

Business Case for Natural Refrigerants

June 12-14, 2018 – Long Beach

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YourCleanEnergy
LLC
Anchorage, Alaska

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



Celebrate the power of nature...TM

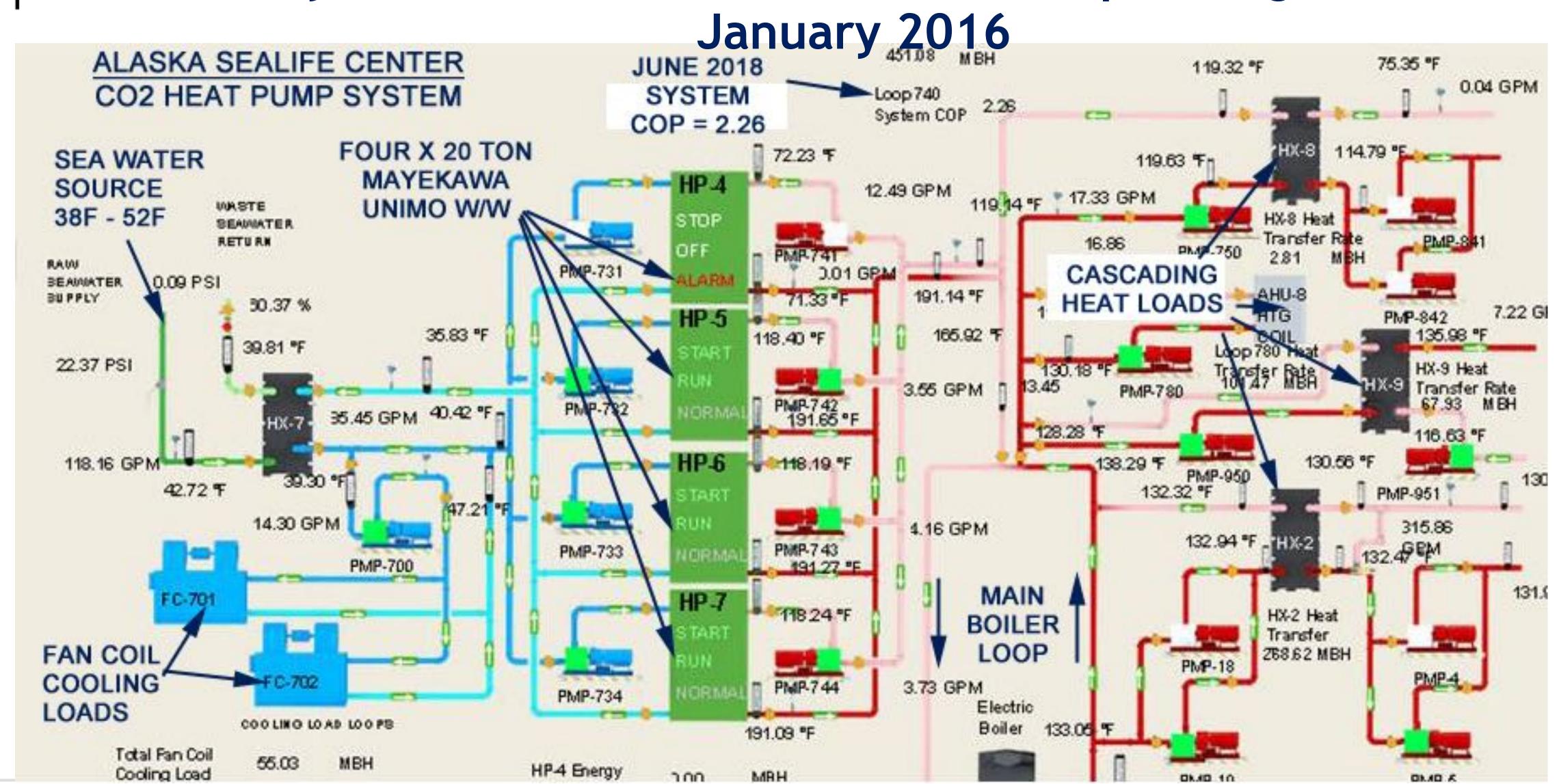


Four x 20 ton Trans-critical CO2 Mayekawa Heat Pumps Installed At Alaska SeaLife Center In January



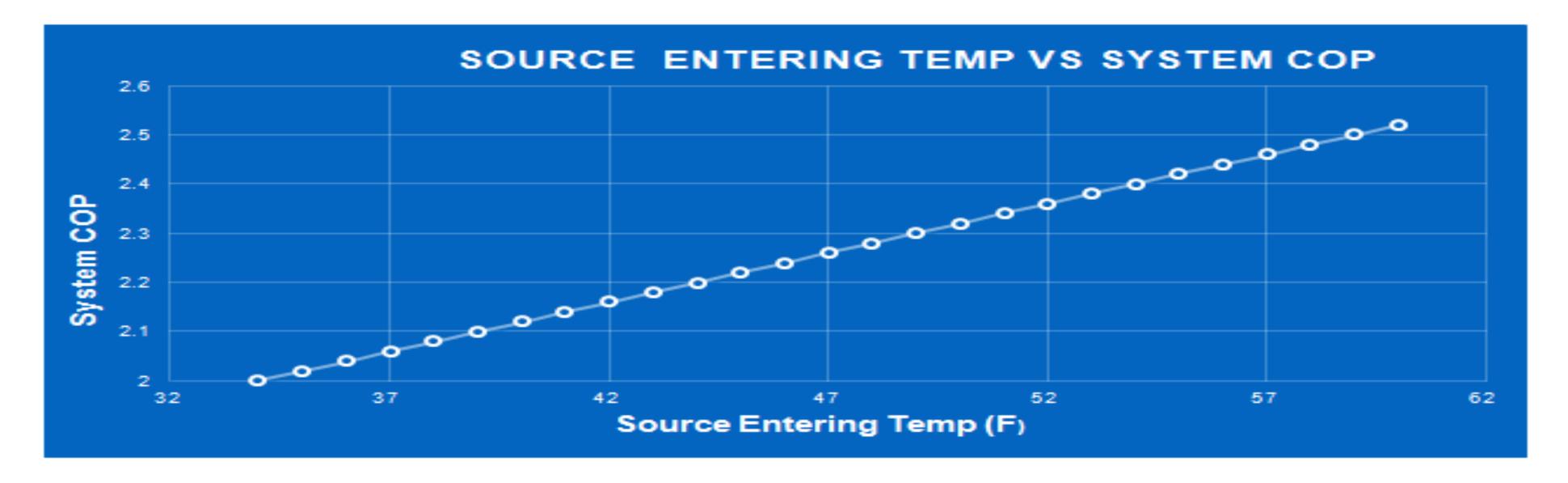


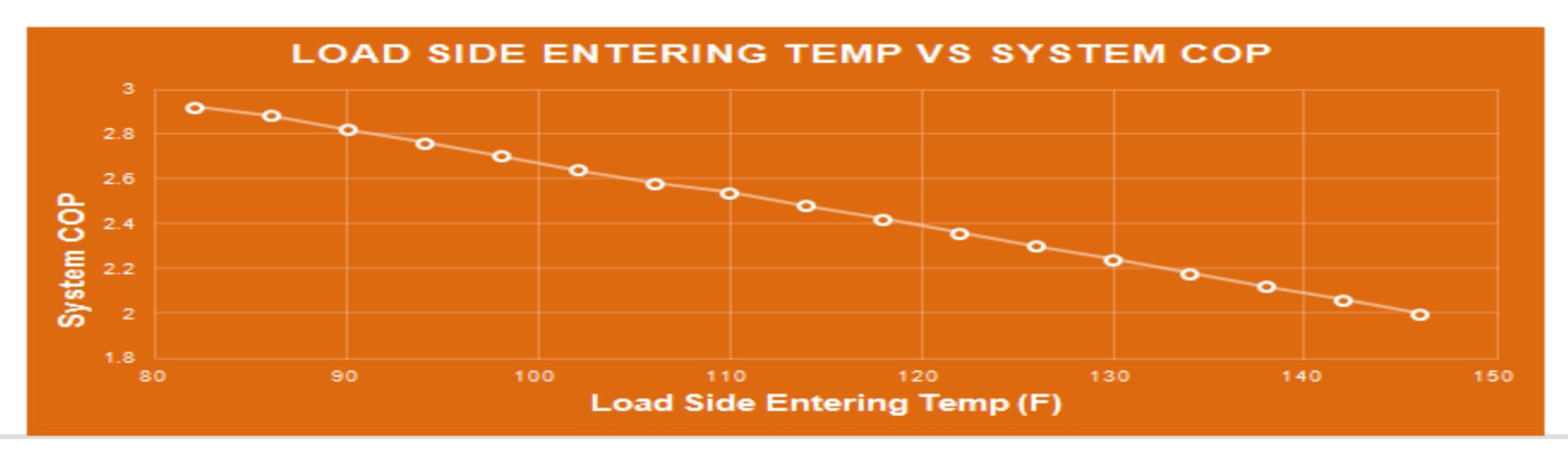
Lessons Learned: Trans-Critical CO2 Heat Pump System At Alaska SeaLife Center - Operating Since





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





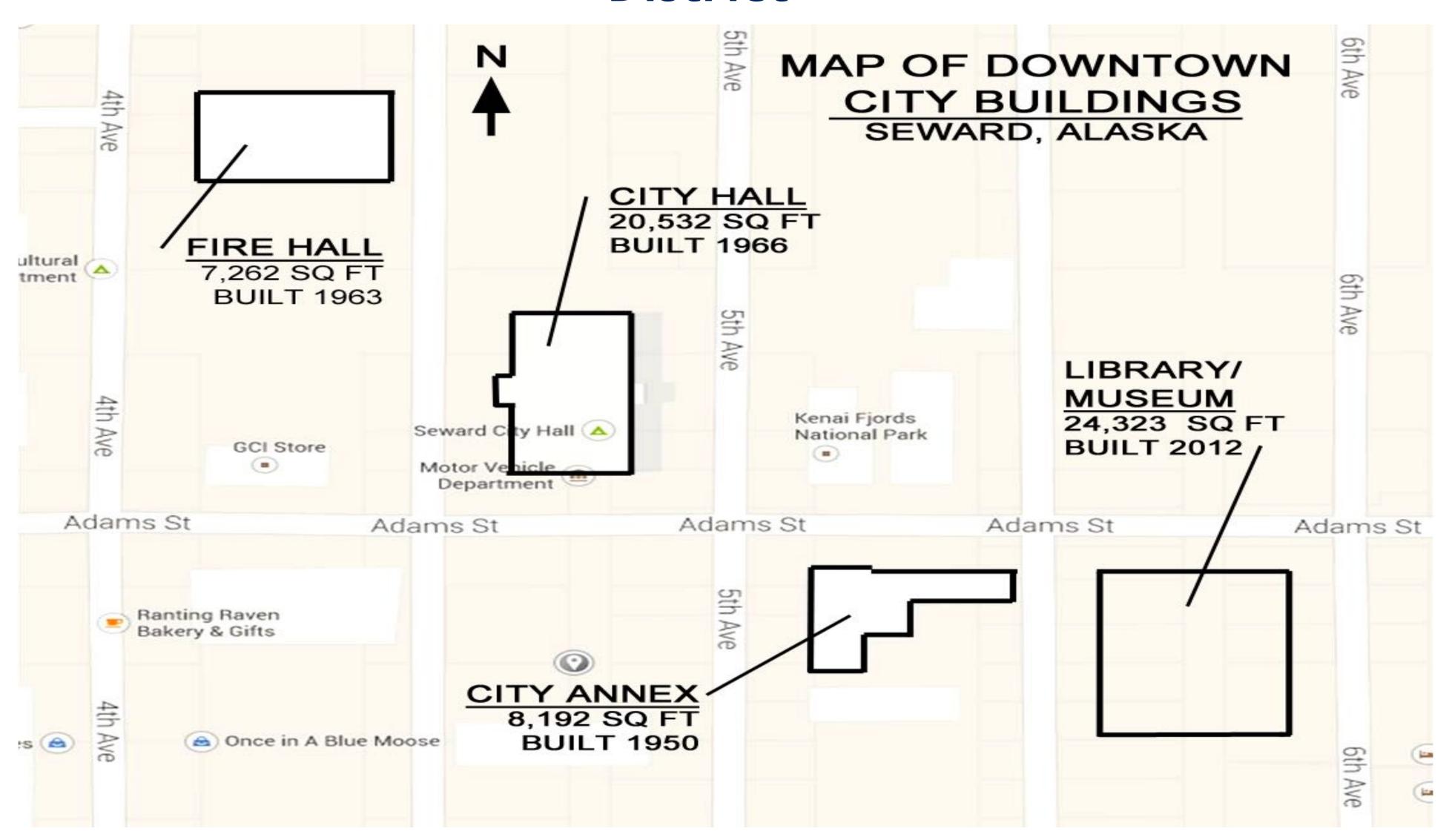


City Of Seward, Alaska - Four City buildings In Heating



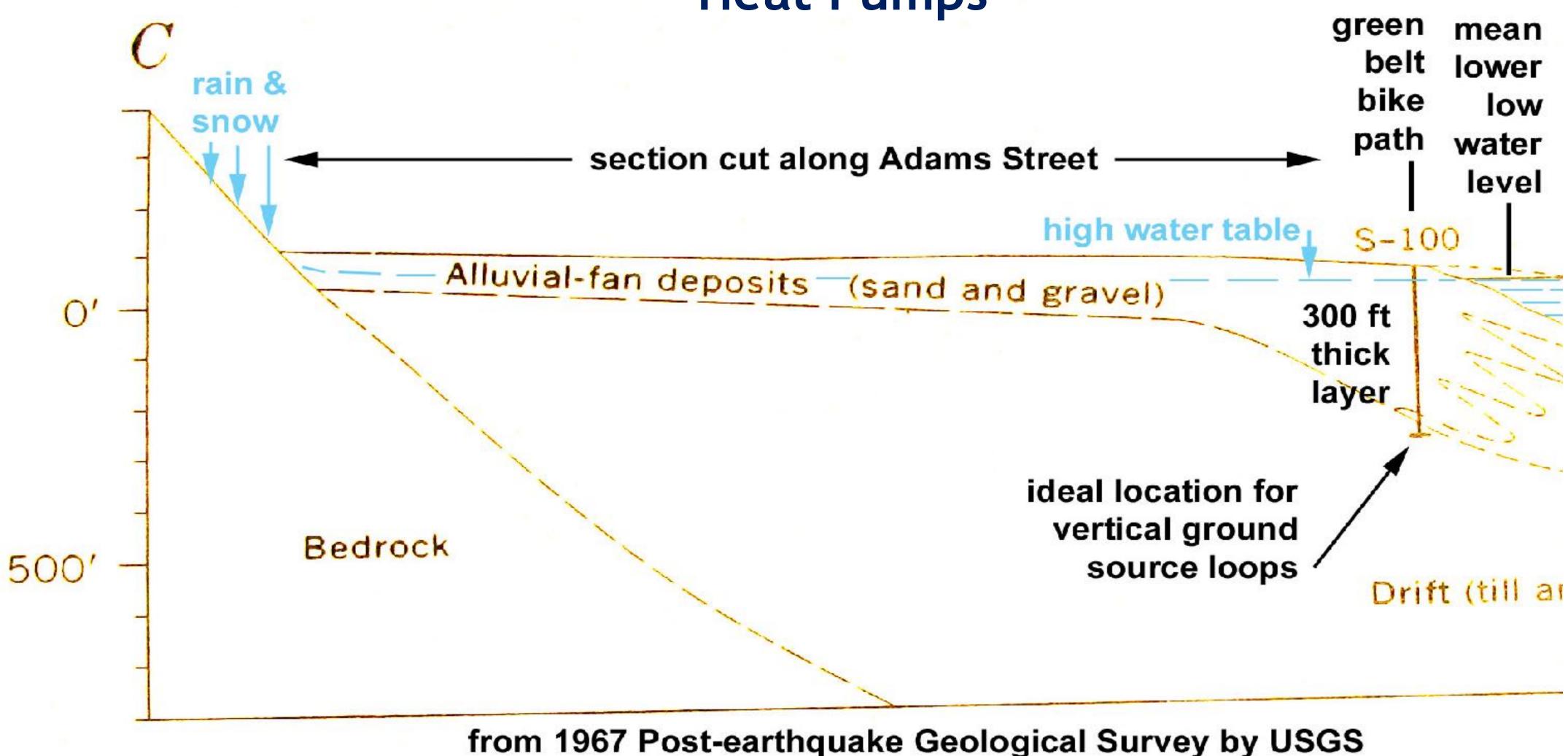


City Of Seward, Alaska - Four City buildings In Heating District





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



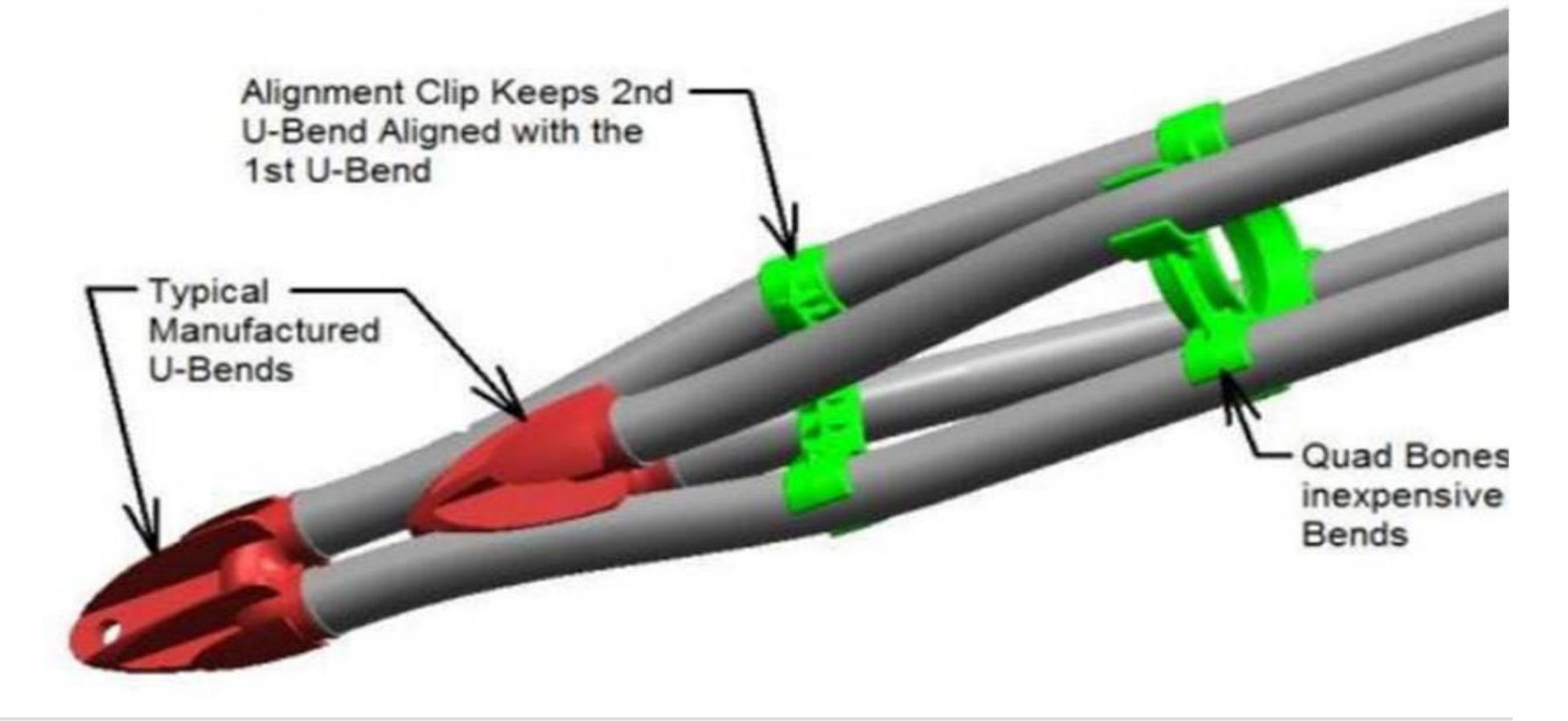


Source Heat Will Be Extracted From Tidal Inflow Via Innovative Vertical HDPE Loops

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 ATMO spher Seward DRAWING G-1: CONCEPT PLAN STARTER HEATING DISTRICT EVALUATION CITY OF SEWARD, ALASKA 1.5" DIA INSULATED PEX SUPPLY & > RETURN MAINS TO CARRY HYDRONIC CONCEPT PLAN BY ANDY BAKER, PE FIRE HALL HEAT FROM CITY HALL TO FIRE HALL YOURCLEANENERGY LLC 7,262 SQ FT JUNE 13 2018 NOTE: ALIGNMENT OF BURIED PIPING MAY BE MODIFIED TO REDUCE COST AND/OR UTILITY 2" INSULATED PEX CONFLICTS SUPPLY & RETURN MAINS TO CARRY HYDRONIC CIRC PUMPS HYDRONIC HEAT FROM LIBRARY TO CITY HALL MOVE HOT WATER TO HEATING APPLIANCES CITY TEES FOR CONNECTION TO FUTURE (TYPICAL FOR EACH BLDG) , HALL 4" DIA INSULATED HDPE CAMPGROUND SHOWER FACILITY SUPPLY & RETURN MAINS TO CARRY GROUND HEAT TO BT LIBRARY BASEMENT Kenai Fjords Seward City Hall (A National Park GCI Store 20,532 Motor VehiclSQ-FT RESURRECTION Adams St Adams St Adams St. Adams St Adams St BAY PUSH/PULL LOOP PUMPS MOVE GROUND SOURCE FLOW TO EACH HEAT PUMP Ranting Raven BRANSON SOURCE SIDE BUFFER TANKS Street & Breakfast Bakery & Gifts **LOCATION OF 4 INCH** LIBRARY/ **PAVILLION** 0 DIAMETER X 300 FT DEEP MUSEUM TRANS-CRITICAL CO2 HEAT PERFORATED PVC PUMPS, LOAD SIDE LOOP 1.5" DIA INSULATED **GROUND WATER** 24,323 SQ FT PUMPS, BUFFER TANKS MONITORING WELL SUPPLY & RETURN MAINS Seward Sea Once in A Blue Moose TO CARRY HOT WATER FROM LIBRARY TO ANNEX Sunshine House B&B **NEW BOREHOLE FIELD WITH** DOUBLE U-BEND 1" HDPE th Lodging VERTICAL GROUND LOOPS TO 220 FT DEPTH IN WATER SATURATED ALLUVIAL GRAVEL 0 4 BIKE Google ATMOsphere America / PATH Authentic Folk

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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



Thank you very much!

Andy Baker, PE YourCleanEnergy LLC

