This presentation premiered at WaterSmart Innovations

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INNOVATIONS

Residential Landscape Irrigation Audits using GIS Technology

Nancy Scott
Conservation Manager
Water District No. 1
Johnson County, Kansas

WaterOne
Water District No. 1 of Johnson County

About The District

- A rapidly growing suburban metro area.
- Max. day increasing faster than ave. annual day.
- Frequent treatment plant expansions driving rates up.
  - Current capacity 180 mgd
  - Capacity in 2009 210 mgd
- Customers wanting less volatile rates.

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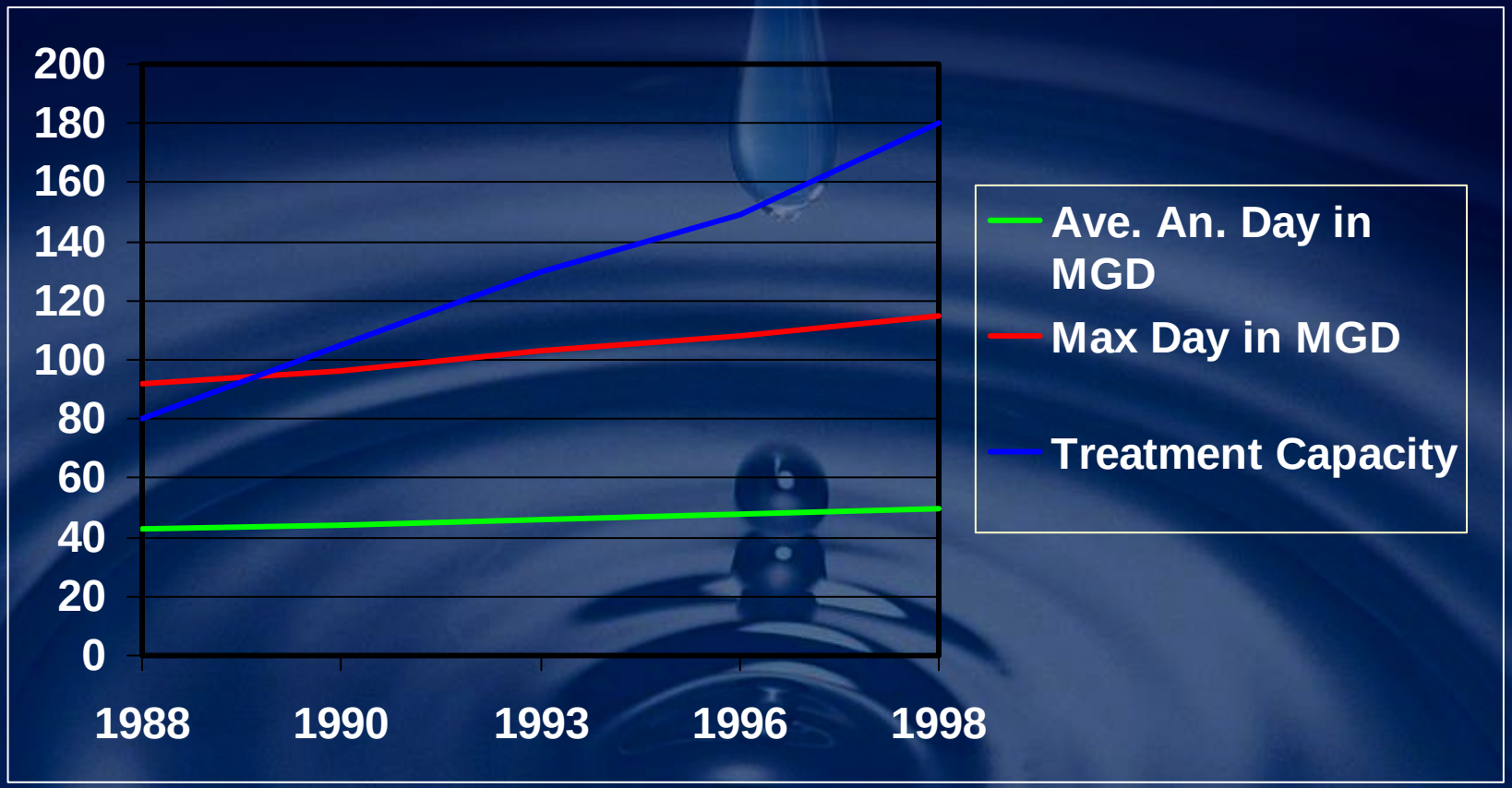
Rapid Growth



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Service Area Characteristics

- 271 Square Miles
- 15 Cities and portions of 3 other cities
- Suburban Population: 400,000
- 135,000 Connections
- 90% of customers are single-family residential.

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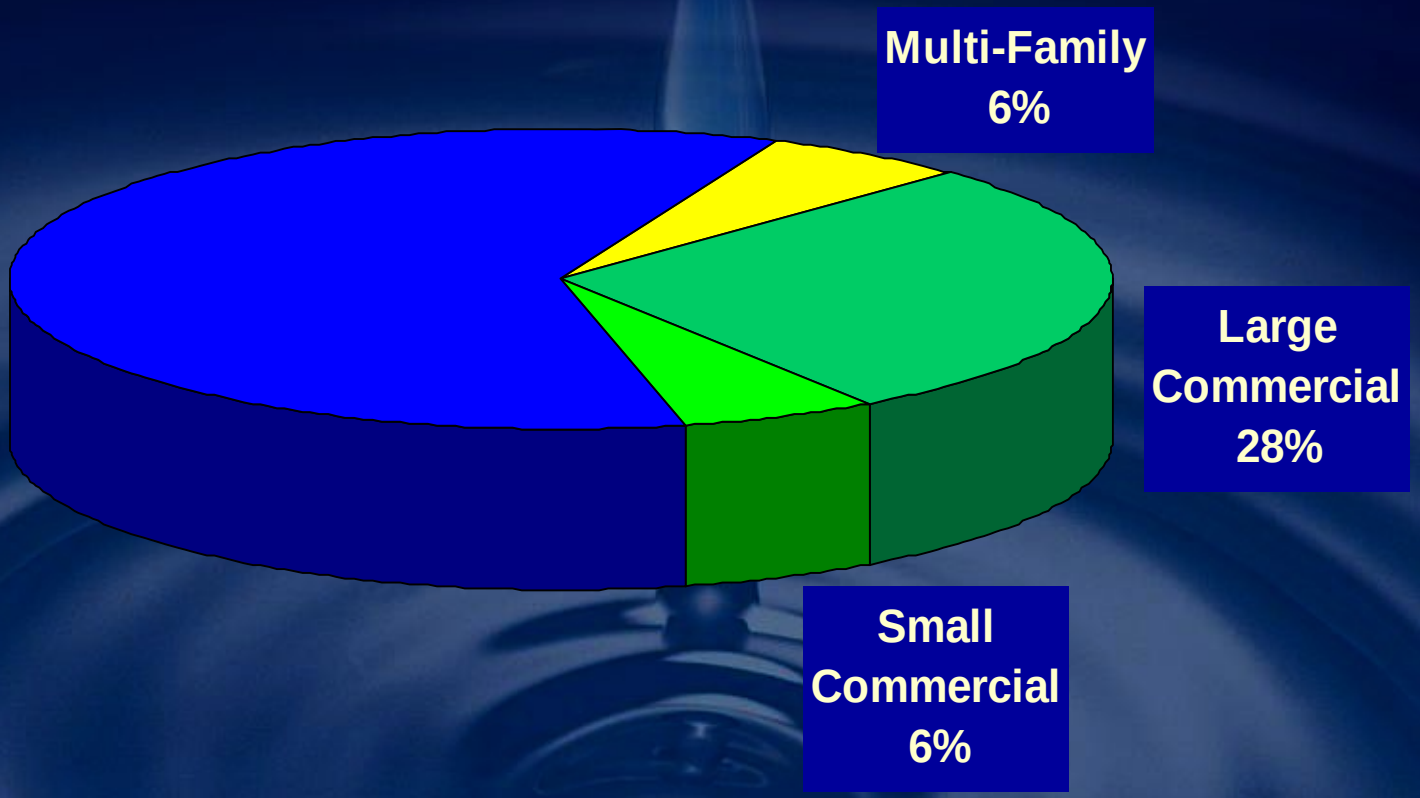
Outdoor Water Usage By Customer Category



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Local Climate and Soils

- Annual rainfall approx. 40 inches.
- Summer storms are short and intense.
- Heavy clay soils throughout area.
- High potential for runoff.

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Landscape Characteristics

- Over 90% of residential irrigated area is turf.
- Bluegrass is most prevalent turf.
- Lower water-using turf is typically managed as if it were Bluegrass.
- Irrigation times and frequencies are excessive relative to rainfall.
- Irrigation water is generally applied at a greater rate than the soil can absorb.

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Landscape Characteristics (Cont.)

- Single family customers are the largest outdoor water users.
- Approximately 30% of customers have automatic irrigation systems.
- Customers in new residential areas tend to use more water and are more apt to have automatic irrigation systems than customers in the older, established areas.

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Common Landscaping Problems

- City ordinances and HOA by-laws require lush, green turf.
- Irrigation systems are poorly designed.
- Irrigation clocks are typically programmed to apply two inches of water per week from April through October. "Set it and forget it."

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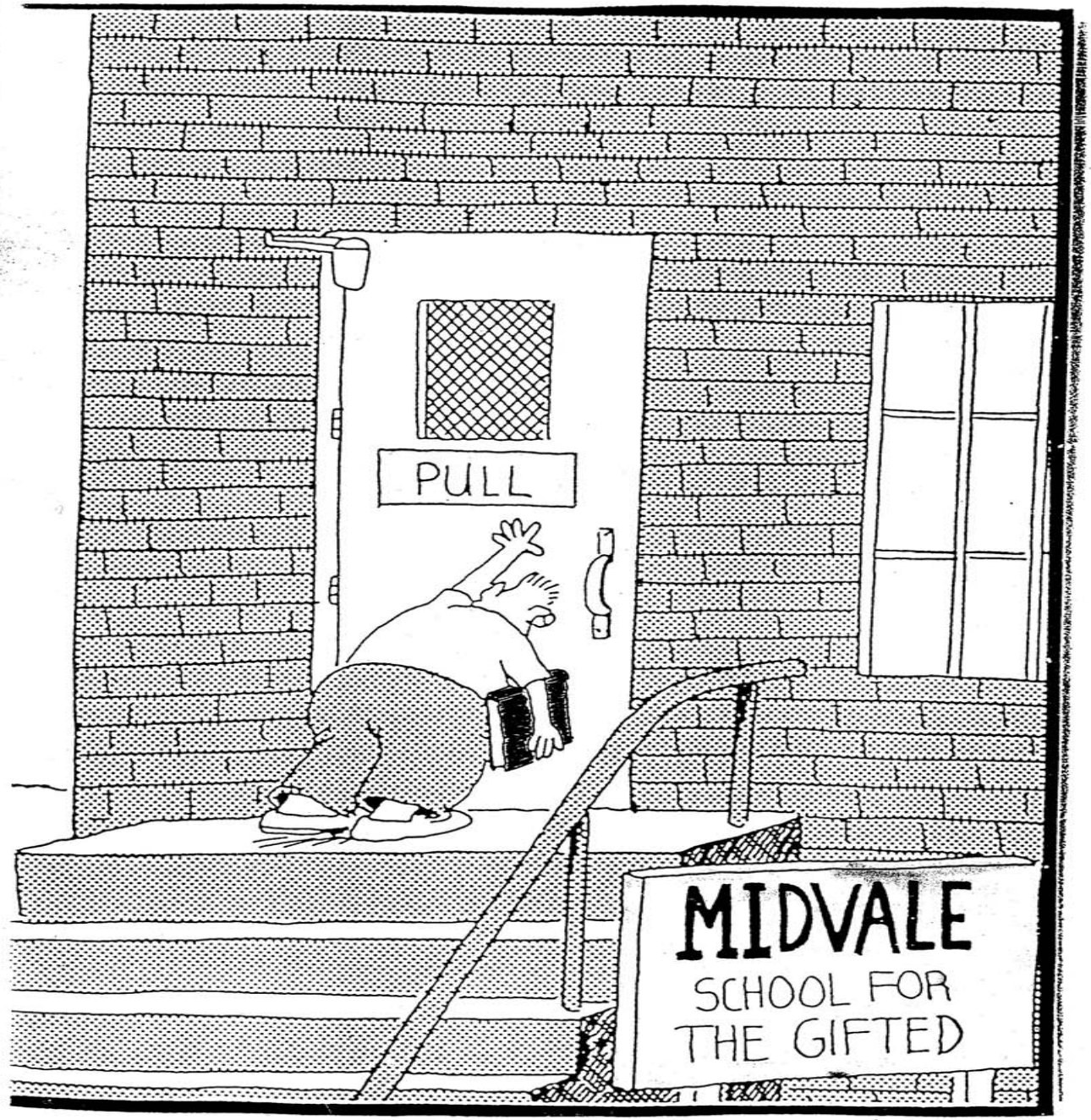
PULL
MIDVALE
SCHOOL FOR
THE GIFTED

Demand Management Program Goals

- Reduce peak outdoor water demands with the least amount of lost revenue.
- Delay future expansion of treatment facilities.
- Estimated savings is approximately $4 million per year of delay.

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Residential irrigation audits

- Very popular customer service
- Methods implemented
  - Version 1.0
  - Version 2.0 and 2.1
  - Version 3.0 (Hopefully)
  - Web site self-audit

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Summary of Customer Evaluations

- Over 15,000 audits have been completed
- 35% of customer surveys are returned
- 73% of respondents expect to implement suggested changes to reduce water use
- 33% of respondents expect to cut water use by 5-15%
- 42% of respondents expect to cut water use by greater than 15%
- 30% customers were watering well below ET with great results. Landscapes looked great.

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Original Residential Audit Program

- Used IA “Calculation of System Performance” - No.2 and No.3 using catch cans
- Took an average of 2 hours in field and 30 minutes at the office
- Mailed reports caused customer confusion
- Residential customers were less apt to implement changes

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New and Improved Residential Audit Program - 1998 Version 2.0

- Used IA “Calculation of System Performance” - No.1 using square footage of irrigated areas and flow rates
- Took an average of 60 minutes in field and 30 minutes in the office
- Mailed reports caused customer confusion
- Follow up indicated that customers were still reluctant to implement changes

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Irrigation System Evaluation Worksheet

Current Service Data

Service Address | **Meter Size** | **Consumption Class**

Acct No (| **Phone (H)** | **(W)**

Name | **Notes** 5 zones

General Irrigation System Data

Audit Date 7/1/2008 **Time** 7:30 AM **Auditor** Jennifer Smith

Lot Size 10980 Irrigated Area 8710 Turf Area _____ Turf Type C,S

No. of Zones 5

Sprinkler Make Rainbird Model No _____

Rain Sensor ____ (Y, N) Excess Thatch ____ (Y, N) Cycles ____ (Y, N)

Normal Runtime Days 3(A) Time 4am = A

Beginning Reading 0186594.2 Ending Reading 0186758.5

Notes No mumnt 1716700 6/17

10058 14 days

718 gal/day

1715 gpd

39 SL6

Water District No. 1 of Johnson County

Irrigation System Evaluation Worksheet

Station Inspection Data								
Program ID								
Station No	1	2	3	4	5			
Normal Runtime	30	10	30	15	15			
Gallons Per Minute	18	14	16	20	17			
Square Footage	2184	1150	2772+2604			(5376)		8710
Shade (N,L,M,H)*								
Head Inventory	6	7 X	5	5				
Pop Up		X						
Rotor	X		X	X	X			
Impact								
Stream Rotor								
Soaker								
Bubbler								
Full Head	1							
3 Quarters Head				1				
Half Head		4	2	2	3			
Side Spray Head								
Quarter Head	6	3	3	2	1			
Inspection Results								
Broken Head								
Broken Pipe								
Broken Seal								
Broken Valve								
Head Clogged								
Head Elevated								
Head Low								
Head OK								
Head Stuck								
Head Tilted								
Low Head Drainage								
Pressure Low								
Pressure High								
Radius Long								
Radius Short								
Spray Blocked								
Spray Misdirected								
1" of Water Sq. Ft. X .624	1362	717	3854		1			
Gallons per Zone Mins. X GPM	540	140	480	300	255	(1035)		=17
Inches of Water Applied/Watering	.40	.20	.30	.30	.30			
Recommended Time	22	12-15	—	—	—			

5023

42x66 + 84 + 31

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B4 = ='C:\MSOffice\Access\SWAT\[TESTRSLT.XLS]Service Audit Inspection Data'!$E$2

S ROY HEDGE

Station	Square Footage	1" of Water	MINS	FREQ	TOTAL MINS/WK	GPM	Apply Rate	TOTAL ApplyRt/Wk	TOTAL GAL/WK
1	2200	1373	20	7	140	28	0.41	2.86	3920
2	1100	686	15	7	105	22	0.48	3.37	2310
3	1100	686	3	7	21	23	0.10	0.70	483
4	3965	2474	30	7	210	28	0.34	2.38	5880
5	2965	1850	30	7	210	12	0.19	1.36	2520
6	2965	1850	30	7	210	11	0.18	1.25	2310
7	1800	1123	6	7	42	16	0.09	0.60	672
8	400	250	5	7	35	8	0.16	1.12	280
9	0	0	0.0	7	0	0.0	#DIV/0!	#DIV/0!	0
10	0	0	0.0	7	0	0.0	#DIV/0!	#DIV/0!	0
11	0	0	0.0	7	0	0.0	#DIV/0!	#DIV/0!	0
12	0	0	0.0	7	0	0.0	#DIV/0!	#DIV/0!	0
13	0	0	0.0	7	0	0.0	#DIV/0!	#DIV/0!	0
14	0	0	0.0	7	0	0.0	#DIV/0!	#DIV/0!	0
SQ FT		15496				ACTUAL	18375	1.90	
						GOAL	9660		

Worksheet A | Schedule A | Worksheet B | Schedule B | Alternate | Manual | Sheet6 | Sheet7

NUM

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90%

es New Roman 11

F10 =$F$7*B10

S ROY HEDGE

Month	Inches of Water Needed Per Week	Total Minutes to Water per Week													
		Zone1	Zone2	Zone3	Zone4	Zone5	Zone6	Zone7	Zone8	Zone9	Zone10	Zone11	Zone12	Zone13	Zone14
April	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
May	0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sept	0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0
October	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The watering schedule listed above shows the total amount of minutes to water per week and should be divided by the number of times you intend to water for that week. The schedule also assumes an average lawn setting with full-sun exposure, and an average year's weather. As the temperature changes throughout the watering season, it is better for your lawn and more water efficient to water deeply and infrequently. For example, in April you generally would only need to water once every ten to fourteen days because of the frequent rains and cooler temperatures in the Spring and Fall. In July, however, you generally would need to water every four to six days because of the hotter and drier weather conditions. Watering deeply and infrequently will train your lawn to send roots down deep in the soil which will give you a hardier more water efficient lawn. The amount of water shown above may be decreased in shady areas, and during cooler and wetter than normal weather conditions. No watering should be done after a soaking rain until the soil dries out.

Soils in most home lawns in Johnson County have a high clay content. Clay soils compact easily, restricting water penetration into the root zone. To fully water the root zone of the turf it may be necessary to water using the cycle and soak method. Water once nearly to the point of runoff, and then stop watering to allow time for the water to be absorbed into the soil. Water again 30 - 60 minutes later to apply the remaining amount of water. Slopes and extremely heavy clay soils may require the watering to be broken into three cycle and soak periods to avoid runoff.

NOTE: The average soil in Johnson County can only absorb about one-half of one inch of water per hour. The sprinkler gauge provided during your sprinkler evaluation can help you determine how long you can run your sprinklers before the water will start to run off. As a general rule of thumb, to avoid runoff, do not run pop-up type sprinkler heads for more than 10 minutes at a time. Rotor type and impact type sprinkler heads should only run for about 25 minutes at a time. If you want to apply more than recommended minutes worth of water, use the cycle and soak method described above. Refer to the Sprinkler Evaluation Summary Sheet enclosed to find out which type of sprinkler heads you have on your system.

Worksheet A | Schedule A | Worksheet B | Schedule B | **Alternate** | Manual | Sheet6 | Sheet7

NUM

New and Improved Residential Audit Program - 1998 Version 2.0

- Used IA “Calculation of System Performance” - No.1
- Took an average of 90 minutes in the field
- Hand-written reports were calculated and generated in the field.
- Allowed us to review the report with the customer, during a “teachable” moment.

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Water District No. 1 of Johnson County

New and Improved Residential Audit Program - 1998 Version 2.0 (Cont.)

- Allowed us to discuss and explain recommendations
- Allowed us an opportunity to address their fears about reducing their watering times
- Allowed us to assist them in making the recommended changes on the spot

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Water District #1 of Johnson Count Irrigation System Evaluation Summary

Name: _____ Appt. Date: _____ Time: _____ Auditor: _____

Address: _____ Irrigated Area: _____ Turf Area: _____ Frequency: _____

	Zone: 1	Zone: 2	Zone: 3	Zone: 4	Zone: 5	Zone: 6
Current Runtime:						
Rec. Time:						
GPM:						
*App. Rate:						

COMMENTS

Zone: 1 _____ Zone: 4 _____

Zone: 2 _____ Zone: 5 _____

Zone: 3 _____ Zone: 6 _____

	Zone: 7	Zone: 8	Zone: 9	Zone: 10	Zone: 11	Zone: 12
Current Runtime:						
Rec. Time:						
GPM:						
*App. Rate:						

COMMENTS

Zone: 7 _____ Zone: 10 _____

Zone: 8 _____ Zone: 11 _____

Zone: 9 _____ Zone: 12 _____

As the sprinkler system is currently operated, it uses approximately _____ gallons per cycle.

ADDITIONAL COMMENTS: _____

*Amt. of water applied in inches per watering.

Really New and Even More Improved Residential Audit Program Version 2.1

- Used IA “Calculation of System Performance” - No.1 and GIS technology.
- Takes an average of 45 minutes
- Computer generated reports are calculated and generated in the field.
- Allows us to review the report with the customer, during a “teachable” moment.

WaterOne

Water District No. 1 of Johnson County

Really New and Even More Improved Residential Audit Program Version 2.1 (Cont.)

- Allowed us to discuss and explain recommendations
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Water District No. 1 of Johnson County

sktop docking station

pricing call 888-925-5226

In the field or in the office the DESKDOCK Desktop Docking System enables the HH3 computer to be instantly connected to peripherals. Simply slip the computer onto the stainless steel alignment pins and tilt the computer back for full connectivity via one USB port, two serial ports, one parallel port, one PS/2 keyboard port, and power. All DESKDOCKS also include an SVGA connector which also can also be utilized if the Hammerhead is equipped for external video. Peripheral devices can be fully integrated within the DESKDOCK system. Made of heavy gauge extruded aluminum, the DESKDOCK can be bolted to a counter for maximum stability. With no moving parts, the DESKDOCK reduces clutter while providing years of reliable service.

- Compact design (6 1/2" high X 9" wide X 8 3/4" deep at base)
- No adjustments or moving parts for highest reliability
- Angled for easy viewing in nearly all conditions
- Standard connectivity using full-size connectors (1 EPP parallel port, 2 serial, 1 USB, 1SVGA video, 1 PS/2 keyboard, and 1 power connector)
- Recharges/powers HH3 with AC power supply.
- Optional integrated devices include: fax/modem, ethernet network adapter, CD ROM, floppy disk drive, and other data storage devices
- Built-in shielding and noise reduction circuitry
- Padded "feet" to prevent slipping or damage to desk surface
- Full-size standard connectors

Water District No. 1 of Johnson County

Irrigation System Evaluation Worksheet

Current Service Data

Service Address | **Meter Size** | **Consumption Class**

Acct No (| **Phone (H)** | **(W)**

Name | **Notes** 5 zones

General Irrigation System Data

Audit Date 7/1/2008 **Time** 7:30 AM **Auditor** Jennifer Smith

Lot Size 10980 Irrigated Area 8710 Turf Area _____ Turf Type CS

No. of Zones 5

Sprinkler Make Rainbird Model No _____

Rain Sensor ____ (Y, N) Excess Thatch ____ (Y, N) Cycles ____ (Y, N)

Normal Runtime Days 3(A) Time 4am = A

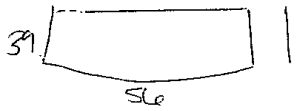
Beginning Reading 0186594.2 Ending Reading 0186758.5

Notes No mumnt 176700 6/17

10058 14 days

718 gal/day

1715 gpc



Water District No. 1 of Johnson County

Irrigation System Evaluation Worksheet

Station Inspection Data								
Program ID								
Station No	1	2	3	4	5			
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Shade (N,L,M,H)*								
Head Inventory	6	7	5	5				
Pop Up		X						
Rotor	X		X	X	X			
Impact								
Stream Rotor								
Soaker								
Bubbler								
Full Head	1							
3 Quarters Head				1				
Half Head		4	2	2	3			
Side Spray Head								
Quarter Head	6	3	3	2	1			
Inspection Results								
Broken Head								
Broken Pipe								
Broken Seal								
Broken Valve								
Head Clogged								
Head Elevated								
Head Low								
Head OK								
Head Stuck								
Head Tilted								
Low Head Drainage								
Pressure Low								
Pressure High								
Radius Long								
Radius Short								
Spray Blocked								
Spray Misdirected								
1" of Water Sq. Ft. X .624	1362	717	3854		1			
Gallons per Zone Mins. X GPM	540	140	480	300	255	(1035)		=17
Inches of Water Applied/Watering	.40	.20	.30	.30	.30			
Recommended Time	22	12-15	—	—	—			

50x23

42x66 + 84 + 31

Edit View Insert Format Records Tools Window Help

Main Switchboard

Water District No. 1 of Johnson County

SWAT Version 4

Welcome to the Sprinkler Water Audit Tracker

Exit SWAT

MAIN SWITCHBOARD

Report Switchboard

Service Switchboard

Schedule Switchboard

View

NUM


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Edit:
Select Area
Delete Area
Process:
Calculate Area
Save Zones
Print
Quit
Stop
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Image: L27


Current PIN: 2805069058
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221,334.43
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Select Area
Delete Area
Process:
Calculate Area
Save Zones
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Prop: L27
Image: L27
Image: L27


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elp, click Help Topics on the Help Menu.

Edit View Image Options Help

ArcView GIS 3.2a

File Edit Table Field Window Help

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Attributes of Zones

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Polygon	7	0.015	658.912	0	658.912	116.251
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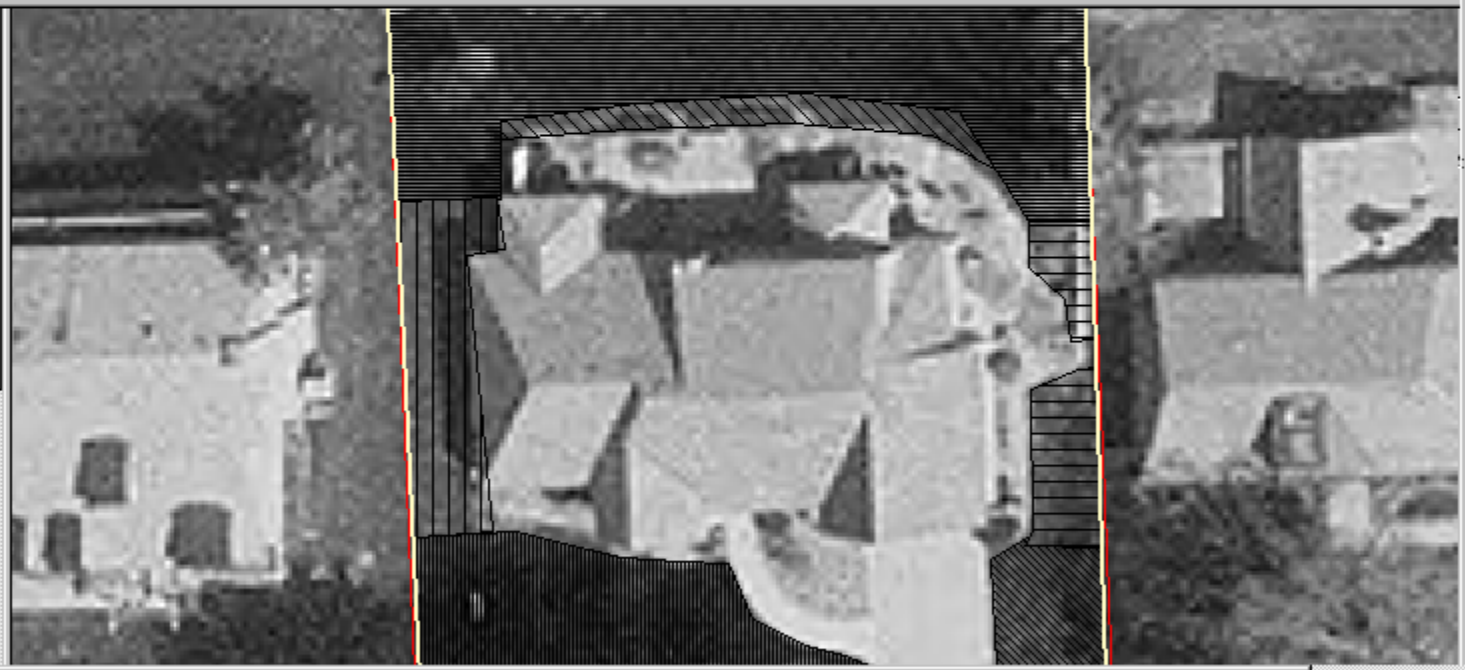

Current

Grid Size

Zone Nu

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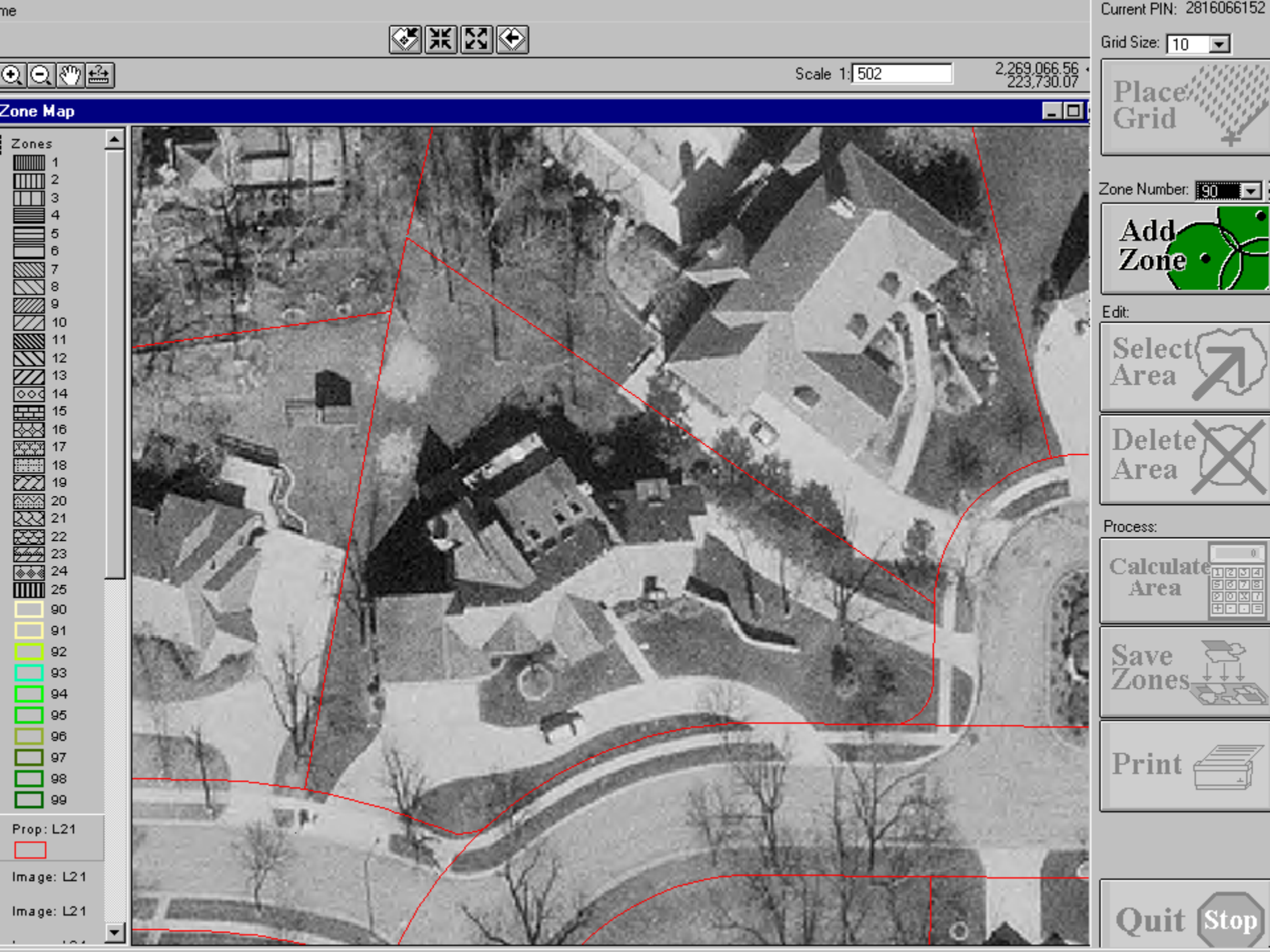
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Zone Map
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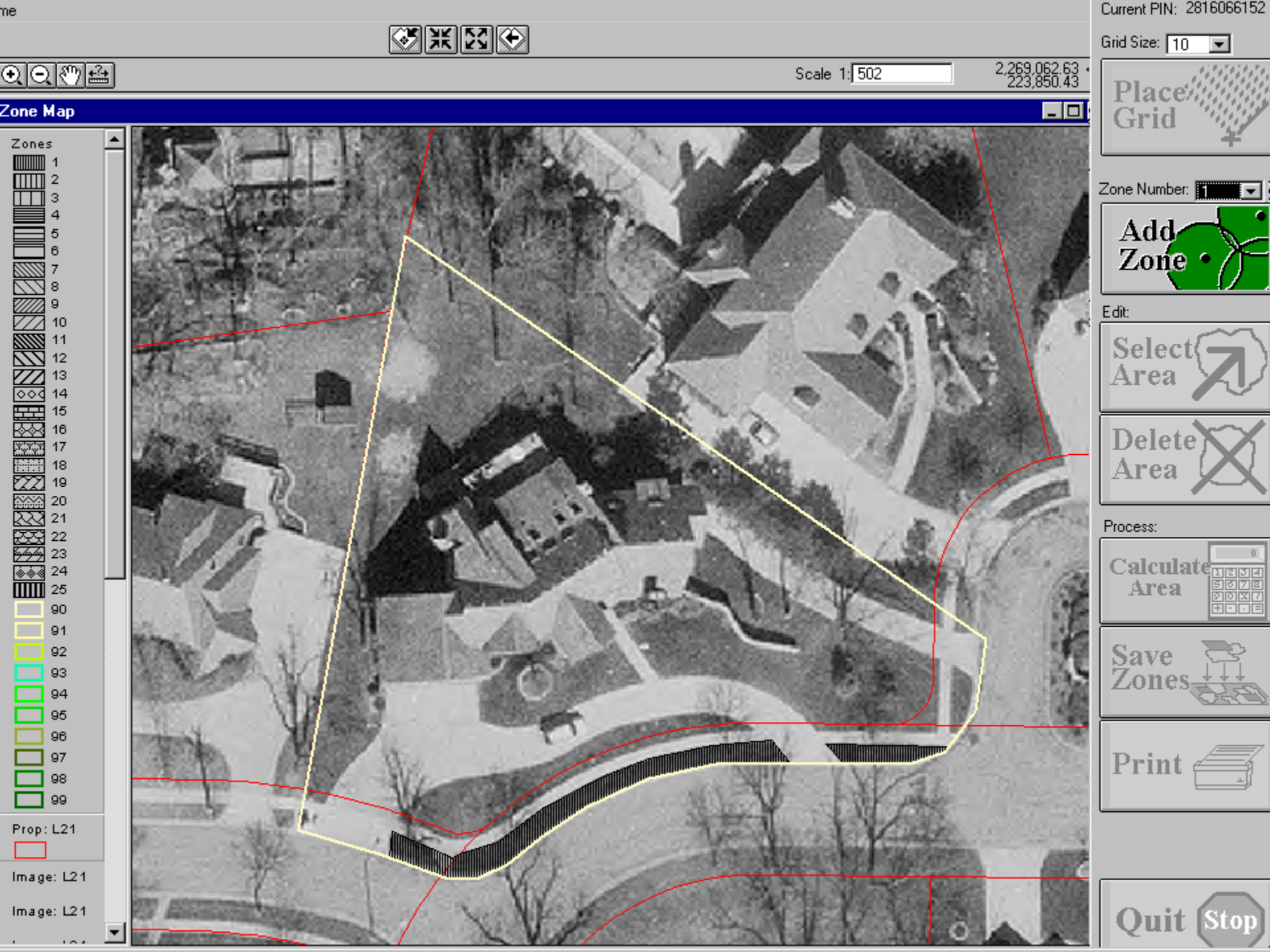
Save Zones
Print
Quit
Stop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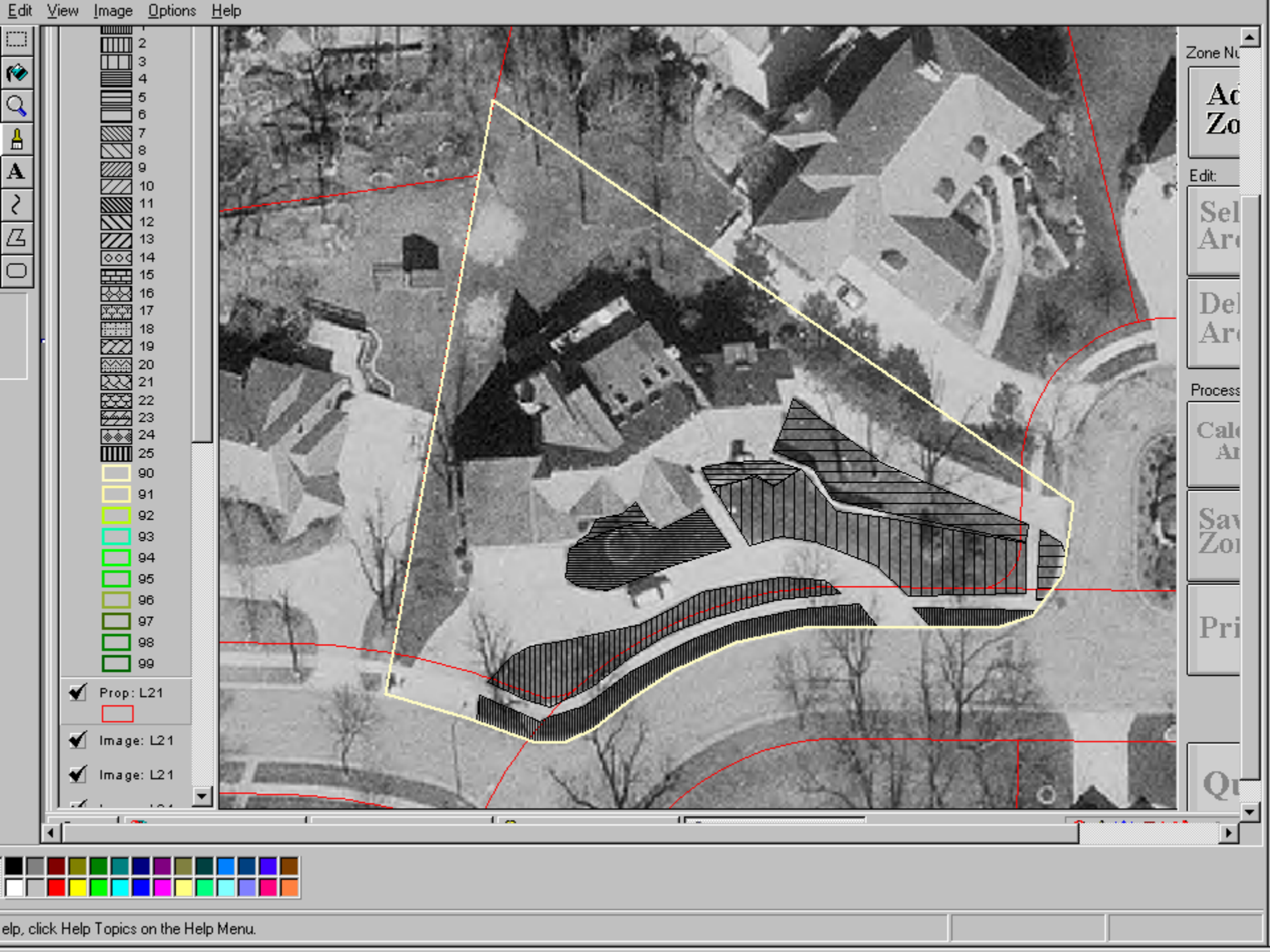
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Zone Nu
Edit:
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elp, click Help Topics on the Help Menu.

Edit View Image Options Help

ArcView GIS 3.2a

File Edit Table Field Window Help

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Attributes of Zones

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Polygon	5	0.006	274.626	0	0.002	0.232
Polygon	5	0.006	274.626	0	178.647	76.460
Polygon	5	0.006	274.626	0	95.978	59.604
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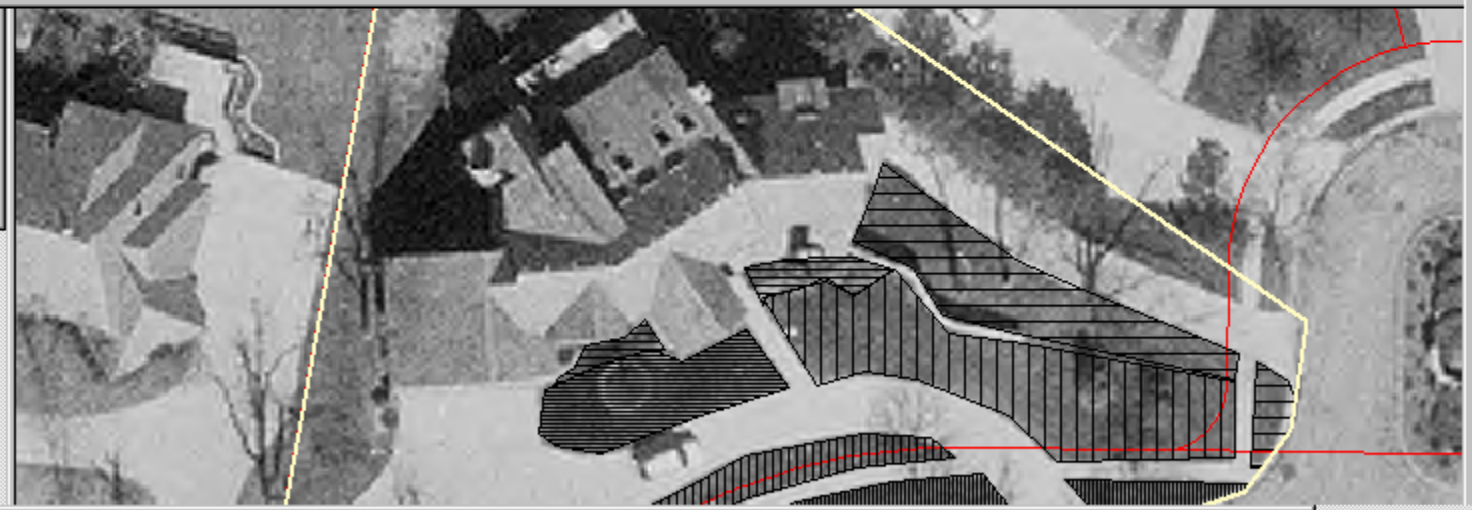

Zone

Current

Grid Size

Zone Nu

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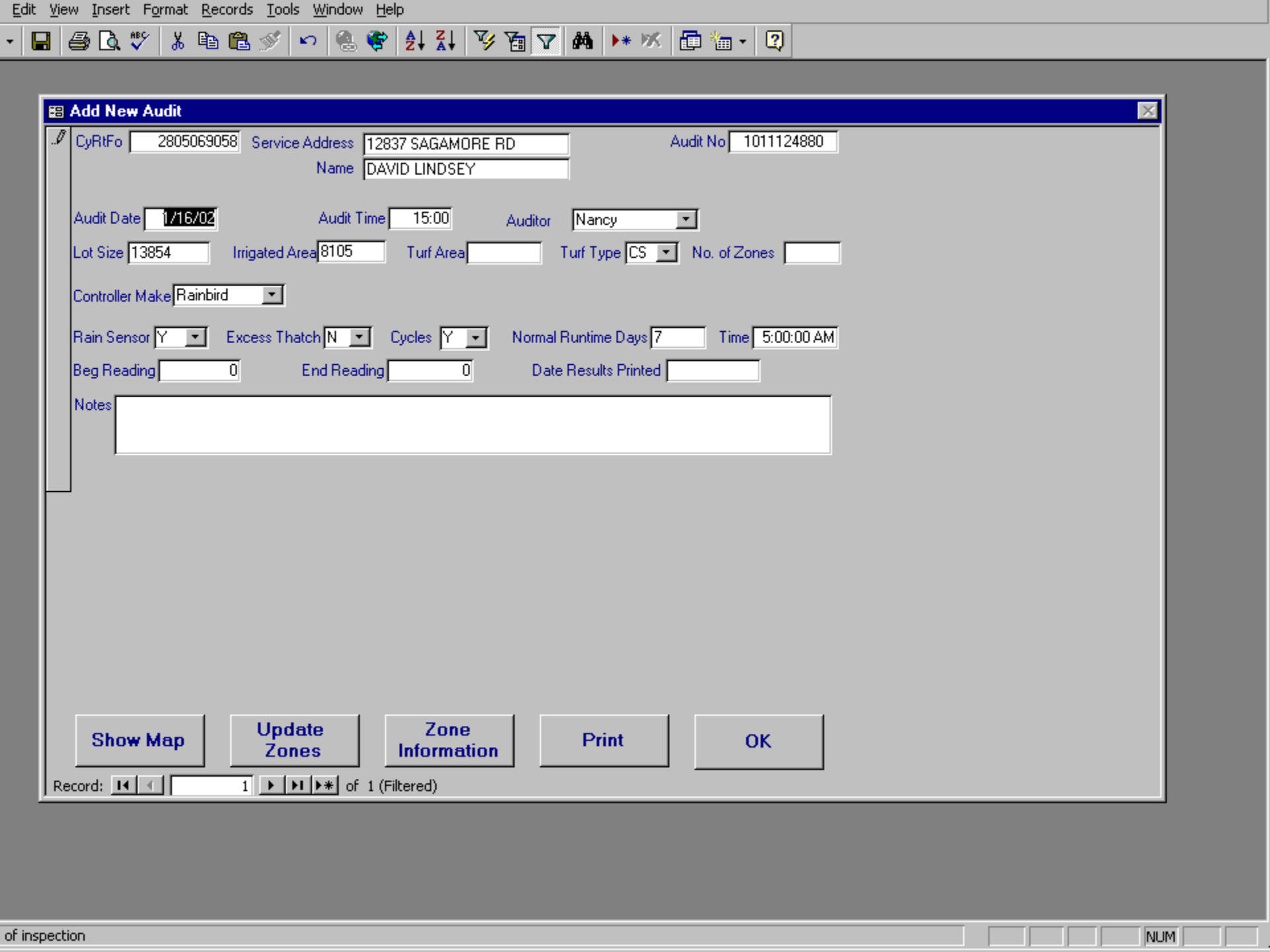
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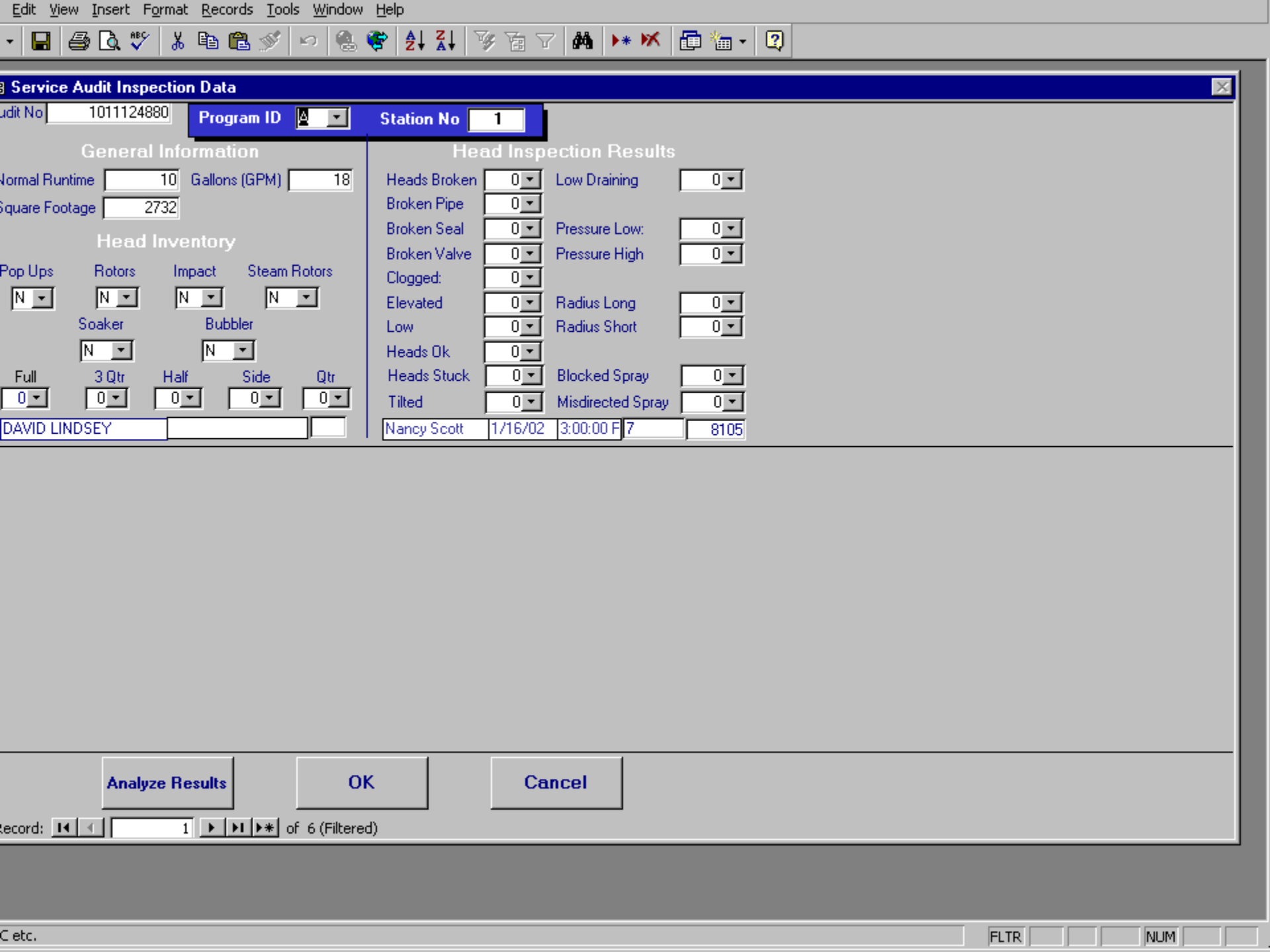
Name DAVID LINDSEY
Audit No 1011124880
Audit Date 1/16/02
Audit Time 15:00
Auditor Nancy
Lot Size 13854
Irrigated Area 8105
Turf Area
Turf Type CS
No. of Zones
Controller Make Rainbird
Rain Sensor Y
Excess Thatch N
Cycles Y
Normal Runtime Days 7
Time 5:00:00 AM
Beg Reading 0
End Reading 0
Date Results Printed
Notes
Show Map
Update Zones
Zone Information
Print
OK
Record: 1 of 1 (Filtered)
of inspection
NUM


Edit View Insert Format Records Tools Window Help
Service Audit Inspection Data
udit No 1011124880
Program ID A
Station No 1
General Information
Normal Runtime 10
Gallons (GPM) 18
Square Footage 2732
Head Inventory
Pop Ups Rotors Impact Steam Rotors
N N N N
Soaker Bubbler
N N
Full 3 Qtr Half Side Qtr
0 0 0 0 0
DAVID LINDSEY
Head Inspection Results
Heads Broken 0
Broken Pipe 0
Broken Seal 0
Broken Valve 0
Clogged: 0
Elevated 0
Low 0
Heads Ok 0
Heads Stuck 0
Tilted 0
Low Draining 0
Pressure Low: 0
Pressure High 0
Radius Long 0
Radius Short 0
Blocked Spray 0
Misdirected Spray 0
Nancy Scott 1/16/02 3:00:00 F 7 8105
Analyze Results
OK
Cancel
ecord: 1 of 6 (Filtered)
C etc.
FLTR
NUM

Water District #1 of Johnson Count Irrigation System Evaluation Summary

Name: _____ Appt. Date: _____ Time: _____ Auditor: _____

Address: _____ Irrigated Area: _____ Turf Area: _____ Frequency: _____

	Zone: 1	Zone: 2	Zone: 3	Zone: 4	Zone: 5	Zone: 6
Current Runtime:						
Rec. Time:						
GPM:						
*App. Rate:						

COMMENTS

Zone: 1 _____ Zone: 4 _____

Zone: 2 _____ Zone: 5 _____

Zone: 3 _____ Zone: 6 _____

	Zone: 7	Zone: 8	Zone: 9	Zone: 10	Zone: 11	Zone: 12
Current Runtime:						
Rec. Time:						
GPM:						
*App. Rate:						

COMMENTS

Zone: 7 _____ Zone: 10 _____

Zone: 8 _____ Zone: 11 _____

Zone: 9 _____ Zone: 12 _____

As the sprinkler system is currently operated, it uses approximately _____ gallons per cycle.

ADDITIONAL COMMENTS: _____

*Amt. of water applied in inches per watering.

Improved Residential Audit Program Version 3.0 (Coming)

- Delayed due to wet year and corresponding budget freeze
- Will be web based and allow customers to include real time billing and account information
- Will use wireless features on laptop in the field for real time access for customers as we train them in operating their system efficiently

WaterOne

Water District No. 1 of Johnson County

Questions?

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Waterone.org

WaterOne
Water District No. 1 of Johnson County