



# Installation Automation: Maintenance Made Easy

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*Installation Management Command*



Controlled by : HQ IMCOM  
Controlled by : AMIM-PW  
Limited Dissemination Control: DL ONLY  
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# Installation Automation: Maintenance Made Easy

## Agenda

- **ArmyMaintenance.com (ArMA)**
- **USAG Humphreys Maintenance Automation with Data Analytic**



# ArMA Mission

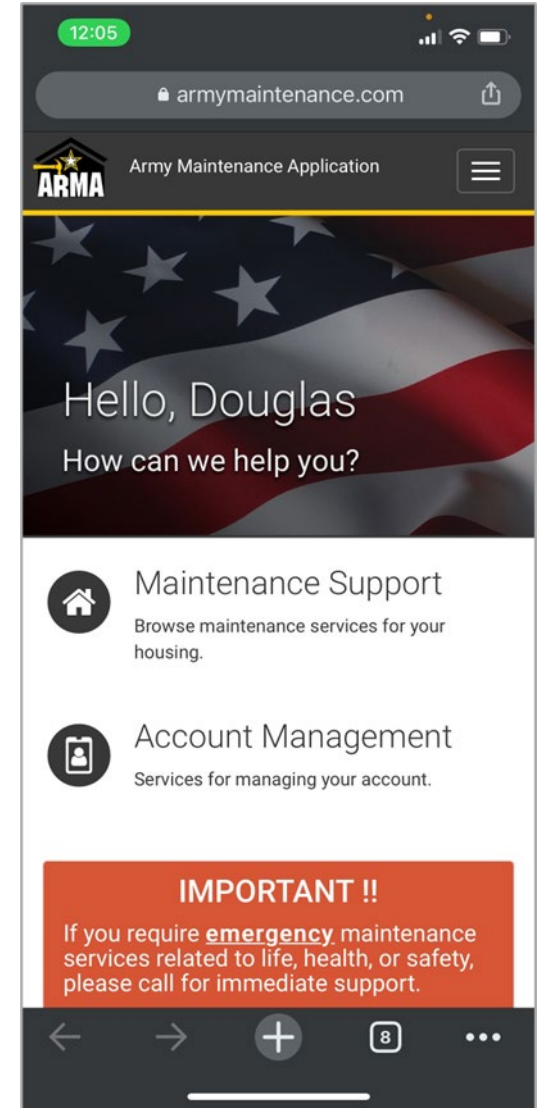
**Create a digital platform for customers of Army-maintained installations to submit and track maintenance requests.**

- **Original scope – Army-managed housing and barracks**

Soldiers and their families reporting housing related issues, for Army government managed housing, on a smart phone and/or publicly available website

- **Current expanded scope – “Fence-to-fence”**

ANY garrison customer can create a maintenance request for ANY DPW managed building or location, including utilities, roads, grounds, airfield, rail, etc.



# ArMA Workflow



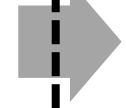
**ArmyMaintenance.com Customer**

Customer Submit Maintenance Request



**DPW Clerk**

Triage Request for work/non-work



**DPW Clerk**

Create GFEBS Demand Maintenance Order (DMO)



**DPW Technician**

Execute Work - Time, Equipment, Materials



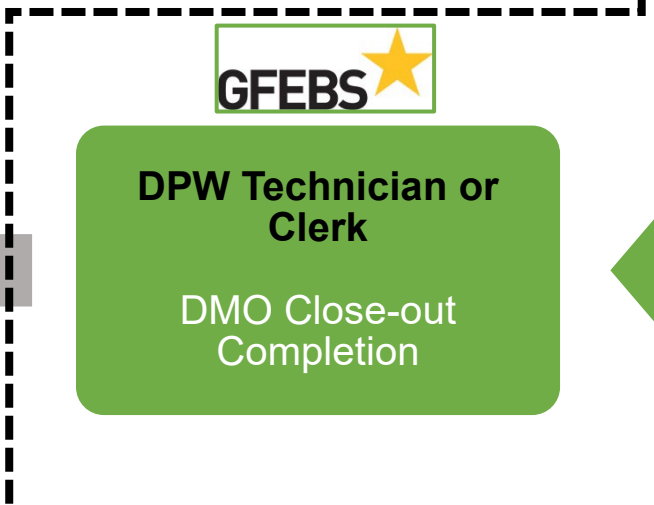
**DPW Technician or Clerk**

DMO Close-out Completion



**ArmyMaintenance.com Customer**

Receive Resolution and Complete Survey

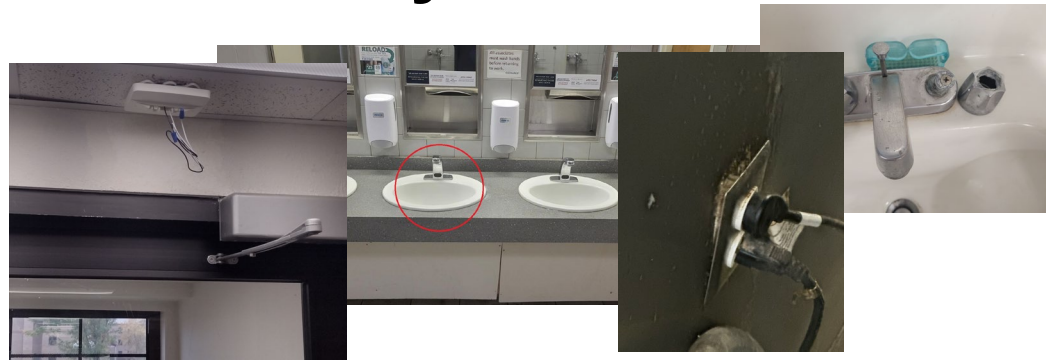


135K+ active users

2M+ total maintenance requests

In the last 12 months:

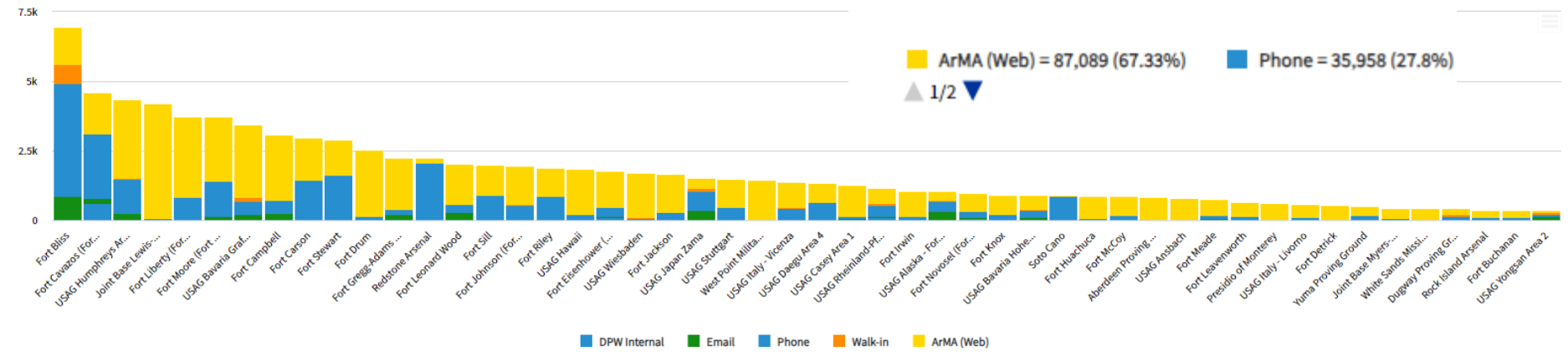
- 1.23M maintenance requests
- 451K in Barracks (37%)
- 58K in Army Family Housing (5%)
- 21K are Mold-Related (<2%)
- 154K included a picture (13%)



Maintenance Requests by Channel (Open)



Maintenance Requests by Installation (Last 30 Days)

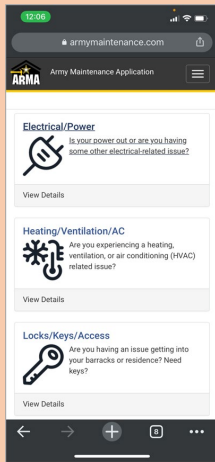


# Field Service Management (FSM) Pilot Program

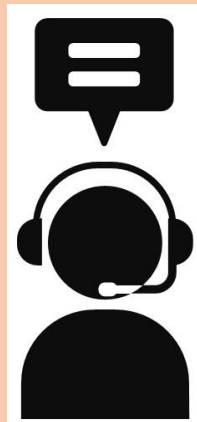


## Digital, paperless process for maintenance

Customer submits request



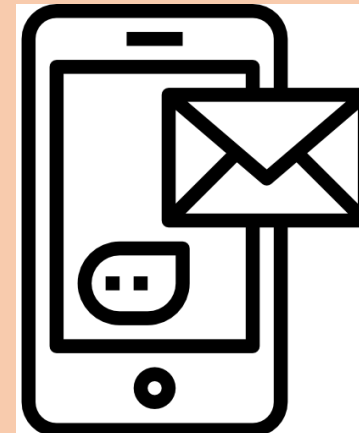
DPW Clerk Creates Work Order



Technician Receives Order, Records Time, and completes work



Customer receives completion notification



GFEBs

DPW Plant Maintenance  
Work Reported for cost accounting at completion



## ArMA Value to the Army

## ArMA Partner Value



- Digital communication with garrison customers
- Reports for commanders at all echelons
- Auditable and accountable record of maintenance requests and orders
- Available 24x7x365



- HUBZone Certified, SBA WOSB
- Premier ServiceNow Partner



- Army Enterprise Platform
- FedRAMP IL2/IL4/IL5 certified Environment



# United States Army Garrison Humphreys



## Maintenance Automation with Data Analytic







### OPPORTUNITIES

- Motivated leadership
- Recent command change at USAG Humphreys
- Willing workforce ready to follow leadership
- Hard working
- Awareness that there is a problem
- Common objective between US and Republic of Korea
- Proactive support and engagement from Installation Major Command (IMCOM) PAC





## IMCOM Korea BUILDER Program

Workplanning Data Analysis - March 2022



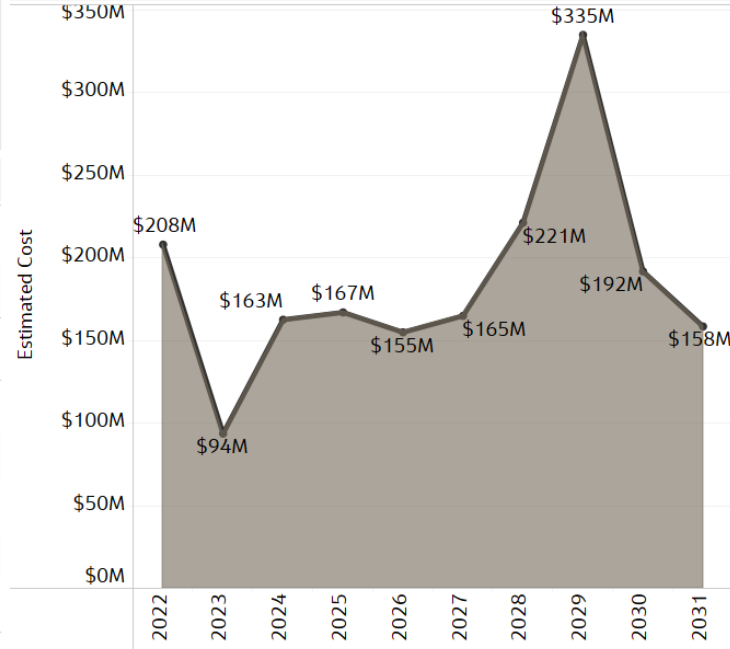
### Garrison Property

Number of Buildings	550	
Building Area (SF)	16,891,797	
Complex Name	Number of Buildings	Building Area (SF)
KS792 Camp Humphreys	539	16,830,039
KS104 Camp Ames	7	19,500
KS622 ICHEON - SOCKOR	2	13,985
zz-NonV NonVertical	1	26,481
KS691 Pyongtaek Cpx Area	1	1,792

### 10-Yr Total Work Cost

**\$1.86B**

### Unconstrained 10-Year Workplan

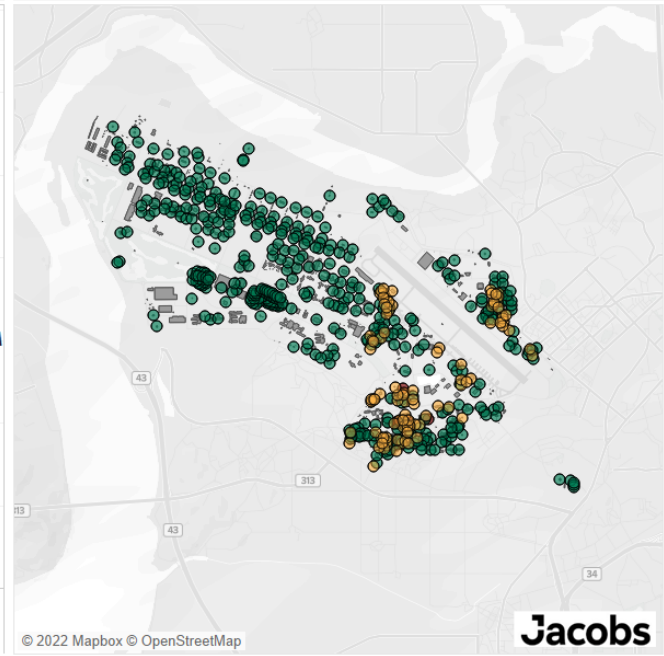


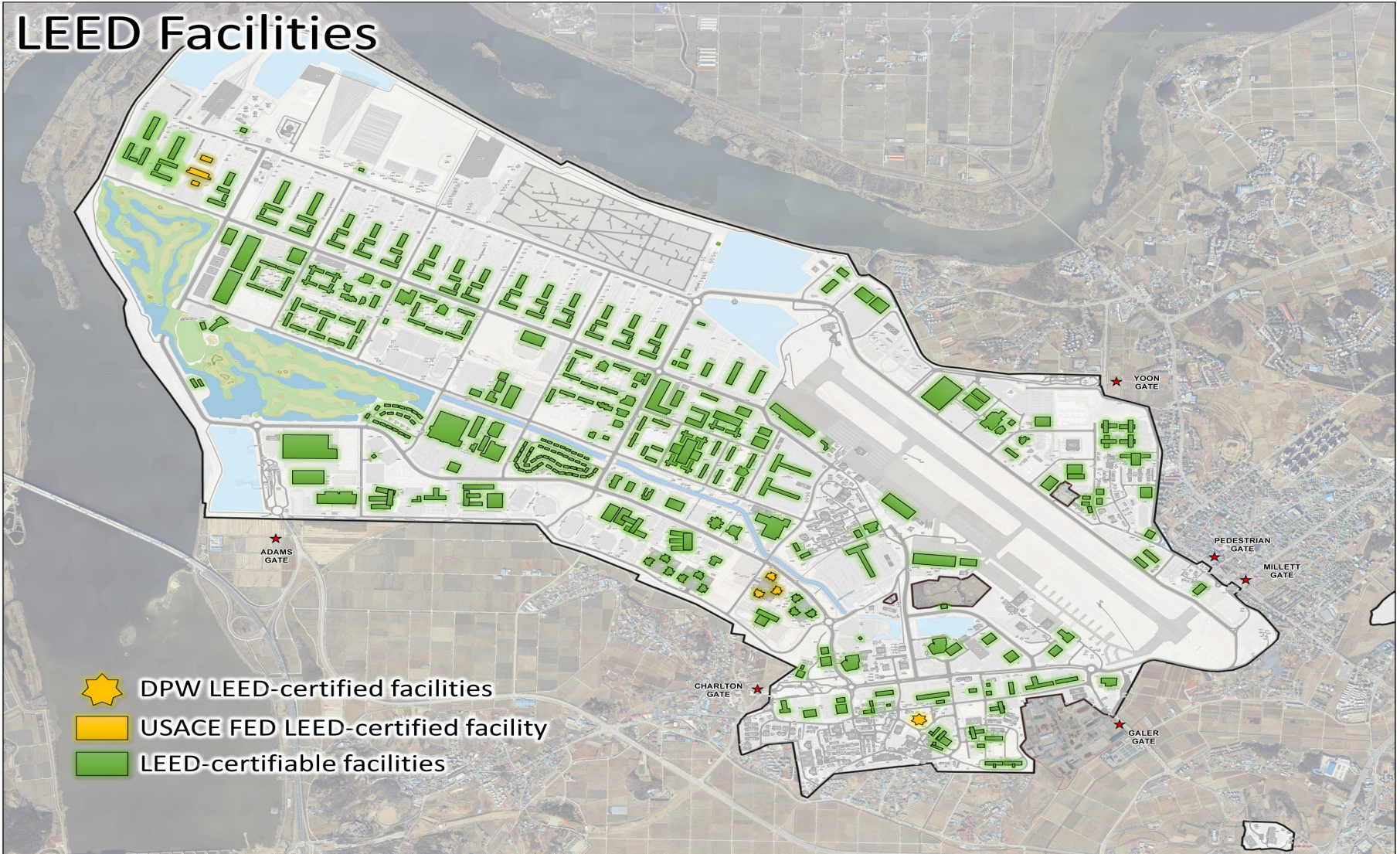
## Executive Summary

Site Name

- Camp Casey
- USAG Camp Humphreys
- USAG Daegu (Camp Henry)
- USAG Yongsan

### INSTALLATION BCI RESULTS

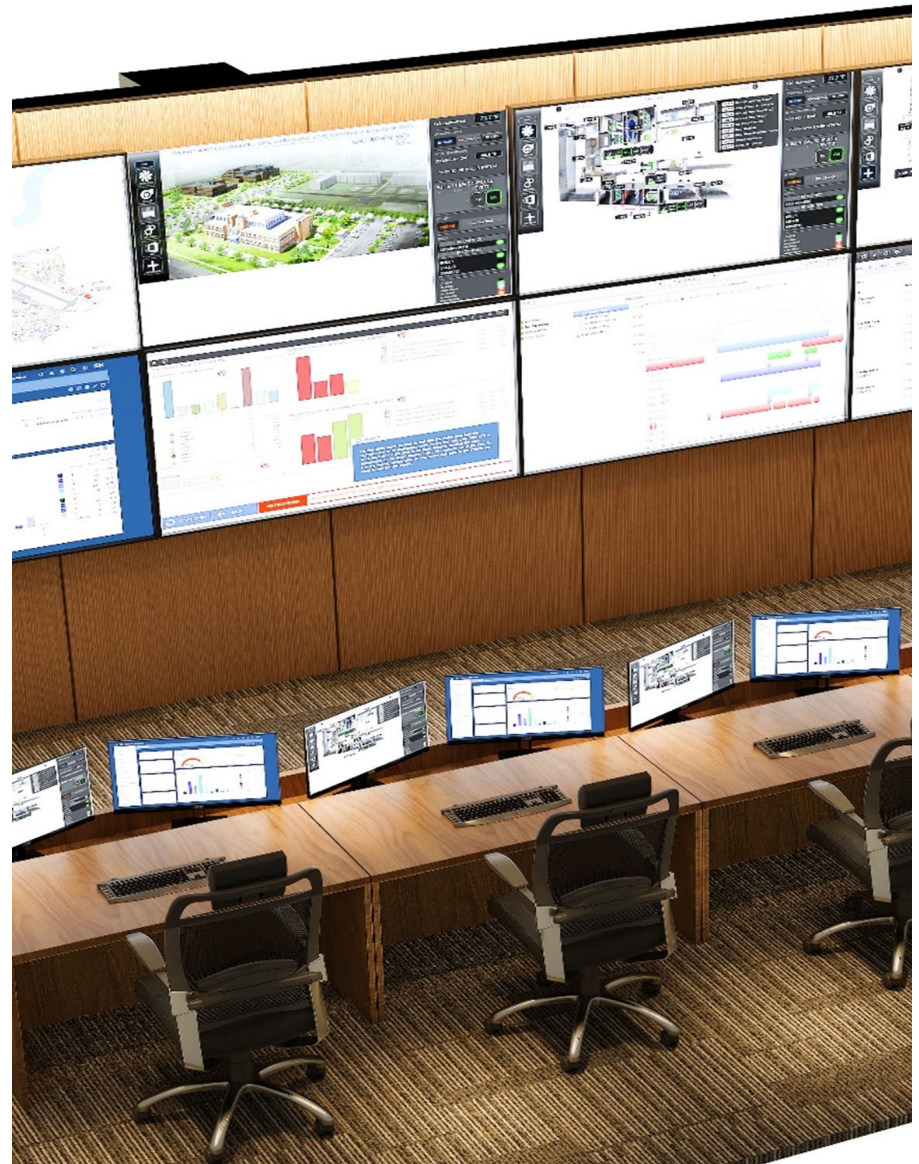




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# USAG Humphreys Maintenance Automation with Data Analytic



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# Maintenance Automation with Data Analytic

## Monitor



### Building Level

- UMCS
- Smart Meter

### Outside Utilities

- SCADA
- MicroGrid

## Respond



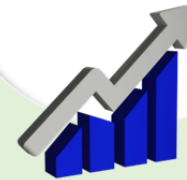
### Assess Problem

- Equipment Manuals
- "As Built" Drawings
- Supply Stockages
- Existing Service Orders

### Coordinate Response

- Building Manager
- O&M Work Force
- Work Reception
- Garrison Services

## Forecast



### Evaluate Facilities

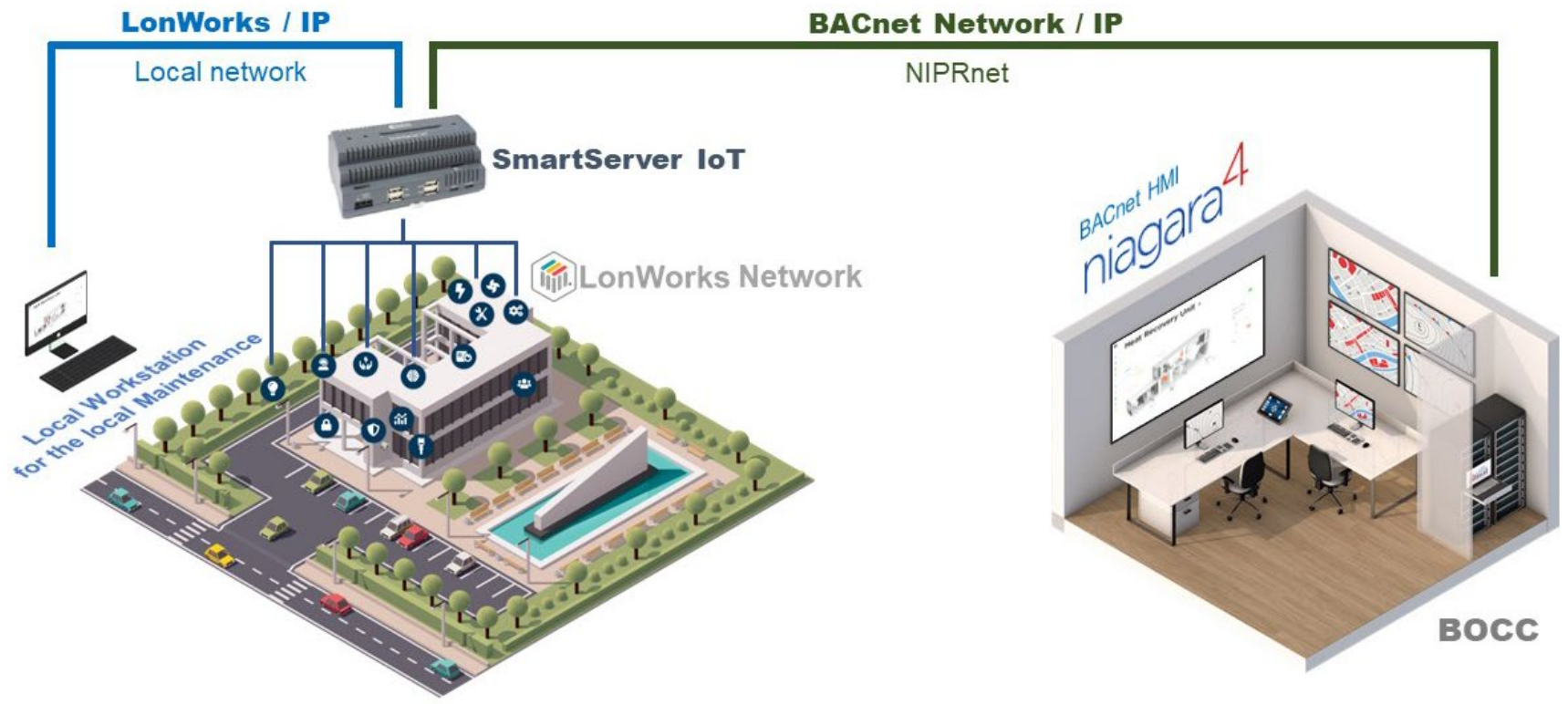
- Army Systems
- Trend Analysis
- Local Metrics

### Inform Plans

- Annual Work Plan
- Swing Space Plan
- Master Plan



# USAG Humphreys System Integration Architecture



## UMCS OVERVIEW



U.S. ARMY GARRISON HUMPHREYS



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# Maintenance Automation with Data Analytic

## Installation Data

### Asset/Inventory

- ISR
- RPLANS
- HQIS
- IGI&S Systems

### Resources

- GFEBs

### Utilities

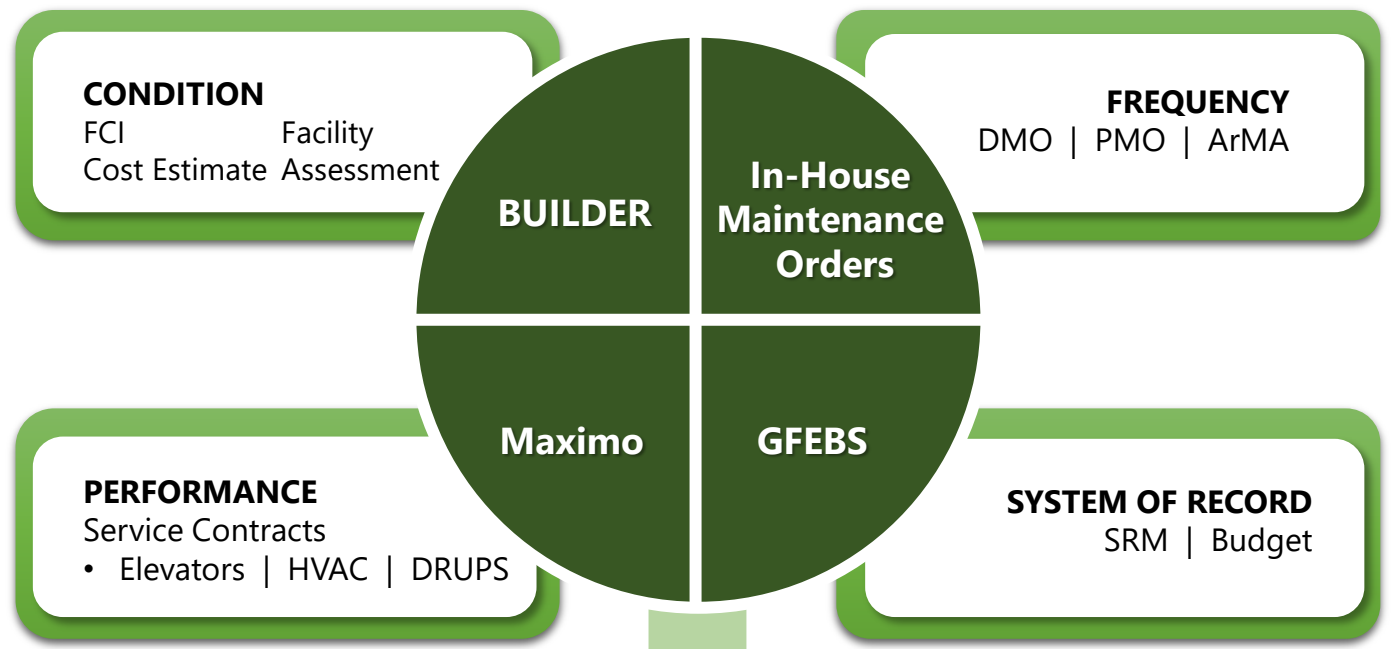
- AEWRs
- Energy & Water Planning

### Operational

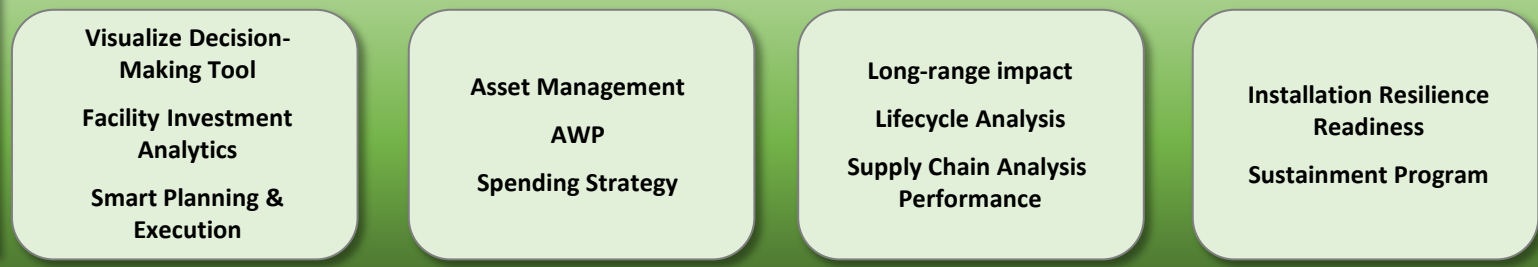
- Control Systems
- O&M Records
- Space Utilization

### Future

- IOT Devices
- Cybersecurity Assessments



## DATA-DRIVEN DECISION-MAKING



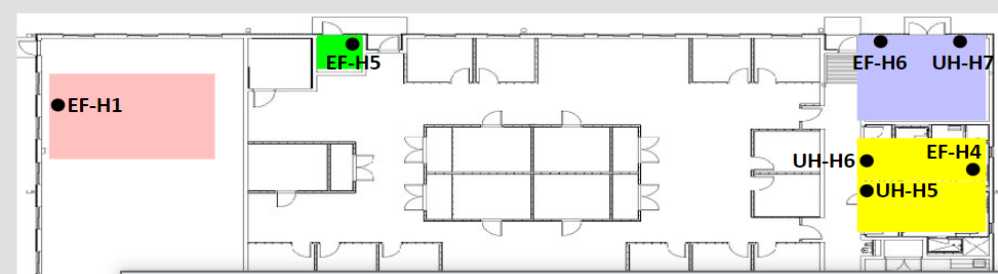


# Backup Slides



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Pop up - Google Chrome

Not secure | [https://localhost:4431/ord?station:%7Cslot:/Services/AlarmService/All\\_Alarms/vie...](https://localhost:4431/ord?station:%7Cslot:/Services/AlarmService/All_Alarms/vie...)

Time Range: ? to ? 1 Source(s) / 1 Alarm(s)

Info	Timestamp	Source	Ack State	Alarm Class
<input type="checkbox"/>	06-Feb-23 8:55:41 AM KST	EF-H-6 ZONE_T&UH-H-7 ZONE_T	0 Acked / 1 Unacked	B07031_CRITICAL

- [EF-H-4] TOILET(132, 133, 134)
- [EF-H-5] ELEC RM(124)
- [EF-H-6] MECH RM(135)
- [UH-H-5] WOMEN(132)
- [UH-H-6] MEN (134)
- [UH-H-7] MECH RM(112)

### EXHAUST FAN

OPERATED BY ZONE TEMP \* DEFAULT : 95°F

Unit	MANUAL	OUTPUT	ZONE-T	SP
EF-H-1	OFF	OFF	69.0 °F	95.0 °F
EF-H-2	OFF	OFF	67.5 °F	95.0 °F
EF-H-3	OFF	OFF	75.1 °F	95.0 °F
EF-H-5	OFF	OFF	62.4 °F	95.0 °F

EF-H-6 (2SPEED FAN) \* HIGH : 95°F / LOW : 77°F

**HIGH**

MANUAL	OUTPUT	ZONE-T	SP
OFF	OFF	63.7 °F	95.0 °F

**LOW**

MANUAL	OUTPUT	ZONE-T	SP
OFF	ON	77.0 °F	

INTERLOCKED WITH LIGHTING

EF-H-4 **ON** MANUAL OFF OUTPUT OFF

### UNIT HEATER

OPERATED BY ZONE TEMP \* DEFAULT : 68°F

Unit	MANUAL	OUTPUT	ZONE-T	SP
UH-H-5	OFF	OFF	71.5 °F	68.0 °F
UH-H-6	OFF	OFF	72.5 °F	55.0 °F

\* DEFAULT : 55°F

Unit	MANUAL	OUTPUT	ZONE-T	SP
UH-H-7	ON	ON	63.7 °F	55.0 °F

**OA TEMPERATURE** 32.1 °F

HEATING MODE

**MODE SELECTED BY** TEMP

0 : TEMP / 1 : USER / 2 : MONTH

- SELECTED BY OA-TEMP

TEMP\_SP 68.0 °F

- SELECTED BY USER

HEATING ON

- SELECTED BY MONTH (NOT HEATING MODE)

4 ~ 10

**EMERGENCY SHUTOFF**

**LEGEND**

ONLINE STATUS  OFFLINE STATUS

ALARM STATUS  OVERRIDE STATUS

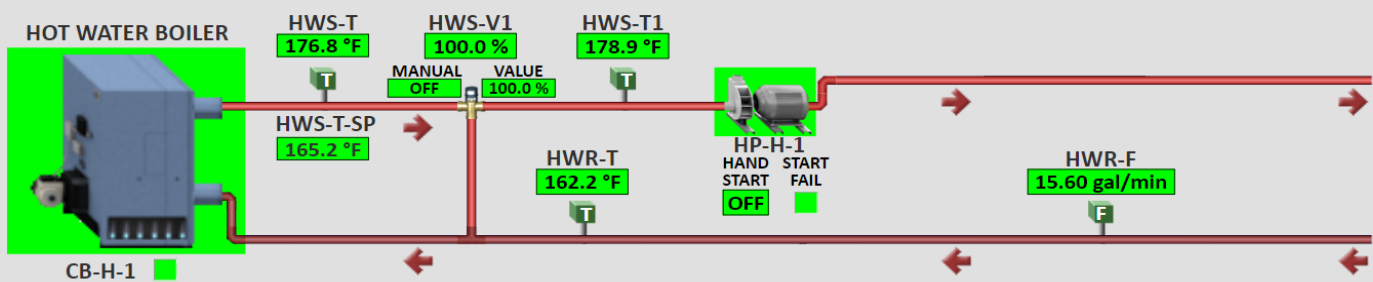
# Building Automation System/UMCS

## BOILER

SYSTEM MODE AUTO

CB-G-1 STOP

HP-G-1 STOP



NOTE: OARC IS WORKING WITH ONLY CONDENSING HOT WATER BOILER, NOT WITH 3-WAY MIXING CONTROL VALVE. THE 3-WAY CONTROL VALVE IS SET 100% FLOW POSITION.

OA TEMPERATURE 29.8 °F

HEATING MODE

MODE SELECTED BY TEMP

0 : TEMP / 1 : USER / 2 : MONTH

- SELECTED BY OA-TEMP

TEMP\_SP 68.0 °F

- SELECTED BY USER

HEATING ON

- SELECTED BY MONTH (NOT HEATING MODE)

4 ~ 10

**EMERGENCY SHUTOFF**

OFF

**LEGEND**

ONLINE STATUS ONLINE OFFLINE STATUS OFFLINE

ALARM STATUS ALARM OVERRIDE STATUS OVERRIDE



1 of 10
OLD TREND METER
REPORT
4 of 25

**OPERATION AND MAINTENANCE MANUALS**

FOR  
CY09 A09Y615, VMF 040, INSTALLATION VMF'S  
USAG HUMPHREYS, KOREA

[ VOLUME 4 OF 9 ]

CHAPTER 4. MECHANICAL

HWS-T1  
178.3 °F

HWR-T  
162.5 °F

HP-H-1  
HAND START FAIL  
OFF

HWR-F  
15.60 gal/min

CB-H-1  
HAND OFF

NOTE: OARC IS WORKING WITH ONLY CONDENSING HOT WATER BOILER, NOT WITH 3-WAY MIXING CONTROL VALVE. THE 3-WAY CONTROL VALVE IS SET 100% FLOW POSITION.

HEATING ON

- SELECTED BY MONTH (NOT HEATING MODE)

3 ~ 10

EMERGENCY SHUTOFF

LEGEND

■ ONLINE STATUS    ■ OFFLINE STATUS  
■ ALARM STATUS    ■ OVERRIDE STATUS



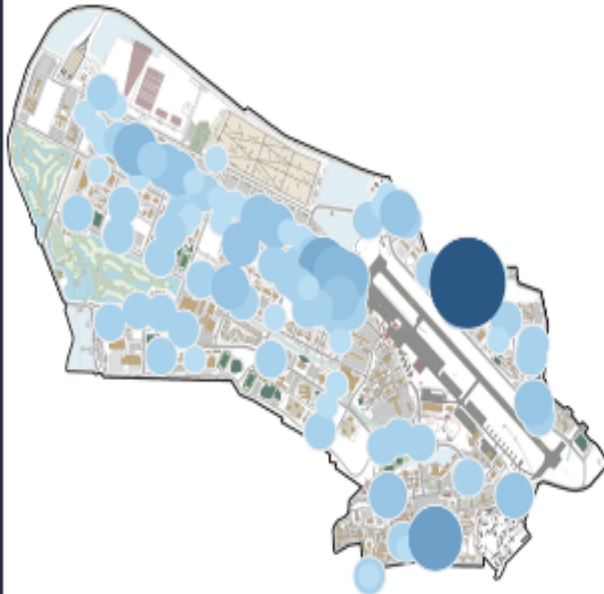
No longer required to submit pre-serial or post-serial COVID-19 tests

FROM 10/5/2020 To 2/1/2023

Most Unscheduled Task Occurred

Total Unscheduled Work

195



Most Occurred Type of Work

Total	3,682	2,276
1 Transfer to M&M	994	357
2 BAS Operation	721	417
3 General Service Work	619	408
4 Figure HVAC equipment	111	113
5 Explain operation method	142	70
6 Replace valve actuator	122	65
7 Replace sensor	121	67
8 Repair valve actuator	115	94
9 Replace damper actuator	78	47
10 Temporary Operation		

This Year Last Year

Most Costly Type of Work (Labor & Material) (Unit : KRW)

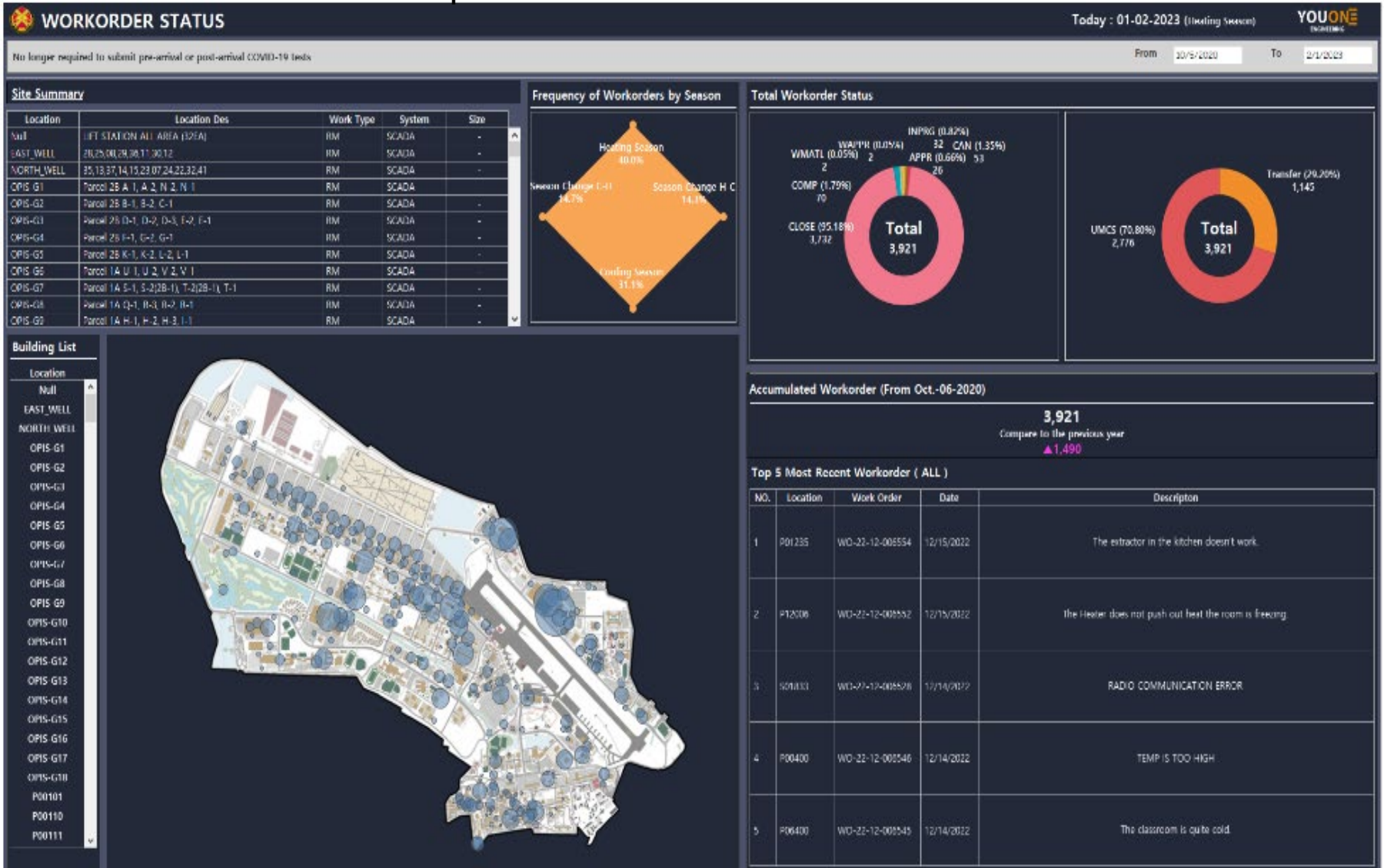
Total	1,011,947,318	1,747,034,948
1 BAS Operation	508,022,280	350,852,306
2 General Service Work	230,051,733	250,910,393
3 Repair valve actuator	180,300,187	171,575,549
4 Replace DOC	124,385,154	104,623,287
5 Replace valve actuator	115,450,062	86,500,550
6 Transfer to M&M	91,011,820	51,981,971
7 Replace sensor	70,230,206	23,813,434
8 Replace damper actuator	65,313,687	33,682,825
9 Replace comm cable	55,888,826	191,575

This Year Last Year

Material IN and OUT Status

Model	Description	Last IN Date	Last OUT Date	Qty (IN)	Qty (OUT)	Used Count (IN)	Used Count (OUT)	Usage Rate	Current Balance
AF524-MFT-S	Damper Actuator	12/30/2021	13/12/2022	70	122	2	107	9.5%	0
A71 BK-140-03-N51	Dist. Temp. sensor (Temp. Only) for Schneider	08/08/2021	08/12/2022	100	101	1	81	5.8%	41
THW#14	Power Cable for 120V circuit	Null	01/12/2022	0	20	0	2	0.2%	563
	Power Cable wire (THW#14) Black	Null	28/10/2022	0	704	0	20	1.8%	391
	Power Cable wire (THW#14) Blue	Null	17/08/2022	0	160	0	5	0.4%	740
	Power Cable wire (THW#14) Green	Null	28/10/2022	0	65	0	9	0.8%	885
	Power Cable wire (THW#14) Red	Null	17/06/2022	0	160	0	5	0.4%	730
	Power Cable wire (THW#14) white	Null	28/10/2022	0	654	0	17	1.5%	456
EST-12	Battery 12V 74H	05/05/2021	11/07/2022	40	118	1	39	3.2%	22
E2012S	Cable wire for sensing and control 2C	05/28/2022	08/11/2022	3,612	2,620	3	30	3.4%	1,367
UTP Cat5e	UTP Cat5e	08/24/2021	13/12/2021	300	481	1	35	3.1%	250
NR24 SR-S	Damper Actuator	09/15/2021	14/10/2022	20	36	1	23	2.0%	0
UGLK160	Damper Actuator(ACT/SR/SCM) 310MM(2-10VDC)	Null	28/11/2022	0	12	0	9	0.8%	0
	Retrofit Linkage(Belimo)	Null	13/12/2022	0	29	0	27	2.4%	0
	Retrofit Linkage(Schneider)	Null	08/06/2021	0	6	0	4	0.4%	0
AT31600	Modulating Valve(locking type) NON-Spring Return	08/10/2021	28/11/2022	26	42	3	36	7.3%	1
M57520A2007-U	DAMPER ACTUATORS	02/18/2022	14/12/2022	34	45	3	26	2.3%	1
RBC124	APC Battery (RBC124)	Null	02/09/2022	0	1	0	1	0.1%	0
	UPS Battery(for Back-UPS)per 15000	08/24/2021	01/01/2022	14	25	1	25	7.3%	0

# Data visualization platform/Dashboard





# PREVENTIVE MAINTENANCE STATUS

Today : 01-02-2023 (Heating Season)



No longer required to submit pre-arrival or post-arrival COVID-19 tests

Phase (A) From 10/5/2020 To 2/5/2023

## PREVENTIVE MAINTENANCE HISTORY

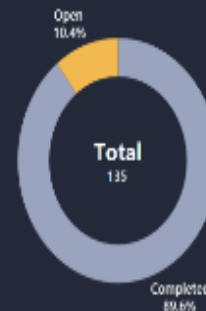
Location	Start Date	End Date	Report Date	Description
P00110	10/04/2022	10/28/2022	Ongoing	CMTY/COONE CTR/INDOR SWIM POOL
P00123	11/14/2022	12/09/2022	Ongoing	ARMY LODGINGS
P00125	10/01/2021	01/07/2022	02/10/2022	Morning Calm Conference Center (MCC)
P00501	02/21/2022	03/11/2022	04/15/2022	PT/DRG CLUB
P00595	05/23/2022	06/10/2022	06/27/2022	CHAPEL
P00596	06/13/2022	06/30/2022	07/21/2022	FAM LIFE CTR
P00727	11/07/2022	11/09/2022	Ongoing	PO BRANCH
P00880	07/18/2022	08/12/2022	09/07/2022	AIRFIELD OPERATION BLDG
P00882	01/04/2021	02/06/2021	03/12/2021	AC MAINT HSR
	12/17/2021	01/07/2022	03/17/2022	AC MAINT HSR
P00889	08/16/2022	09/02/2022	10/05/2022	FIRE STATION
P01735	11/10/2022	11/10/2022	Ongoing	FIRE STATION
P01452	05/23/2021	06/04/2021	07/22/2021	CONSOLE OPEN DIN
P01750	01/17/2022	03/23/2022	04/15/2022	TeleVideo Center
P01760	05/17/2021	05/21/2021	07/22/2021	BLG STATION
P01811	03/28/2022	06/30/2022	07/21/2022	AC MAINT HSR (Under Construction)
P02200	04/01/2022	05/20/2022	Ongoing	Communication Center
P02730	07/01/2022	07/31/2022	08/19/2022	DMARR
P02240	08/01/2022	08/26/2022	09/15/2022	BAND TRAIN BLDG
P02250	08/19/2022	10/07/2022	11/09/2022	AUTO SKILL CTR/SPT010
P02213	07/22/2021	01/31/2021	04/22/2021	MEDICRM Admin/REF 1-4qs
P02230	08/01/2021	09/14/2021	10/18/2021	CDC SCHOOL AGE
P02410	08/15/2021	09/30/2021	11/16/2021	CDC UNDER 5 YRS
P02510	12/01/2021	12/31/2021	01/05/2022	BLDG K (KICK Meet Shop)
P02541	10/25/2021	11/12/2021	02/04/2022	BLDG F (EXCH WAREHOUSE)
P02545	12/13/2021	12/31/2021	02/25/2022	BLDG TD (COMT HUM WH DEP)
P02550	01/01/2022	02/31/2022	03/10/2022	BLDG TT (STORAGE SP INST) (SG FLRN STR) (D STORE)
P02700	02/15/2021	03/26/2021	04/21/2021	EXCH MAIN STORE
P02711	01/04/2021	01/21/2021	02/18/2021	SKILL DEV (NA)
P02722	12/21/2020	12/31/2020	01/25/2021	NSM BLDG CENTER
P02723	11/07/2022	12/02/2022	Ongoing	AUDITORIUM SP
P02724	10/11/2022	11/04/2022	Ongoing	RECREATION CTR
P02804	06/10/2022	06/12/2022	08/19/2022	FM BLDG UPL (1+1)
P06100	05/01/2021	06/30/2021	08/10/2021	GEN INST BLDG
P06110	07/01/2021	08/31/2021	09/30/2021	BM CENTER
P06120	07/14/2022	01/31/2022	04/12/2022	NCCA and Newark UPL
P06143	03/29/2021	04/30/2021	05/18/2021	USAR CENTER
P06145	01/20/2021	02/10/2021	03/05/2021	Consolidated Headquarters Bldg
P06155	07/22/2021	01/12/2021	04/15/2021	NSM/BN OPS Bldg
P06217	08/05/2022	09/30/2022	11/09/2022	PHYS FIT CTR
P06321	06/21/2021	07/02/2021	08/19/2021	DINING FACILITY
P06350	08/01/2021	08/14/2021	11/09/2021	CMTY/COONE CTR
P06360	07/25/2022	07/31/2022	09/16/2022	CHAPEL 2

## PM Processing Time

Working Time 64,737 Days (1 Day = 8 Man\*Hr)

Average 492 Days (1 Day = 8 Man\*Hr)

## PM Completion Rate



## PM Status Map



## PM Completion List

Location	Start Date	Report Date	Description
P07431	09/19/2022	11/11/2022	CO HQ BLDG (Readiness Modu)
P07434	08/19/2022	11/11/2022	CO HQ BLDG (Readiness Modu)
P07435	08/19/2022	11/11/2022	CO HQ BLDG (Admin Modu)
P07436	10/04/2022	11/11/2022	CO HQ BLDG (Admin Modu)
P07437	10/04/2022	11/11/2022	CO HQ BLDG (Readiness Modu)
P07441	10/04/2022	11/11/2022	CO HQ BLDG (Readiness Modu)
P02250	08/19/2022	11/09/2022	AUTO SKILL CTR/SPT010
P08017	08/05/2022	11/09/2022	PHYS FIT CTR
P12302	08/05/2022	10/25/2022	Visitor Control Center/Youn Gat.
P12303	08/05/2022	10/25/2022	J Lane ID Check Despy (Youn)
P12312	09/05/2022	10/25/2022	Gate House/Youn Gate
P00889	08/16/2022	10/5/2022	FIRE STATION
P12056	08/25/2022	10/5/2022	VEH MAINT SHOP
P06000	08/01/2022	8/28/2022	CHAPEL 1
P06000	07/25/2022	8/10/2022	CHAPEL 2
P02240	08/01/2022	9/15/2022	BAND TRAIN BLDG
P00880	07/18/2022	9/7/2022	AIRFIELD OPERATION BLDG