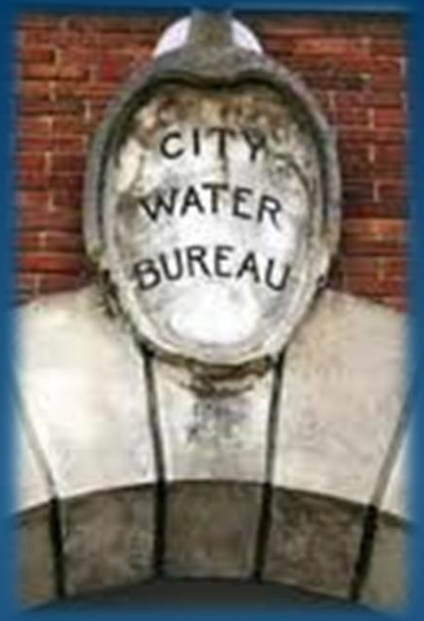
Jennifer Garbely

CHLORINATION IMPROVEMENTS

For the Portland Water Bureau 220 MGD
Bull Run River System

Today's Discussion

- Background
- Issues
  - Current chlorine system
  - Site constraints and safety
  - Operations needs
- Design analysis
- Cost analysis
- Recommendations



About Portland Water Bureau…

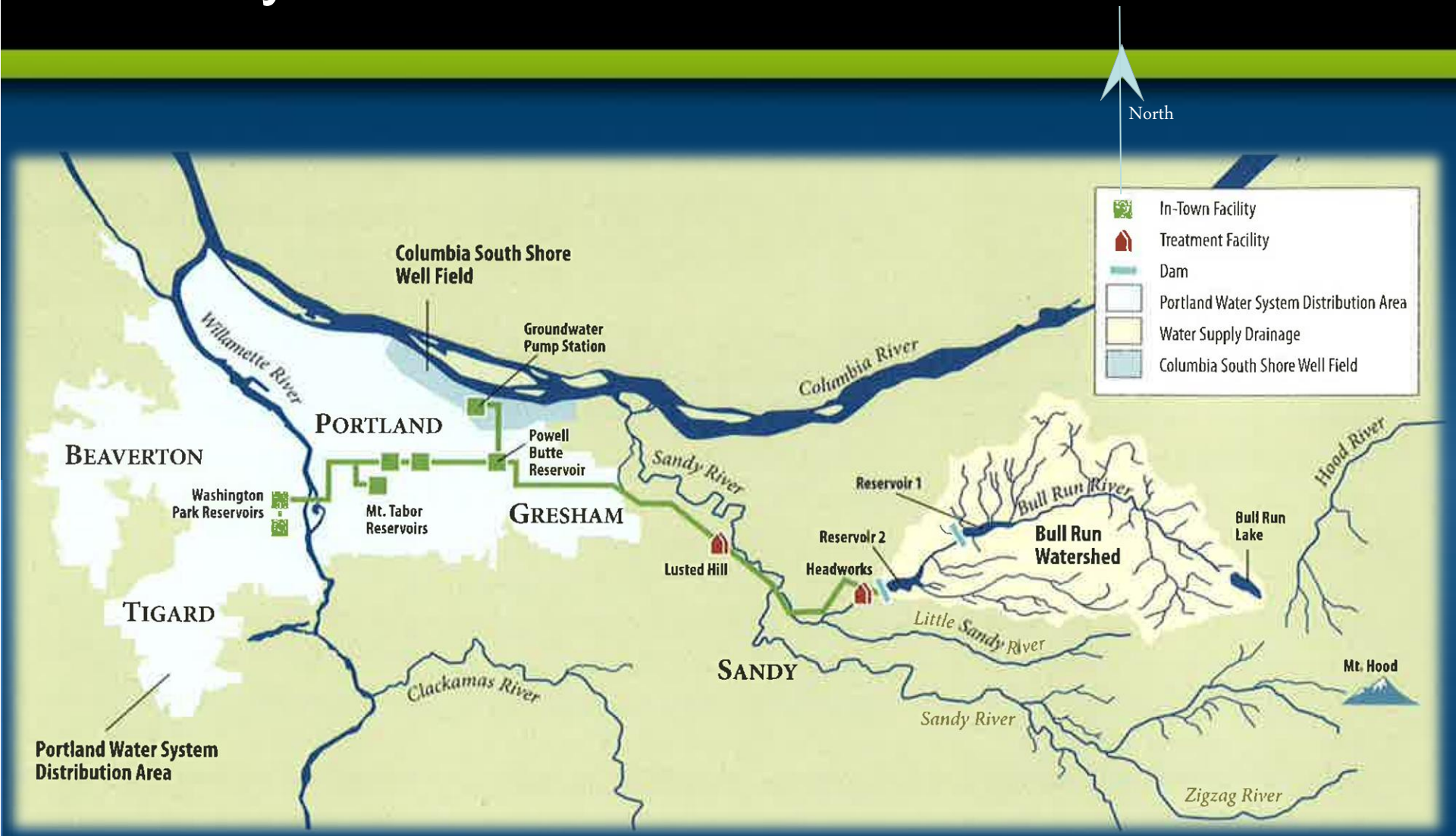
- Portland's service area covers parts of Counties in:
  - Multnomah,
  - Washington and
  - Clackamas Counties
- The Portland water system serves drinking water to over 900,000 Oregonians
  - Almost one-quarter of the population of Oregon
- The bureau's retail and wholesale service area is approximately 225 square miles

AECOM

History of Watershed

- On June 17, 1892, President Benjamin Harrison proclaimed the Bull Run watershed a national forest reserve.
- In 1904 President Theodore Roosevelt signed a "Trespass Act" which restricted access to the watershed.

PWB System: Overview



Need for the Study

EPA's Long Term 2 Enhanced Surface Water Treatment Rule (LT2)

The LT2 requires changes to how open finished drinking water reservoirs are managed and operated.

The rule requires that water systems with uncovered finished water reservoirs, like those at Portland's Mt. Tabor and Washington Parks, either cover the reservoirs or provide treatment at the outlets of the reservoirs to either remove or inactive *Cryptosporidium* and other viruses.

This study is only evaluating the existing chlorine gas system for improvements.

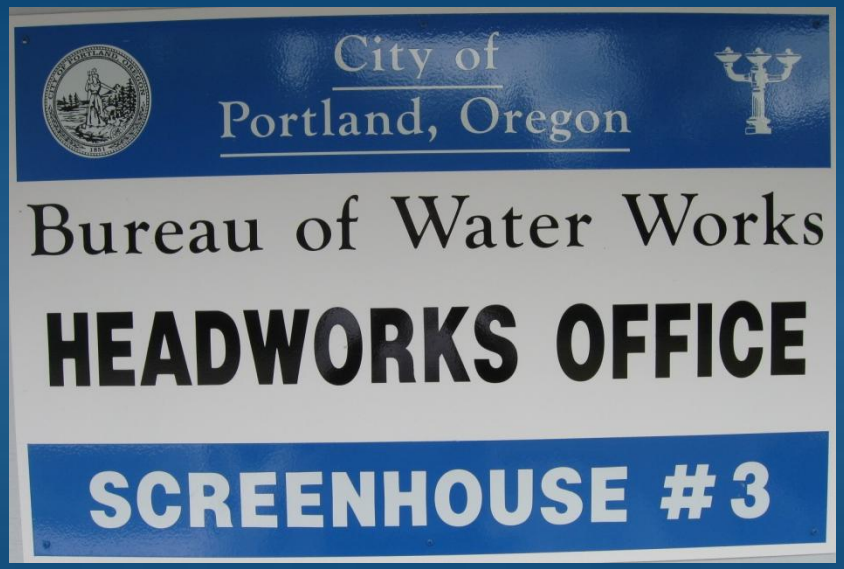
PWB System: Headworks

AECOM

PWB System: Headworks

AECOM

PWB System: Headworks

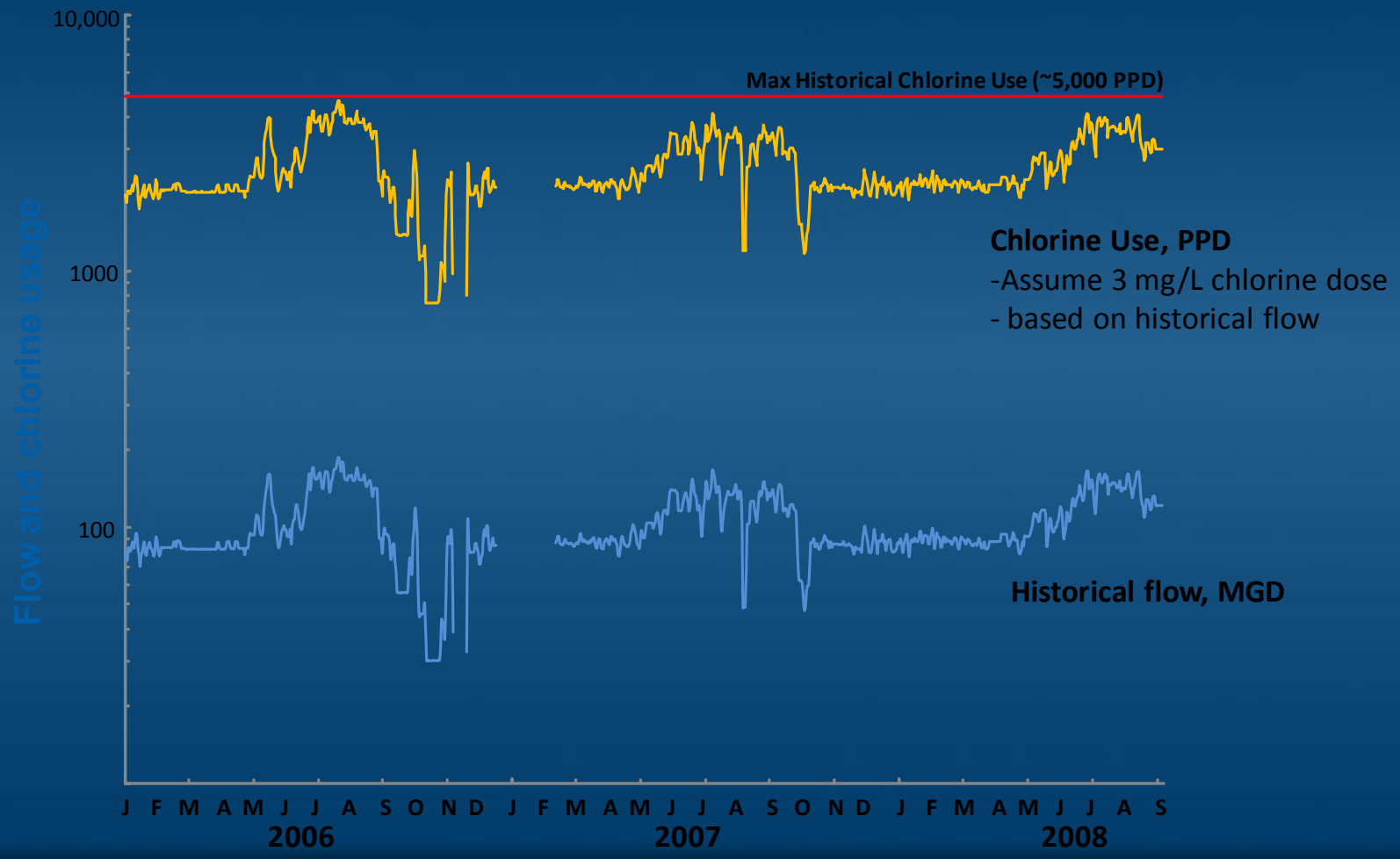


AECOM

PWB System: Headworks

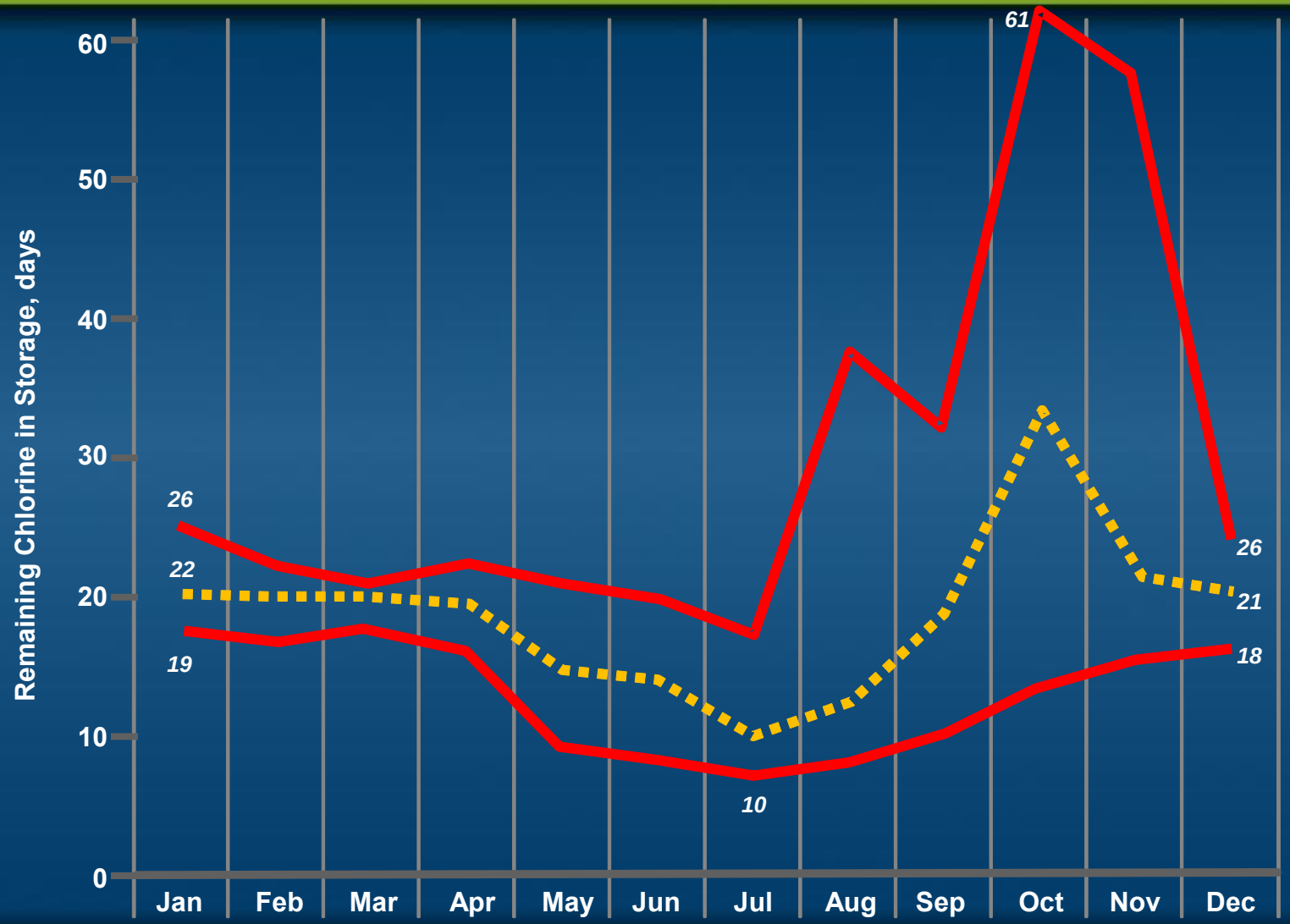
AECOM

Average Flow Rate



AECOM

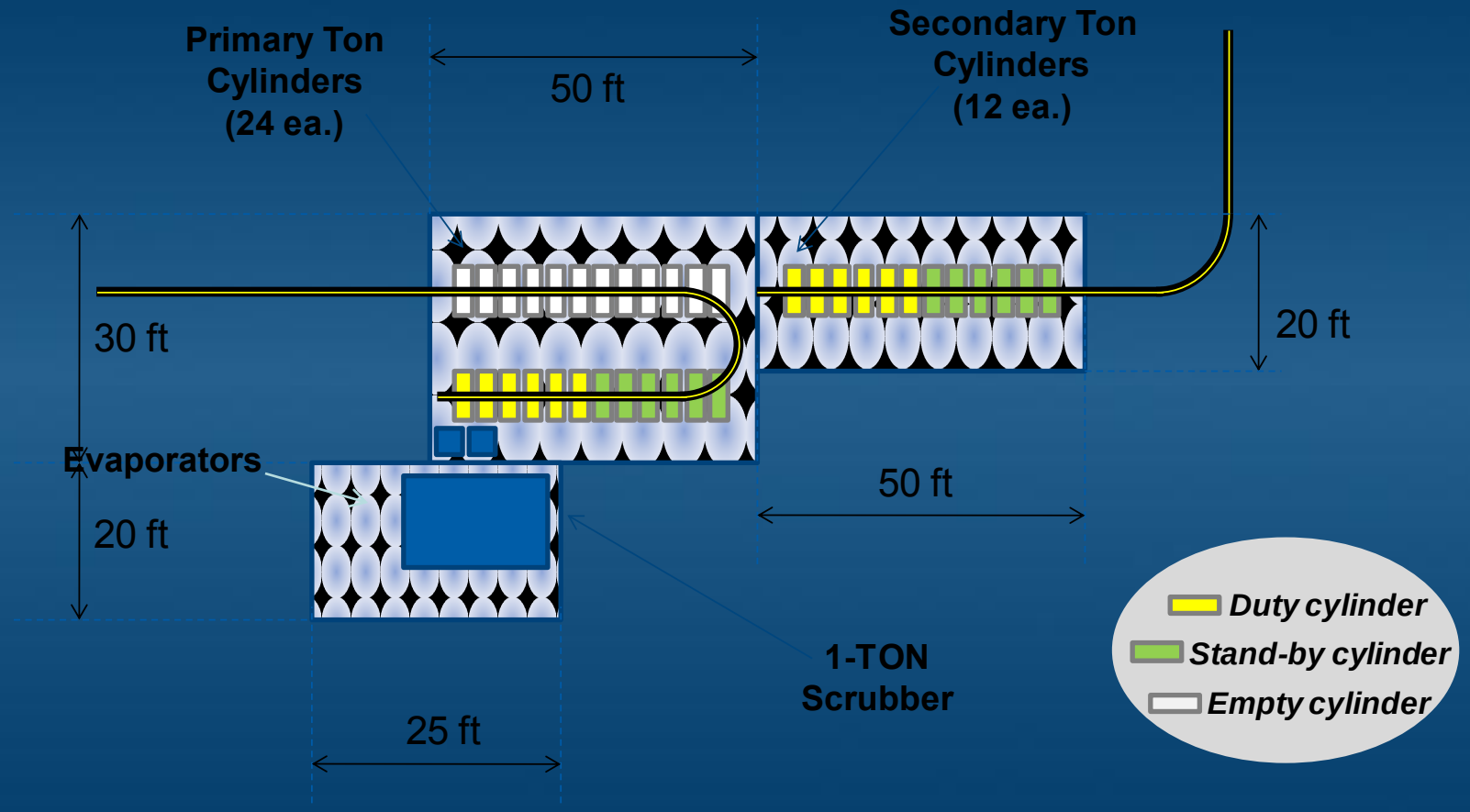
Historical Standby Chlorine Storage



Design Criteria Summary

Parameter	Minimum	Average	Maximum
Historical Information			
Treated water flow rate, MGD	30	101	186
Chlorine dose, mg/L	0.9	3.0	5.2
Design Criteria			
Treated water flow rate, MGD	30	101	212
Design Chlorine Dose	3.0	3.0	3.0
Chlorine use, PPD (at 3.0 mg/L)	751	2,535	5,304
Chlorine use, PPH (at 3.0 mg/L)	31	106	221
Minimum Days Storage (at 3.0 mg/L)	61	20	10

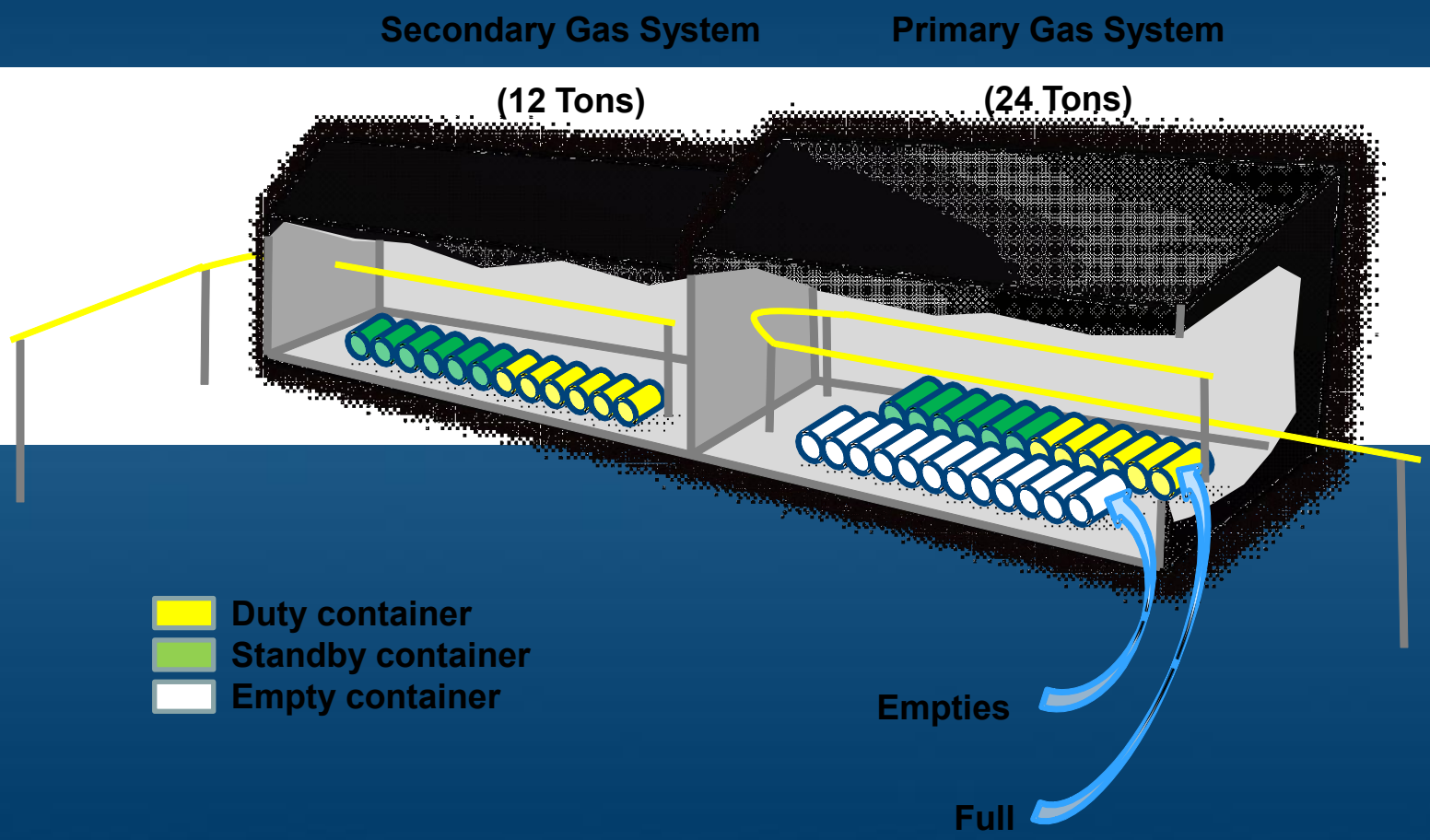
Existing Gas System - *Layout*



Note: Chlorinators located in SH3 not shown.

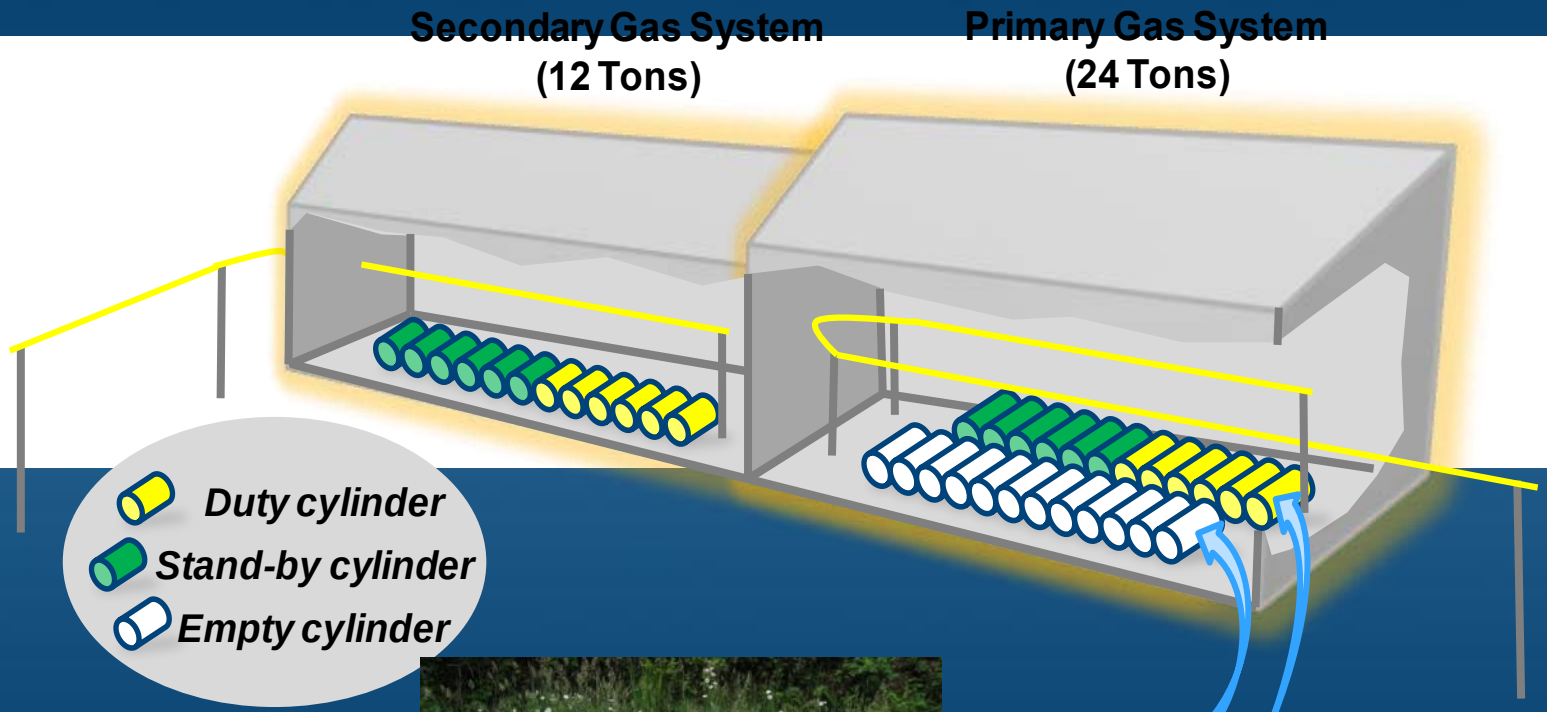
AECOM

Existing Gas System - *Benefits*



AECOM

Existing Gas System - *Challenges*



Use of trailer for transport

AECOM

Existing Gas System - *Challenges*

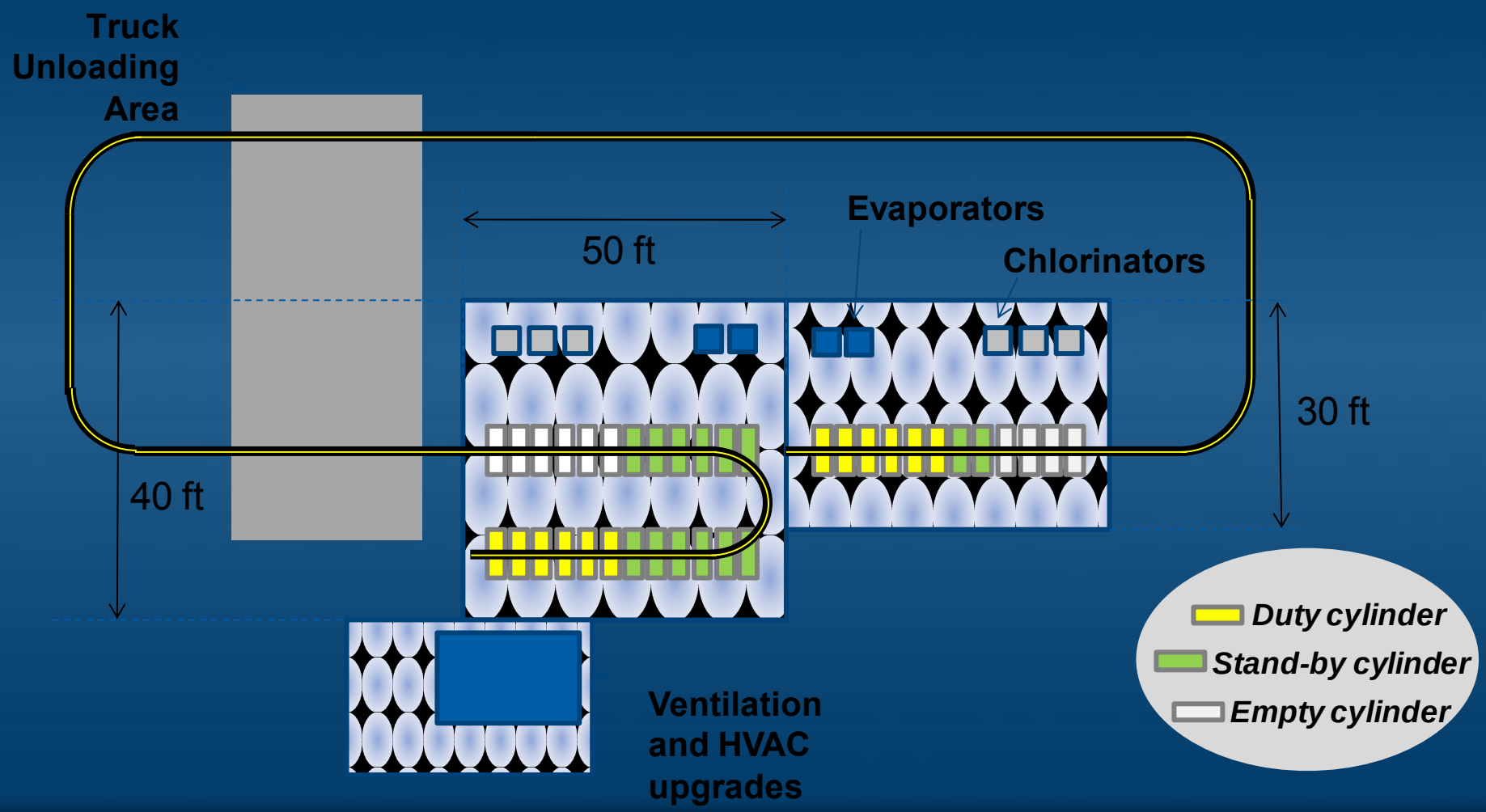
1-TON scrubber is used during normal ventilation, depleting capacity

O&M Space is restrictive

Excessive vibration is experienced at the injectors during certain flow conditions

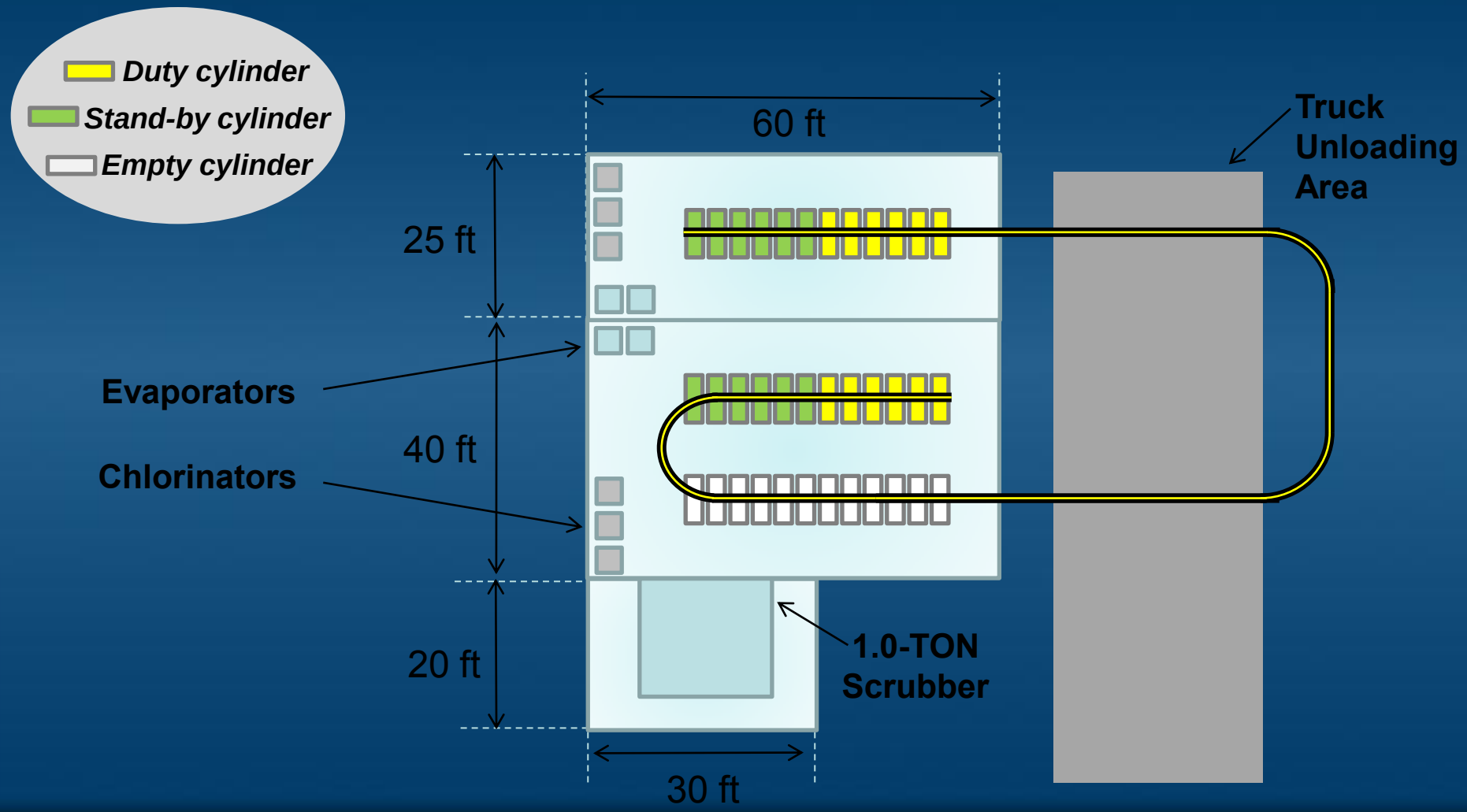
AECOM

Existing System – *Recommended Upgrades*



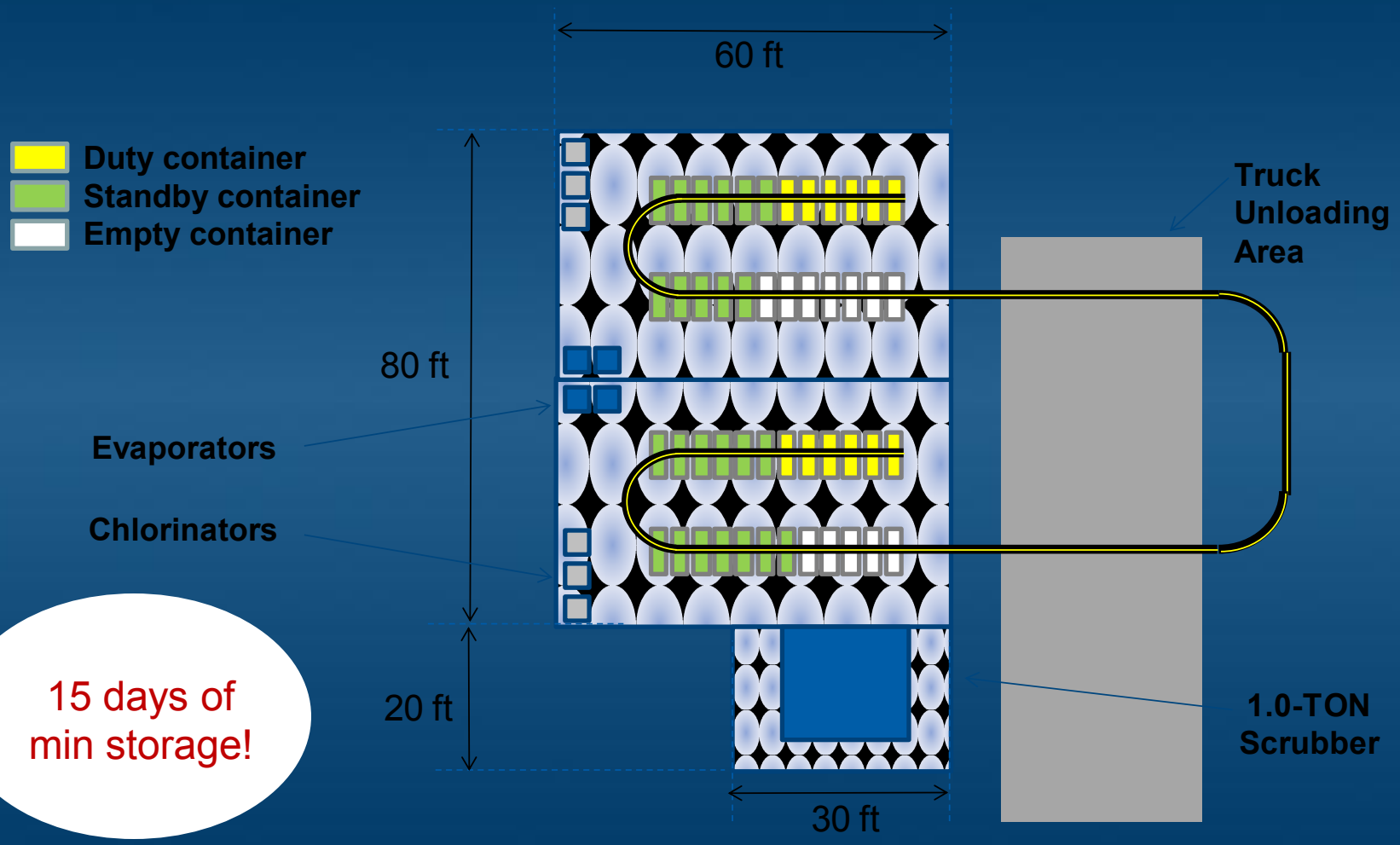
AECOM

New Gas System - *Proposed Layout*



AECOM

New Gas System - *Proposed Layout*



15 days of min storage!

AECOM

Capital Costs, $M

Parameter	Upgrade Existing	New Gas Building	New Gas Building, 15 days
Building	0.50	1.80	2.16
Tanks	--	--	--
Chlorine equipment & appurtanances	0.50	0.56	0.56
Other pumps, piping, valving, etc.	0.18	0.25	0.25
Electrical and I&C	0.30	0.30	0.30
Installation and construction (30%)	0.44	0.87	1.20
Contingency (25%)	0.48	0.95	1.30
Total Estimated Capital Costs	**$2.40**	**$4.73**	**$5.62**

AECOM

O&M Costs, $M

Parameter	Upgrade Existing	New Gas Building	New Gas Building, 15 days
Disinfection-related chemicals	0.24	0.24	0.24
Corrosion-related chemicals	0.31	0.31	0.31
Power cost	--	--	--
Labor requirements	--	--	--
Total Estimated O&M Costs	**$0.55**	**$0.55**	**$0.55**

Notes:
1. O&M costs for the 'existing' and 'new' gas options only include costs for chemicals and standard maintenance
2. O&M costs do not include labor cost of current PWB staff that will operate the system

Life-Cycle Costs, $M

Parameter	Upgrade Existing	New Gas Building	New Gas Building, 15 days
Capital	$2.40	$4.73	$5.62
O&M (chlorine and corrosion)	$8.18	$8.18	$8.18
Total Estimated Cost	**$10.6**	**$12.9**	**$13.8**

Notes:
1. O&M costs are calculated to be present worth based on 20 year life and 3% rate of return
2. Gas facility O&M costs only include chemical use (i.e., no labor or power costs)

AECOM

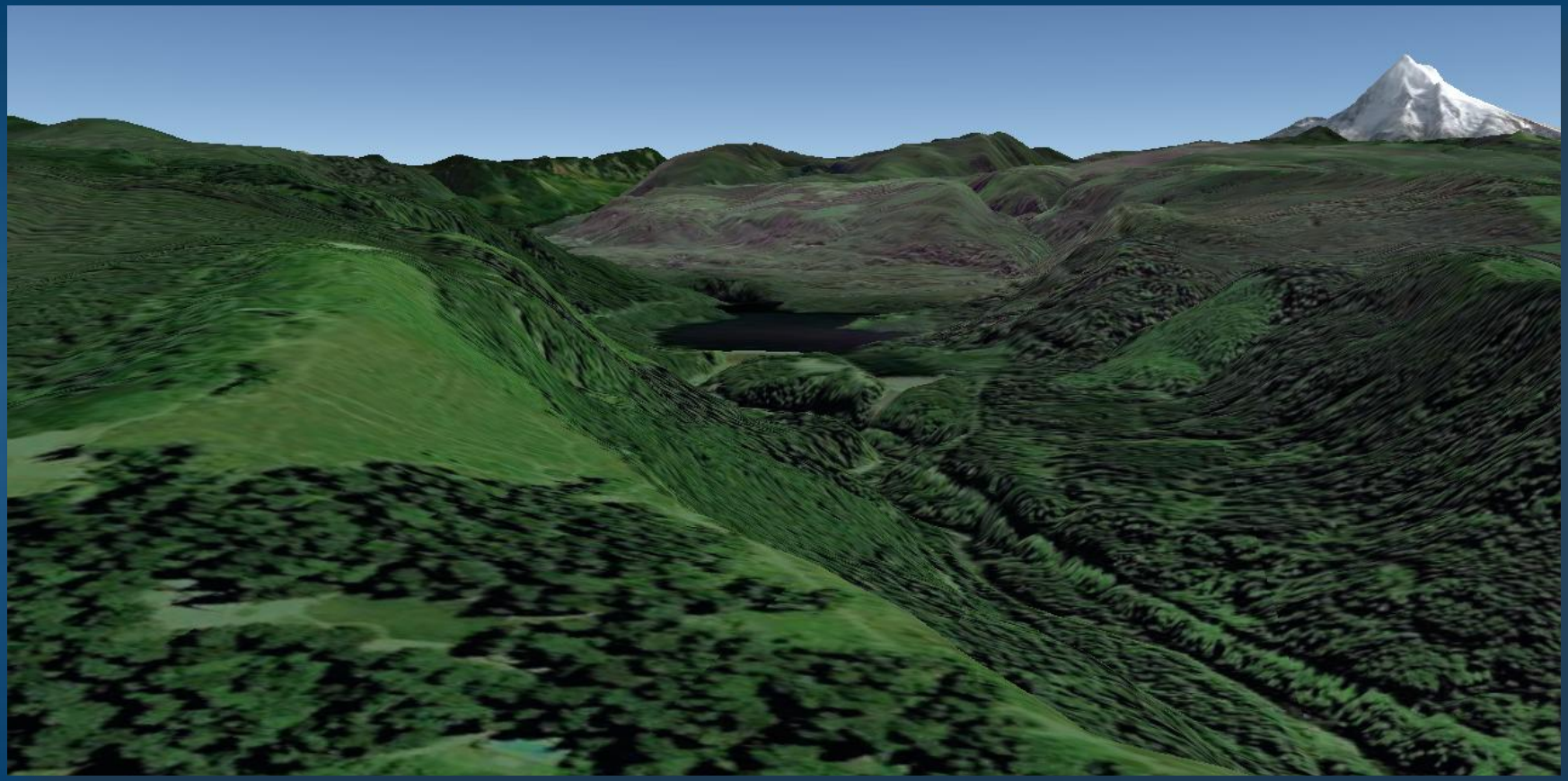
Chlorine Gas Issues

- Chemical Facility Anti-Terrorism Standards (CFATS) Committee
  - Ruled at this moment will not be brining Water and Wastewater facilities into the program and will be regulated still by EPA
- Supply: Low risk anticipated
- No significant near-future impacts anticipated

Recommendations

- No current impacts for the use of Chlorine gas as a regulatory issue
  - PWB Staff like the ease of operation of using chlorine gas
- Improve the safety of the facility
- Consider increasing days of storage

Questions



AECOM