

# Controlled Environment Agriculture

City Council Study Session

August 1, 2017



CITY OF JOHN DAY

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# Topics for discussion

- Environment
- Operations
- Market & Economics



# What is hydroponics?

**Hydroponics** is a subset of hydroculture, the method of growing plants without soil, using mineral nutrient solutions in a water solvent.



# Why hydroponics?

## **Utilize our resources**

- Take advantage of our abundant resources (sunlight and water) and turn them into a revenue source.

## **Increased growth rate**

- Plants will mature up to 25% faster and produce up to 30% more than the same plants grown in soil.

## **Controlled environment**

- Climate
- Nutrients
- Year-round growing season

## **Fewer problems with disease, funguses, and bug infestations**

# Will it work here?

**Yes!!!**

## **We have:**

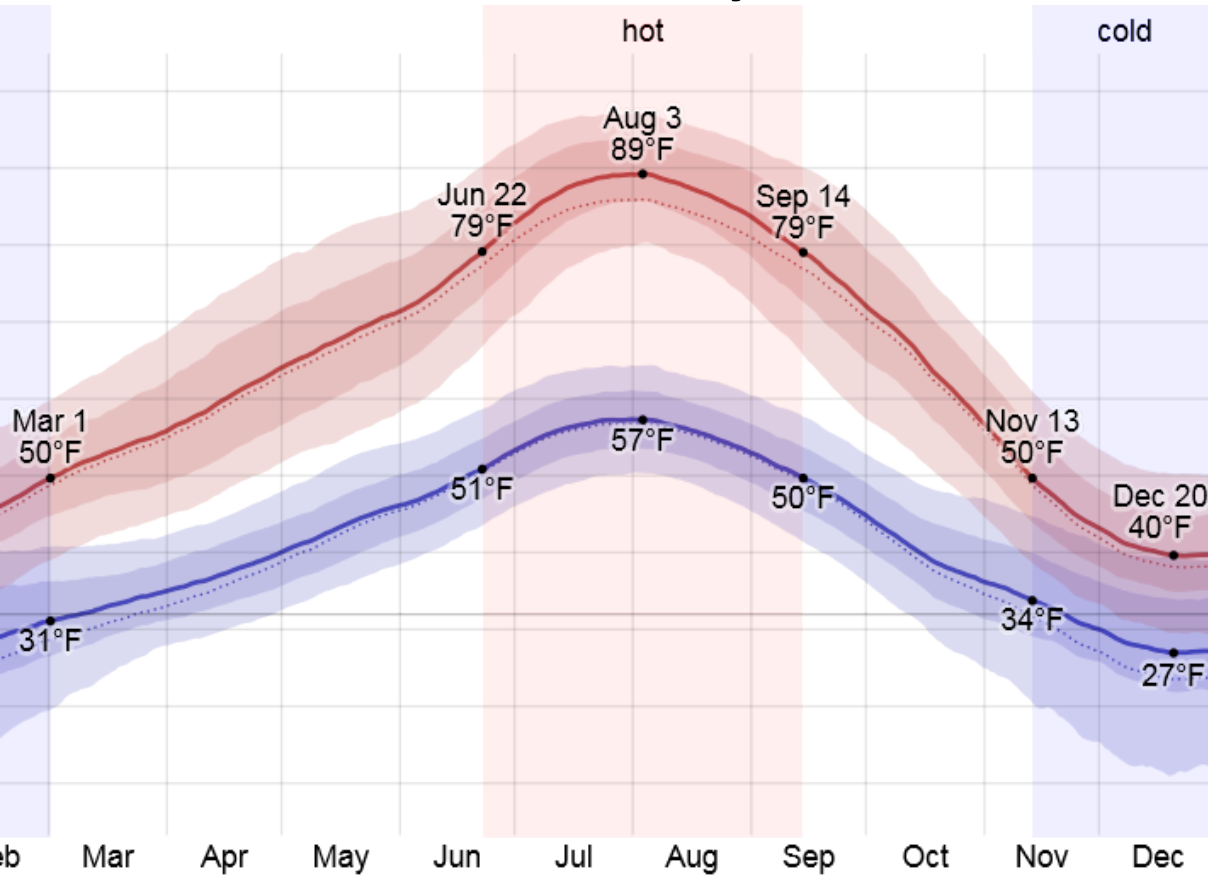
- Abundance of sun and water
- Level ground and room to scale
- Climate conducive to optimal growth and production  
(example- Ontario, Canada)

Tomatoes are grown on about 7,000 ha across the country, producing from 500,000 to 550,000 tons, valued at between \$75 and \$80 million. Ontario accounts for more than 98% of the production. Canada is the main producer of greenhouse tomatoes in North America. Our average temperatures and solar energy are comparable to that of Ontario.

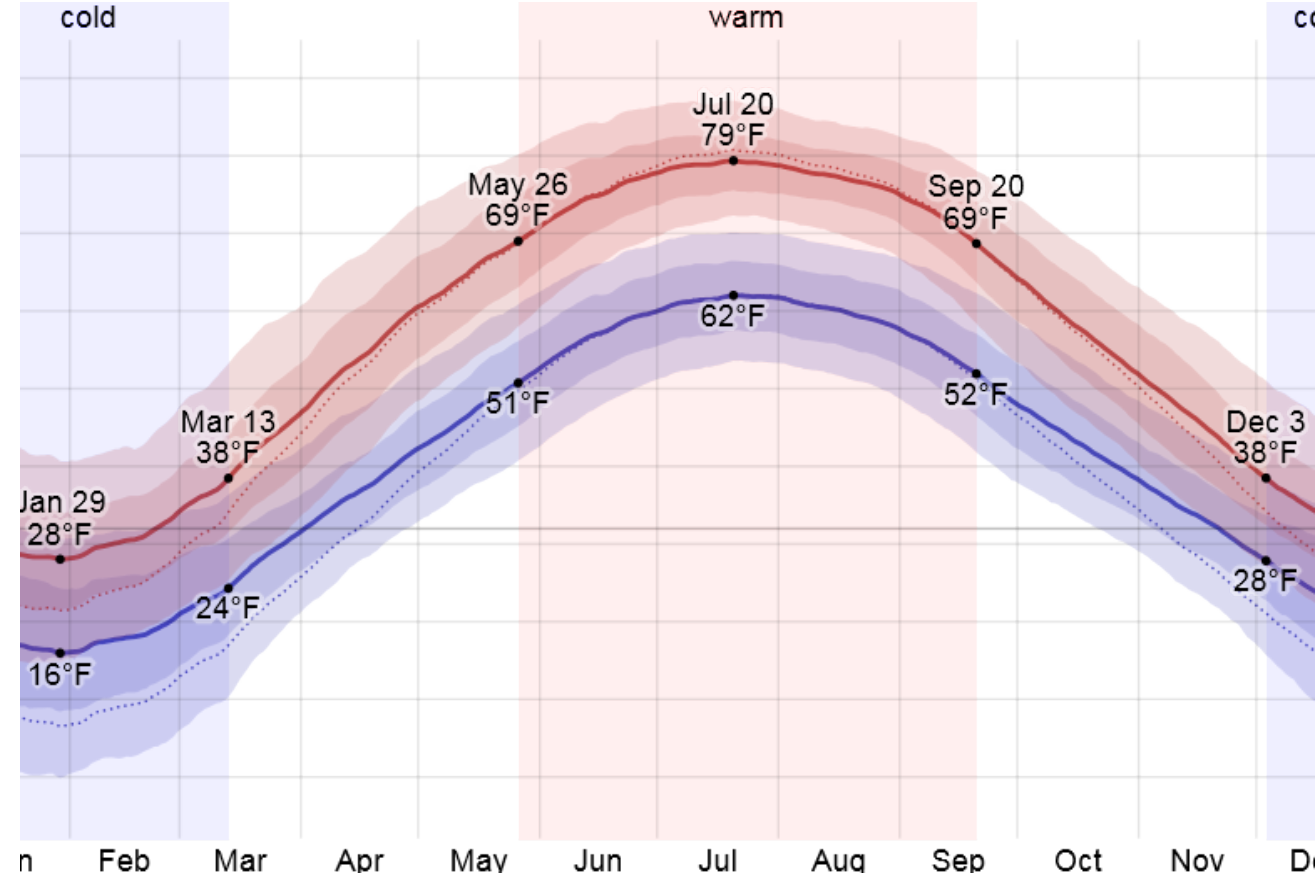


# Average High and Low Temperature

## John Day



## Ontario, Canada

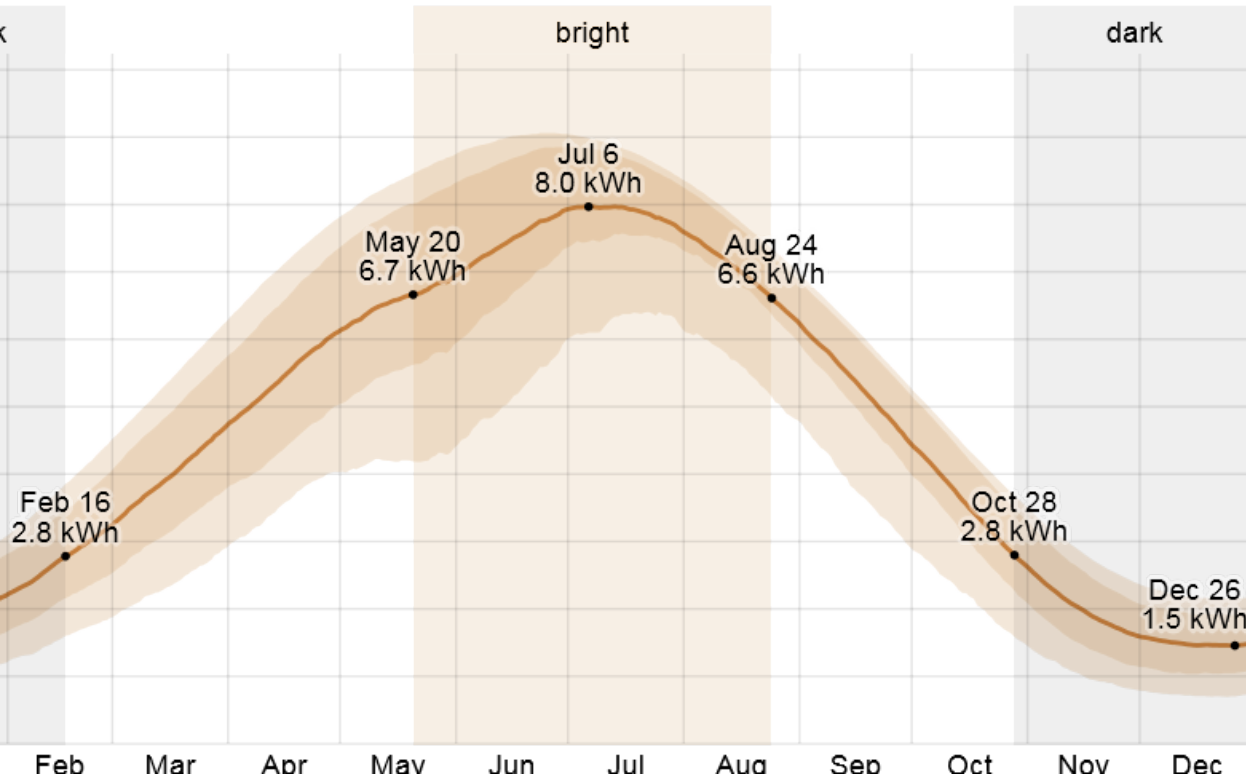


The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

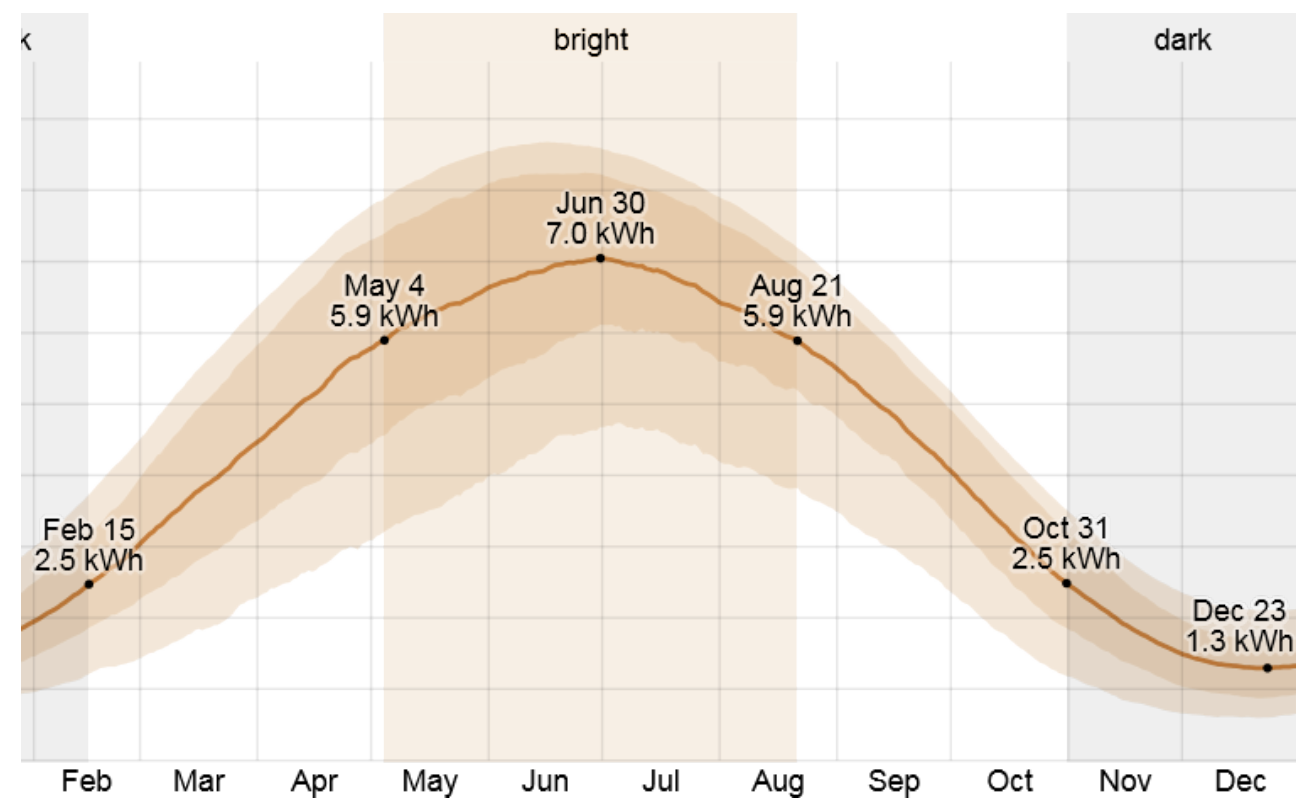


# Average Daily Incident Shortwave Solar Energy

## John Day



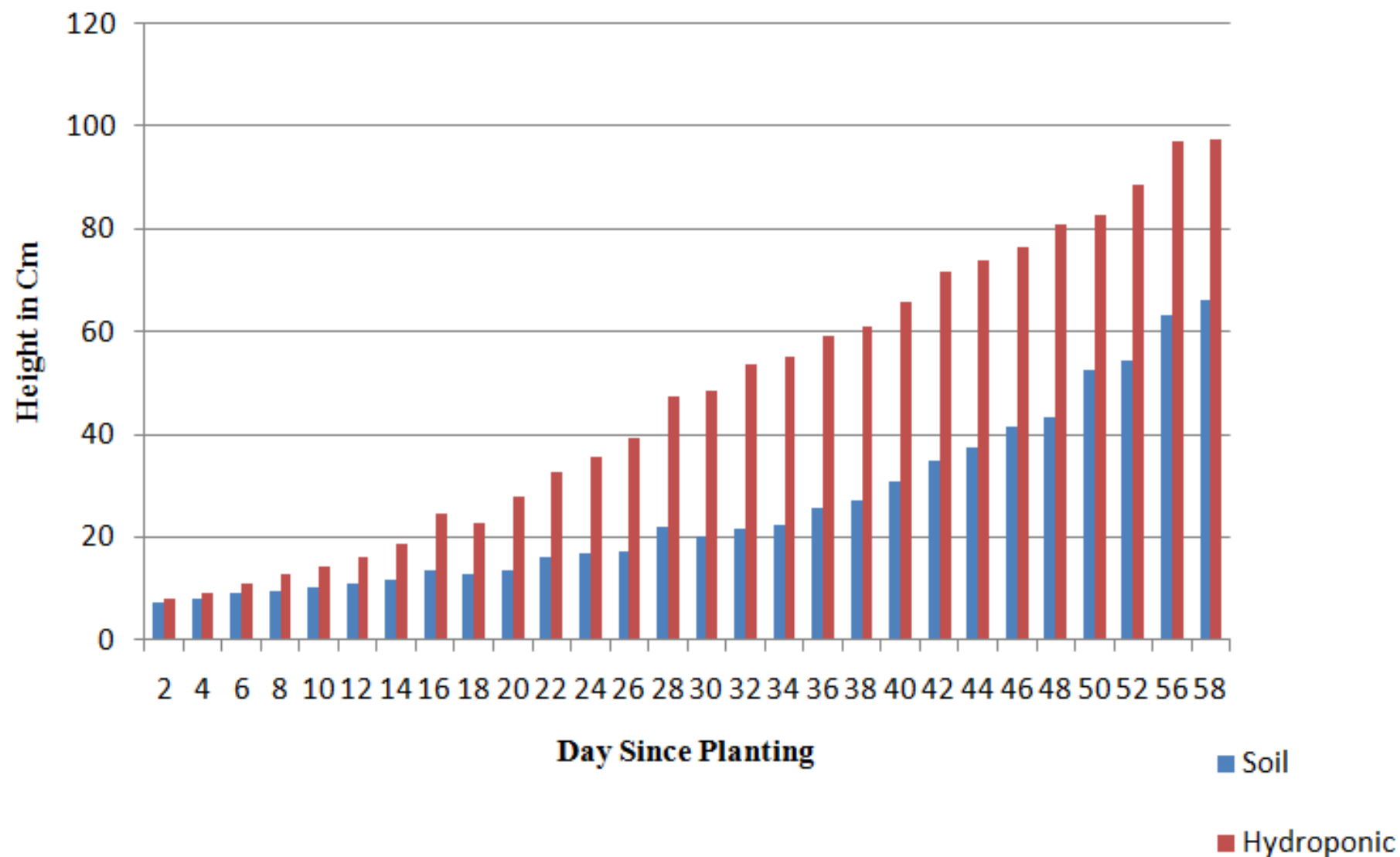
## Ontario, Canada



The average daily shortwave solar energy reaching the ground per square meter (orange line), with 25th to 75th and 10th to 90th percentile bands.



## The Effect of Use of Hydroponic System Compared to Soil Grown Tomato Plants on Height





# Types of hydroponic systems

6 main types of hydroponic systems:

1. Deep Water Culture (reservoir method)
2. Nutrient Film Technique (NFT).
3. Ebb and Flow
4. Wicking
5. Drip
6. Aeroponics

Vertical farming and Horizontal farming

- Most companies either specialize in vertical or horizontal farming using variations of these systems depending on the greenhouse design and the crop type desired.

Horizontal farming- Dutch buckets utilizing a modified Ebb and Flow system



Vertical farming- Zip Grow towers utilizing a NFT system



# What can we grow?

## **Greens**

- Swiss chard, mustard greens, kale, arugula, cabbage, bok choy, lettuce,

## **Herbs**

- Oregano, mint, chives, thyme, fennel, basil, cilantro, parsley, lemongrass, chevil

## **Fruiting crops**

- Tomatoes, cucumbers, peppers, squash, eggplants, beans, strawberries

## **Specialty/Cash crops (i.e. Hops, Bamboo, Flowers/Ornamentals)**

- Each crop has its own requirements for optimal growth and production. Greenhouses can be set-up using various systems and climate controls, but the more variety of crop type the more complicated it can get.



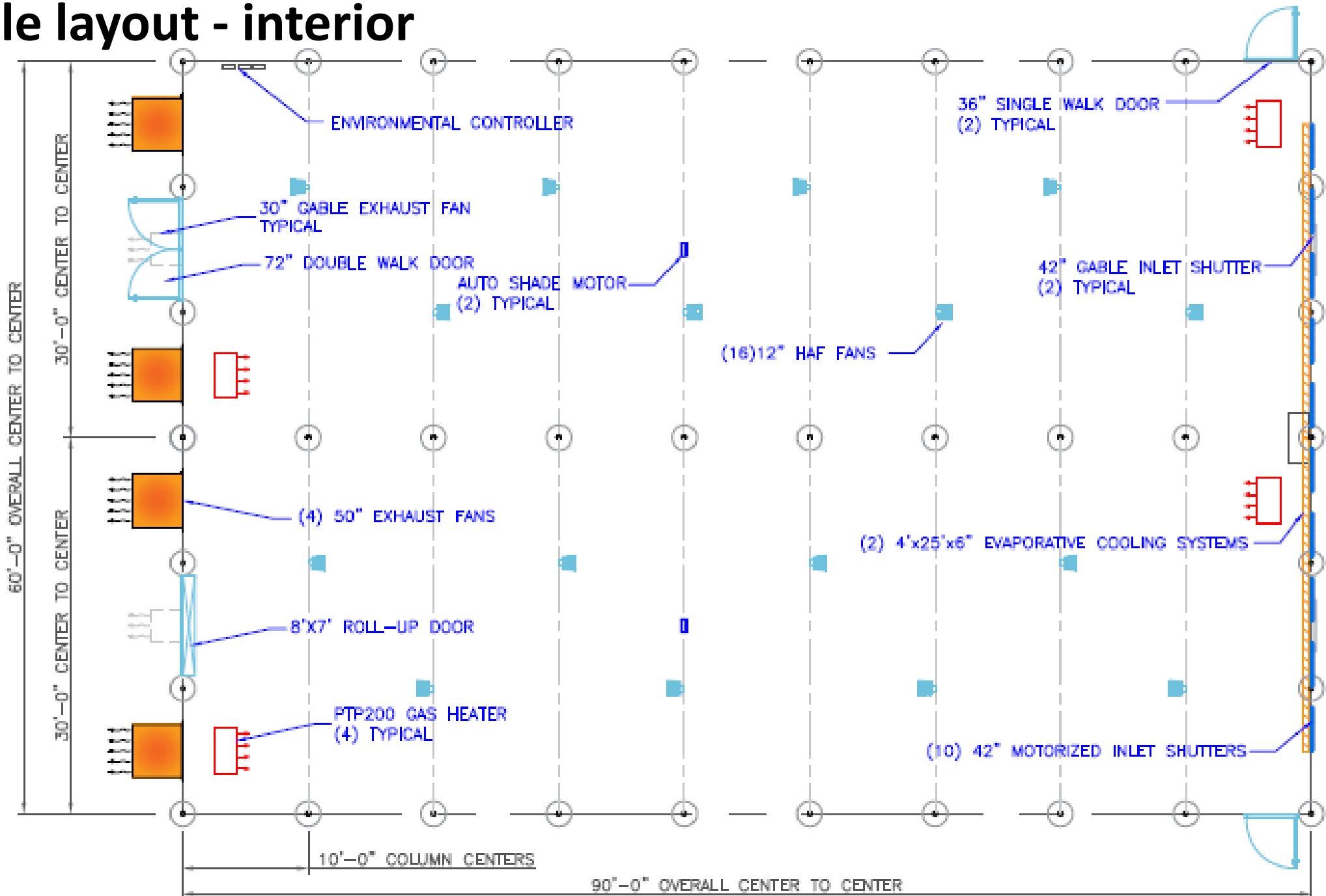
# Pilot Greenhouse

## Scope

- Build a pilot-scale greenhouse system in the range of 5000-6000 SF
- One bay will be engineered for Leafy greens and herbs, while the other bay will be engineered around vine and fruiting crops.
- Include visitor center space with digital displays and curb appeal for prospective investors / visitors
- Pilot scale facility doubles as potential research facility for academic and/or commercial partners



# Sample layout - interior





# 2.5 Acre Treatment Plant (Orange) with 5,400 SF pilot scale greenhouse (Green) and notional street plan

**Notional Area Plan**  
Pilot-scale Greenhouse and WW TP

**Legend**

- Extension Street
- John Day Treatment Plant
- New Treatment Plant
- Pilot-scale Greenhouse
- Portion to be used to Iron Triangle
- Riverfront Trail 2





# Pilot yield and revenue projections

## Produce yields

- Greens, herbs and fruiting crops will be scaled to match local market
- Volume (gross sales and weight) will be received from Chesters and Huffmans
- Targeting School District and Hospital as potential wholesale/retail customers + local restaurants

## Initial estimates

- 1200 lbs of produce per week = 31 kilotons annually (rough order of magnitude)
- Revenue will vary based on product type and seasonal variations in supply and demand as well as configuration of greenhouses and farming systems



# Capital Expenditure

## Greenhouse/system costs /delivery/install:

- \$250,000-\$350,000 (ROM estimate)

## Site prep/utility costs:

- Est. \$50,000

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## Total capital cost:

- \$300,000-\$400,000

+

## Operational expenses (materials + labor):

- Est. \$75,000 - \$100,000 annually

There are a wide variety of greenhouses with varying costs depending the structure/covering material, gutter height, mechanical and farming systems.



# Value equation

Benefit to the community

- **Fresh produce** (possibly harvested same day purchased)
- **Local production = Local jobs** (2-3 workers for pilot greenhouse)
- **Academic and research opportunities** (partnership with higher ed)
- **Revenue source** goes into sewer fund to help lower customer rates
- **Economic value** from reclaimed water





# Timing and partnerships

## Timing

- 8-month planning window (July 2017 – March 2018)
- 4-month construction window (April 2018 – July 2018)
- Initial seeding through first harvest (August 2018 – October 2018)

## Partnerships

- Governor's regional solutions team
- Community Reinvestment Act (CRA) funds
- Academic partnerships
- Non-profits
- Local crowdsourcing campaign

# Resource Needs

## Budget Resolution / Appropriations Change

- Add Agribusiness Program fund to the Sewer account
- Projecting \$96,408 for year-one operating budget
  - \$54,234 personnel expenditures
  - \$42,174 materials and services

## Personnel

- Hire Agribusiness Project Manager to assist with greenhouse design/research and initial training
- Begin planning for engineering, construction and future Head Grower
- Assist public works on treatment plant feasibility study and innovation gateway design / planning



# Images of commercial greenhouses

















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