



Public Works Department

GIS for Fleet Maintenance

Esri User Conference

GIS—The Intelligent Nervous System

July 8 - 12, 2019 | San Diego Convention Center, San Diego, California





IMPROVE EFFICIENCY & PERFORMANCE



CREATE A RELIABLE MAINTENANCE SCHEDULE



MANAGE ASSETS LIFECYCLE PREDICTIVE ANALYSIS



Fleet Maintenance Division Assets

- 1,200+ Equipment / Vehicles
- 148 Compress Natural Gas (CNG) Vehicles
- Maintains Various Agencies / Authorities Vehicles
- Manages County Fueling System



Challenges of Preventive Fleet Maintenance

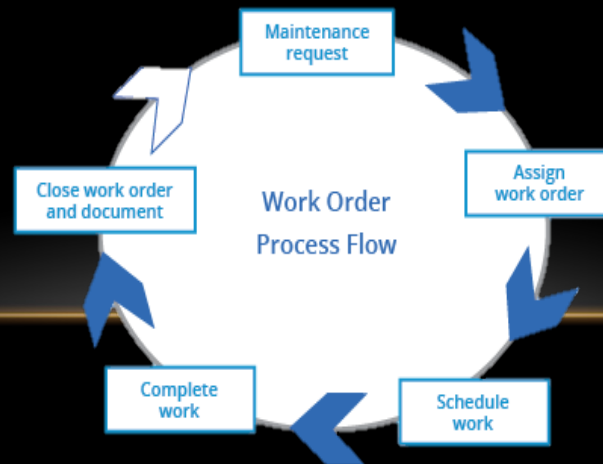
- Preventive Maintenance Schedules
- Deferring Maintenance
- Dependence on Driver Reporting Issues





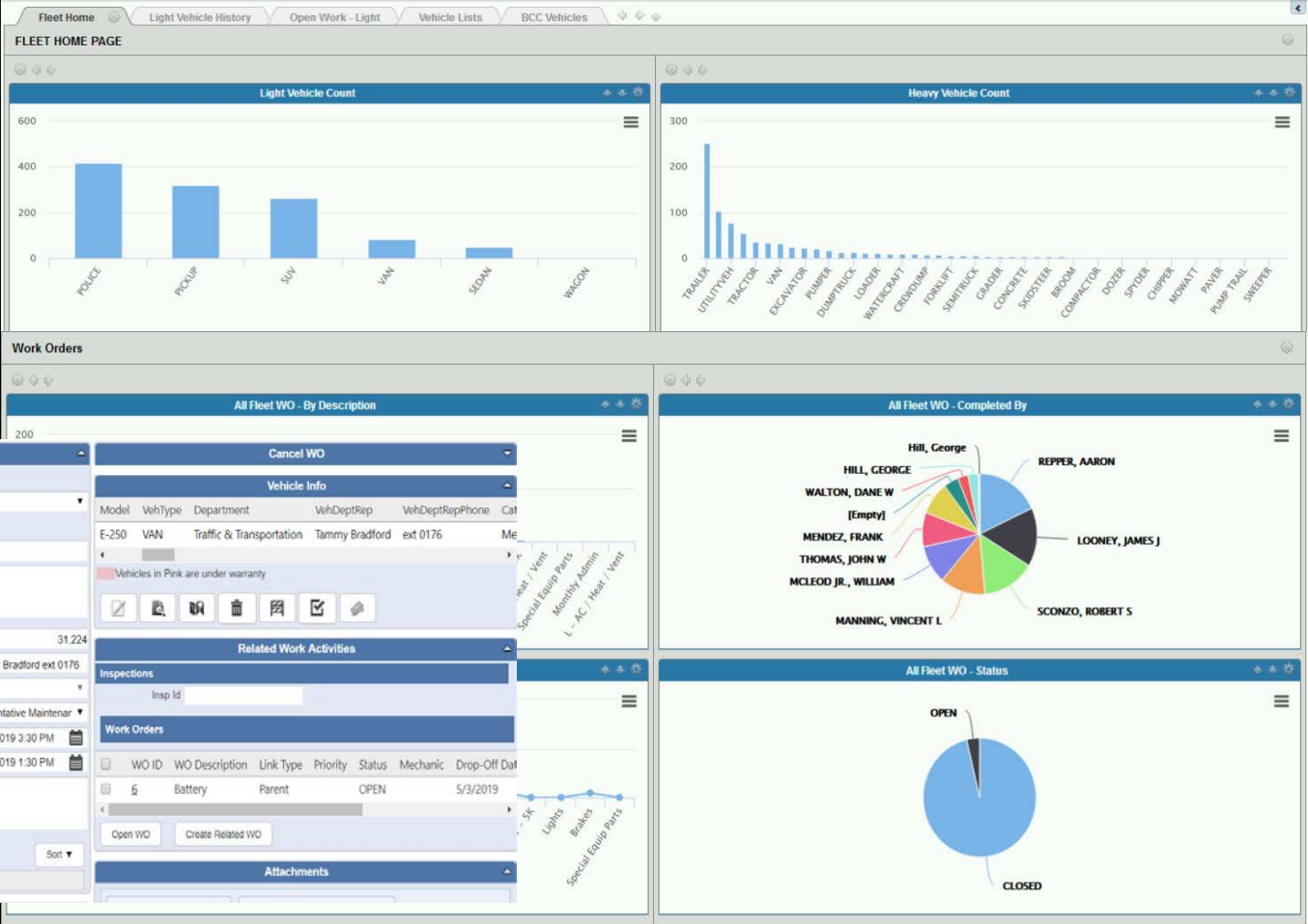
Problems of Deferred Maintenance

- **Delaying Maintenance Increase Future Cost**
- **Contributes to Safety Hazards**
- **Maintenance Backlog → Vicious Cycle**
 - **Leads to... System Failures & More Reactive Work**





Fleet Maintenance System





Vehicle Info in WMS

Cityworks®

Search...



ADMIN, FLEET ▼

Inbox

Create Work Orders

Search Work Orders

Search Vehicle History

Search Vehicle Inventory

Add New Vehicle

Storeroom

Calendar

Preventive Maintenance ▼

Admin ▼

GIS Search Criteria Data ▼



Drag a column header and drop it here to group by that column

VINNum	VehClass	VehType	Year	Make	Model	LastServDate	LastPMServDate	LastCNGServDate	LastServNote	EstNextPMDDate	EstNextPMMtrRead
1D7HU18N24J205743	LIGHT	PICKUP	2004	DODGE	PICKUP	12/18/2018 5:00:00 PM	12/18/2018 5:00:00 PM		08-Preventative Maintenance	6/16/2019 5:00:00 PM	211012
1GNEK13Z16R137766	LIGHT	SUV	2006	CHEVY	TAHOE	2/26/2018 12:00:00 AM	2/26/2018 12:00:00 PM		Oil Change 5k for Light Vehicle	8/25/2018 12:00:00 PM	90825
1GNEK13Z26R138652	LIGHT	SUV	2006	CHEVY	TAHOE	12/19/2018 5:00:00 PM	11/15/2016 7:27:00 AM			5/14/2017 7:27:00 AM	121219
1FAFP53U56A217327	LIGHT	SEDAN	2006	FORD	TAURUS	1/24/2019 5:00:00 PM	11/29/2018 12:00:00 PM			5/28/2019 12:00:00 PM	46463
1FTNF20566EC85570	LIGHT	PICKUP	2006	FORD	F-250	12/17/2018 5:00:00 PM	12/17/2018 5:00:00 PM		08-Preventative Maintenance	6/15/2019 5:00:00 PM	149847
1FTNF205X6EC85569	LIGHT	PICKUP	2006	FORD	F-250	6/26/2019 4:00:00 PM	12/13/2018 5:00:00 PM		05-Routine Inspection	6/11/2019 5:00:00 PM	62972
1FTRF14W06NB22167	LIGHT	PICKUP	2006	FORD	F-150	5/23/2019 4:00:00 PM	12/19/2018 3:30:59 PM		32-Accident	6/17/2019 3:30:59 PM	187900
1FMCU0DG6AKC96877	LIGHT	SUV	2010	FORD	ESCAPE	6/20/2019 4:00:00 PM	12/12/2018 8:30:00 PM		05-Routine Inspection	6/10/2019 8:30:00 PM	55264
1FTMF1CM6BF825220	LIGHT	PICKUP	2011	FORD	F-150	12/19/2018 5:00:00 PM	12/19/2018 5:00:00 PM		08-Preventative Maintenance	6/17/2019 5:00:00 PM	131637
1GKW2PEG9BR255381	LIGHT	SUV	2011	GMC	YUKON XL 2500 4X	11/29/2018 12:00:00 PM	11/29/2018 12:00:00 PM			5/28/2019 12:00:00 PM	166480
1FMHK788CGA43271	LIGHT	SUV	2012	FORD	EXPLORER	12/7/2018 5:00:00 PM	12/7/2018 5:00:00 PM		08-Preventative Maintenance	6/5/2019 5:00:00 PM	55360
1FTMF1CM0CFA89445	LIGHT	PICKUP	2012	FORD	F-150	12/28/2018 5:00:00 PM	12/28/2018 5:00:00 PM		08-Preventative Maintenance	6/26/2019 5:00:00 PM	31846
1FTX1CM1DF861420	LIGHT	PICKUP	2013	FORD	F-150	12/14/2018 2:32:28 PM	12/14/2018 2:32:28 PM		08-Preventative Maintenance	6/12/2019 2:32:28 PM	34538
1FTX1CM5DF861419	LIGHT	PICKUP	2013	FORD	F-150	2/20/2019 5:00:00 PM	12/12/2018 3:41:29 PM			6/10/2019 3:41:29 PM	47911
1FTX1EM9DF084380	LIGHT	PICKUP	2013	FORD	F-150	12/6/2018 12:00:00 PM	12/6/2018 12:00:00 PM		08-Preventative Maintenance	6/4/2019 12:00:00 PM	18695
5N1AN0NV0EN809635	LIGHT	SUV	2014	NISSAN	XTERRA	12/6/2018 12:00:00 PM	12/6/2018 12:00:00 PM		08-Preventative Maintenance	6/4/2019 12:00:00 PM	20665
1FTX1CMXEKD94267	LIGHT	PICKUP	2014	FORD	F-150	6/26/2019 4:00:00 PM	12/21/2018 5:00:00 PM	3/8/2019 9:00:00 PM	04-Drivers Report	6/19/2019 5:00:00 PM	93358
1FTX1EM8EKE02833	LIGHT	PICKUP	2014	FORD	F-150	5/6/2019 7:30:45 PM	12/21/2018 5:00:00 PM		04-Drivers Report	6/19/2019 5:00:00 PM	44785
1FA6PG0G71E5403168	LIGHT	SEDAN	2014	FORD	FUSION	4/16/2019 5:15:00 PM	12/27/2018 5:00:00 PM		04-Drivers Report	6/25/2019 5:00:00 PM	9806
1FTFX1EF2EK D94282	LIGHT	PICKUP	2014	FORD	F-150	11/16/2018 11:08:35 AM	11/16/2018 11:08:35 AM		Air Filter	5/15/2019 11:08:35 AM	70549
1FT7W2A63FEC03441	LIGHT	PICKUP	2015	FORD	F-250	4/23/2019 4:00:00 PM	12/18/2018 5:00:00 PM	3/11/2019 3:00:00 PM	04-Drivers Report	6/16/2019 5:00:00 PM	46353
1FTMF1CM6FKG23147	LIGHT	PICKUP	2014	FORD	F-150	5/21/2019 4:00:00 PM	12/6/2018 12:00:00 PM	6/8/2015 12:00:00 AM	04-Drivers Report	6/4/2019 12:00:00 PM	55303



IMPROVE EFFICIENCY & PERFORMANCE

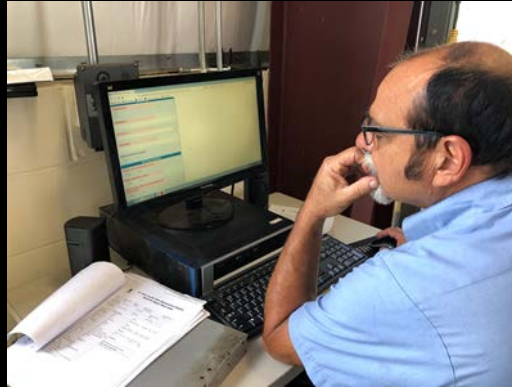


Low-Tech Fleet Management System

- **Driver's Reporting Dependent**
- **Incomplete Data Not Suitable for Reporting**
- **Unreliable Information Leads to Downtime**
- **Less Wrench Time... More Wait Time...**



Fueling System Integration





Survey123 Vehicle Pre-Trip Checklist

SJC Vehicle Pre-Trip Checklist

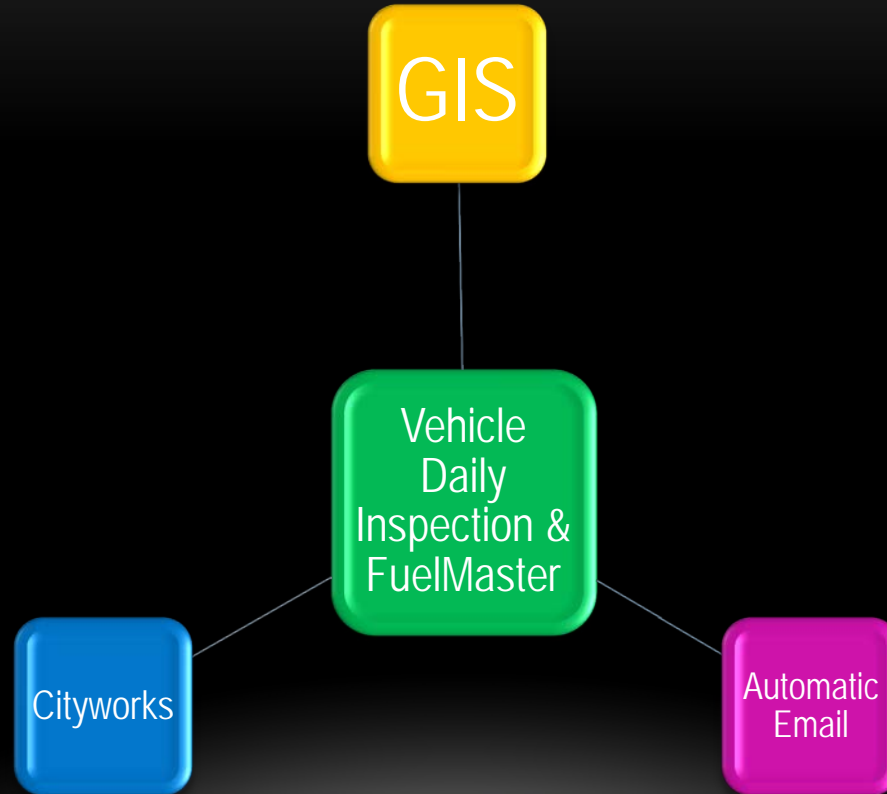
- User Submission Info ▶
- Equipment Info ▶
- Vehicle Walk-Around Check List ▶
- Vehicle Maintenance Report ▶

Submit

Powered by Survey123 for ArcGIS



Utilizing GeoEvent Server





CREATE A RELIABLE MAINTENANCE SCHEDULE



Dynamic PM Reporting

Cityworks®										Search	Refresh	Print	ADMIN, FLEET ▾
Inbox	Create Work Orders	Search Work Orders	Search Vehicle History	Search Vehicle Inventory	Add New Vehicle	Storeroom	Calendar	Preventive Maintenance ▾	Admin ▾				
GIS Search Criteria	Data ▾							INSP Due - CNG Vehicles					
Drag a column header and drop it here to group by that column													
VINNum	VehClass	VehType	Year	Make	Model	LastServDate	LastPMServDate	LastCNGServDate		extPMTrRead			
1D7HU18N24J205743	LIGHT	PICKUP	2004	DODGE	PICKUP	12/18/2018 5:00:00 PM	12/18/2018 5:00:00 PM						
1GNEK13Z16R137766	LIGHT	SUV	2006	CHEVY	TAHOE	2/26/2018 12:00:00 AM	2/26/2018 12:00:00 PM						
1GNEK13Z26R138652	LIGHT	SUV	2006	CHEVY	TAHOE	12/19/2018 5:00:00 PM	11/15/2016 7:27:00 AM						
1FAFP53U56A217327	LIGHT	SEDAN	2006	FORD	TAURUS	1/24/2019 5:00:00 PM	11/29/2018 12:00:00 PM						
1FTNF20566EC85570	LIGHT	PICKUP	2006	FORD	F-250	12/17/2018 5:00:00 PM	12/17/2018 5:00:00 PM		08-Preventative Maintenance	8/15/2019 3:00:00 PM	149847		
1FTNF205X6EC85569	LIGHT	PICKUP	2006	FORD	F-250	6/26/2019 4:00:00 PM	12/13/2018 5:00:00 PM		05-Routine Inspection	6/11/2019 5:00:00 PM	62972		
1FTRF14W06N822167	LIGHT	PICKUP	2006	FORD	F-150	5/23/2019 4:00:00 PM	12/19/2018 3:30:59 PM		32-Accident	6/17/2019 3:30:59 PM	187900		
1FMCU0D6AKC96877	LIGHT	SUV	2010	FORD	ESCAPE	6/20/2019 4:00:00 PM	12/12/2018 8:30:00 PM		05-Routine Inspection	6/10/2019 8:30:00 PM	55264		
1FTMF1CM68F825220	LIGHT	PICKUP	2011	FORD	F-150	12/19/2018 5:00:00 PM	12/19/2018 5:00:00 PM		08-Preventative Maintenance	6/17/2019 5:00:00 PM	131637		
1GKW2PEG9BR255381	LIGHT	SUV	2011	GMC	YUKON XL 2500 4X4	11/29/2018 12:00:00 PM	11/29/2018 12:00:00 PM			5/28/2019 12:00:00 PM	166480		
1FMHK788CGA43271	LIGHT	SUV	2012	FORD	EXPLORER	12/7/2018 5:00:00 PM	12/7/2018 5:00:00 PM		08-Preventative Maintenance	6/5/2019 5:00:00 PM	55360		
1FTMF1CM0CFA89445	LIGHT	PICKUP	2012	FORD	F-150	12/28/2018 5:00:00 PM	12/28/2018 5:00:00 PM		08-Preventative Maintenance	6/26/2019 5:00:00 PM	31846		
1FTEX1CM1DFB61420	LIGHT	PICKUP	2013	FORD	F-150	12/14/2018 2:32:28 PM	12/14/2018 2:32:28 PM		08-Preventative Maintenance	6/12/2019 2:32:28 PM	34538		
1FTEX1CM5DFB61419	LIGHT	PICKUP	2013	FORD	F-150	2/20/2019 5:00:00 PM	12/12/2018 3:41:29 PM			6/10/2019 3:41:29 PM	47911		
1FTEX1EM9DFB04380	LIGHT	PICKUP	2013	FORD	F-150	12/6/2018 12:00:00 PM	12/6/2018 12:00:00 PM		08-Preventative Maintenance	6/4/2019 12:00:00 PM	18695		
5N1AN0NV0EN809635	LIGHT	SUV	2014	NISSAN	XTERRA	12/6/2018 12:00:00 PM	12/6/2018 12:00:00 PM		08-Preventative Maintenance	6/4/2019 12:00:00 PM	20665		
1FTEX1CMXEKD94267	LIGHT	PICKUP	2014	FORD	F-150	6/26/2019 4:00:00 PM	12/21/2018 5:00:00 PM	3/8/2019 9:00:00 PM	04-Drivers Report	6/19/2019 5:00:00 PM	93358		
1FTEX1EM8EK02833	LIGHT	PICKUP	2014	FORD	F-150	5/6/2019 7:30:45 PM	12/21/2018 5:00:00 PM		04-Drivers Report	6/19/2019 5:00:00 PM	44785		
1FA6P0G71E5403168	LIGHT	SEDAN	2014	FORD	FUSION	4/16/2019 5:15:00 PM	12/27/2018 5:00:00 PM		04-Drivers Report	6/25/2019 5:00:00 PM	9806		
1FTFX1EF2EK D94282	LIGHT	PICKUP	2014	FORD	F-150	11/16/2018 11:08:35 AM	11/16/2018 11:08:35 AM		Air Filter	5/15/2019 11:08:35 AM	70549		
1FT7W2A63FEC03441	LIGHT	PICKUP	2015	FORD	F-250	4/23/2019 4:00:00 PM	12/18/2018 5:00:00 PM	3/11/2019 3:00:00 PM	04-Drivers Report	6/16/2019 5:00:00 PM	46353		
1FTMF1CM9EKG23147	LIGHT	PICKUP	2014	FORD	F-150	5/24/2019 4:00:00 PM	12/6/2018 12:00:00 PM	6/8/2015 12:00:00 AM	04-Drivers Report	6/4/2019 12:00:00 PM	55303		



Preventative Maintenance Dashboard



Fleet Maintenance - BCC Light Vehicle Operations Dashboard

Active BCC Light Vehicles WITHOUT a PM in the Last Six Months

CV# 1054 - FORD EXPEDITION
BCC - Dept# 1224
Last Service Date: 9/12/2016, 8:00 PM
Last PM Service Date: 9/13/2016, 2:27 AM
Last Service Note: Oil Change 5k for Light Vehicle

CV# 1067 - FORD F-150
BCC - Dept# 1224
Last Service Date: 11/6/2016, 7:00 PM
Last PM Service Date: 11/18/2014, 7:15 AM
Last Service Note: Oil Change 5k for Light Vehicle

CV# 1839 - FORD EXPLORER
BCC - Dept# 1224
Last Service Date: 5/9/2017, 8:00 PM
Last PM Service Date: 5/10/2017, 1:00 AM
Last Service Note: New Vehicle Preparation

CV# 1069 - FORD F-150
BCC - Dept# 1224
Last Service Date: 11/6/2017, 7:00 PM
Last PM Service Date: 11/7/2017, 3:47 AM
Last Service Note: Oil Change 5k for Light Vehicle

CV# 0295 - CHEVY TAHOE
BCC - Dept# 1224
Last Service Date: 2/25/2018, 7:00 PM
Last PM Service Date: 2/26/2018, 7:00 AM
Last Service Note: Oil Change 5k for Light Vehicle

CV# 0104 - CHEVY SUBURBAN
BCC - Dept# 1224
Last Service Date: 9/27/2018, 2:00 PM
Last PM Service Date: 10/19/2017, 8:00 AM
Last Service Note: Air Filter

CV# 0194 - FORD RANGER
BCC - Dept# 0080
Last Service Date: 10/22/2018, 8:00 AM
Last PM Service Date: 10/22/2018, 8:00 AM
Last Service Note: Differential Service

CV# 1829 - FORD ESCAPE
BCC - Dept# 1148
Last Service Date: 10/25/2018, 8:00 AM
Last PM Service Date: 10/25/2018, 8:00 AM
Last Service Note: Oil Change 5k for Light Vehicle

CV# 0230 - CHEVY SUBURBAN

Last update: a minute ago

Number of BCC Light Vehicles That Have Not Had PM for...

> 6 Months

54

> 1 Year

8

PM Count

96

Vehicles with a PM Service

Current Month

Service Count

188

Vehicles serviced including PM

Current Month

BCC Light Vehicles Due for PM this Month

CV# 1764 - FORD ESCAPE
BCC - Dept# 0012

Last PM Date: 12/6/2018, 7:00 AM
Estimated Next PM: 6/4/2019, 8:00 AM

Last Fuel Meter Read: 24,123
Estimated Meter Read for Next PM: 25,813

CV# 1645 - FORD F-150
BCC - Dept# 0080

Last PM Date: 12/6/2018, 7:00 AM
Estimated Next PM: 6/4/2019, 8:00 AM

Last Fuel Meter Read: 55,831
Estimated Meter Read for Next PM: 55,303

CV# 1526 - NISSAN XTERRA
BCC - Dept# 0043

Last PM Date: 12/6/2018, 7:00 AM
Estimated Next PM: 6/4/2019, 8:00 AM

Last Fuel Meter Read: 16,576
Estimated Meter Read for Next PM: 20,665

CV# 1477 - FORD F-150
BCC - Dept# 0046

Last PM Date: 12/6/2018, 7:00 AM
Estimated Next PM: 6/4/2019, 8:00 AM

Last Fuel Meter Read: 15,113
Estimated Meter Read for Next PM: 18,695

CV# 1766 - FORD ESCAPE
BCC - Dept# 0043

Last PM Date: 12/6/2018, 7:00 AM
Estimated Next PM: 6/4/2019, 8:00 AM

Last Fuel Meter Read: 8,882
Estimated Meter Read for Next PM: 10,895

CV# 1412 - FORD EXPLORER
BCC - Dept# 0029

Last update: a minute ago

BCC Light Vehicles with High Priority PM

Fuel Meter Read is - or > Estimated Next PM Meter Read

CV# 1577 - FORD F-250
BCC - Dept# 0064

Last PM Date: 4/12/2019, 12:00 PM
Estimated Next PM: 10/9/2019, 12:00 PM

Last Fuel Meter Read: 130,397
Estimated Meter Read for Next PM: 128,209

CV# 1648 - FORD F-250
BCC - Dept# 0080

Last PM Date: 4/5/2019, 8:45 AM
Estimated Next PM: 10/2/2019, 8:45 AM

Last Fuel Meter Read: 81,495
Estimated Meter Read for Next PM: 80,865

CV# 1530 - NISSAN XTERRA
BCC - Dept# 4471

Last PM Date: 3/26/2019, 12:00 PM
Estimated Next PM: 9/22/2019, 12:00 PM

Last Fuel Meter Read: 102,273
Estimated Meter Read for Next PM: 100,855

CV# 1616 - FORD F-250
BCC - Dept# 0080

Last PM Date: 2/28/2019, 12:00 PM
Estimated Next PM: 8/27/2019, 1:00 PM

Last Fuel Meter Read: 194,083
Estimated Meter Read for Next PM: 102,888

CV# 1470 - GMC YUKON
BCC - Dept# 1224

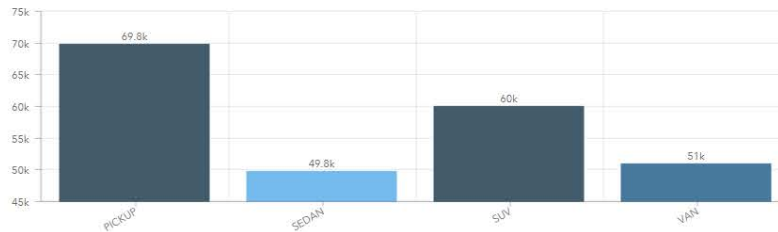
Last PM Date: 2/25/2019, 12:00 PM
Estimated Next PM: 8/24/2019, 1:00 PM

Last Fuel Meter Read: 122,000
Estimated Meter Read for Next PM: 121,128

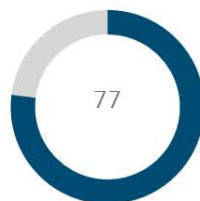
CV# 1557 - FORD F-250
BCC - Dept# 1270

Last update: a minute ago

Average Mileage by BCC Light Vehicle Type

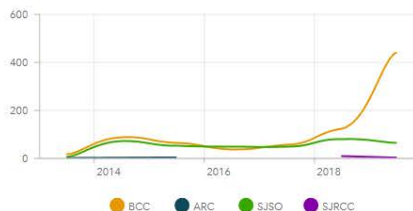


Avg Light Vehicle Condition Score



Based on Vehicle Inspections from Cityworks

Yearly PM Completed Per Agency





MANAGE ASSETS LIFECYCLE PREDICTIVE ANALYSIS



Preventive Maintenance Scheduling

- **Timely & Well-executed PMs Reduce Breakdowns**
 - **Diverse Equipment Presents Challenges**
 - **PMs Must be Tracked, Compared, & Analyzed**
 - **Leveraging Operational Insights for All Maintenance**
-



Decreasing Deferred Maintenance

- 1. Tracking Maintenance Activity**
- 2. Conduct Audit**
- 3. Prioritize Backlog**
- 4. Increase PM**
- 5. Re-asses Work Activity Process**



Question & Comments

Contact Information



Rocky S. Agbunag, MSc, GISP
Information Systems Manager
(904) 209-0273
RAgbunag@sjcfl.us

Krista Marvel, GISP
GIS Systems Analyst
(904) 209-0275
KMarvel@sjcfl.us



Chris Blinn, MS, GISP
Senior Solutions Engineer
(205) 725-5874
Chris.blinn@gisinc.com