

Shannon Reid

Replacing Powell

a Publicly funded task...

Shannon Reid, Principal Design Manager with
TriMet's Engineering and Construction Division
Design and Construction Delivery Department

Design team: RNL/Stantec

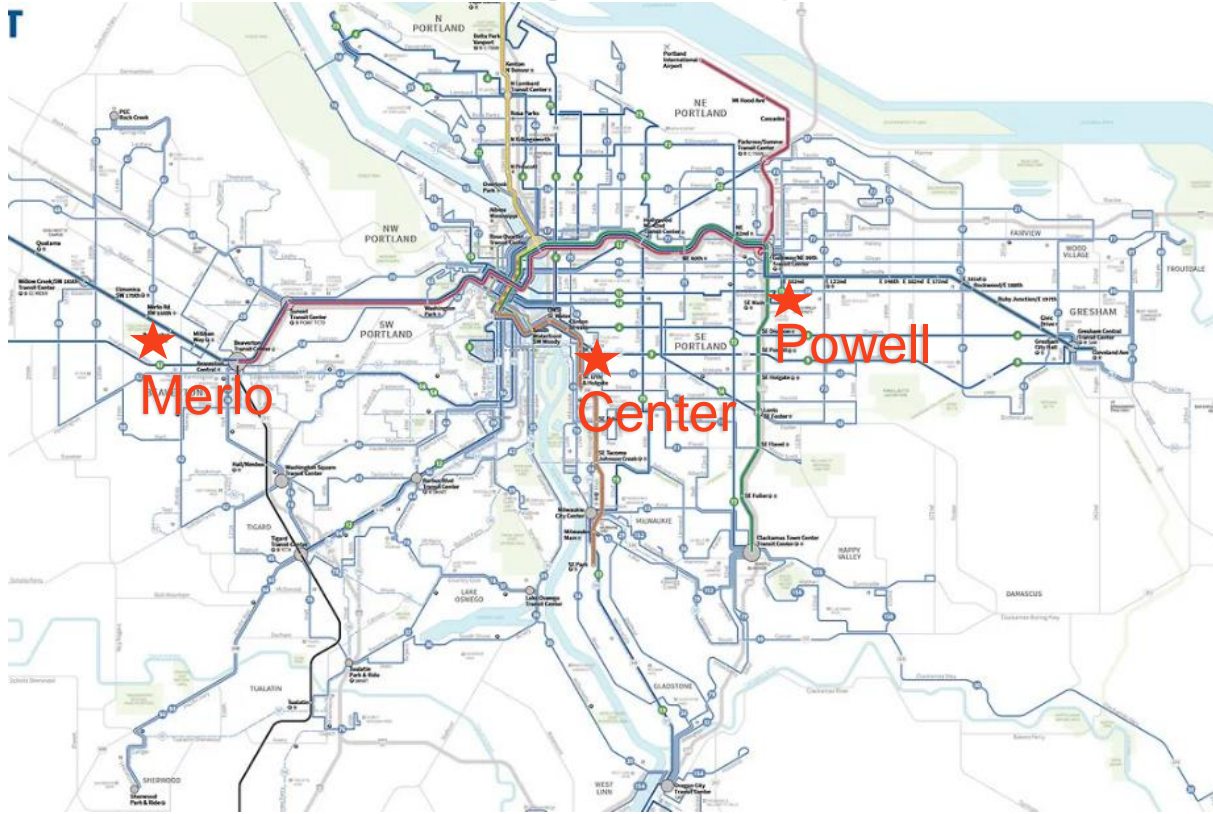
Contractor: JE Dunn

Commissioning agent - Ambient energy/Mead Hunt

Photos Chang Kim Photography

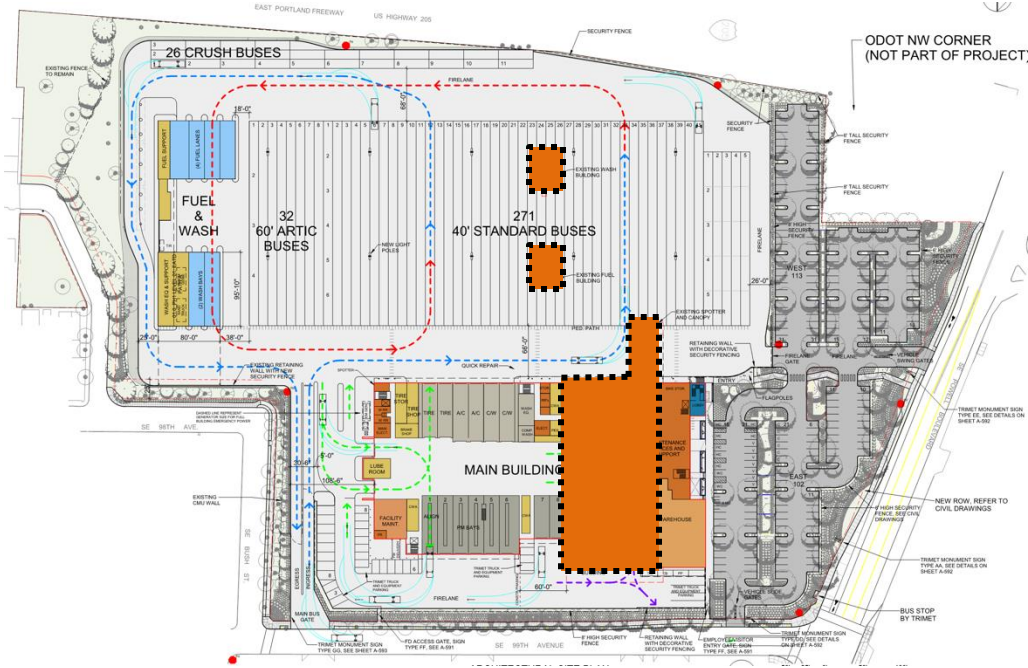


Powell Garage Replacement



Replacing Powell

while remaining operational



- Replacing existing facility built in 1977
- Scope included
 - Maintenance Garage/ FM suite/Stores
 - 26,000sf to 90,000sf
 - Bus yard
 - 246 (40) to 346(40)
 - Transportation Operations
 - 7,00sf to 17,000sf
 - Fuel and Wash
 - 5,500sf to 20,000sf
 - ROW
 - State and city department of transportation upgrades

Replacing Powell

occupant defined Project goals

"Innovation" -

Be Leaders, Not Bleeders

"Happiness" -

Remain The Core Family

"Resiliency" -

Embrace Simplicity

"Beauty" -

Find The Right Balance

"Health" -

Safety Is Our Top Priority





TRI  MET

Powell Garage Replacement











Sean Feeney



RENEWABLE
ENERGY

RAINWATER
CAPTURE

THERMAL





Forest Trail

Main Building

Fuel and Wash Building

Residential

911





TRIMET

Powell Garage Replacement 17











Heather Hardie-Hill

MECHANICAL SYSTEMS



Primary Mechanical Systems

- DOAS with heat recovery
- Radiant floors in the bus maintenance bays
- Medium temp hot water loop via natural gas boilers
- De-stratification fans
- Vehicle exhaust snorkels (by others)

“Other” Mechanical Systems

- AC Bay – heated to 100°F
- Heat pump mini splits in accessory buildings
- AHU with heating and cooling (hot water and DX) for the office spaces



DOAS

Quantity: 2

Capacity: 35,000-cfm each,
1,650-MBh each

Features:

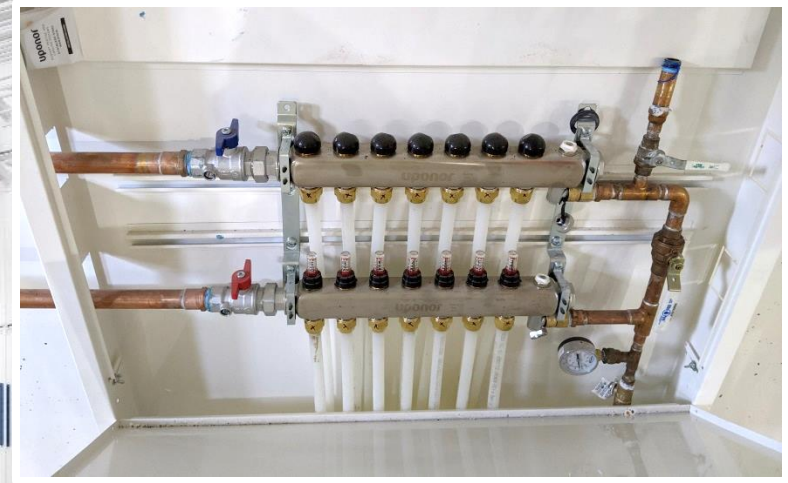
- 100% outside air
- Heating only
- Heat recovery heat exchanger
- Demand control ventilation

RADIANT FLOOR - HEATING

Space Temp: 68°F
Slab Temp: 82°F
Max Water Temp: 105°F
Capacity: 1,300-MBH

Benefits:

- Increased occupant comfort
- Brings the conditioned zone to the users
- Reduces volume of air that requires conditioning
- Reduces fan energy





BOILERS (NATURAL GAS)

Efficiency: 95%
Max Water Temp: 140°F
Capacity: 6,000-MBH

Features:

- Serves radiant floor, DOAS units, AHU, VAVs, and fan coils units

Benefits:

- High capacity
- Low turn down
- Minimal space requirements



DESTRATIFICATION FANS

Quantity: 4
Diameter: 24-ft
Capacity: 200,000-cfm

Benefits:

- Increased Occupant Comfort
- Low energy / high volume
- Reduces stratification in tall spaces



EXHAUST "SNORKELS"

Exhaust: 600-1,200 cfm each

Features:

- Point of use at bus's engine exhaust

Benefits:

- Decreased general exhaust requirements
- Increased indoor air quality

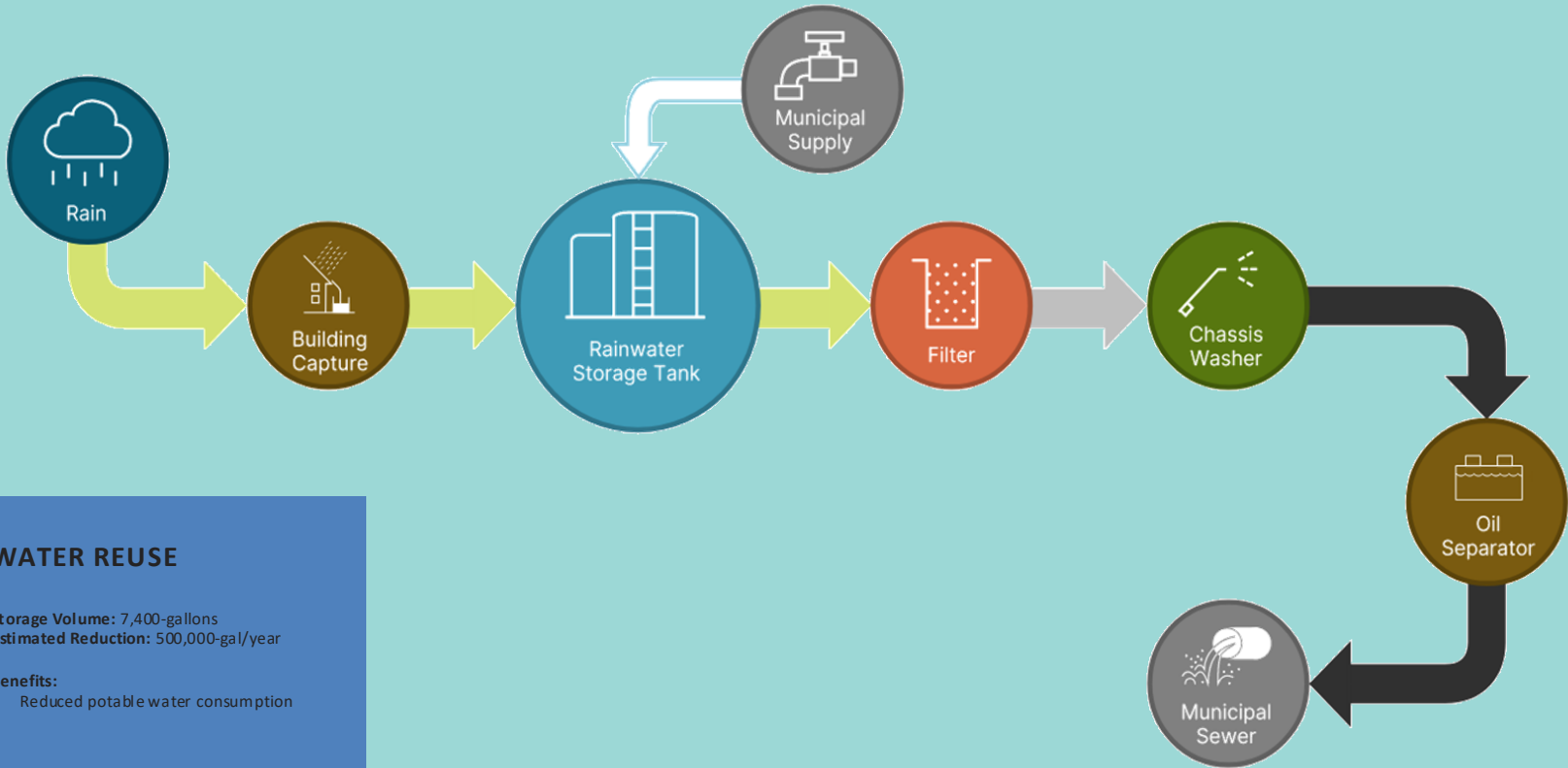
PLUMBING SYSTEMS





Plumbing Systems

- Domestic hot and cold water
- Tepid water for safety showers
- Sanitary waste and vent
- Oily waste for bus maintenance areas and fuel/wash building
- Water recycling in the bus wash building
- Storm water reclamation!



WATER REUSE

Storage Volume: 7,400-gallons
 Estimated Reduction: 500,000-gal/year

Benefits:

- Reduced potable water consumption



Greg Evans

Agenda

Introduction

Cx Process

Challenges & Benefits

Key Takeaways & Results



Commissioning Process

Define Project Goals



- * Replace aging infrastructure to accommodate growth
- * Target EUI of 65 kBtu/sf/yr

Define Commissioning Scope

- * HVAC & temperature controls
- * Domestic plumbing systems, sump pumps
- * Interior & exterior lighting
- * Standby power systems



Integrate and Execute Commissioning



Include commissioning in project manual/specifications

Develop commissioning schedule and incorporate into project

Site visits, testing, retesting, closeout

Challenges & Benefits

Challenges



NON-LOCAL
PROJECT



PANDEMIC



PROJECT
PHASING

Solutions



Extensive coordination



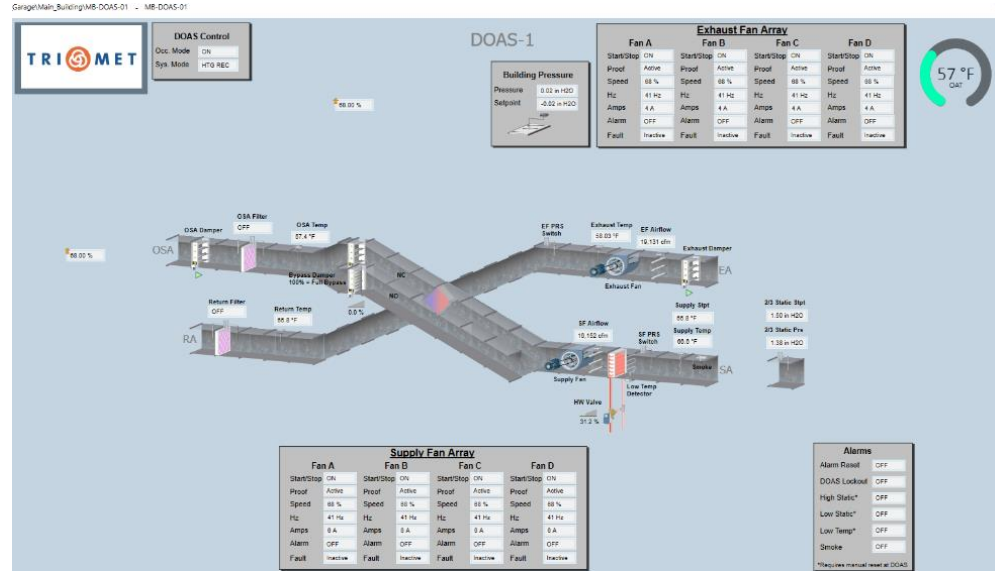
Remote testing



Trend data review

Benefits

- * Follow-through and resolution of issues
- * Reduced operating costs
- * Maintain efficiency and extend lifespan



Key Takeaways & Results

Successful projects start and end with...

- * Collaborative, goal-focused team
- * Effective and timely communication
- * Strict adherence to project specs

Results of the Commissioning process

* 0 commissioning outstanding issues beyond warranty

* <65 kBtu/sf/yr target achieved