Running the Race…
Mobile Solutions in the Fast Lane

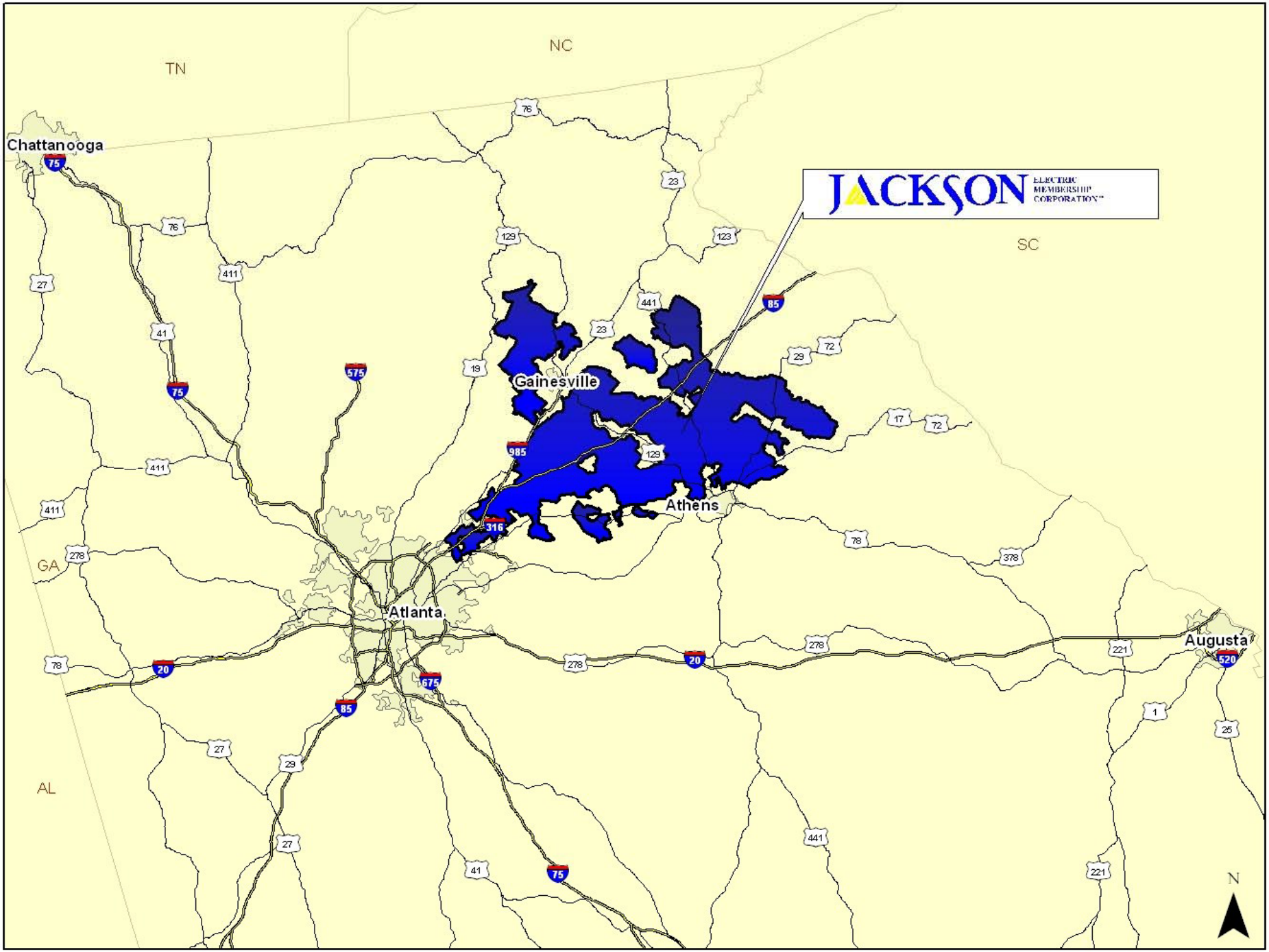
Greg Broussard
Director of Engineering Services
Jackson Electric Membership Corporation

Outline

- About Jackson EMC
- Introduction
- Recent GIS transition
- Current GIS
- Right of Way Tracking
- Transformer Loading
- Mobile data updates
- Display External Data in Mobile GIS
- Lagniappe

About Jackson EMC

- Largest electric cooperative in US in energy sales…in 2004 sold $304 million, 4,205 GWH, 2005 peak load of 1,060 MW
- 2nd largest electric cooperative in US in customers with over 190,000
- Located in Georgia, northeast of Atlanta in high growth corridor
- 440 employees, 4 operating districts
- 220 construction & maintenance contractor employees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CORPORATION
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Athens
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Introduction

Greg Broussard

- Director of Engineering Services at Jackson EMC since 1992.
- Manager of Engineering at an electric cooperative in Texas for 10 years
- City Electrical Engineer at a municipal utility system in South Louisiana for 4 years.
- BS in Electrical Engineering
- Member of GITA, IEEE, and other professional organizations.

Recent GIS Transition

- Conversion from Intergraph to ESRI in 2002
- Prior to moving to ESRI
  - Had a productive GIS system. The GIS Department developed landbase and updated facilities from as-built work orders.
  - Mobile map viewing was used by staking technicians and Engr/Ops supervisors as a map book replacement
  - Completed field inventory of entire system GPSing all location-based features and inventorying all facilities.
- Company users were not new to GIS

Current GIS

- Existing GIS installations
  - ESRI ArcGIS w/Oracle/SDE on Wintel servers
  - ESRI ArcView/M&M ArcFM Viewer
  - ESRI ArcEdit/M&M ArcFM Edit
  - ArcIMS
  - ArcPress
  - GT Viewer
- Upcoming GIS installations
  - ArcFM Designer under development with Dec. 2005 rollout to 22 users

Mobile Computing

…continues in new environment

- Installations for 233 company employees
  - 151 Vehicle mounted Toughbooks
  - 74 Dell laptops
  - 8 workstations
- Facility locate contractors
- Construction contractors
- Vegetation management contractors
- Pole joint use contractors
- Pole inspection contractors

Mobile Computing…

151 Vehicle mounted Toughbooks

- 56 meter readers
  - *Resequence routes, verify account multipliers from CT/PT ratios, lock numbers and gate codes.*
- 4 vegetation management foremen
  - *Track vegetation management cycles and type of work*
- 47 bucket trucks
  - *Construction locations, operation of electric network, power restoration activities*
- 27 derrick trucks
  - *Construction locations*
- 17 meter & apparatus maintenance technicians
  - *Locate individual field equipment to perform maintenance, such as regulators, capacitors, breakers. Verify GIS attribute values associated with the equipment.*

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Mobile Computing…

- 74 Dell laptops
  - 18 staking technicians
    - *Field locate construction sites, design facilities*
  - 24 foreman
    - *Quick prints for maintenance tickets, planning of construction projects and forecasting crew and equipment required.*
  - 3 safety coordinators
    - *Accident investigation, crew and construction site inspection.*
  - 9 Engr/Op supervisors
    - *Tracking construction activities, outage restoration activities*
  - 15 engineers
    - *Run traces for circuit connectivity, calculate load on line segments, administer transformer load management program*.
  - 5 GIS employees
    - *Field verify GIS information, perform GPS activities required to support landbase development*

Mobile Computing…

- 8 workstations..2 dispatchers, 6 communication coordinators
  - *Track crew locations and provide information to other employees on the voice radio system*
- Facility locate contractors
  - *Use GIS data to find field locations of UG facilities and mark them with paint and flags.*
- Construction contractors
  - *Find construction locations*
- Vegetation management contractors
  - *Locate sections of line to be trimmed, mowed, or sprayed and report progress of project by sections of primary line*.
- Pole joint use contractors
  - *Field survey poles with attachments and NESC code violations, report results via Access database file for importation in the GIS.*
- Pole inspection contractors
  - *Locate poles to be treated and report back results of inspection and treatments*

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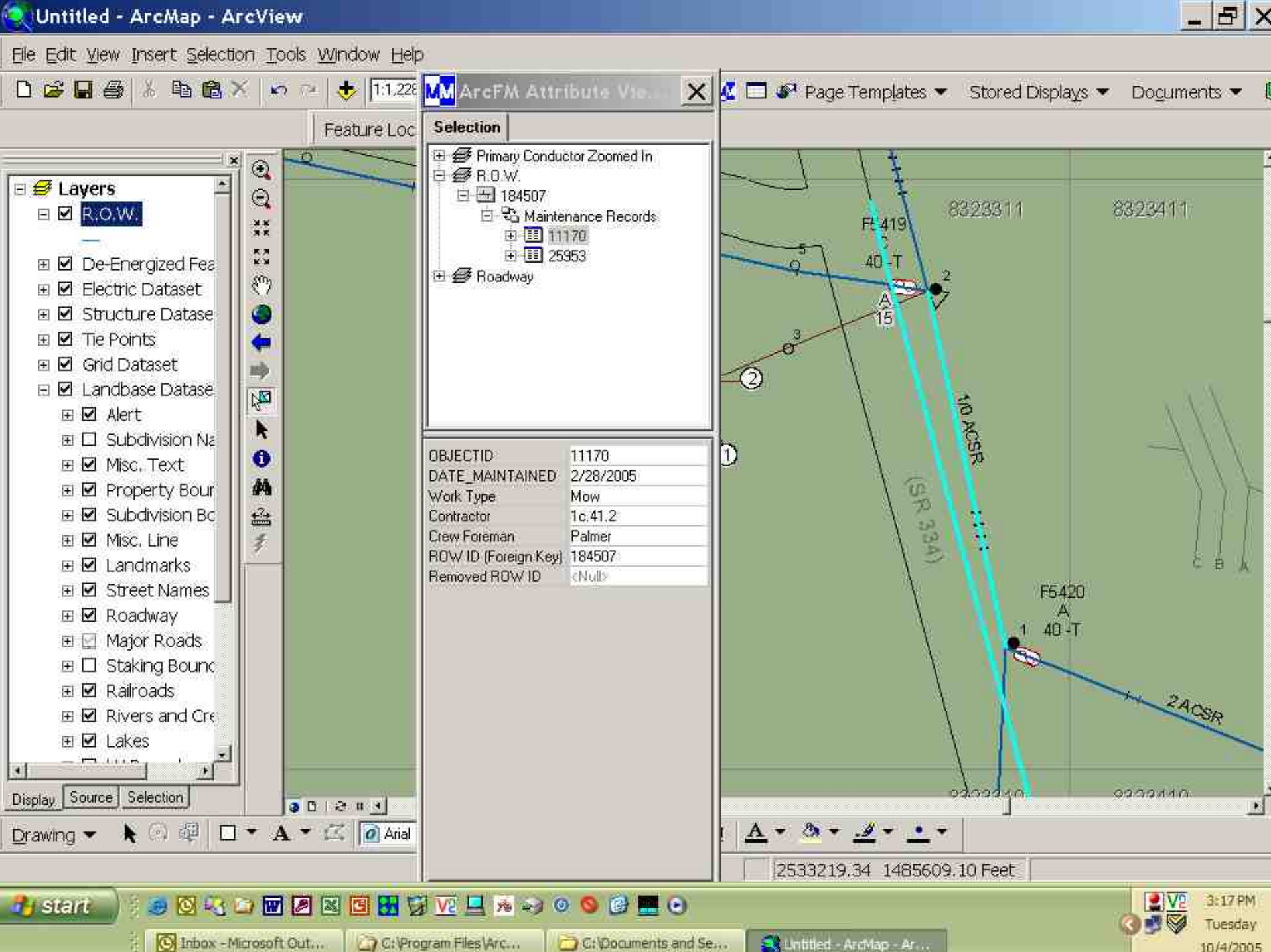
Right of Way Tracking

- Tracking types and dates
  - Mowing
  - Trimming
  - Special alerts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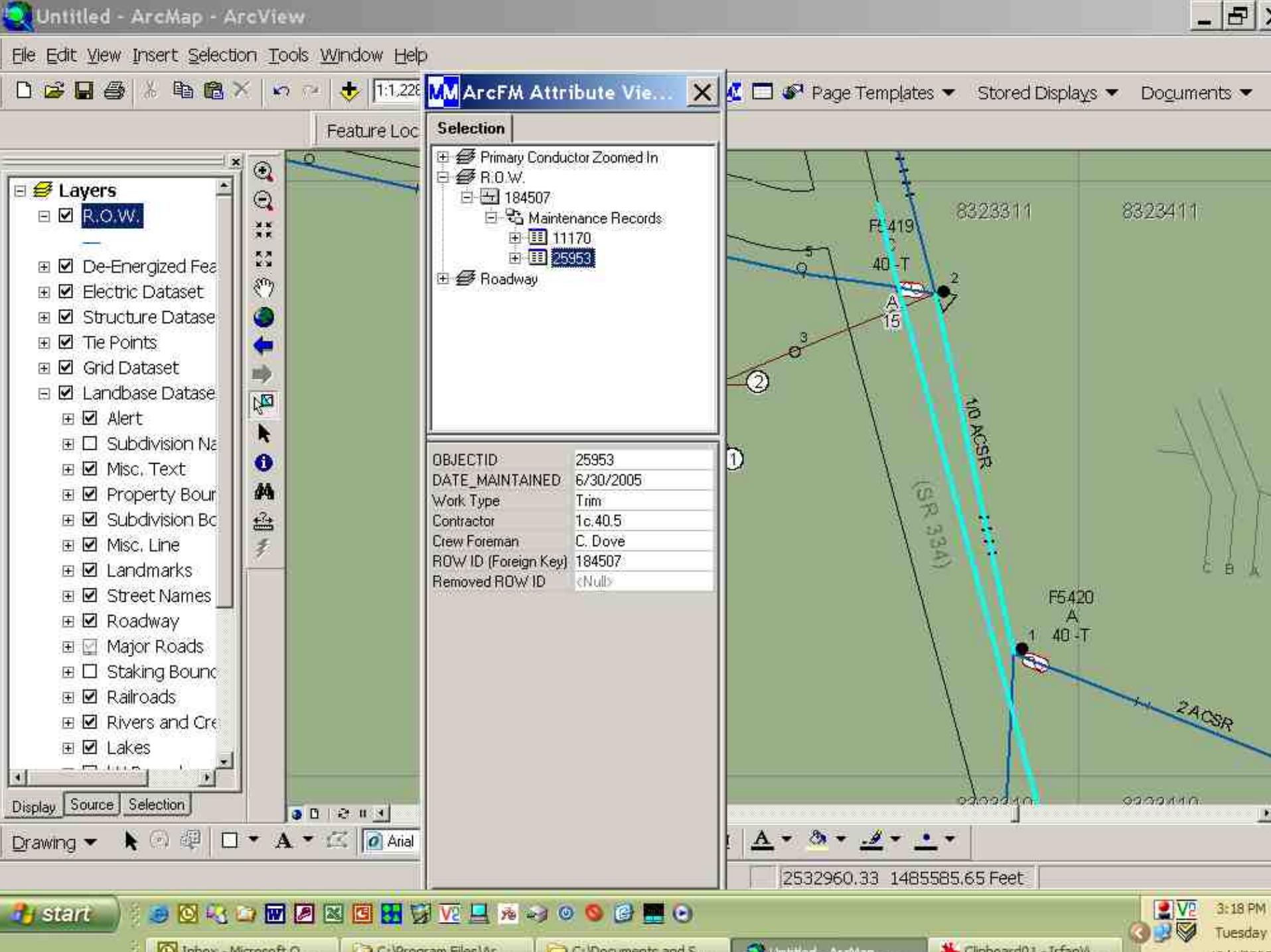
Right of Way Tracking

- Tracking types and dates
  - Mowing
  - Trimming
  - Special alerts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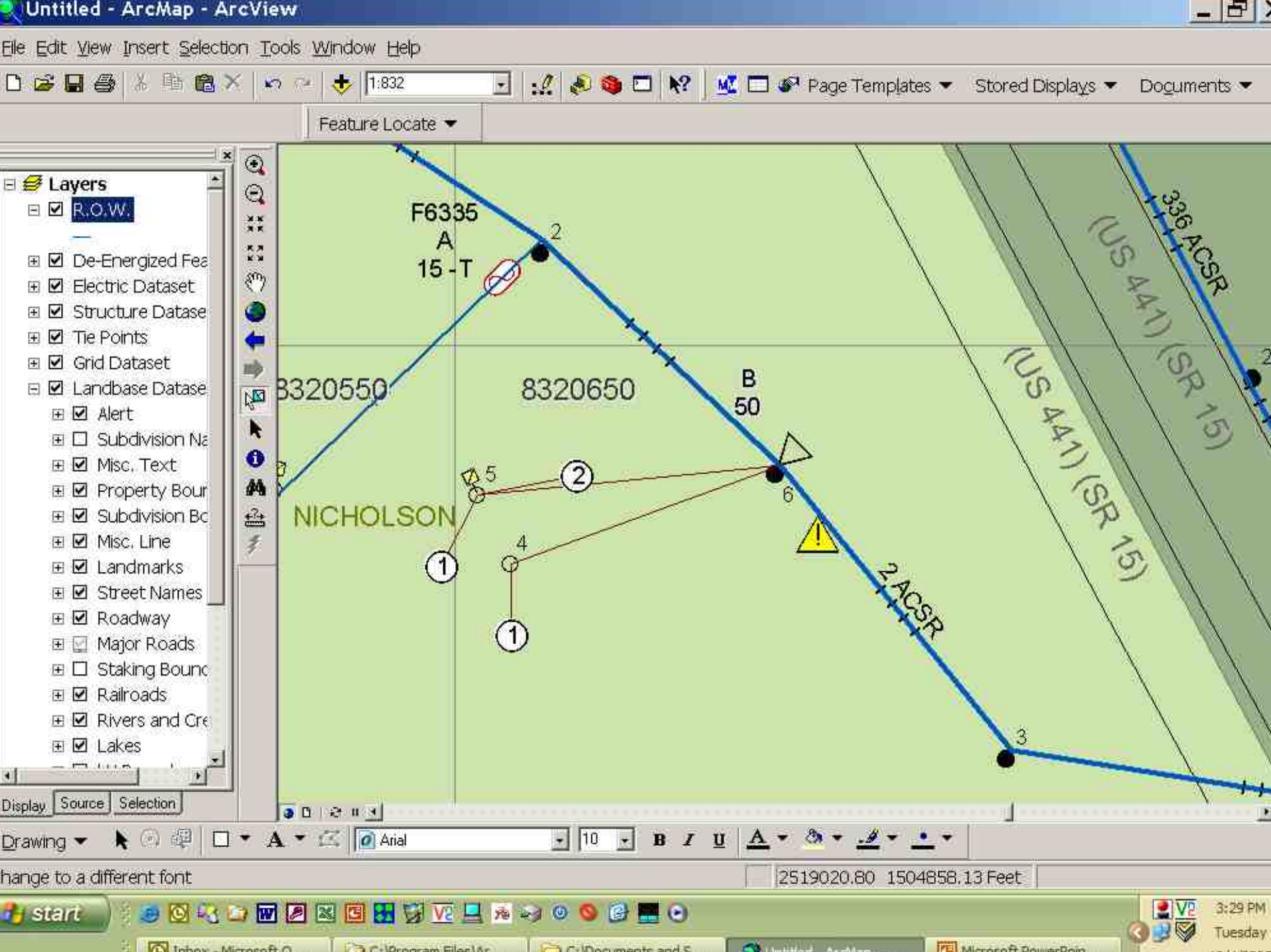
Right of Way Tracking

- Tracking types and dates
  - Mowing
  - Trimming
  - Special alerts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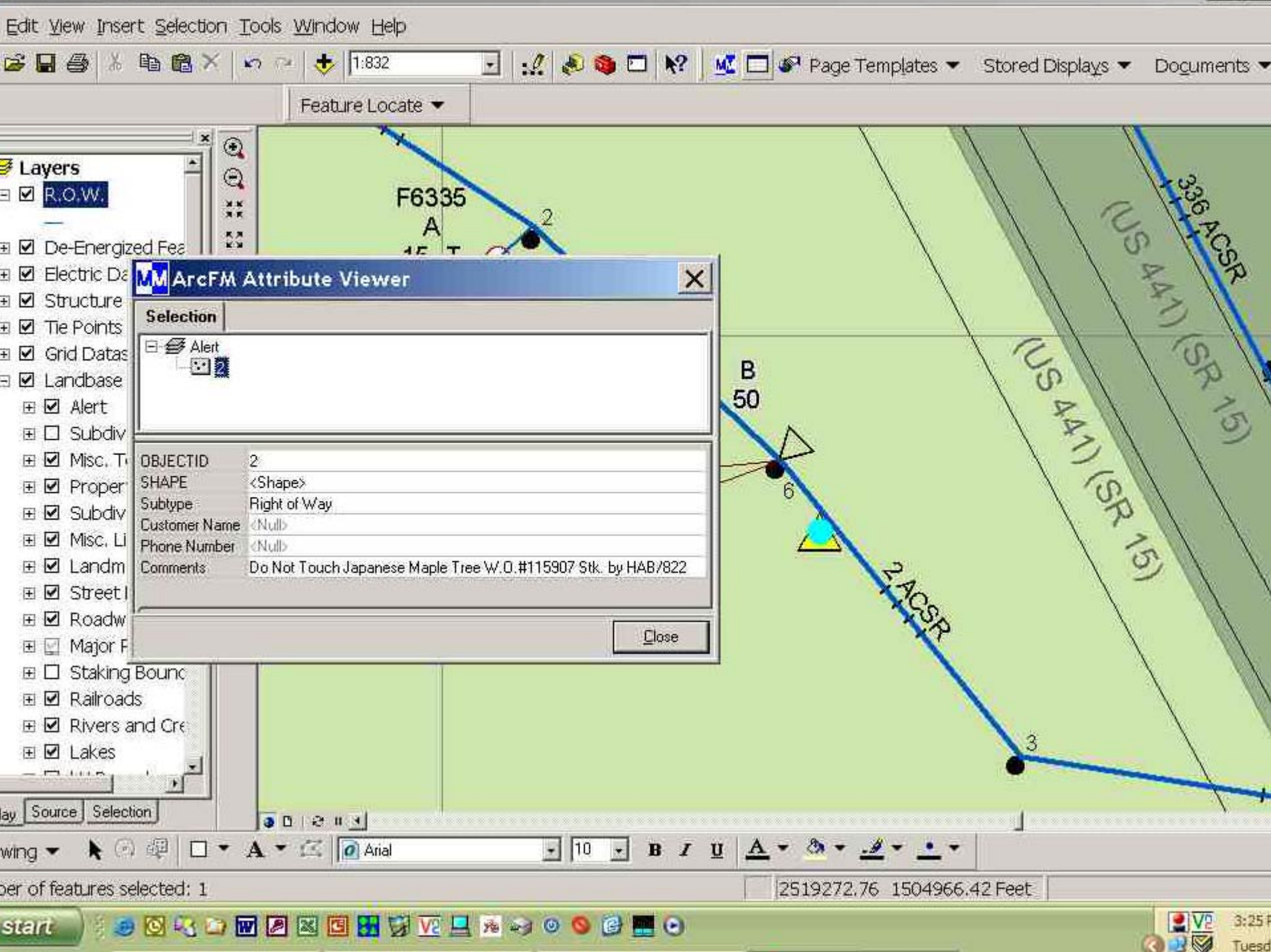
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Transformer Loading

- GIS has connectivity from meter to transformer
- Import monthly meter consumptions from CIS into GIS
- Aggregate consumption data to each transformer
- Calculate monthly KW loading per transformer using a static load factor; 30% for 1 phase and 40% for 3 phase.

$$KW = \frac{KWH}{LF \times \#\ days\ in\ cycle \times 24}$$

- Compare calculated load to previous max stored in GIS and overwrite if higher
- Store both winter and summer max loadings in GIS

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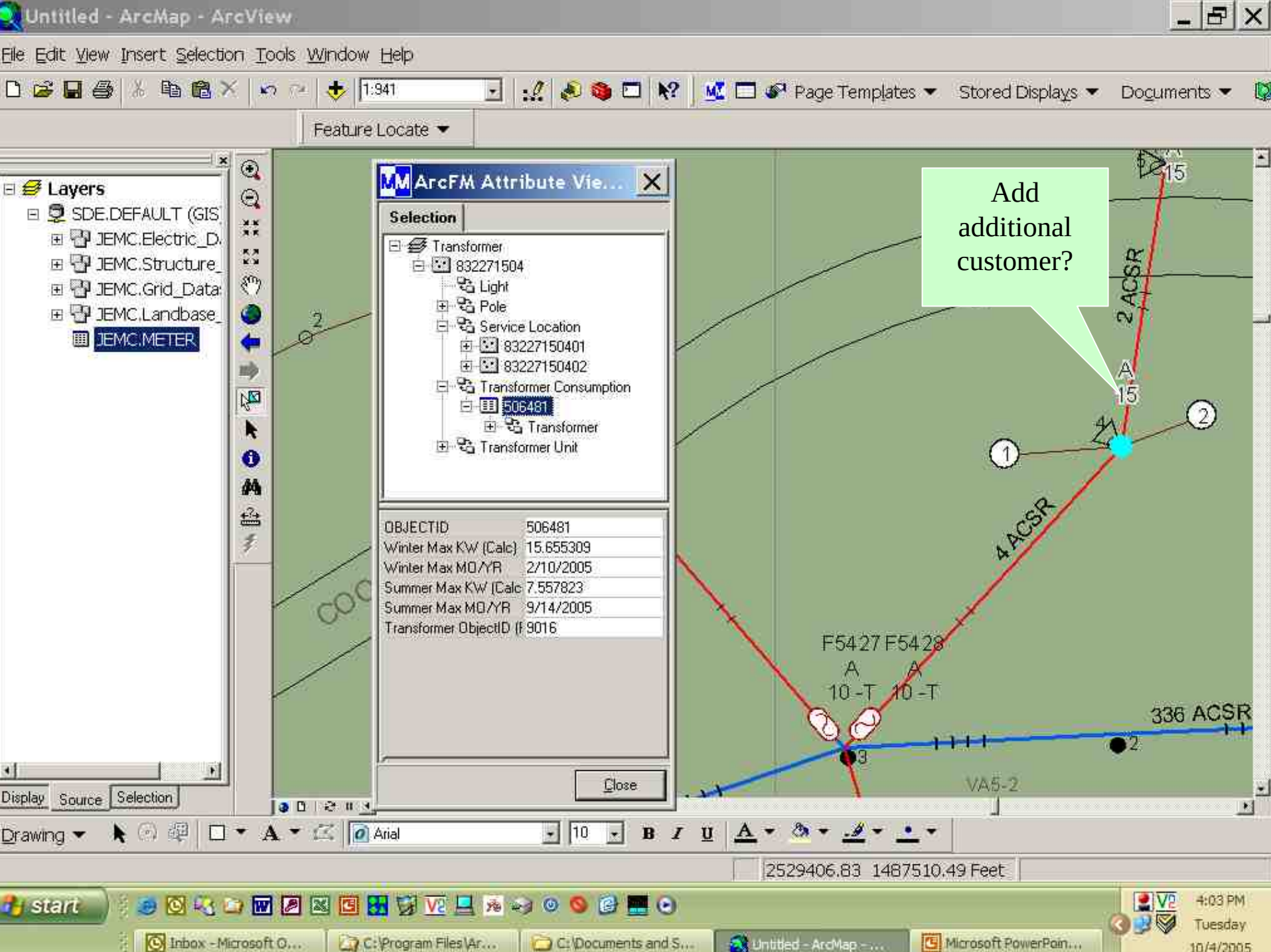
Transformer Loading

- 1 phase example
  - 15 KVA transformer, add additional customer?
- 3 phase example
  - Service to high school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Summer Max KW (Calc 7.557823
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Transformer Loading

- 1 phase example
  - 15 KVA transformer, add additional customer?
- 3 phase example
  - Service to high school

JACKSON EMC GIS

Map Viewers | Applications | Reports | Help Desk

- Substations
- XFMR Loading

Email Mapping Department

Customized Transformer % Loading Report

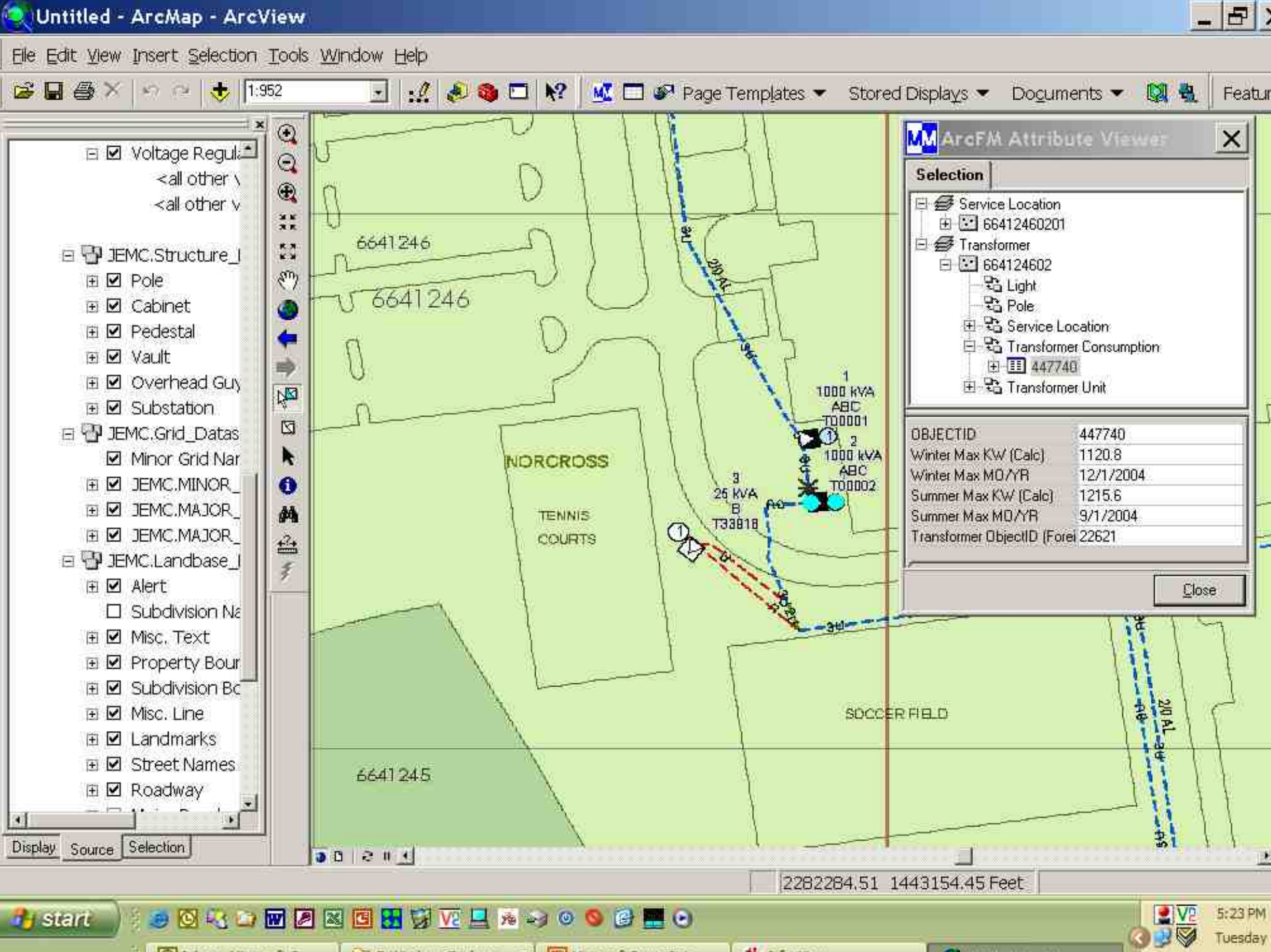
Report Type:	Peaks with Customer Info
Rated KVA > =	1000
Percent Loading >	100 %
District:	All
	Submit Reset

HOME

Excel Export BACK HOME

100 % Loading Report for Transformers with >= 1000 Rated KVA in All Districts

S.No.	A/C No.	Customer	Address	Description	Location Code	Meter Number	Multiplier	Bill Code	Rated KVA	Summer Peak Demand	Summer % Loading	Winter Peak Demand	Winter % Loading
1	184748	KUBOTA MANUFACTURING	2715 RAMSEY RD	PLANT	22233250901	51271422	240	MBS	1500	3962.4	264.16	3741.6	249.44
2	182355	MERIAL	115 TRANS TECH DR		84308040601	84166299	200	GSC	1000	2200	220	2014	201.4
3	113490	SOUTHEASTERN FREEZER	HIGHWAY 60	SOUTHEASTERN FREEZER	22111250501	35899821	300	GS	1500	3168	211.2	2946	196.4
4	320736	U S POSTAL SERVICE	1605 BOGGS RD		65426410101	33452829	400	MBS	1500	2544	169.6	2407	160.47
5	255286	GWINNETT CO BD OF ED	50 TAYLOR RD	MAIN BLDG	64309220101	90054757	200	SLMS	1000	1552	155.2	1346	134.6
6	129686	T C MIRAFI	365 S HOLLAND DR		61247600301	79678701	2400	GSC	2000	3000	150	2781.6	139.08
7	322523	PRIMEX PLASTICS	3435 OLD OAKWOOD RD	PRIMEX PLSTICS PLANT	23140050601	90054752	240	GS	2500	3566.4	142.66	3542.4	141.7
8	177293	HUSSMANN REFRIGERATION	2700 CRESTRIDGE CT		65359270101	54745912	120	MBS	1000	1394.4	139.44	955.2	95.52
9	116257	ATLAS COLD STORAGE	1680 CANDLER RD	PLANT	22119100401	58089865	1440	MBS	2000	2764.8	138.24	2620.8	131.04
10	345840	SUNDANCE PRODUCTS	1425 CANDLER RD	SUNDANCE PRODUCTS PLANT	22117210501	51271424	300	MBS	2500	3285	131.4	3252	130.08
11	173009	GWINNETT CO BD OF ED	5300 SPALDING DR	NORCROSS HIGH	66412460201	80754487	120	MBS	1000	1215.6	121.56	1120.8	112.08
12	116495	ATLAS COLD STORAGE	86 JACKSON CONCOURSE		61139070601	54745915	720	MBS	2500	2757.6	110.3	2901.6	116.06
13	243966	CARMAX	1975 BEAVER RUIN RD		66437210101	01134000	120	GS	1000	1071.6	107.16	962.4	96.24
14	158538	UNITED STATIONERS	125 HORIZON DR		65358320901	84166302	120	MBS	1000	1017.6	101.76	915.6	91.56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Light
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447740
Transformer Unit
OBJECTID 447740
Winter Max KW (Calc) 1120.8
Winter Max MD/YR 12/1/2004
Summer Max KW (Calc) 1215.6
Summer Max MD/YR 9/1/2004
Transformer ObjectID (Forei 22621
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2282284.51 1443154.45 Feet
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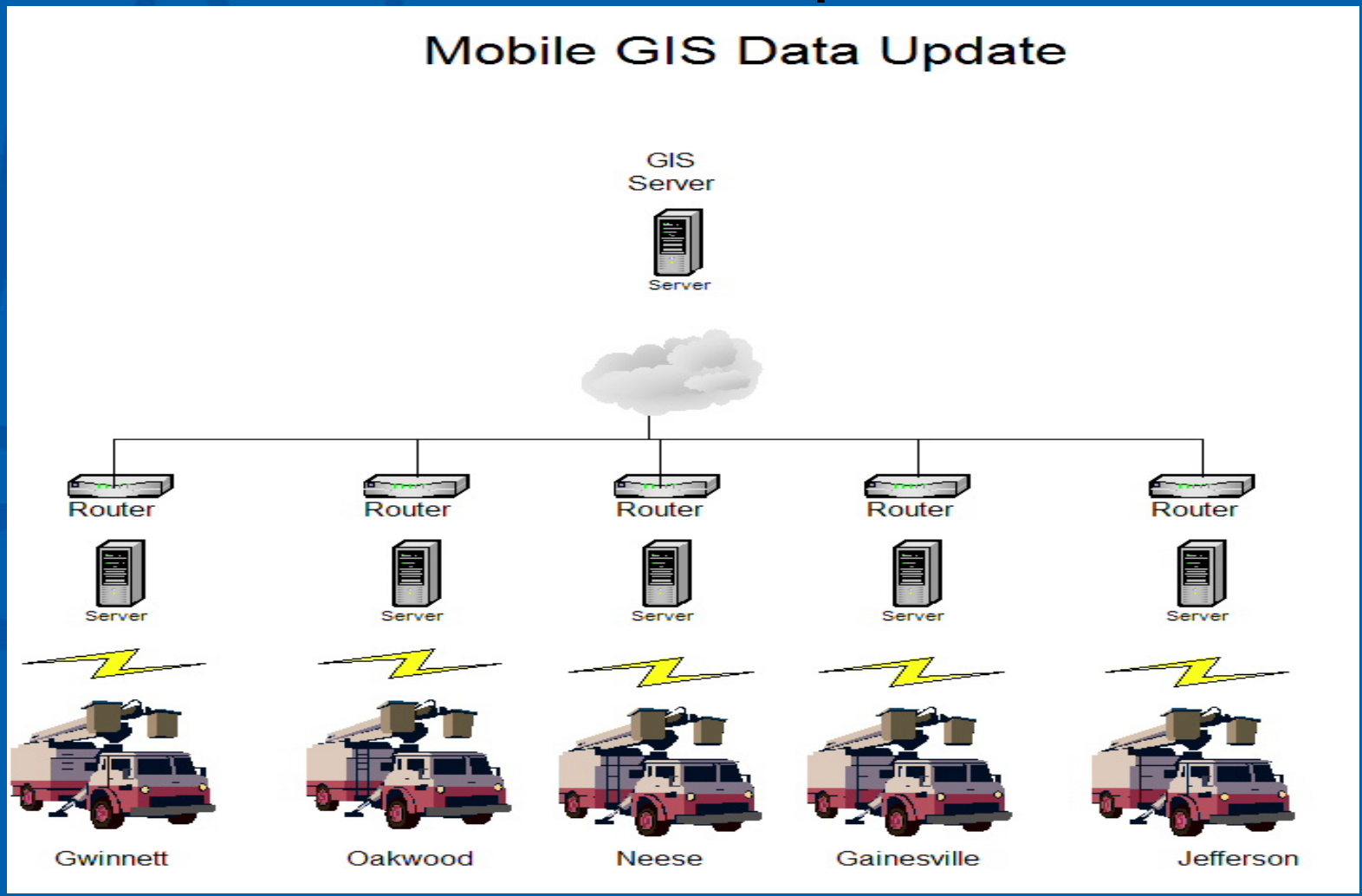
Mobile Data Updates

- 225 mobile data laptop computers spread across 5 physical locations, 151 of these permanently mounted in vehicles
- Data set size of 273mb compressed, 812 mb uncompressed
- ??? How to provide weekly updates to all mobile data installations???

Mobile Data Updates

- Copy weekly update data file from GIS server to DFS file servers at each physical location across WAN

Mobile Data Updates

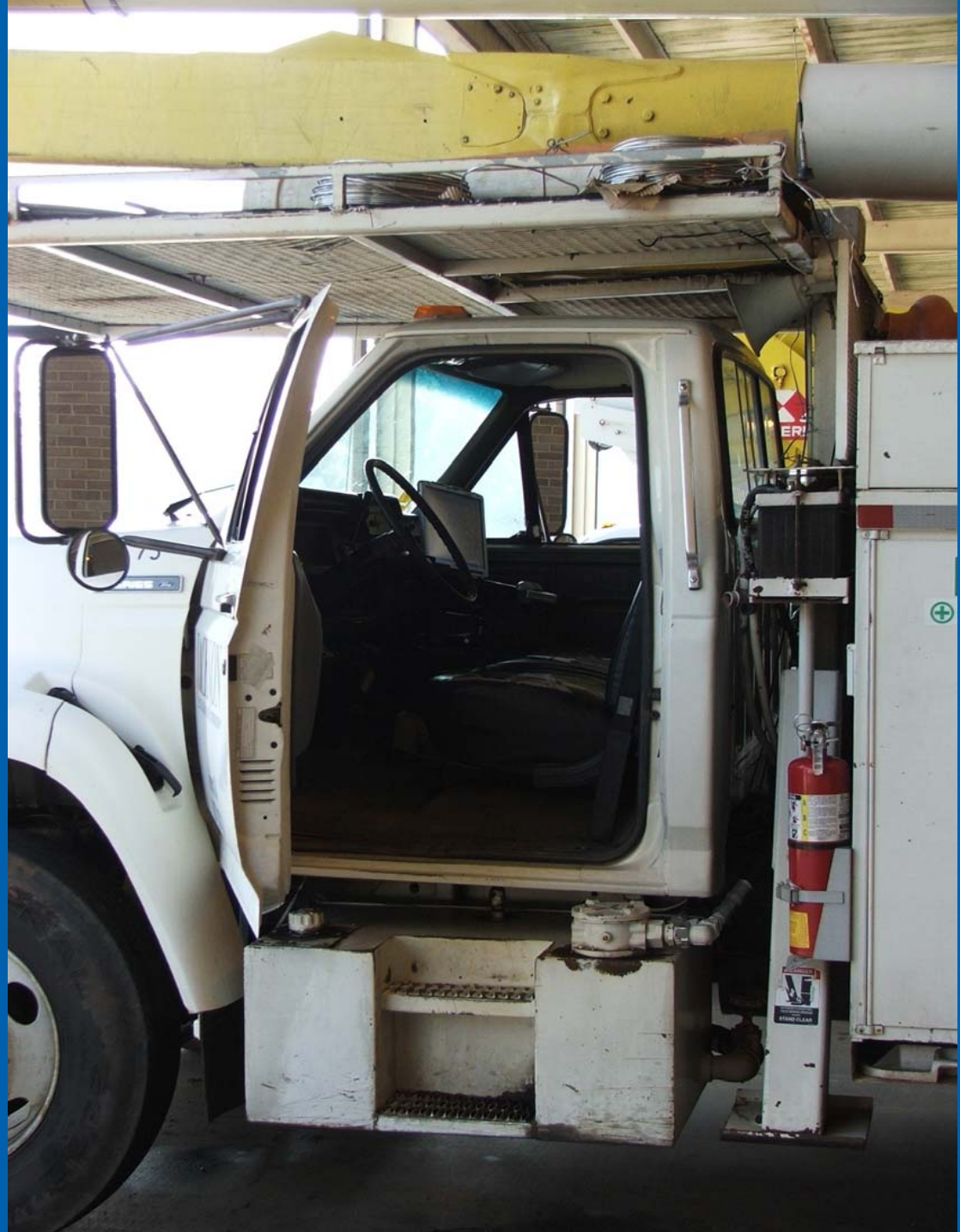


Mobile Data Updates

- Run batch file on each mobile GIS computer to copy compressed update file from file server and expand the data
  - Same batch file on every laptop
  - Run at the same time and same day on every laptop via Windows scheduler
  - Allows standard disk image to be written on each laptop

Mobile Data Updates

- Mobile GIS computers utilize 802.11g wireless network since they are permanently mounted in vehicles.
- Wireless access points are installed at each office location throughout the office and in truck parking locations.




Panasonic
NotePad IV

Mobile Data Updates

- Desired time execution is from 12:00am to 4:00am to maximize daytime wireless network usage
- Utilize VB code within the batch file containing a RND(14,400,000) function to ensure that all computers don't actually execute the copy command within the batch file at the same time
  - (4:00 – 0:00) hrs x (60 x 60 x 1,000) ms/hr = 14,400,000 milliseconds in execution time window
- VB program provides delay in copy command execution in batch file

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Display External Data in Mobile GIS

- Substation information guide example
  - Locate substation in viewer (Exit 44)
  - Query substation attributes
  - Activate PDF file link
  - Display substation equipment information and one line drawing of electrical network within the substation

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LAGNIAPPE

The American Heritage® Dictionary of the English Language: Fourth Edition. 2000.

lagniappe

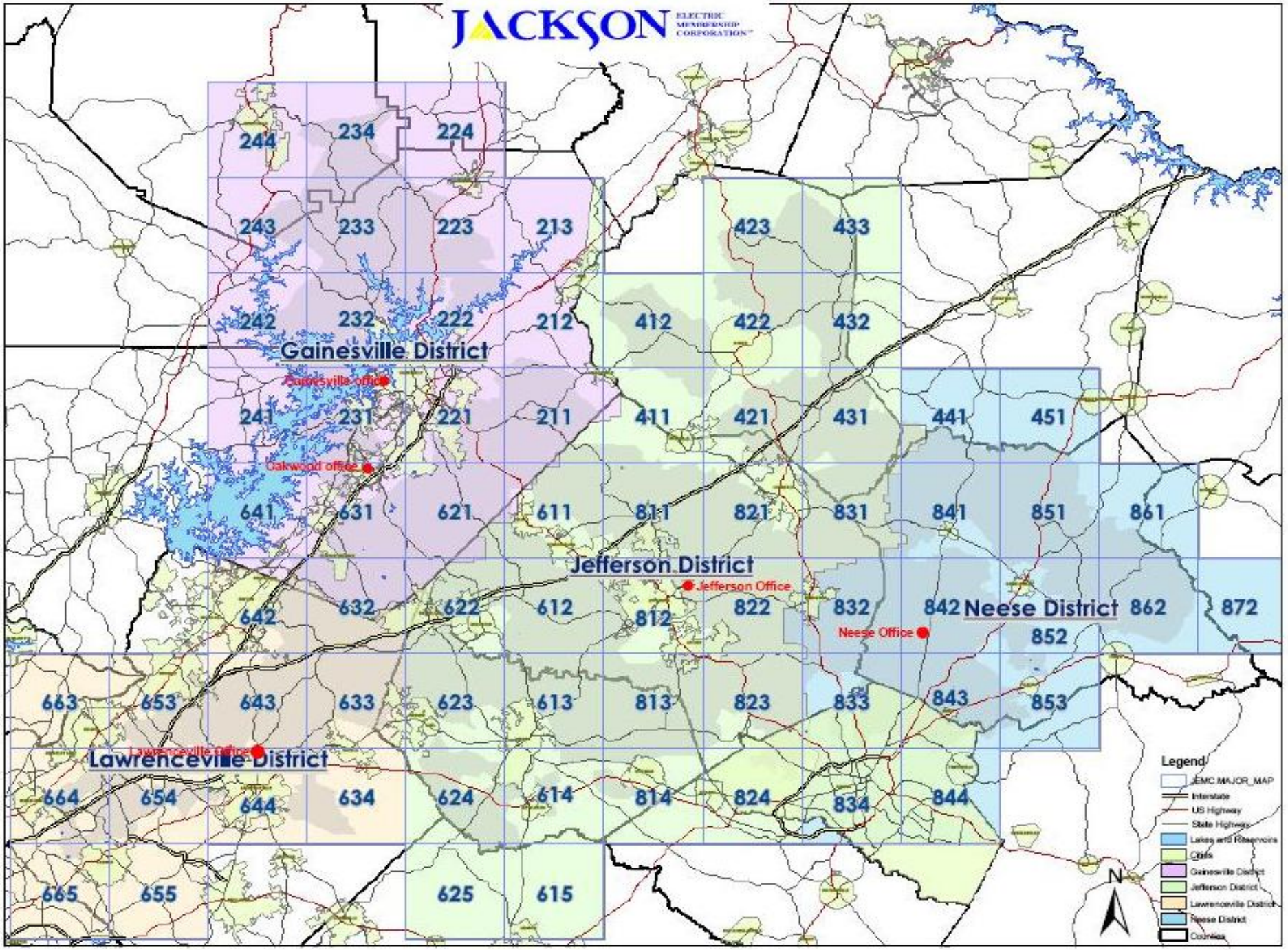
NOUN: *Chiefly Southern Louisiana & Mississippi* **1.** A small gift presented by a storeowner to a customer with the customer's purchase. **2.** An extra or unexpected gift or benefit.

ETYMOLOGY: Louisiana French, from American Spanish *la ñapa*, the gift : *la*, the (from Latin *illa*, feminine of *ille*, that, the; see **al-**[1] in Appendix I) + *ñapa* (variant of *yapa*, gift, from Quechua, from *yapay*, to give more).

REGIONAL NOTE: *Lagniappe* derives from New World Spanish *la ñapa,* "the gift," and ultimately from Quechua *yapay,* "to give more." The word came into the rich Creole dialect mixture of New Orleans and there acquired a French spelling. It is still used in the Gulf states, especially southern Louisiana, to denote a little bonus that a friendly shopkeeper might add to a purchase. By extension, it may mean "an extra or unexpected gift or benefit."

LAGNIAPPE

- Spatial project status report of pole attachment inventory project
  - Data is stored in a spreadsheet
  - Grid status display of work completed within a major map grid.
  - Status display is driven by conditional formatting of all cells within the system map grid view within the spreadsheet.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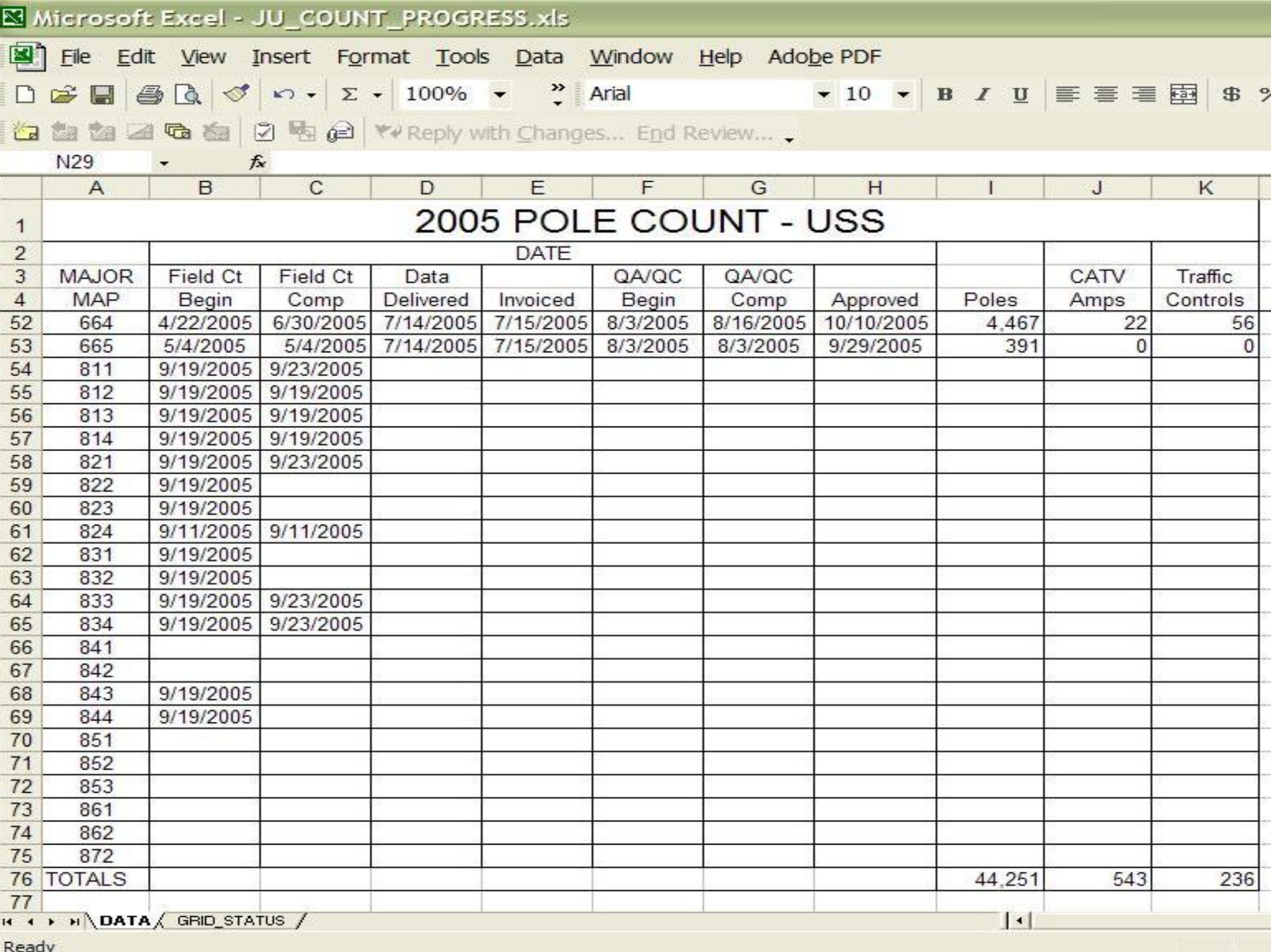

2005 POLE COUNT - USS

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3	MAJOR	Field Ct	Field Ct	Data		QA/QC	QA/QC			CATV	Traffic
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52	664	4/22/2005	6/30/2005	7/14/2005	7/15/2005	8/3/2005	8/16/2005	10/10/2005	4,467	22	56
53	665	5/4/2005	5/4/2005	7/14/2005	7/15/2005	8/3/2005	8/3/2005	9/29/2005	391	0	0
54	811	9/19/2005	9/23/2005								
55	812	9/19/2005	9/19/2005								
56	813	9/19/2005	9/19/2005								
57	814	9/19/2005	9/19/2005								
58	821	9/19/2005	9/23/2005								
59	822	9/19/2005									
60	823	9/19/2005									
61	824	9/11/2005	9/11/2005								
62	831	9/19/2005									
63	832	9/19/2005									
64	833	9/19/2005	9/23/2005								
65	834	9/19/2005	9/23/2005								
66	841										
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68	843	9/19/2005									
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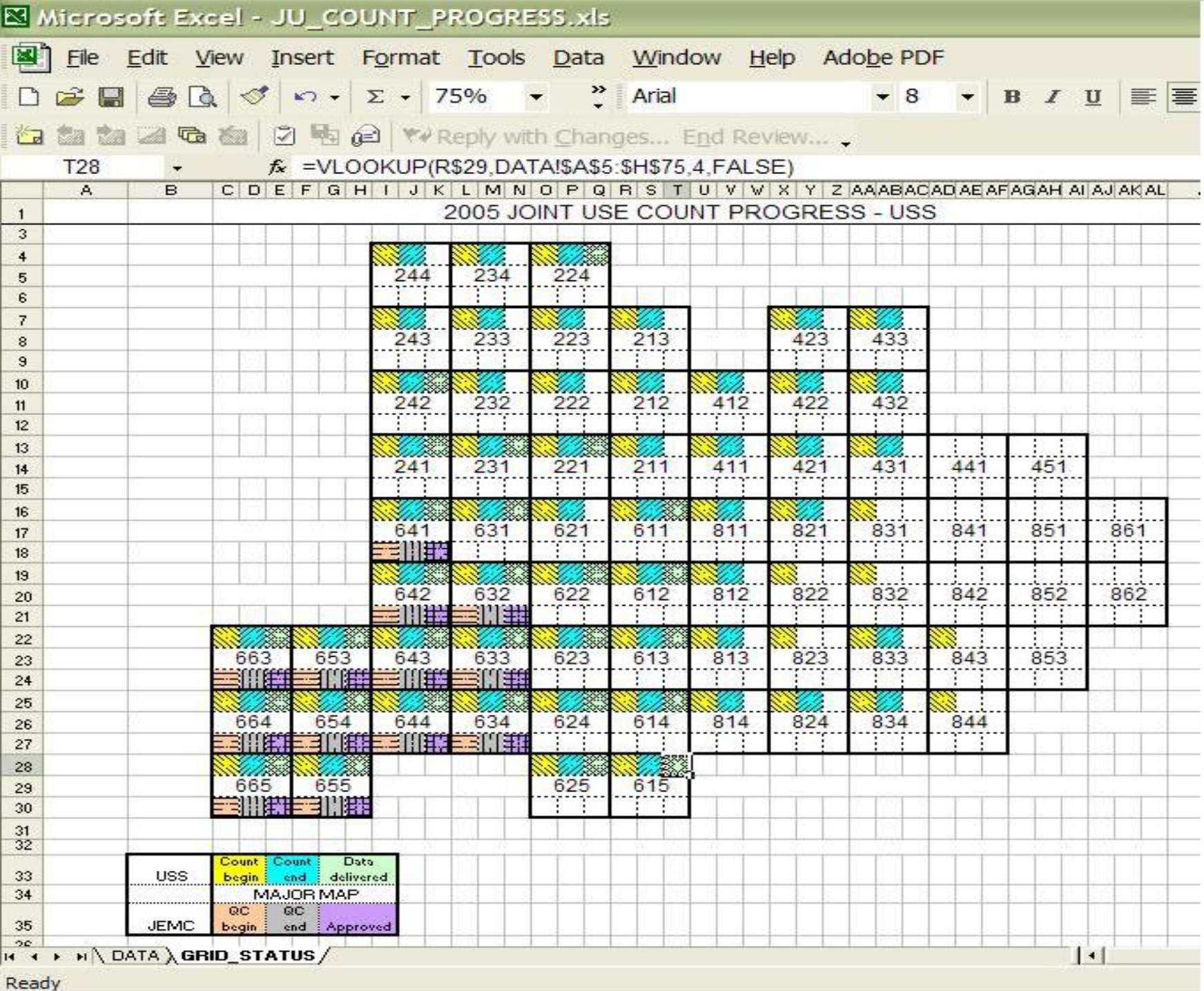
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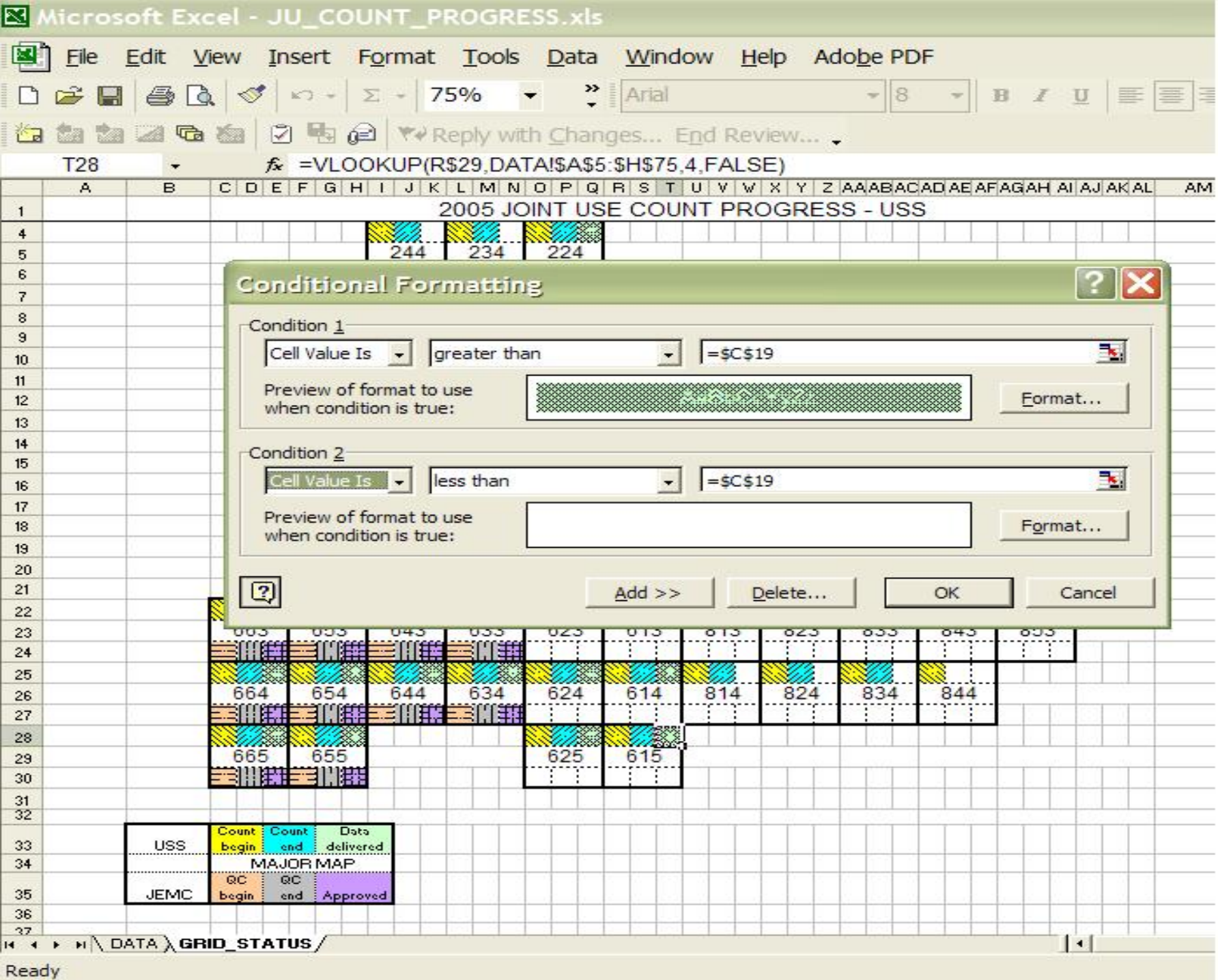
Arial
8
Reply with Changes... End Review...
T28
=VLOOKUP(R$29,DATA!$A$5:$H$75,4,FALSE)
2005 JOINT USE COUNT PROGRESS - USS
244 234 224
243 233 223 213 423 433
242 232 222 212 412 422 432
241 231 221 211 411 421 431 441 451
641 631 621 611 811 821 831 841 851 861
642 632 622 612 812 822 832 842 852 862
663 653 643 633 623 613 813 823 833 843 853
664 654 644 634 624 614 814 824 834 844
665 655 625 615
USS
Count begin
Count end
Data delivered
MAJOR MAP
JEMC
QC begin
QC end
Approved
DATA
GRID_STATUS
Ready


Microsoft Excel - JU_COUNT_PROGRESS.xls
File Edit View Insert Format Tools Data Window Help Adobe PDF
75%
Arial
8
Reply with Changes... End Review...
T28
=VLOOKUP(R$29,DATA!$A$5:$H$75,4,FALSE)
2005 JOINT USE COUNT PROGRESS - USS
244 234 224
Conditional Formatting
Condition 1
Cell Value Is
greater than
=$C$19
Preview of format to use when condition is true:
AaBbCcYyZz
Format...
Condition 2
Cell Value Is
less than
=$C$19
Preview of format to use when condition is true:
Format...
Add >>
Delete...
OK
Cancel
664 654 644 634 624 614 814 824 834 844
665 655 625 615
USS
Count begin
Count end
Data delivered
MAJOR MAP
JEMC
QC begin
QC end
Approved
DATA
GRID_STATUS
Ready

Noble goals

- Expand the availability of GIS data to as many employees as is economically feasible to maximize the value of the data. (huge investments need to pay huge dividends)
- In mobile GIS installations there is a need to maximize the use of available network bandwidth to distribute large GIS datasets
- Find innovative ways to mine and aggregate existing GIS data to provide added functionality and value to your company

Thank You !!!
Questions ???

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