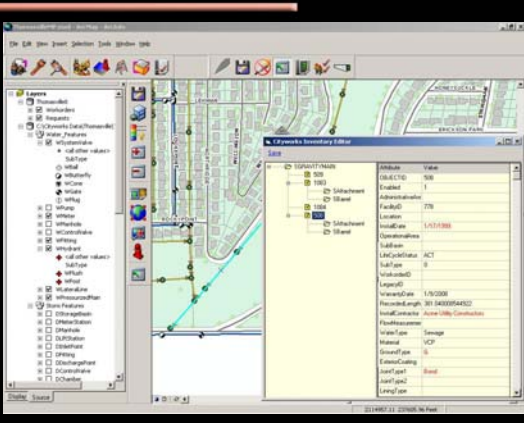
Features:

- Cost summary
- Search & Reporting
- Interactive map display
- Fully integrated with GIS
- Electronic Time Keeping
- Common user interface
- Data Model Independent




Asset Management

- Comprehensive Asset Inventory management
- Custom fields
- Linked to spatial objects
- Device hierarchy
- Illustrate connecting features
- Maintain maintenance history

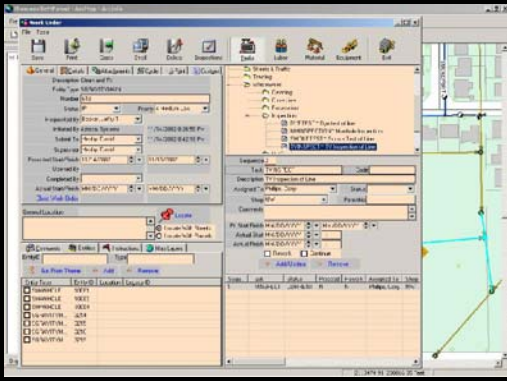



Attribute	Value
Device ID	108
Enabled	1
Administrative	
Facility	778
Location	
Install Date	1/21/2008
Operational	
Tagline	
Link to Status	ACT
Sub Type	0
System ID	
Legend	
Created Date	1/21/2008
Modified Date	3/1/2008 (3400504832)
Parent Name	Asset (108)
Parent ID	
Unit Type	Storage
Material	SCP
Group Name	0
External Code	0
Asset Code	Asset
Asset ID	
Asset Name	




Service Request

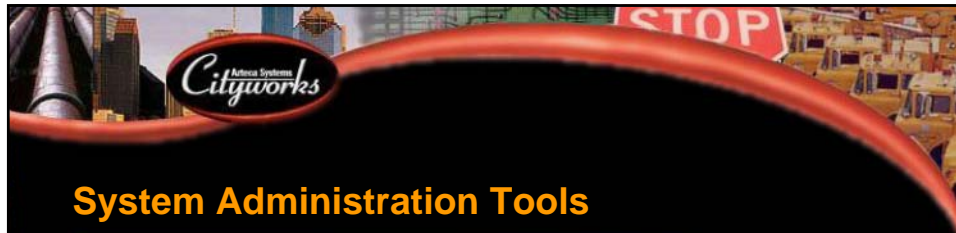
- Initial request for service
- Caller information
- Track labor
- Search/reporting
- Links to Work Order

Work Order

- Linked to Service Request
- Task oriented
- Track (estimated & actual)
 - Labor
 - Materials
 - Equipment
 - Costs
- Print
- Inspections/Tests
- Cost Summary





System Administration Tools

- Set up templates
- Employees, labor
- Materials, Equipment
- Tasks
- Problem codes
- Permits
- Inspections
- Access/Passwords
- Security

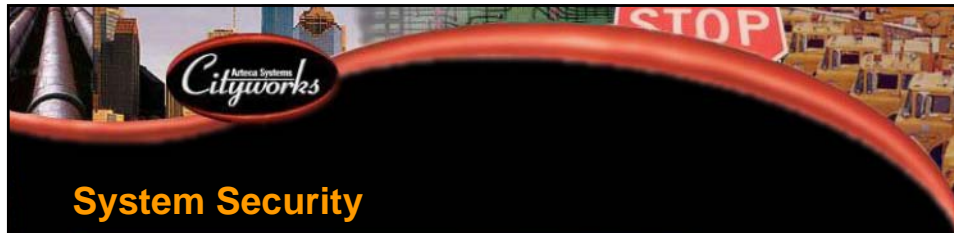



Search & Reporting

- Standardized Reports
- Open Access to Database for Custom Reports
- Open report writing tools
 - Crystal Reports
 - Oracle
 - Access



ID	Description	Priority	Status	Subst To	Projected Start Date
26	Adjust Depth	3			6/8/2000 11:30:3
80	Corrosion Protection	3		Carter, Johnny	5/9/2000
177	Dye test	3			6/7/2000 11:30:3
190	Dye test	3			3/10/2000
169	Dye test	3			2/1/2000
120	Flow test	3		Haroon, Doug	11/17/1999
129	Flow test	3			6/6/2000 11:30:3
131	Flow test	3		Hardy, David	6/7/2000 11:30:3
146	Flow Test	3			11/5/1999



System Security

- Individual
- Group level
- Department level
- Login/Password
- Access control

Cityworks Database Manager

Access Rights

Access Rights: Users Groups

You must create users with your database administrator tools. This tool gives you additional flexibility in customizing access to Cityworks forms for users and groups. Note: Citywork's groups can only be created here. Database groups are not recognized in Pipeworks.

Group ID	User ID	Access Rights
UMSECHIEF	DRAWLINS	0000100001011101001010
UMSECHIEF	CSTEWART	0000100001011101001010
UMSECHIEF	EMCQUEEN	0000100001011101001010
UMSECHIEF	JWALKER	0000100001011101001010
UMSECHIEF	JBREEDLO	0000100001011101001010
UMSECHIEF	LGAINES	0000100001011101001010
UMSECHIEF	RIBANS	0000100001011101001010
UMSECHIEF	RLUNA	0000100001011101001010
UMSECHIEF	RGAINES	0000100001011101001010
UMFSUP	CMCCLEND	000000001001100001010
UMFSUP	MBANKS	000000001001100001010
UMFSUP	VTREAMES	0000000000000000000000

Add/Modify/Delete Users

Group ID:

User ID:

Access To This Form
 Code Tables
 Inventory Data Entry
 GIS Tools
 Unit of Measure
 Labor Hierarchy
 Material Hierarchy
 Equipment Hierarchy
 Work Order Templates
 Create/Edit Work Order
 Delete Work Order


Cityworks Database Login

Database:

User ID:

Password:

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 1997 Patented Version 3.0.128



Extensible

- Call Center
- Field
- Storeroom Management
- Performance Tools
 - GASB 34
 - Asset Analysis



Call Center


- Easy-to-use
- Call-taker application
- Scalable
- Integrated with GIS database
- Initiate Service Request
- Executive Information System




Field Tools: Handheld

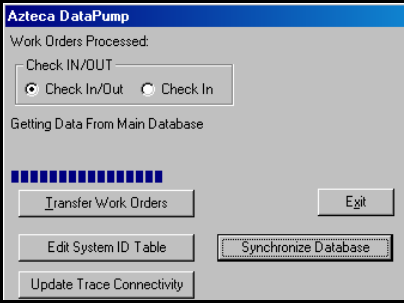
- Handheld / PDA
- Wireless or physical network
- Asset inventory
- Attribute editing
- Real-time tracking





Field Tools: PC-based

- Check In/Out
 - Check out submitted to work orders
 - Check out work order IDs
 - Check in updated work orders
- Check In
 - Check in work orders
- Update System IDs
- Synchronize databases
- Update Trace Connectivity



Storeroom Management

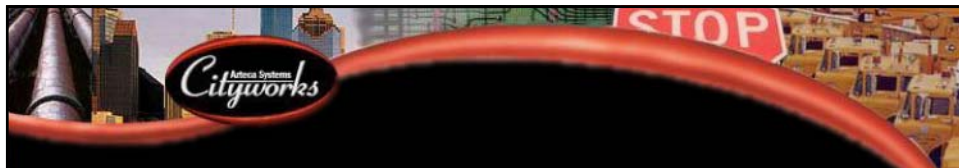
- Materials
- Suppliers
- Requisition
- Issue
- Receive
- Transfer
- Audit
- Transaction history





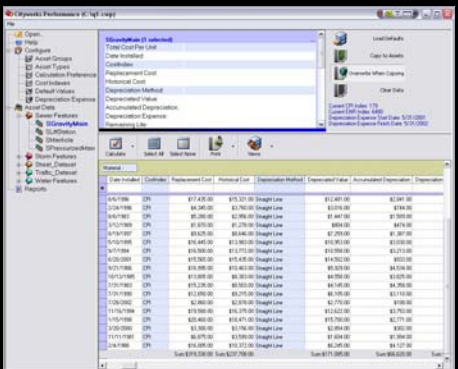
Performance: Financial / GASB 34

- Infrastructure inventory
- Condition
- Infrastructure valuation
- Historical costs
- Depreciation
 - Standard & Modified
- Reporting tools/templates

Performance: Asset Analysis


- Extensible to external modeling systems
 - Pavement
 - Hydraulic
 - Signs
 - Bridges
- Condition rating
- Infrastructure performance
- Recommended maintenance





Azteca Systems

- Only *GIS-based* solution
- Leading developer of Asset/Maintenance Management Systems (CMMS/EAS)
- Since 1986
- Exclusive partner to ESRI
- 30 employees
 - Salt Lake, Los Angeles, Dallas, Chicago
- 25 – 35% annual growth
- Worldwide Business Partners
 - Engineering firms
 - GIS Consultants




Azteca Systems

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