



Business Case for  
Natural Refrigerants

June 12-14, 2018 – Long Beach

Andy Baker, PE  
Project Manager

YourCleanEnergy  
LLC  
Anchorage, Alaska  
USA

# Trans-critical CO2 Heat Pump System District Heating Of Four City Buildings Seward, Alaska





# YourCleanEnergy - Mission Statement

□ History: Providing clean energy consulting (financial evaluation & design) services to commercial and municipal clients in Alaska since 2006.

□ Specialize in sea water heat pump evaluation & design.

□ Successful clean energy projects are ones that are:

- **Affordable**                      **Reliable**                      **Safe**

Your Clean Energy  
■ ■ ■

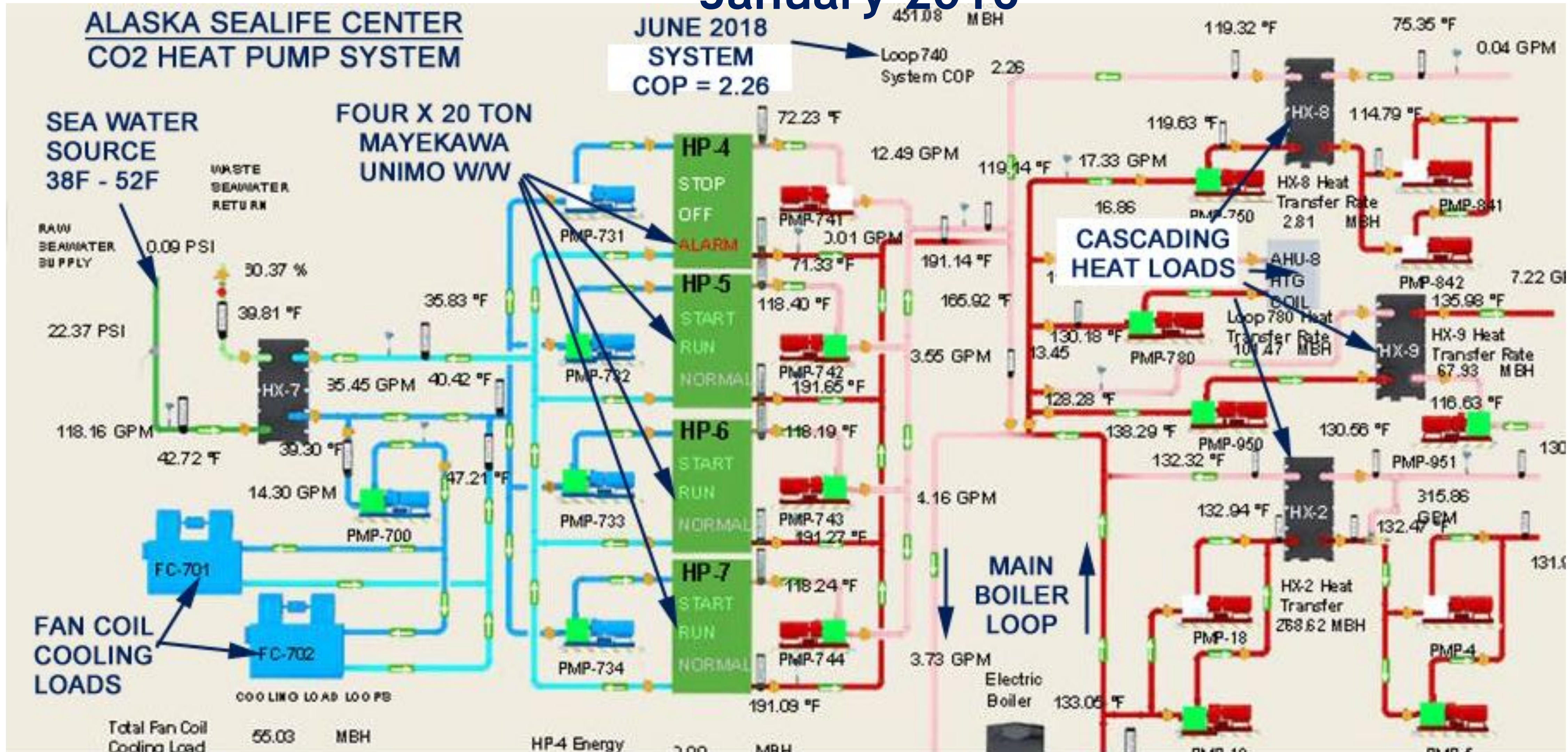
**Celebrate the power of nature...™**



# Four x 20 ton Trans-critical CO2 Mayekawa Heat Pumps Installed At Alaska SeaLife Center In January 2016

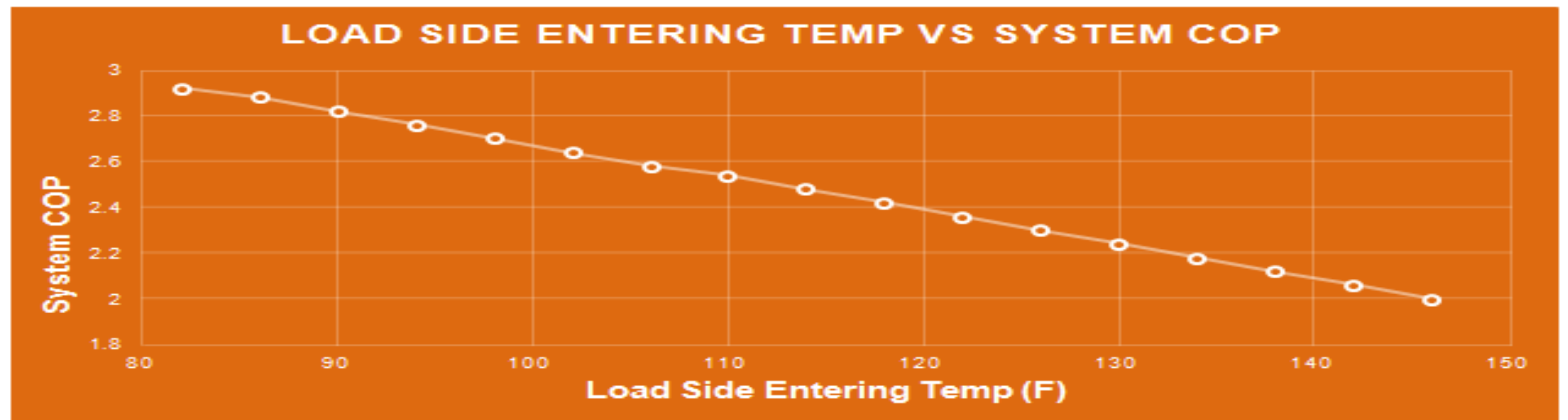
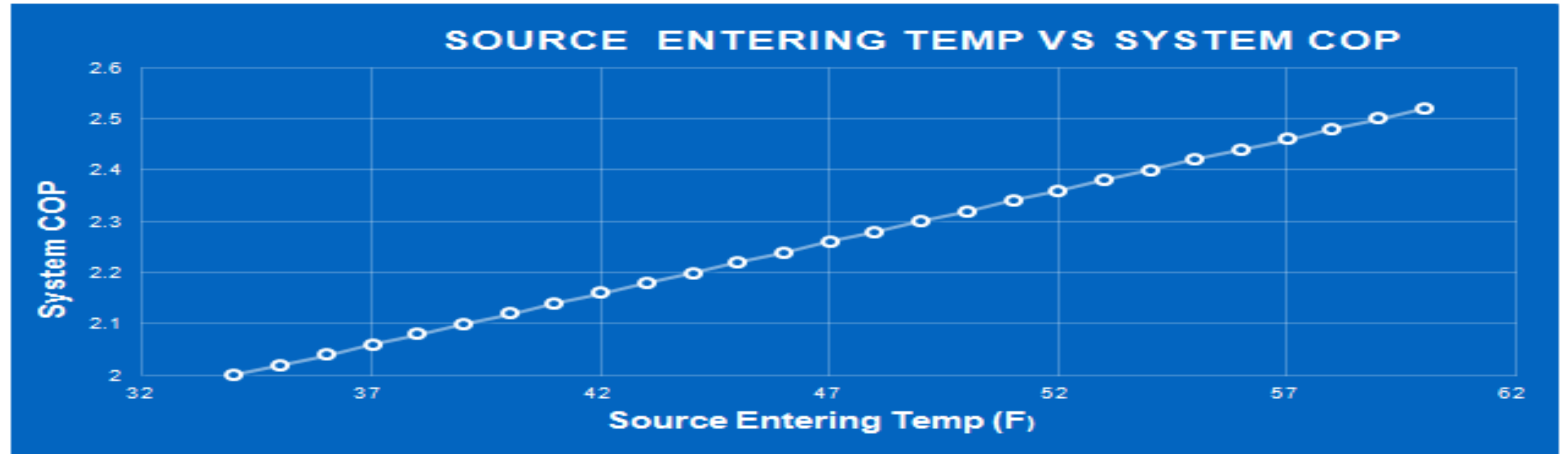


# Lessons Learned: Trans-Critical CO2 Heat Pump System At Alaska SeaLife Center - Operating Since January 2016





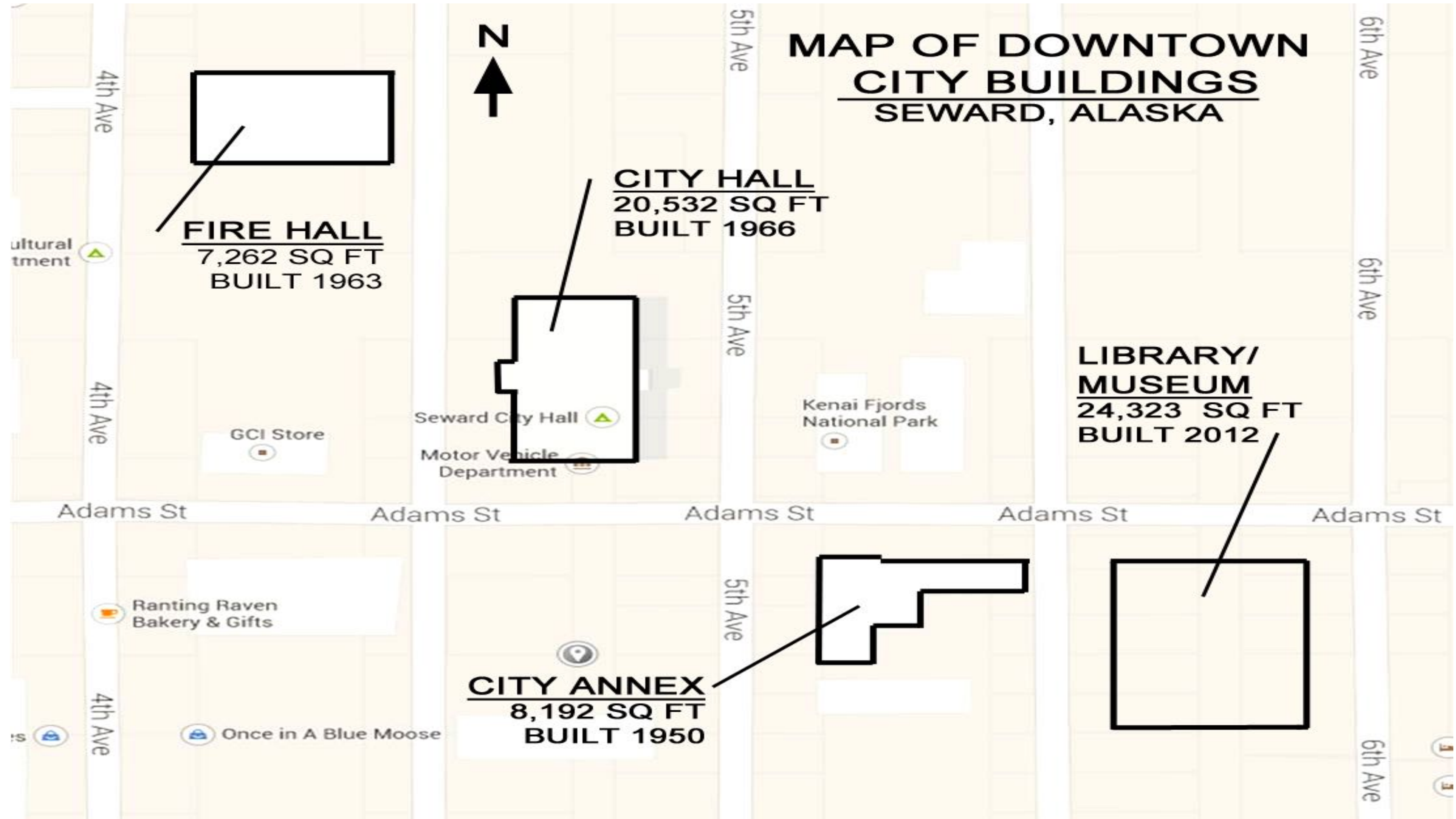
# Goal: Increase Source Temperature And Decrease Load Entering Temperature = Raise System COP



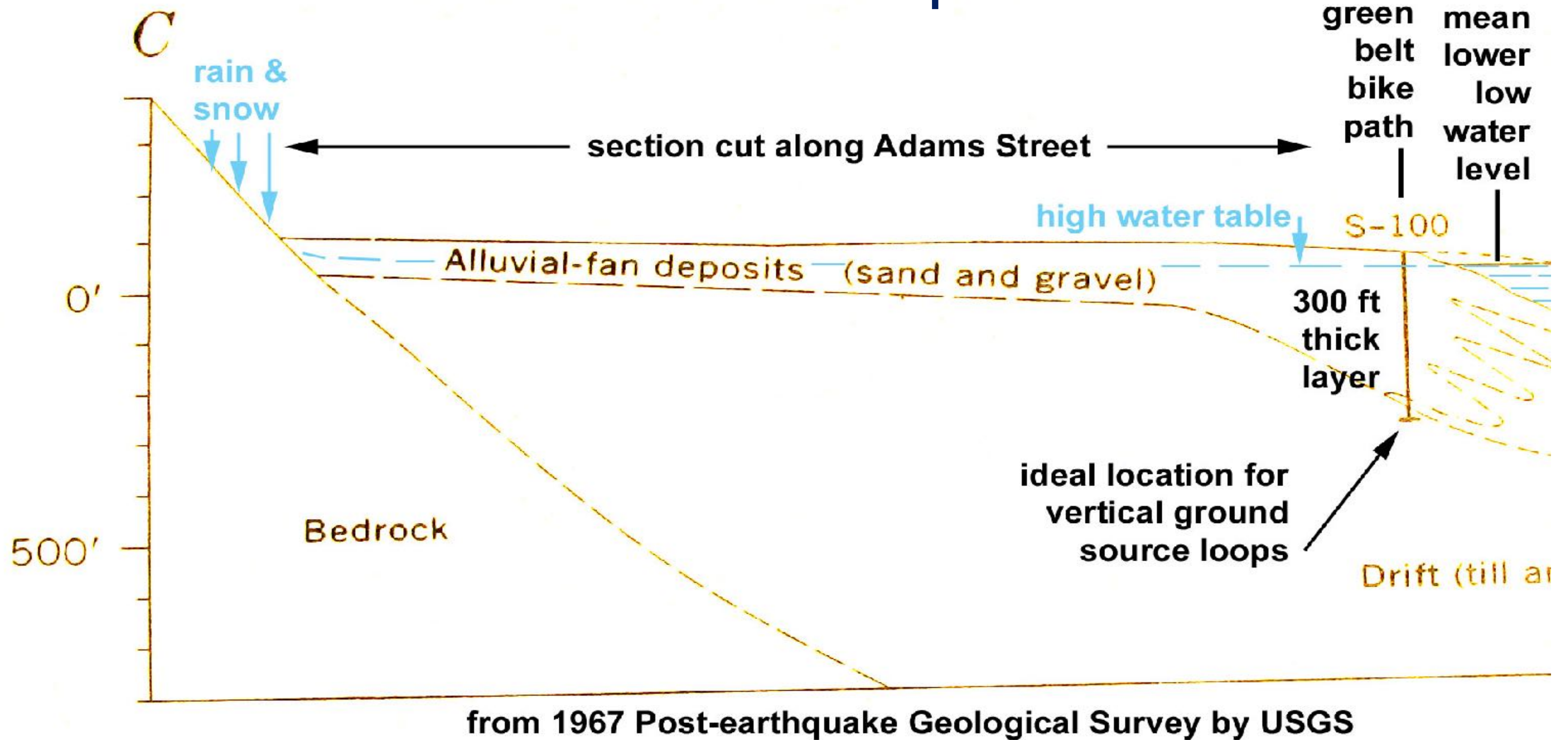
# City Of Seward, Alaska - Four City buildings In Heating District



# City Of Seward, Alaska - Four City buildings In Heating District



# Tidal Inflow In Shore Line Gravel - Similar To Nearby Ocean Temperatures - Will Be Source Heat For CO2 Heat Pumps

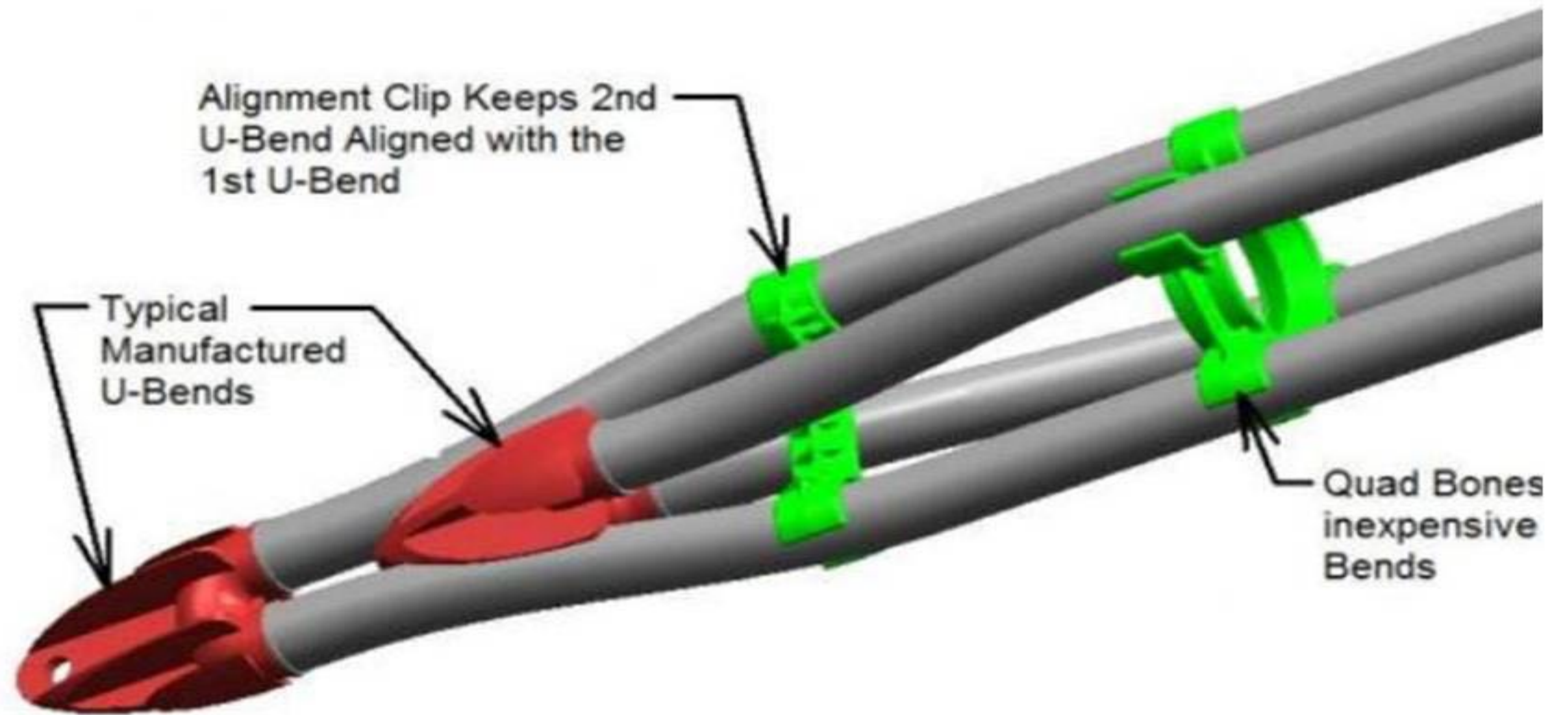




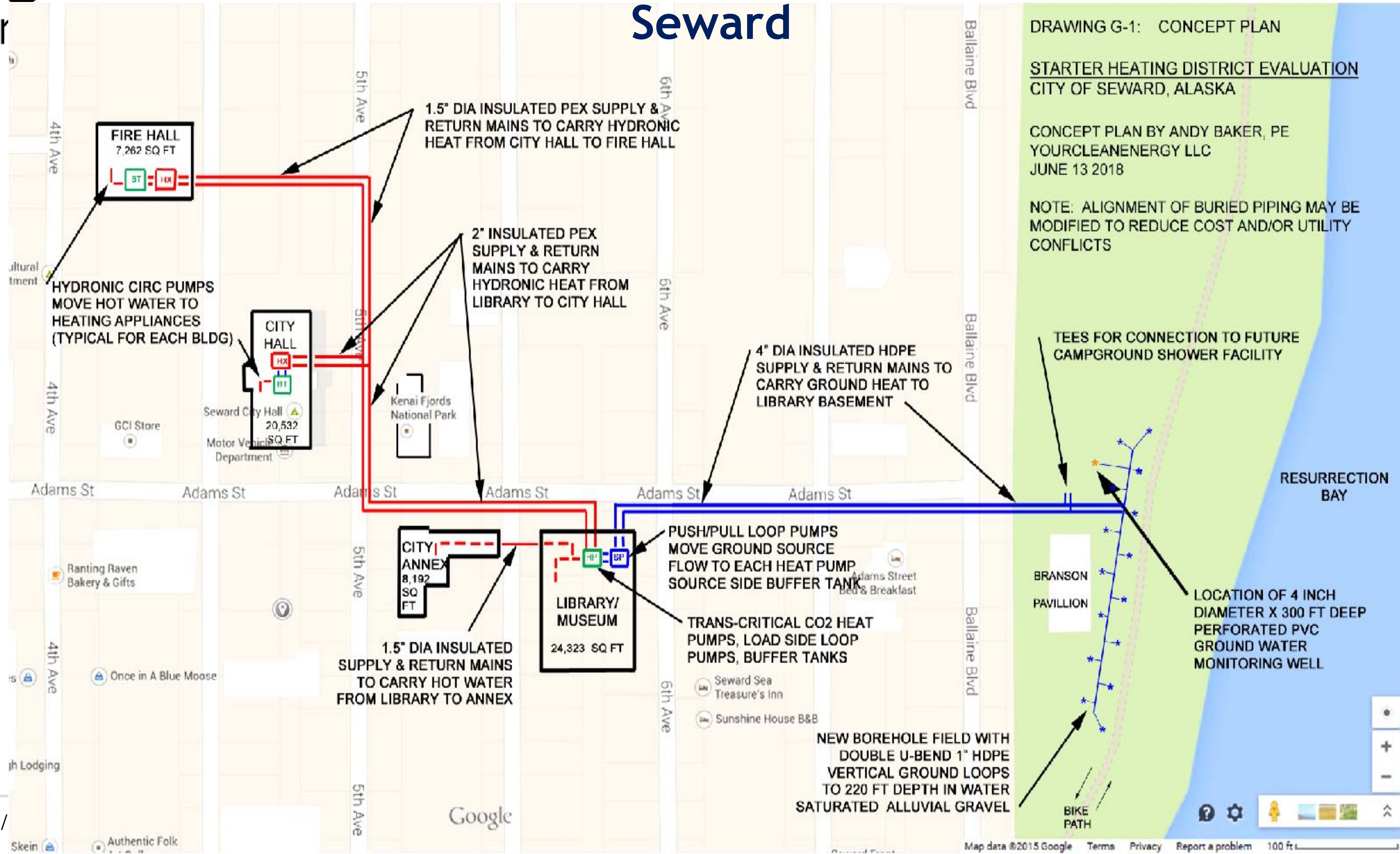
# Source Heat Will Be Extracted From Tidal Inflow Via Innovative Vertical HDPE Loops

DOUBLE U-BENDS  
2 typical HDPE U-Bends and Geothermal  
Sure Clips "Quad Bones"

Geothermal Sure Clip LLC  
Double U-Bend Assembly



# Site Plan For Starter Heating District - City Of Seward





# Benefits Of Using Transcritical CO2 In Seward Heating District

· **Tap The Clean And Abundant Ocean Heat of Resurrection Bay...**

- **Demonstrate Trans-critical CO2 Heat Pumps For District Heat**
- **Create Great Long Term Jobs** In New Construction, Building Energy Efficiency Improvements, Marine Construction, Heat Pump Installation And Maintenance, District Heating Management & Operations.
- **Increase Tourism And Business** Thru The Alaska Winter Months
- **Energy Savings Will Increase Both Local Income & City Revenues**
- **Eliminate Liabilities Of Pollution** from synthetic refrigerants; also the burning of heating oil or wood
- **Put City Of Seward On The World Map** For Clean Energy Innovation



**ATMO**  
sphere

Business Case for  
Natural Refrigerants

June 12-14, 2018 – Long Beach

**Thank you very much!**

**Andy Baker, PE**  
**YourCleanEnergy LLC**

[andybaker@yourcleanenergy.us](mailto:andybaker@yourcleanenergy.us)

