

# IDEA Annual Conference

**Challenge: Can a 100 Year Old District Heating System Cut Water Use by 100%?**

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# Agenda

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**01** Problems / Challenges

**02** Opportunity

**03** Background / Goals

**04** Execution

**05** Summary / Lessons Learned

**06** Questions & Answers

# Problem(s) / Challenges

- BART (Bay Area Rapid Transit) annually pumps millions of gallons of nuisance ground water into the City sewer.
- The District Heating System is one of the largest users of City water.
- NRG costs for boiler makeup water are skyrocketing.
- NRG needs to increase condensate recovery.
- The City of San Francisco is aggressively trying to reduce potable water usage to conserve natural resources.



# Opportunity

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- The BART Powell St. Subway Station is 2 blocks from NRG Steam Plant.
- NRG has a capped condensate return line nearby that could be rerouted to recover the condensate.
- Can ground water be recovered and treated cost effectively?
- Is there a solution that could benefit all parties?



win  
Solution  
win



# Set Big Hairy Audacious Goals (BHAG)

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- Engage City of San Francisco, BART, and District Steam in Project collaboration process.
- Recover/treat 45 million gallons annually of ground water from BART Station.
- Install the first production well permitted in decades in San Francisco at Steam Plant site.
- Reduce storm system potable water usage by 30% in 2018.
- Convert from 92% makeup to 0% potable water makeup by 2028. (10 years)
- Payback on Project, less than 3 years.



# Background:

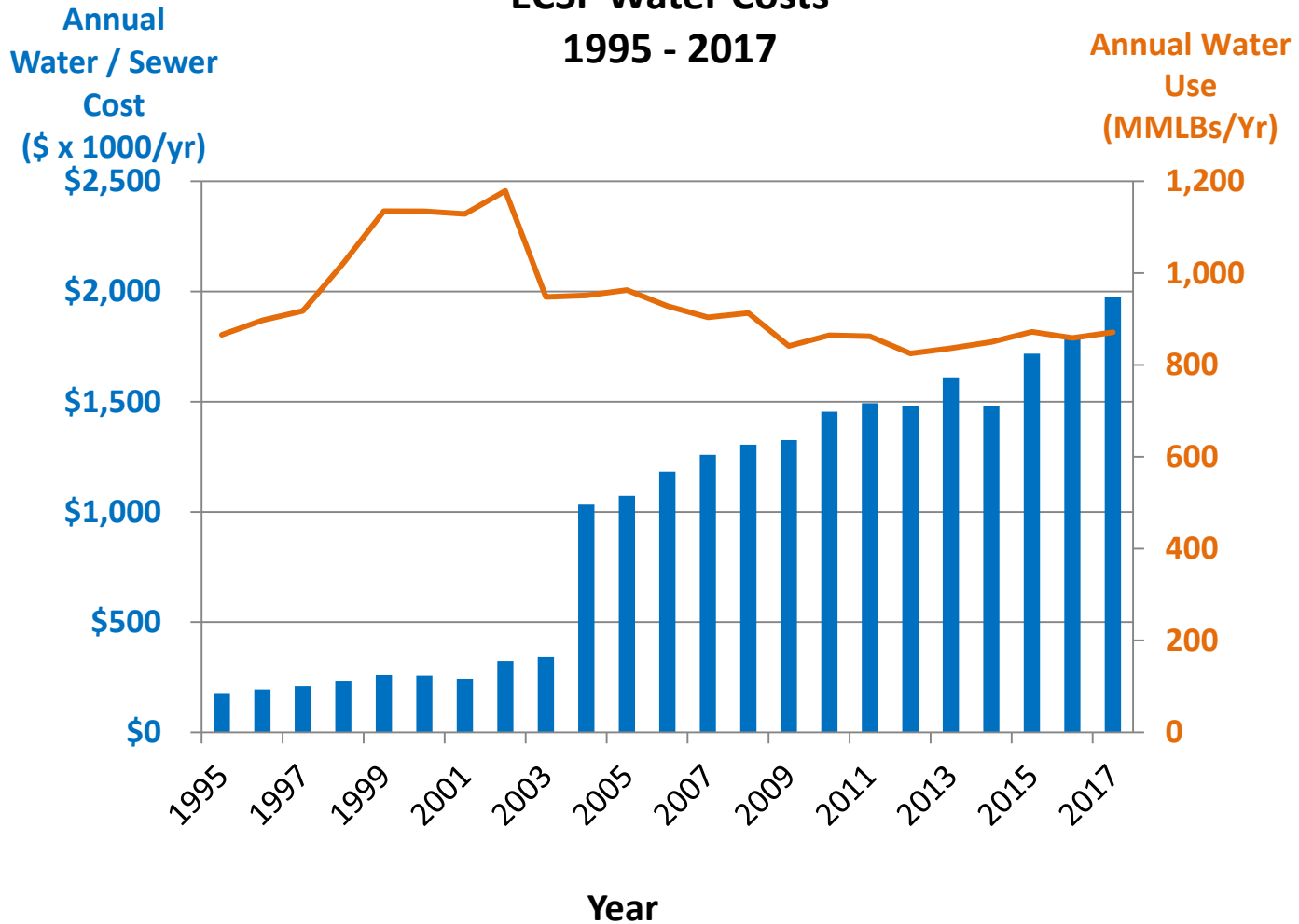
## NRG Energy Center San Francisco

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- Current Steam System is combination of 5 separate steam systems that merged over the last 100 years.
  - There was no system to return condensed steam from customers to plant
  - When system was sold by PG&E in 1992, there was 0% condensate return so the system was 100% City Water makeup
  - Today, through various efficiency projects and installation of some condensate return legs, the system is approximately 92% City Water makeup
    - Approximately 200 gpm average, 700 gpm peak

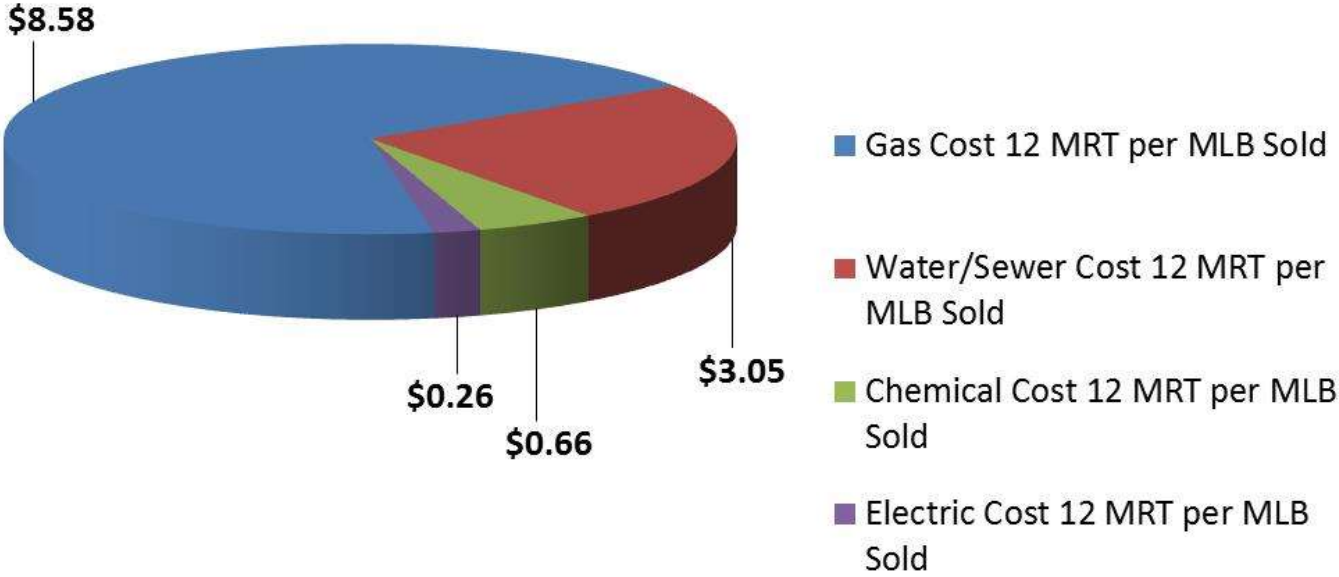
## ECSF Water Costs 1995 - 2017



■ 12-Month Running Water/Sewer Cost (\$ x 1000)

— 12-Month Running Water Use (MMLB/yr)

**Steam Cost of Sales  
(as of Jan 2018)  
\$12.55/MLB Sold**



NOTE: 12 MRT = 12-Month Running Total



# BART Ground Water Recovery Project

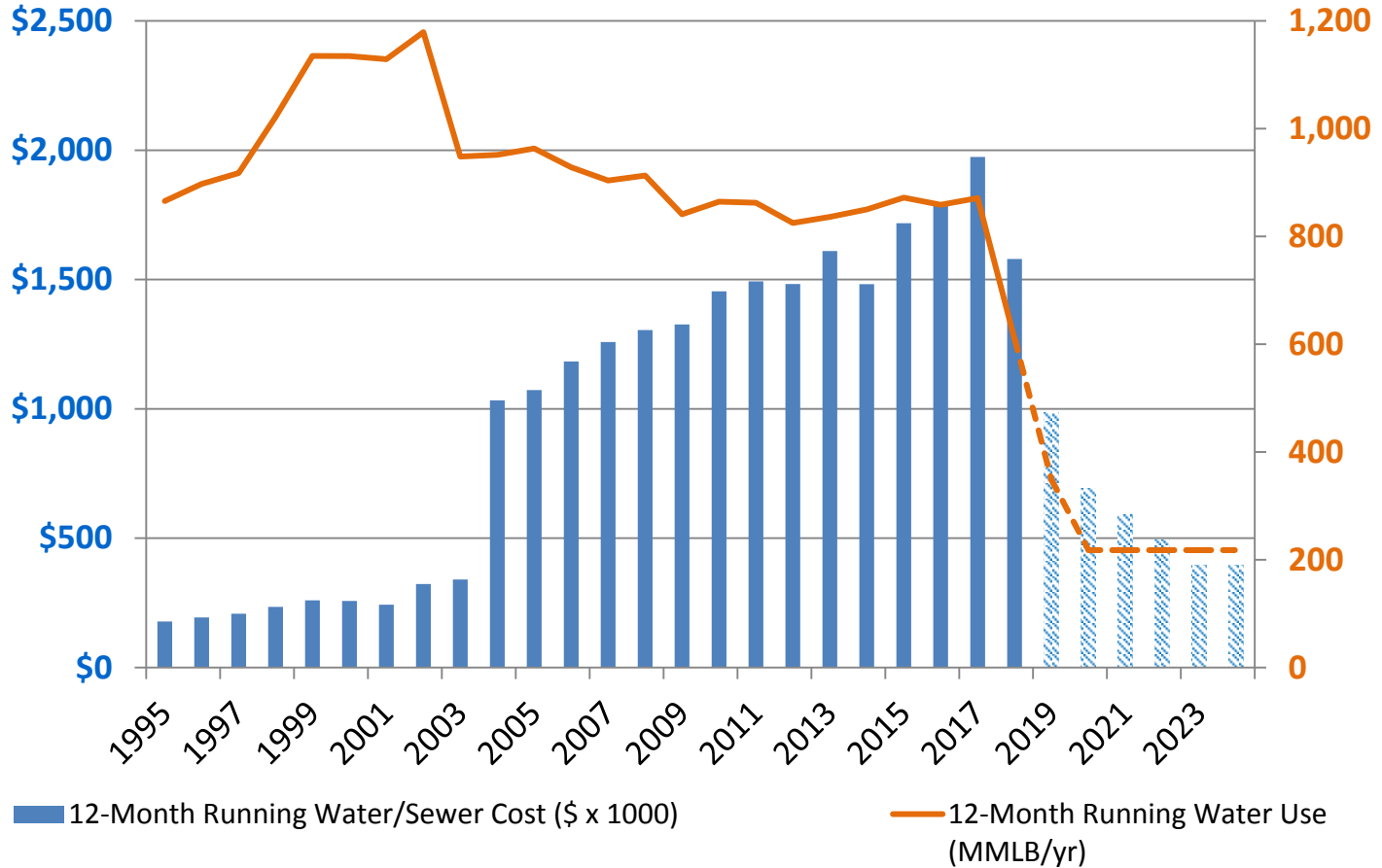
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- Total Project Cost: \$3.5M
- Total Annual Savings: \$1.3M, 2.8 year payback
- City Grant for \$500k
- Savings will be enhanced by adding on-site well
  - Test well indicates at least 100 gpm available for an incremental \$250k spend
  - Would improve project savings by \$300k per year, 0.8 year payback
- Using a combination of ground water and well water will allow us to market a new product called “Sustainable Steam”
  - Goal would be to get USGBC LEED points to enhance marketing of steam in San Francisco

Annual City  
Water/Sewer  
Cost  
(\$ x 1000/yr)

### ECSF Projected Water Cost Improvement w/ BART and Well 2018-2024

Annual City Water Use  
(MMLB/yr)



# Execution

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- Project is divided into 3 sub-projects (Parts) -
  - Part 1: New pumps at Powell St. station
    - BART to install 2 pumps by BART and inventory 1 pump; NRG to supply pumps
  - Part 2: Distribution to route BART water and condensate return to the Jessie St. Plant
    - Run 1,050 ft of condensate return and 750 ft of BART water; build vault on Market St. to install a 3-way valve and tie in to BART water discharge line; install an electrical conduit for control wiring when the trench is open
  - Part 3: Water treatment system at Jessie St. Plant
    - Install an on-site RO based water treatment system to treat BART and City water with provisions for load growth and integration of well water in the future
- All 3 Parts will be managed and executed in parallel

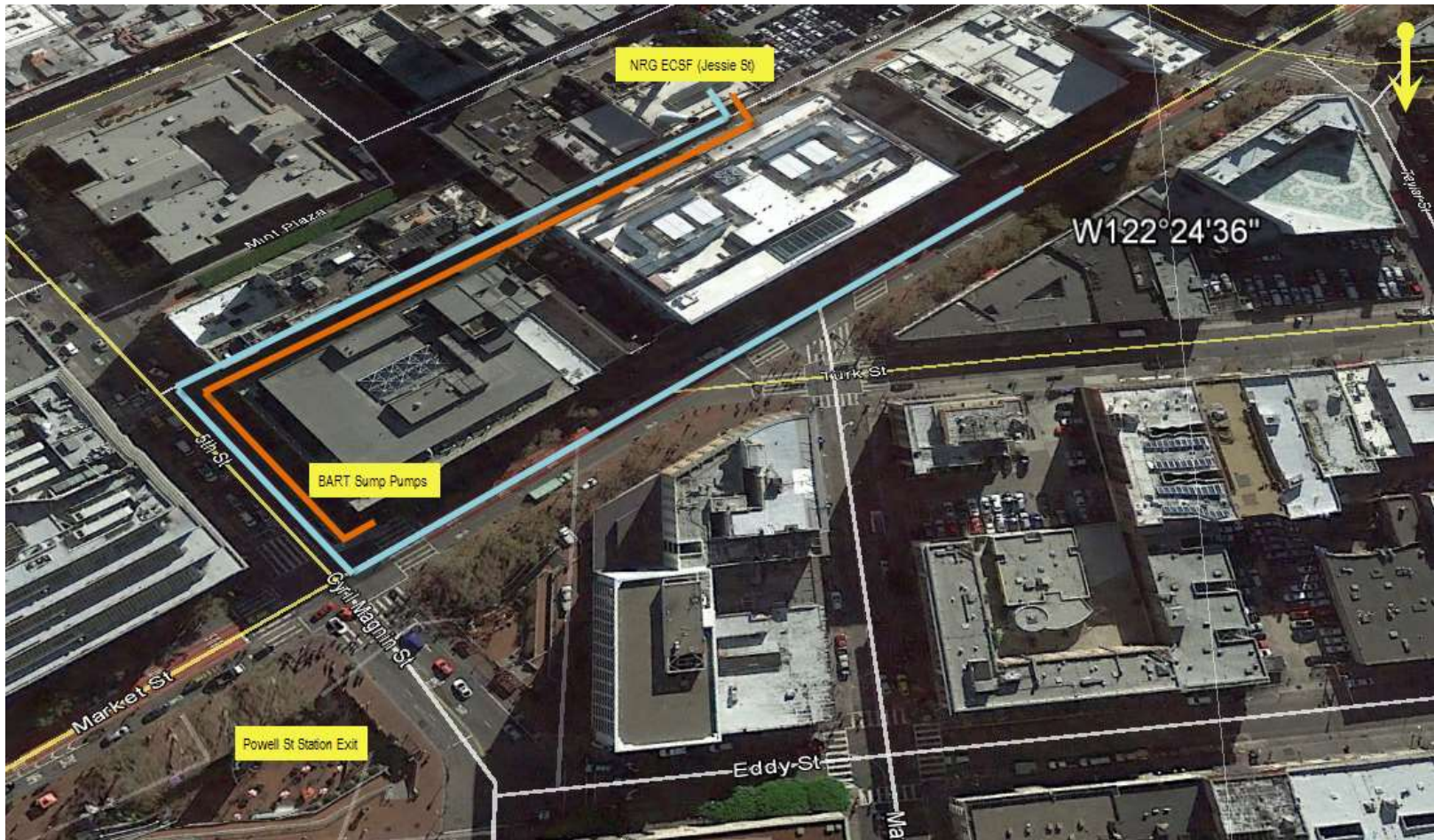
# Part I: BART Recovery

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- Investigate / confirm potential ground water recovery.
- Access 1am to 4am only.
- Determine ground water cleanup requirements.
- Develop options on how to intercept ground water before dump to sewer. Maintain fail safe.
- Flooding BART Station – Not an option.

# Part 2: Distribution



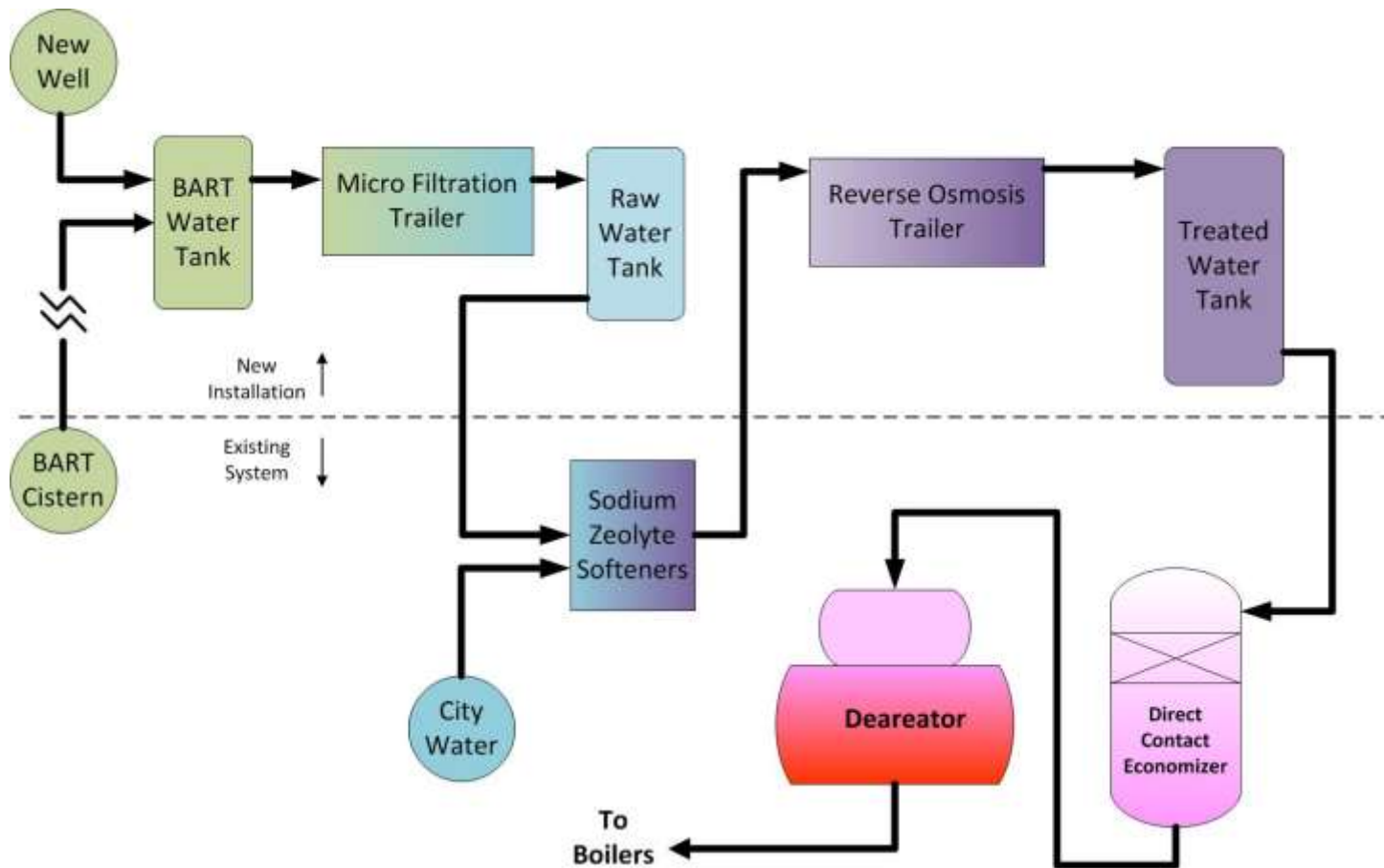
# Part 2: Distribution

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- Explore / validate BART – Sewer tie-in
- Confirm condensate line tie-in
- Install new recovery piping that collects BART ground water and condensate and returns to District Plant.

# Part 3: Water Treatment Design



# Part 3: Water Treatment

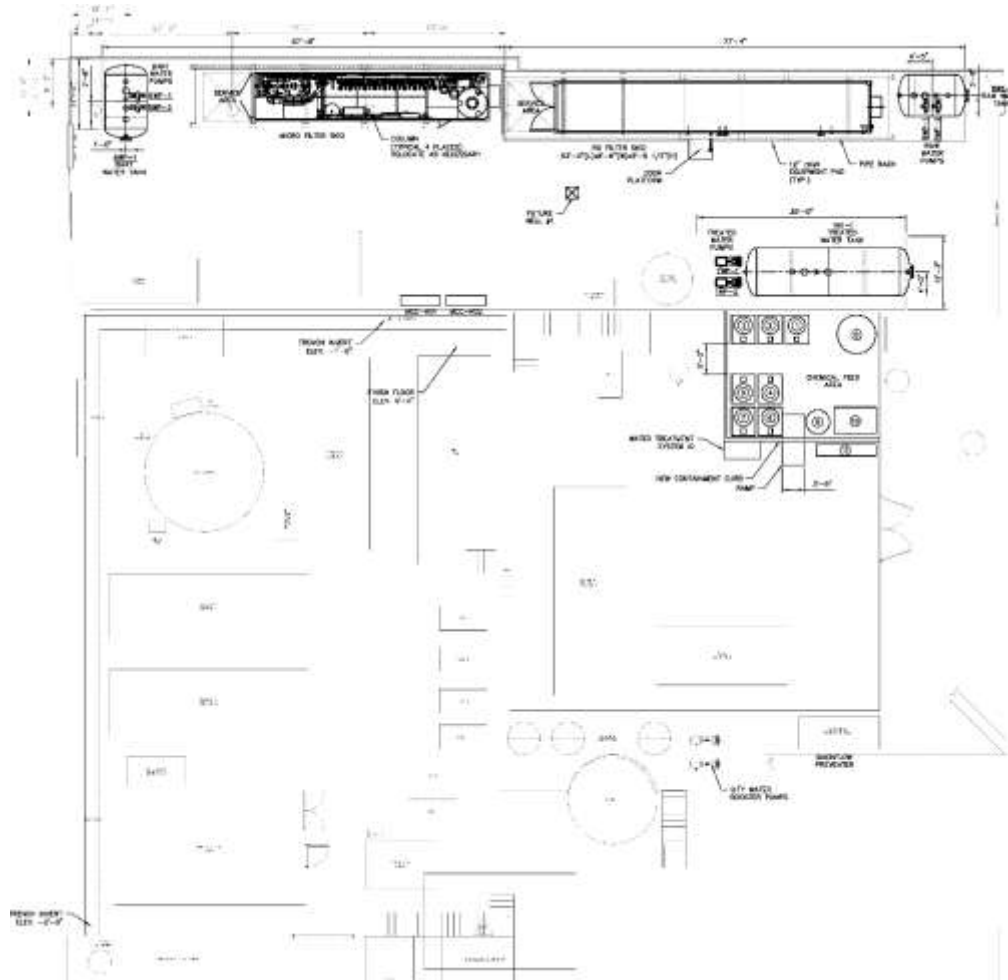
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- Design for RO / Treatment for 100% boiler makeup (700 gpm peak)
- Phases:
  - BART ground water – 2018
  - Condensate – 2018
  - New well – Pending drilling permit
- Conserve space in yard vehicle storage

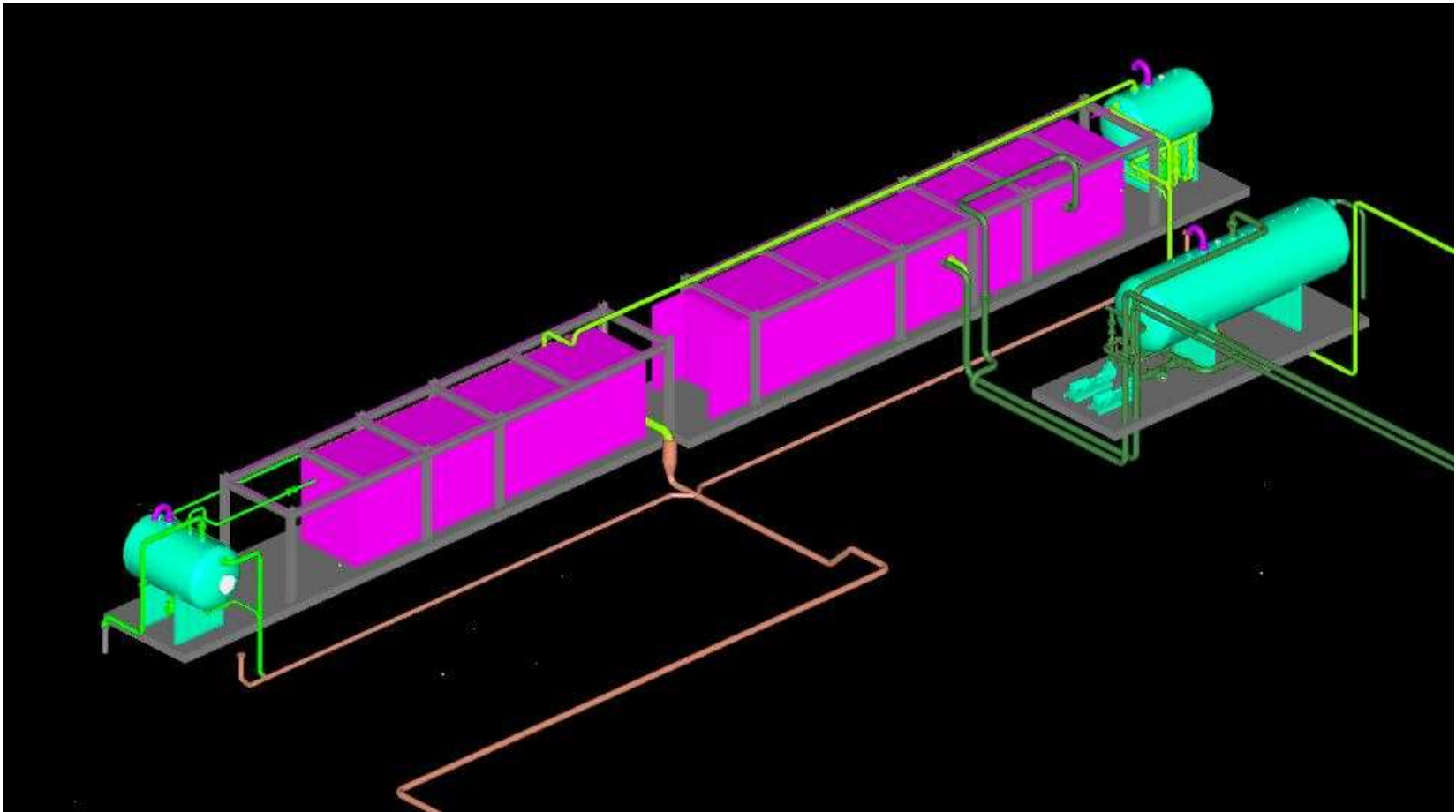


# Site General Arrangement



# Part 3: Water Treatment - Yard

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# Construction Progress

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# Construction Progress

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# Lessons Learned

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- Large, Bureaucratic Agencies can be engaged for Common Good.
  - It just takes time
- Assign risk areas based on skill set:
  - BART – BART Station
  - NRG Distribution
  - RO / Treatments – Suppliers best practices
  - How to make it fit – Hire a good engineer
- Engage City and State in Well Permit - **Much Earlier**

# Expected Results

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- With well water permit, NRG will be zero makeup (Date TBD)
- Phase 1 - 2018
  - Save 30 million gallons of potable water
  - Cut City water usage by 30%
- Phase 2 – 2018 to 2028
  - Install on-site well (waiting from ??); potential 100 gpm (50% load)
  - NRG requires minimal potable water from City water supply
  - NRG reduce water/sewer Costs by \$900,000/year
  - Cut chemical costs by \$200,000/year
  - Reduce distribution system O&M by \$200,000/year