Beyond its Boundary

Developing a New Prototype for Specialized Research

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Learning objectives

Inspiration | Collaborative Planning

Think beyond a project's programmatic boundaries and reinterpret the potential role of a specialized research facility as an element which helps to define and contribute to the broad goals of a research community.

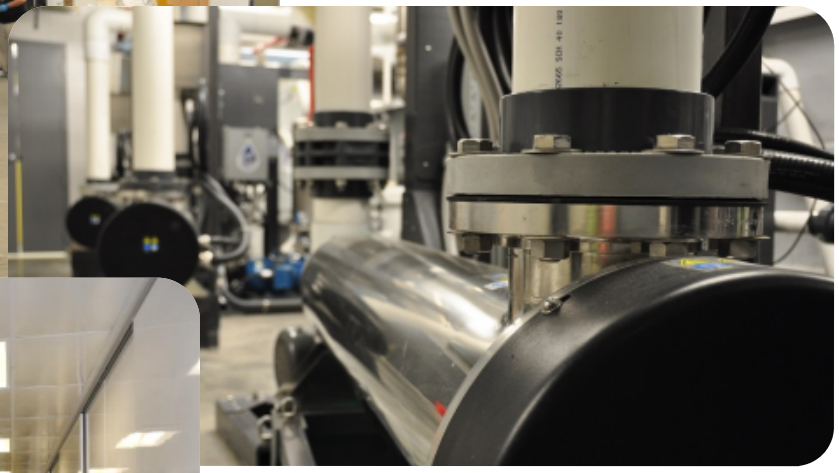
Implementation | "Occupied" Project Phasing

Learn specific design strategies and process techniques that facilitate enhanced phasing for "occupied" laboratory renovations.

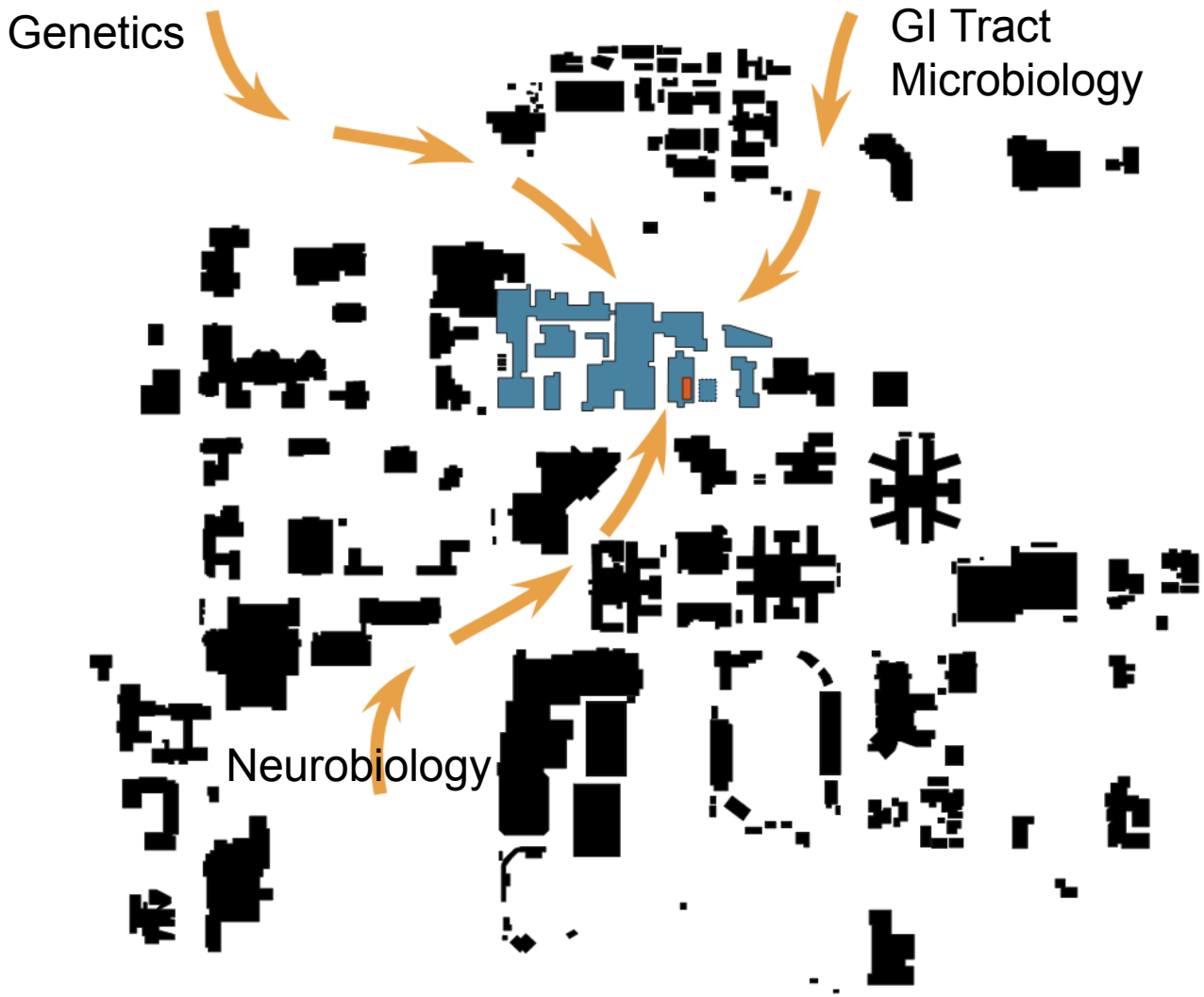
Integration | Opportunity Making

Integrate the use of specialized systems with local and district infrastructure to achieve energy and water conservation beyond what is possible with an isolated project.

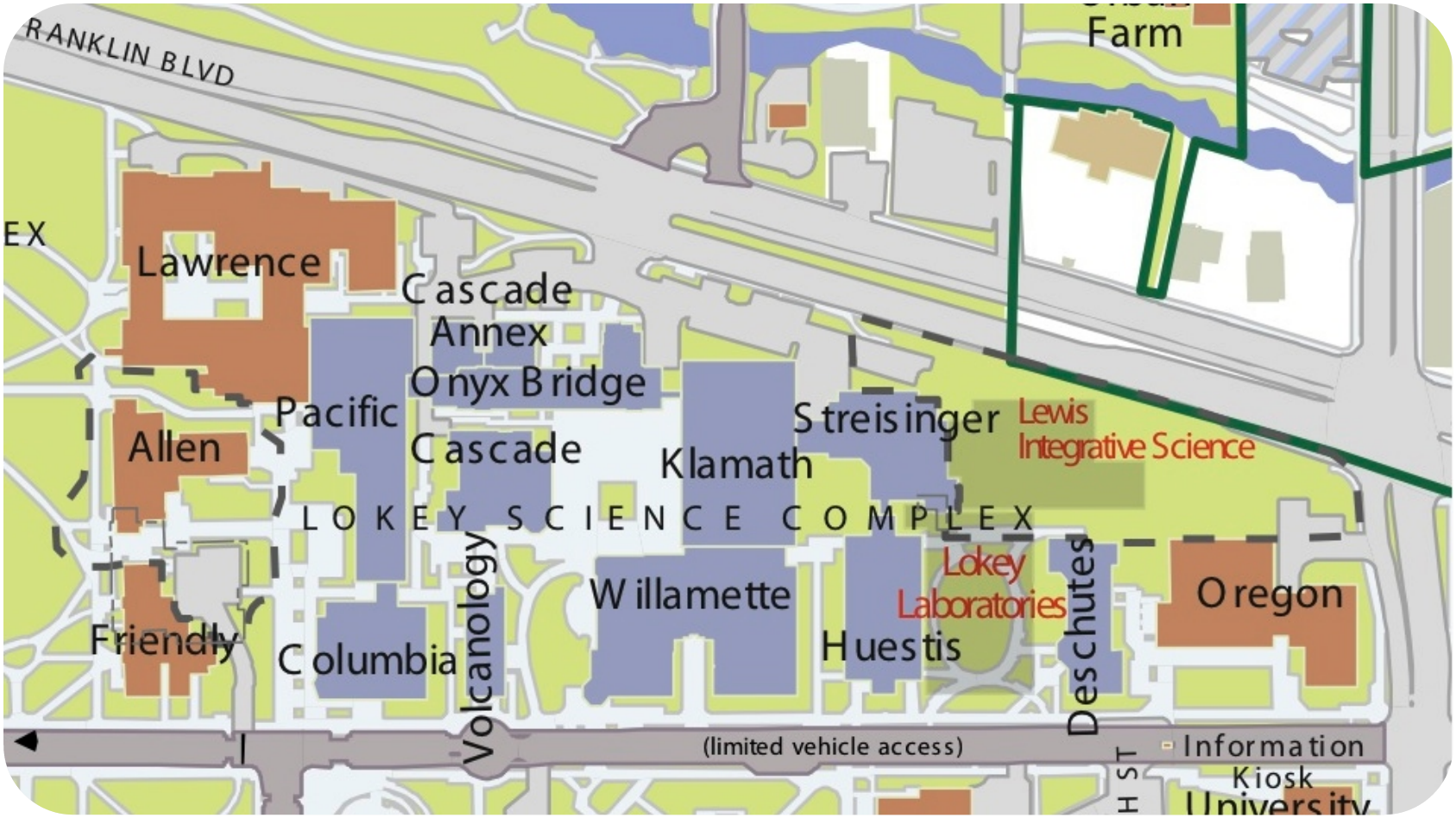
UO Zebrafish Core Facility Expansion



Underground Research Facility in the Core of the Campus

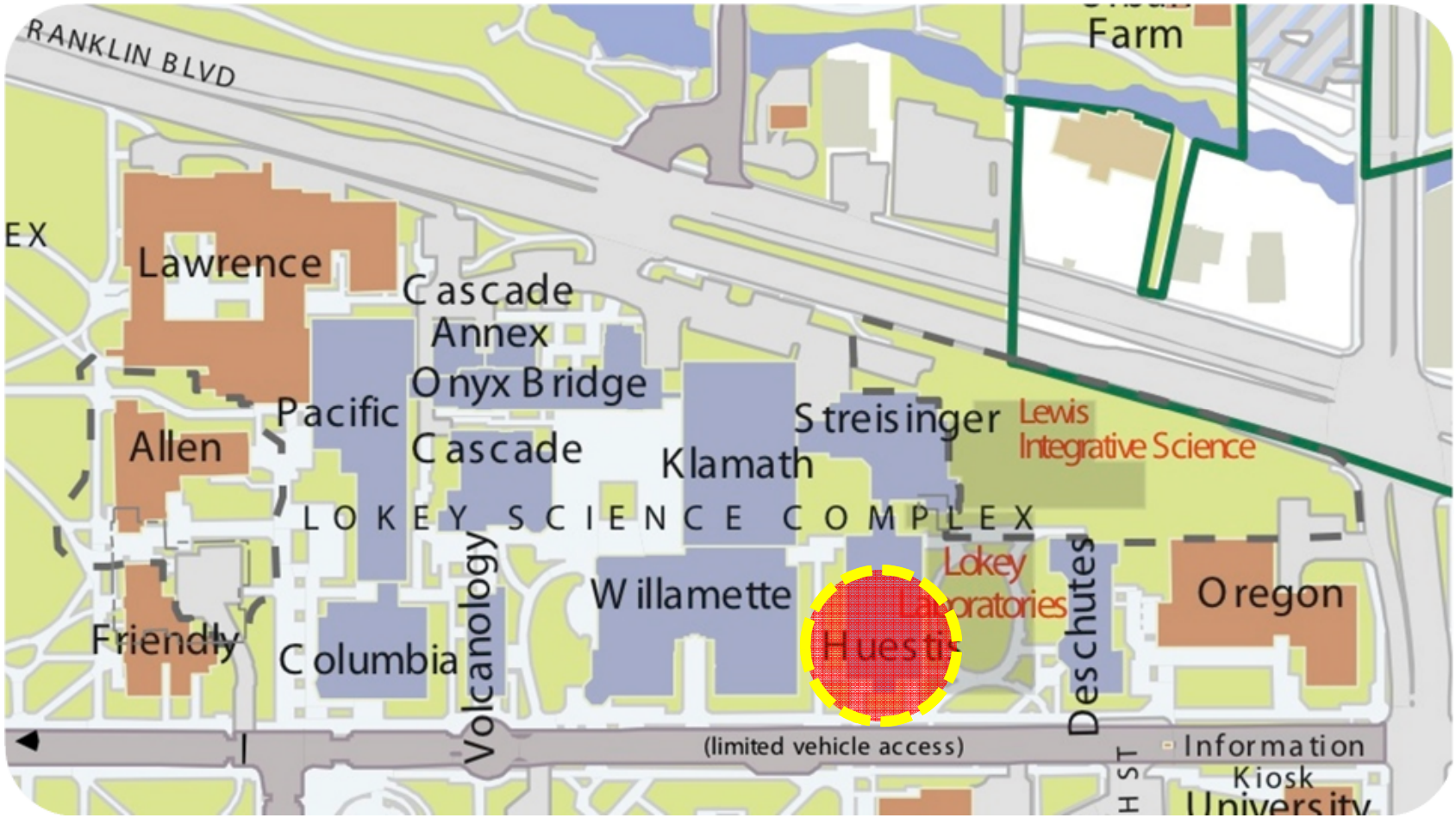


Integrated Science Complex



UO Zebrafish
Core Facility Expansion

Core Facility Replacement



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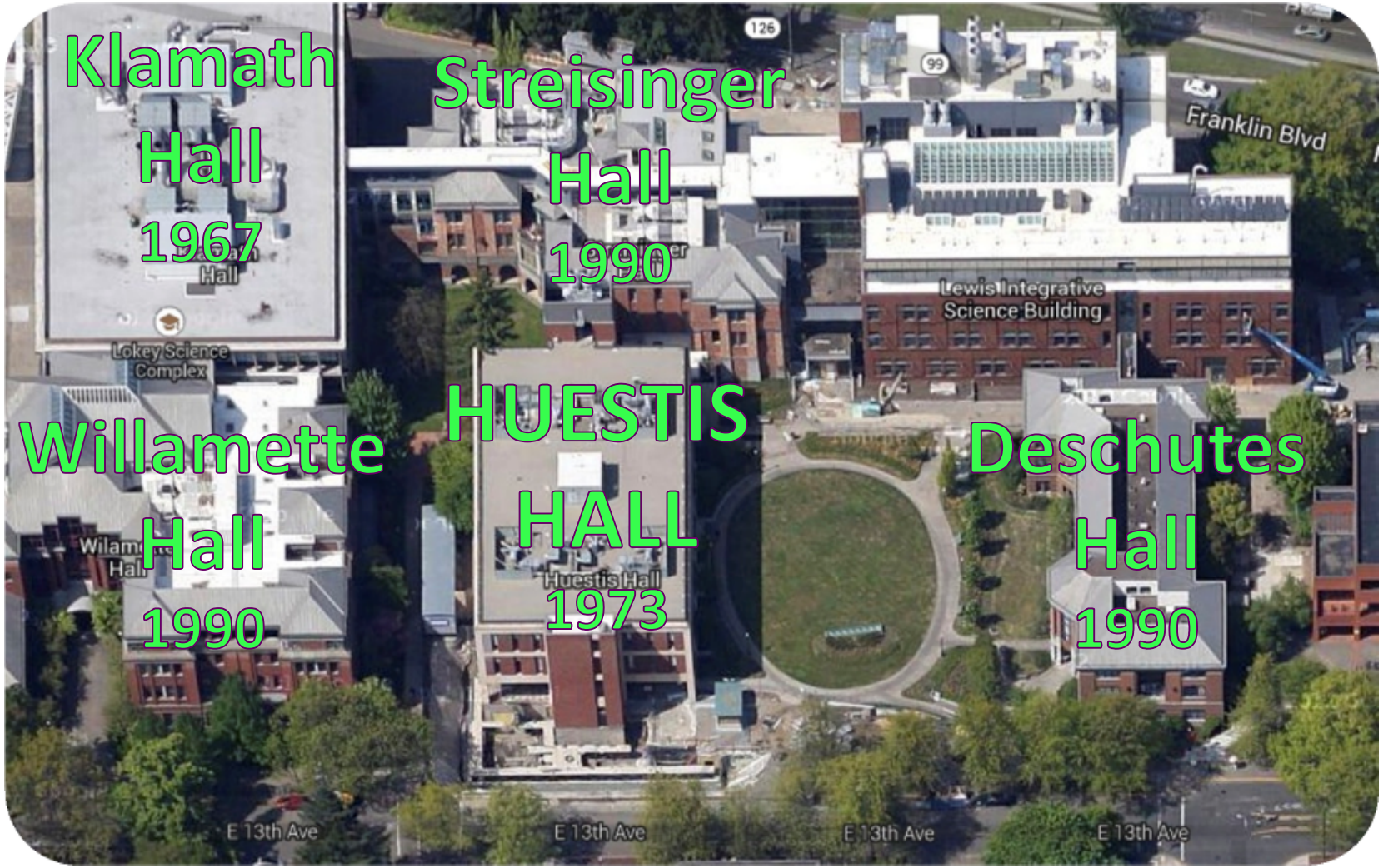
Core Facility Expansion

Background


Klamath Hall 1967
Streisinger Hall 1990
HUESTIS HALL
Huestis Hall 1973
Willamette Hall 1990
Deschutes Hall 1990
Lokey Science Complex
Lewis Integrative Science Building
Franklin Blvd
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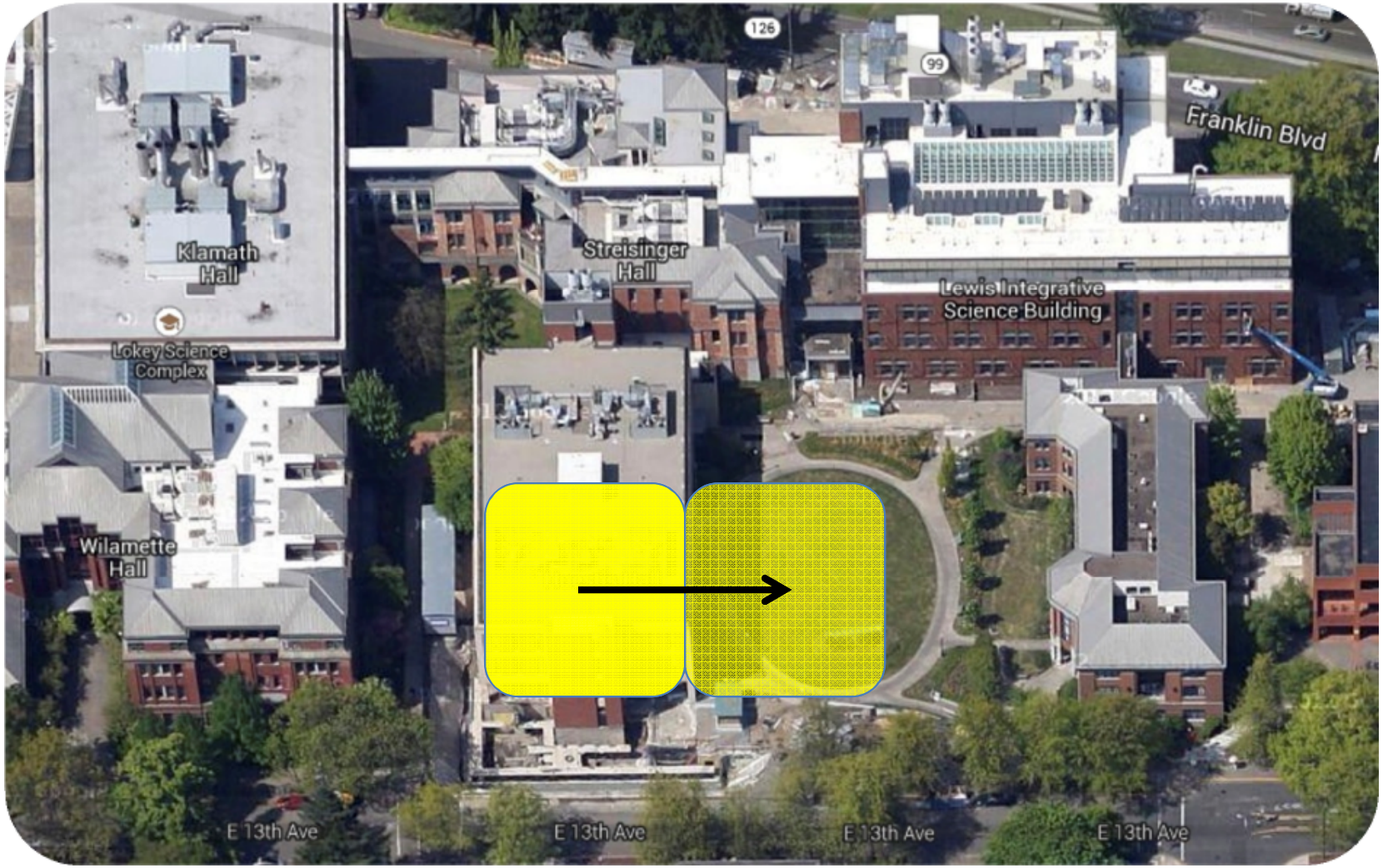
Long range planning



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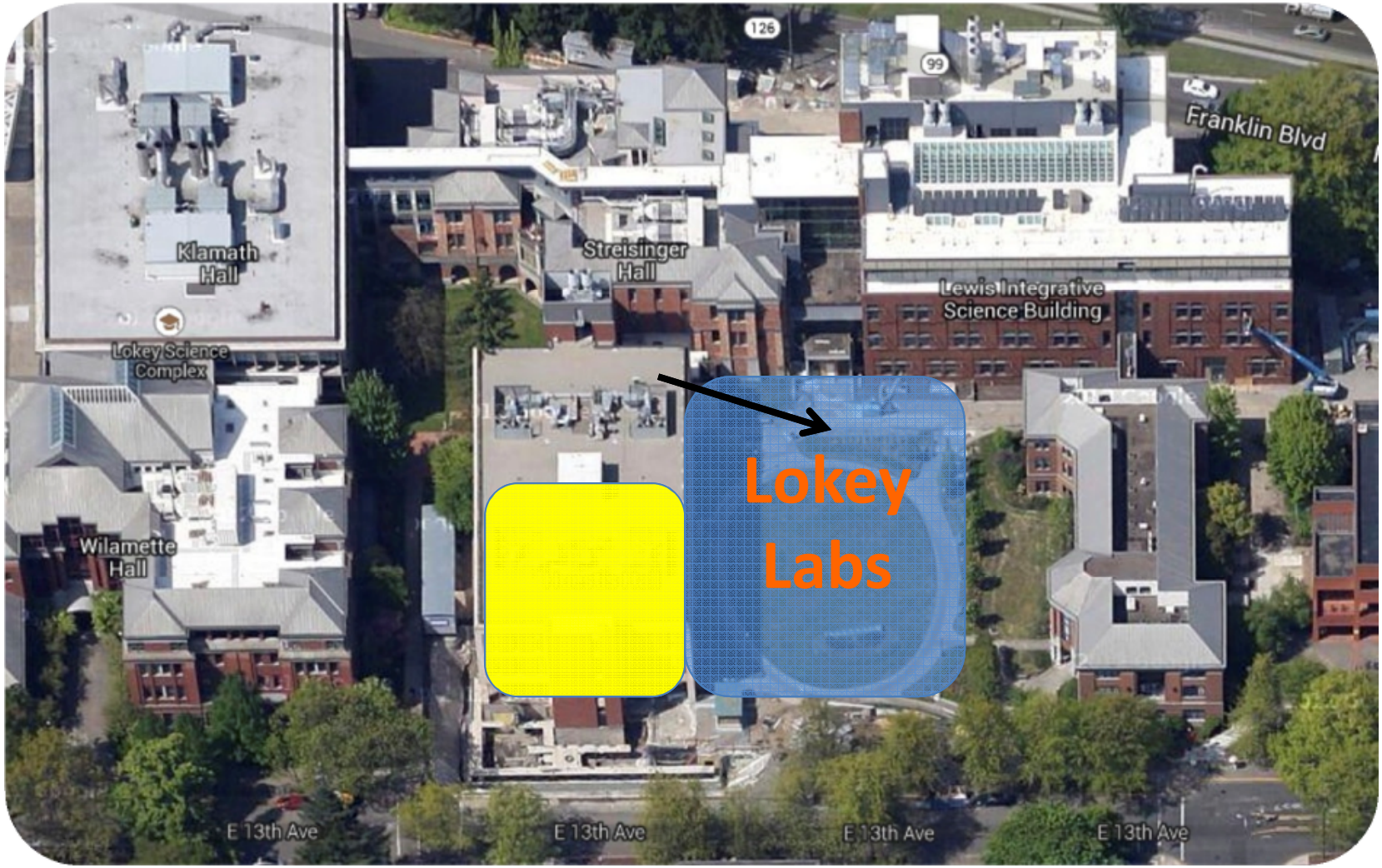

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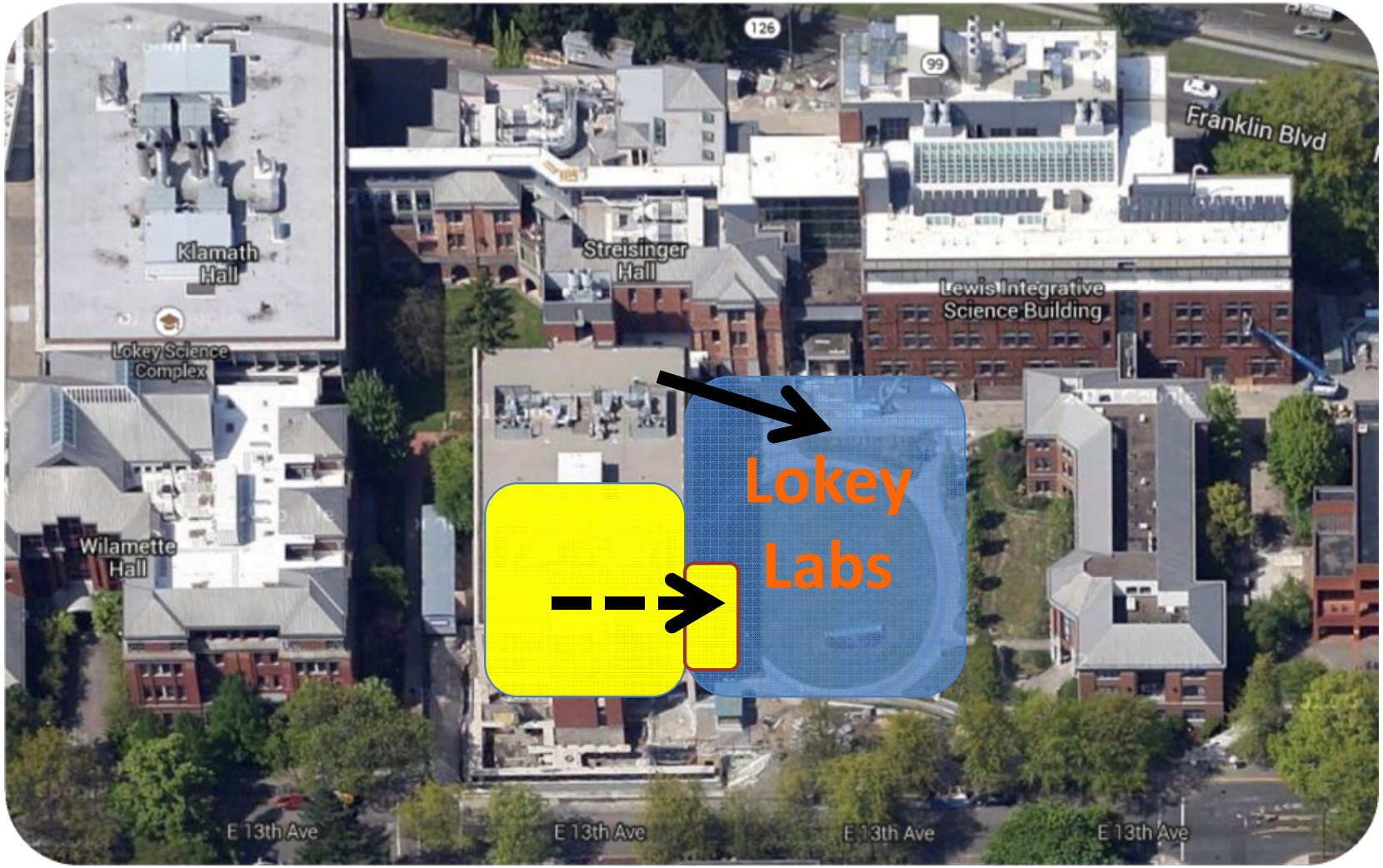

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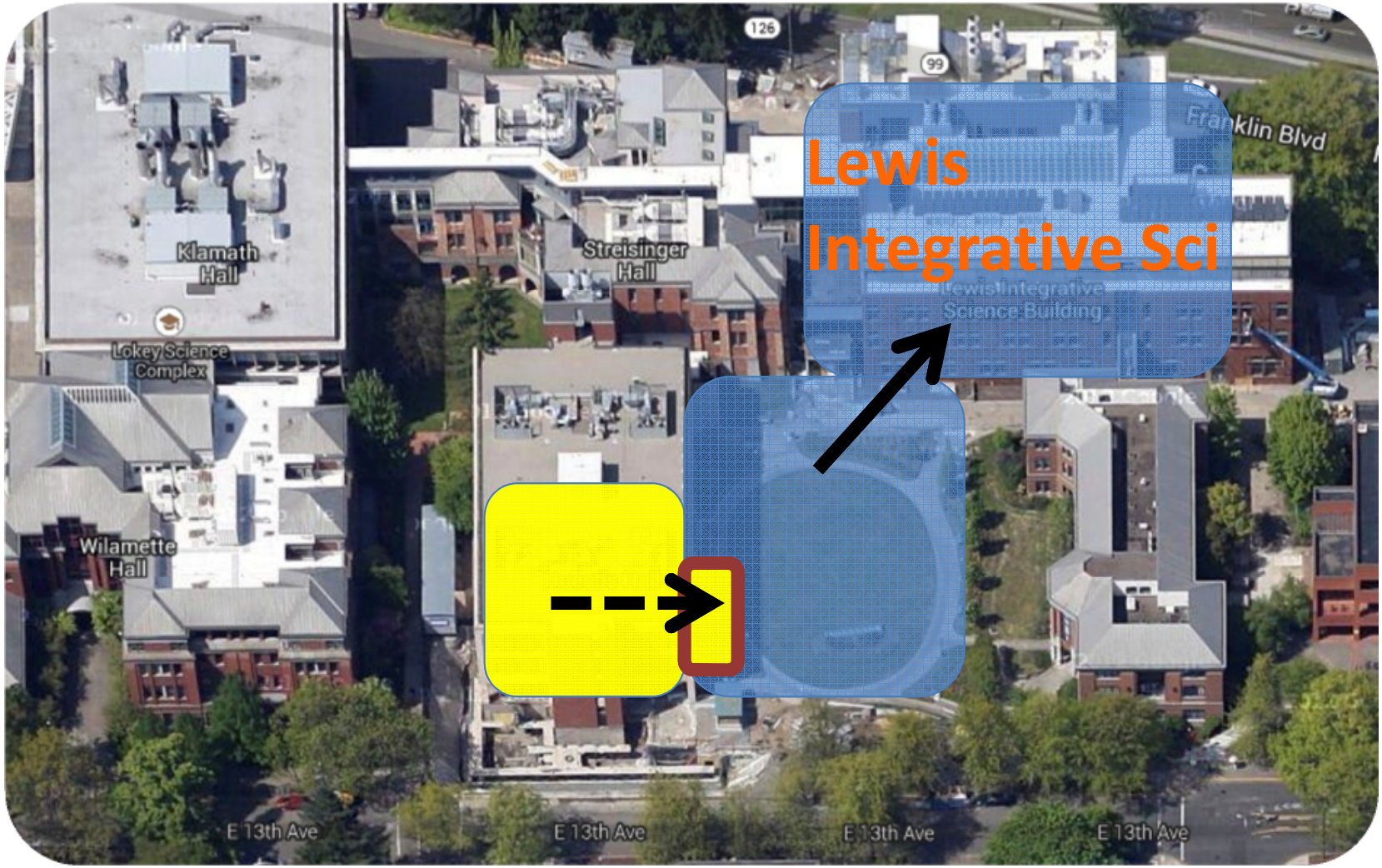
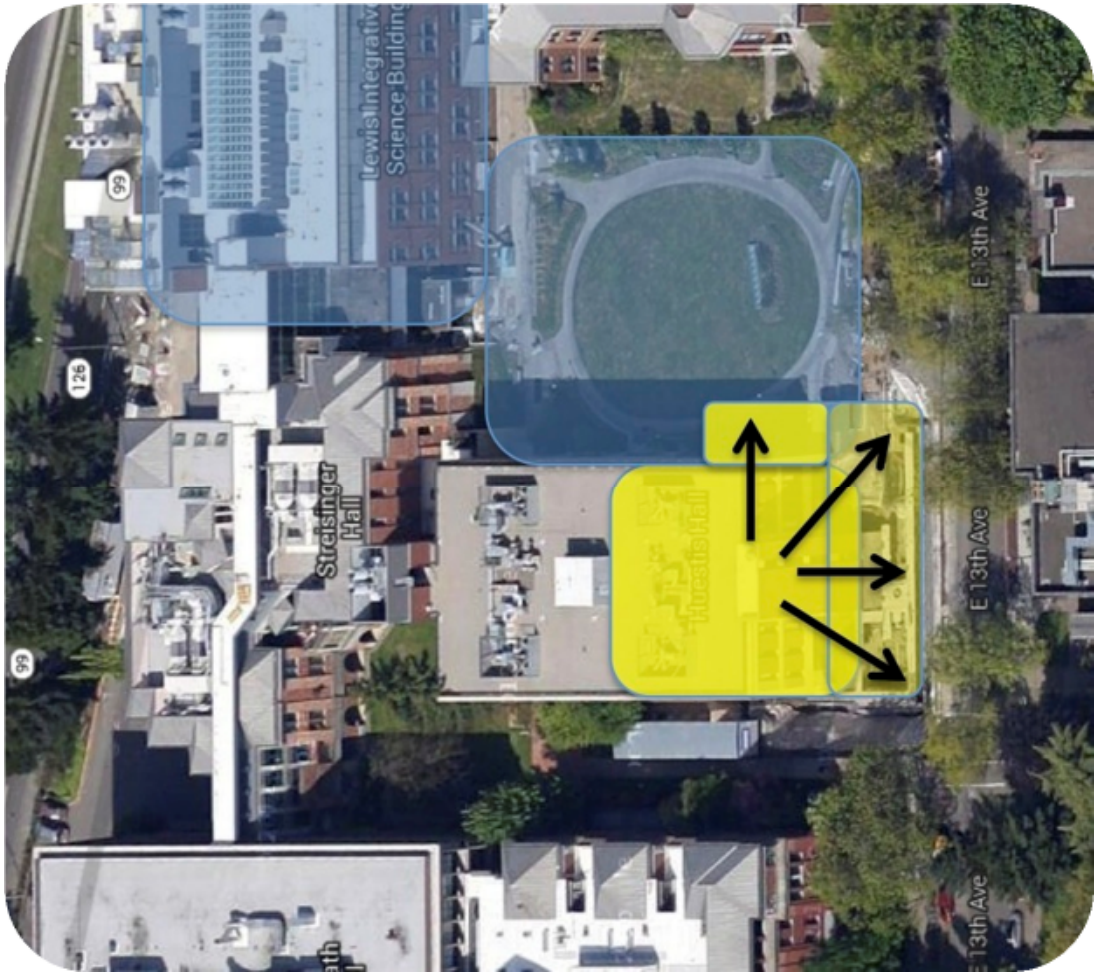


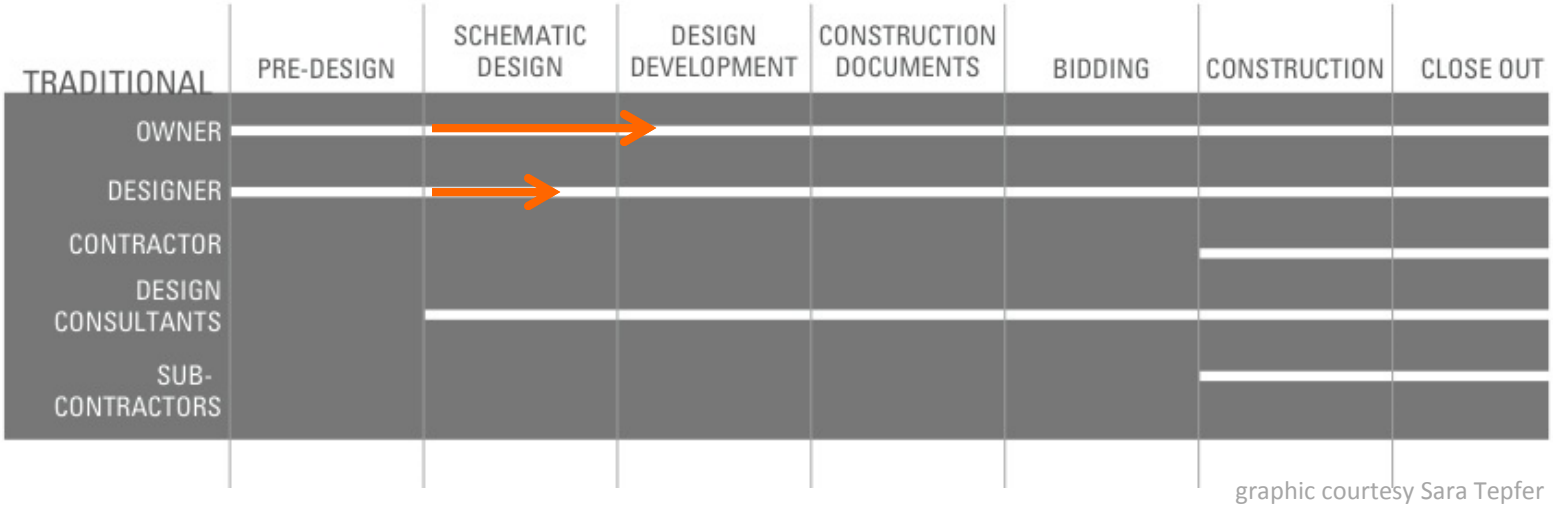
Long range planning

Long range planning

Collaborative planning

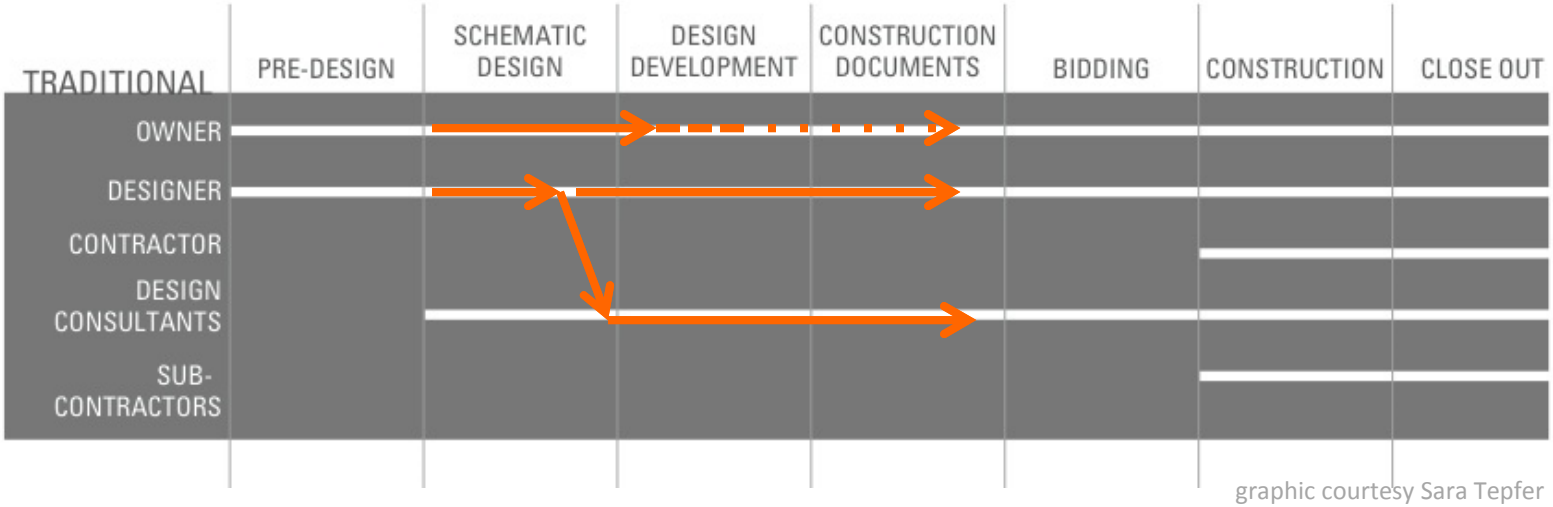


Collaborative planning | Traditional



graphic courtesy Sara Tepfer

Collaborative planning | Traditional



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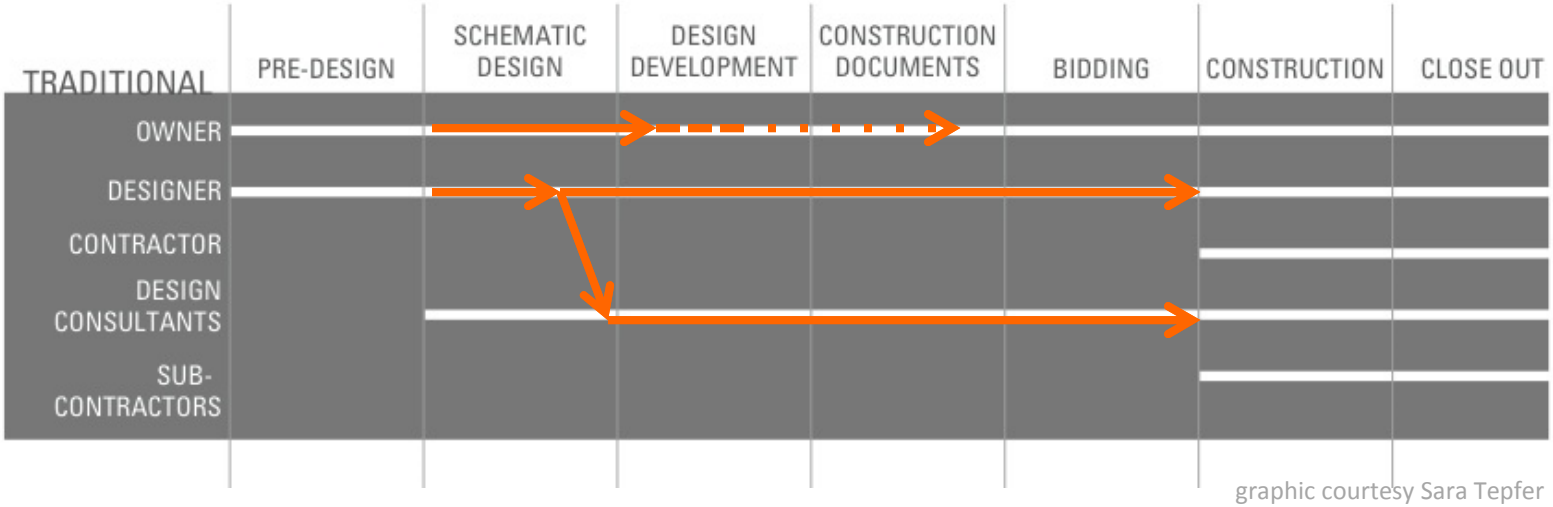

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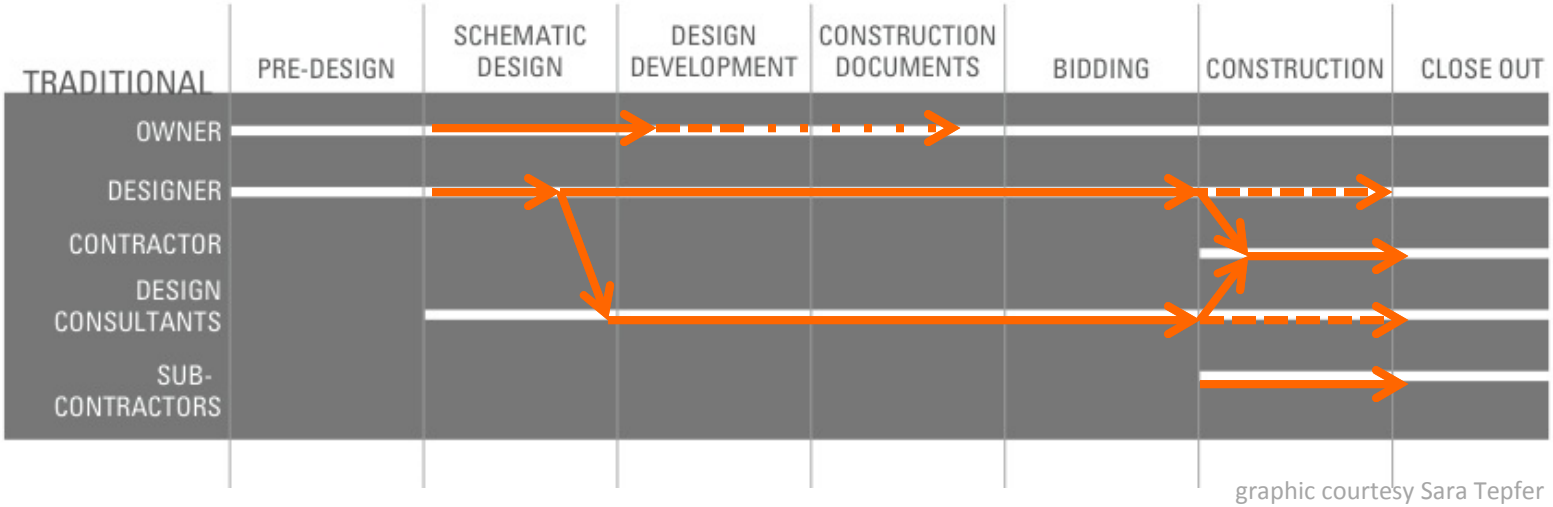

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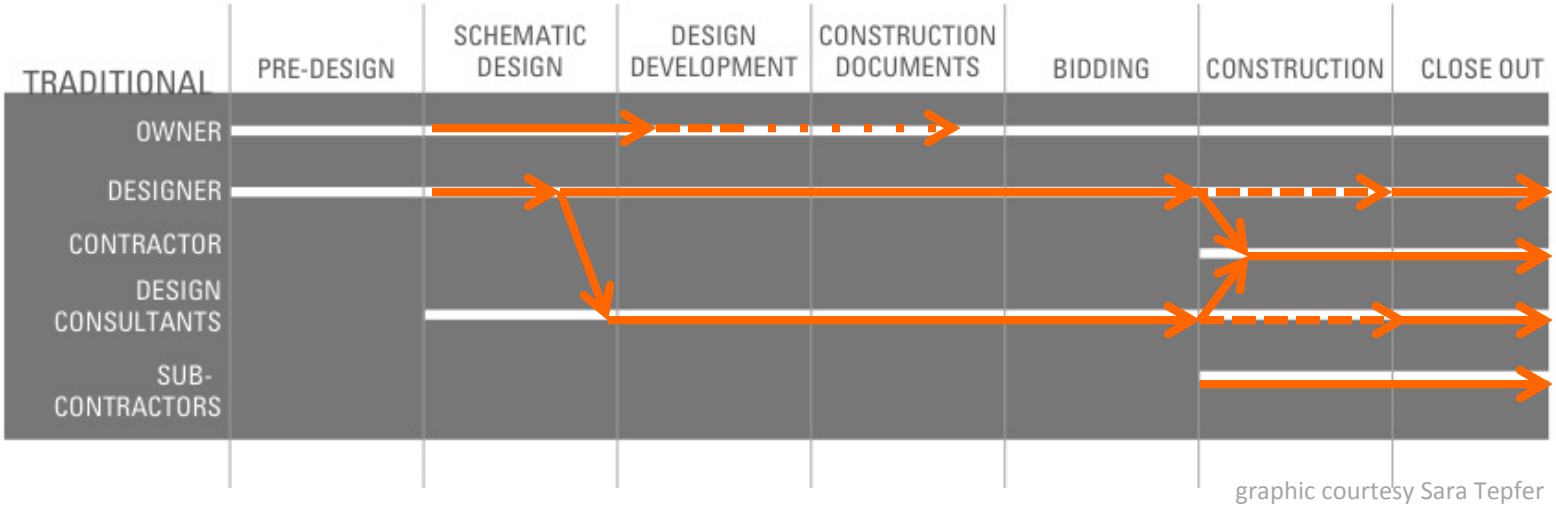

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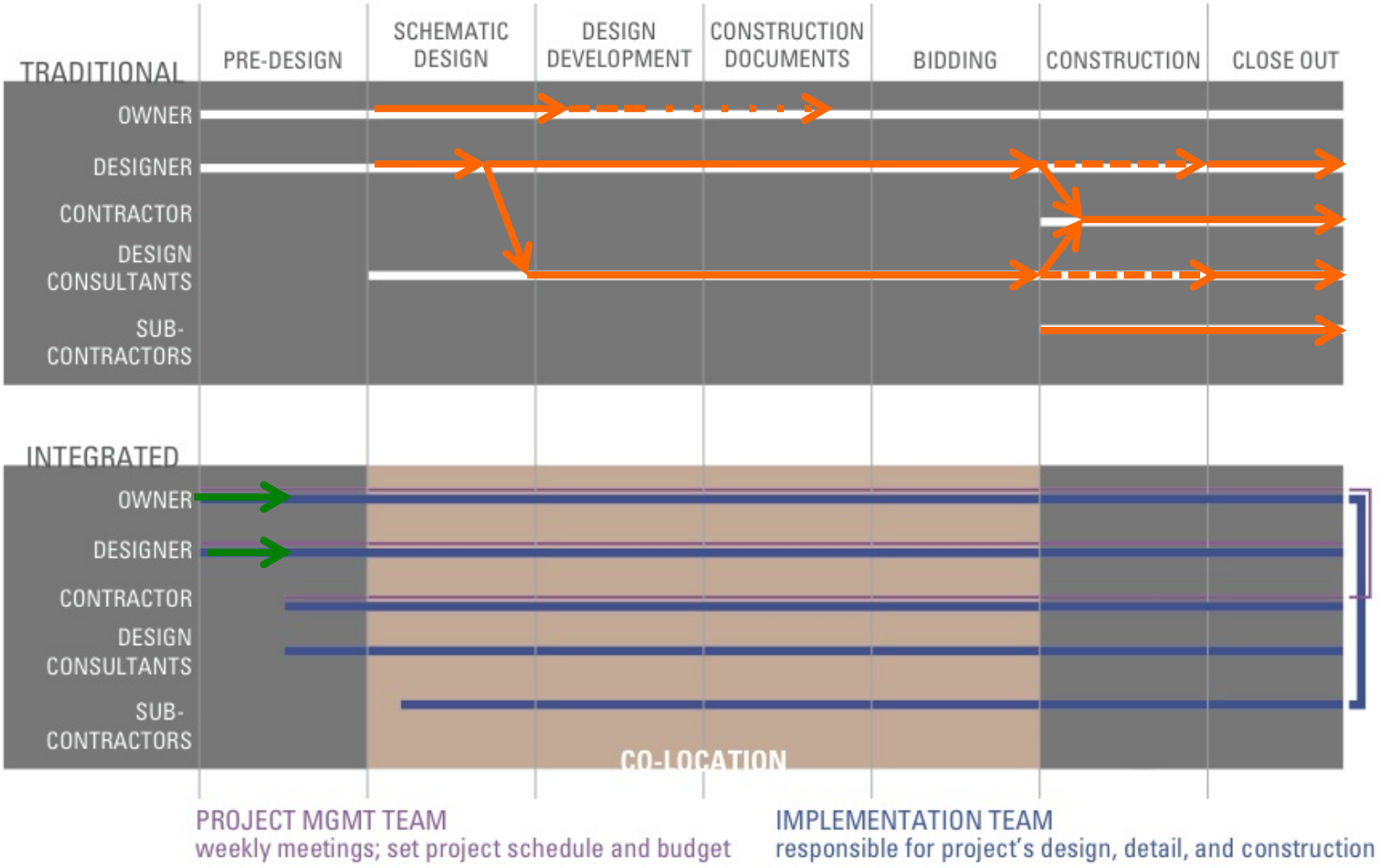
Collaborative planning | Integrated



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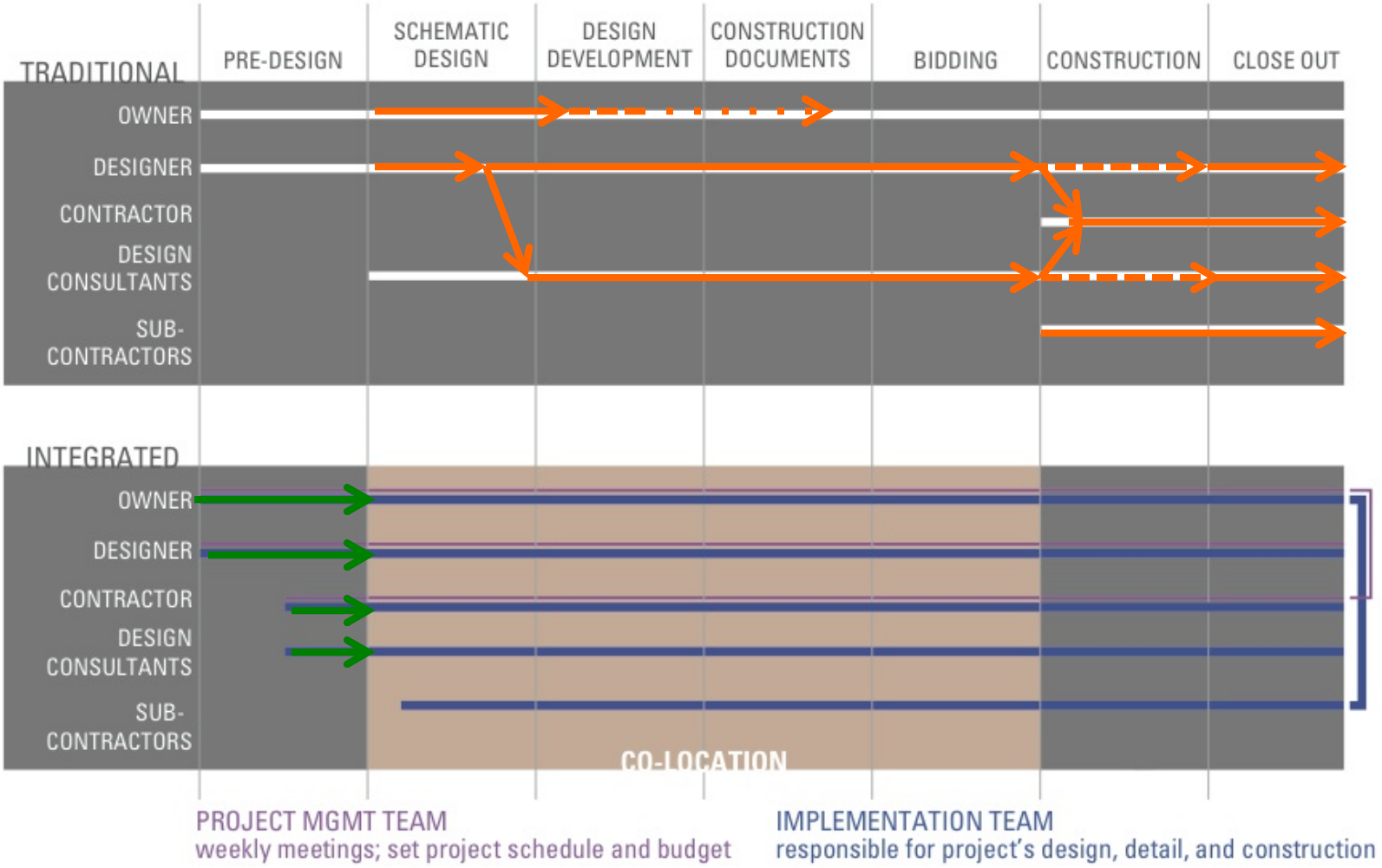

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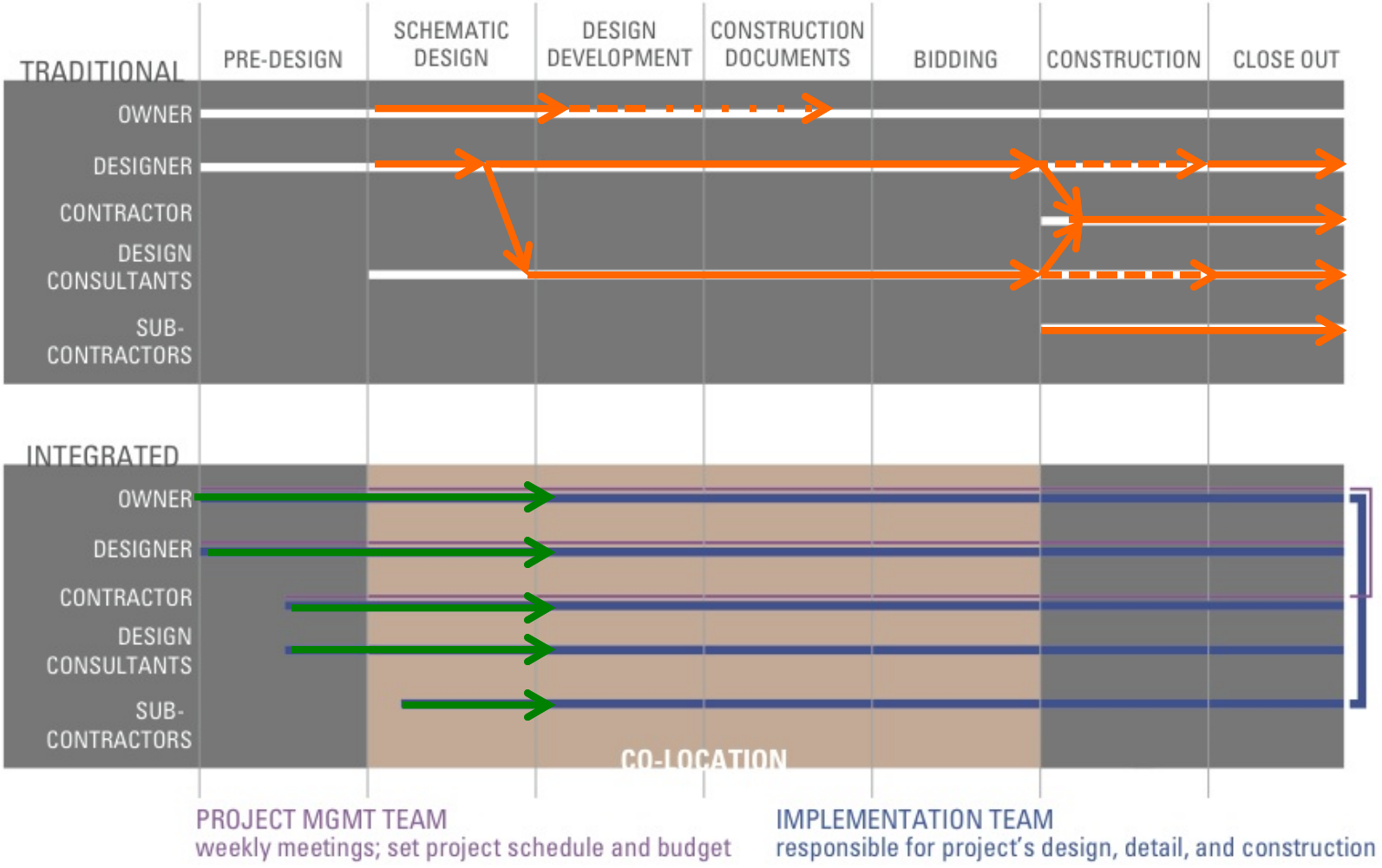
Collaborative planning | Integrated



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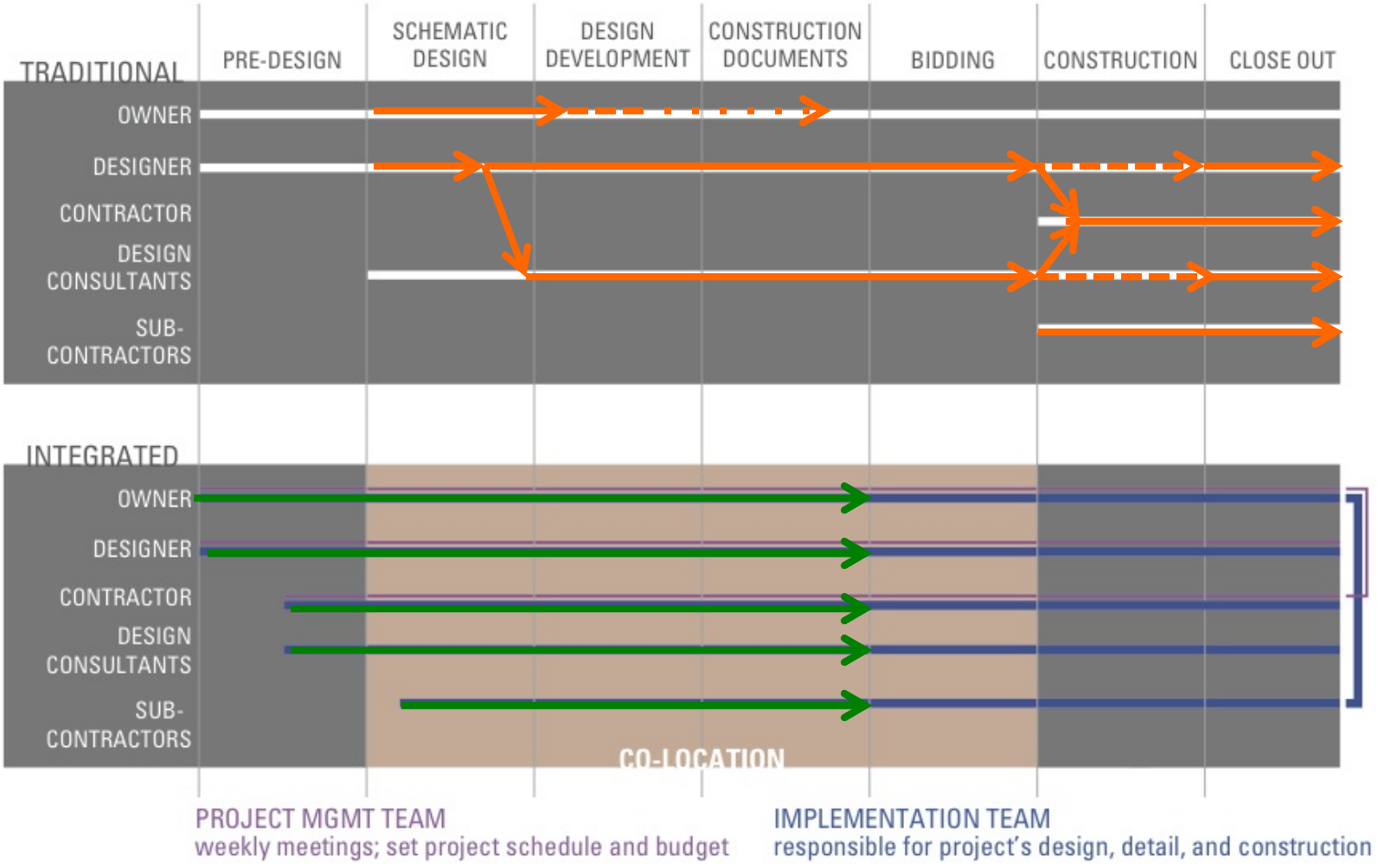
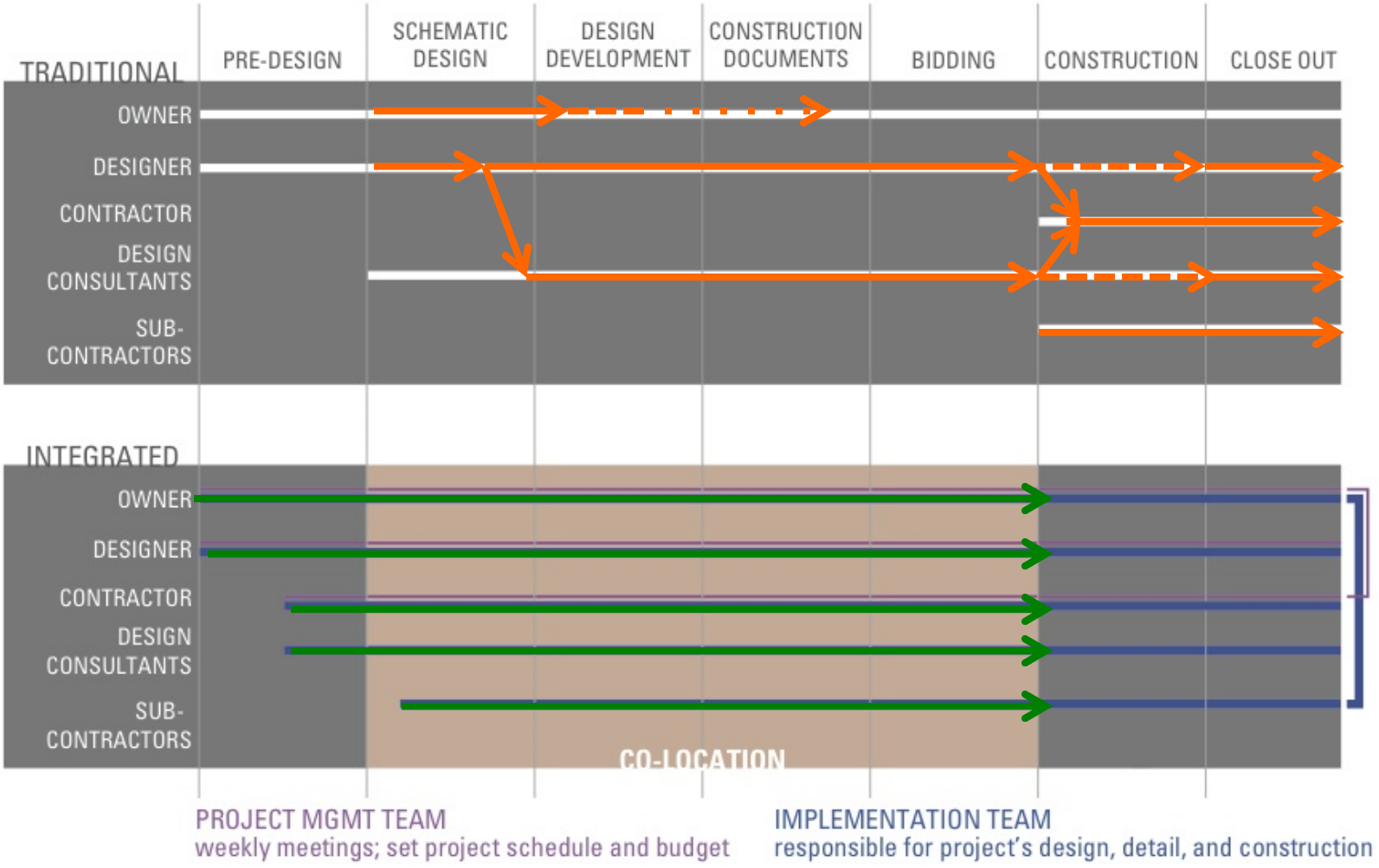


graphic courtesy Sara Tepfer

UO Zebrafish
Core Facility Expansion

Collaborative planning | Integrated



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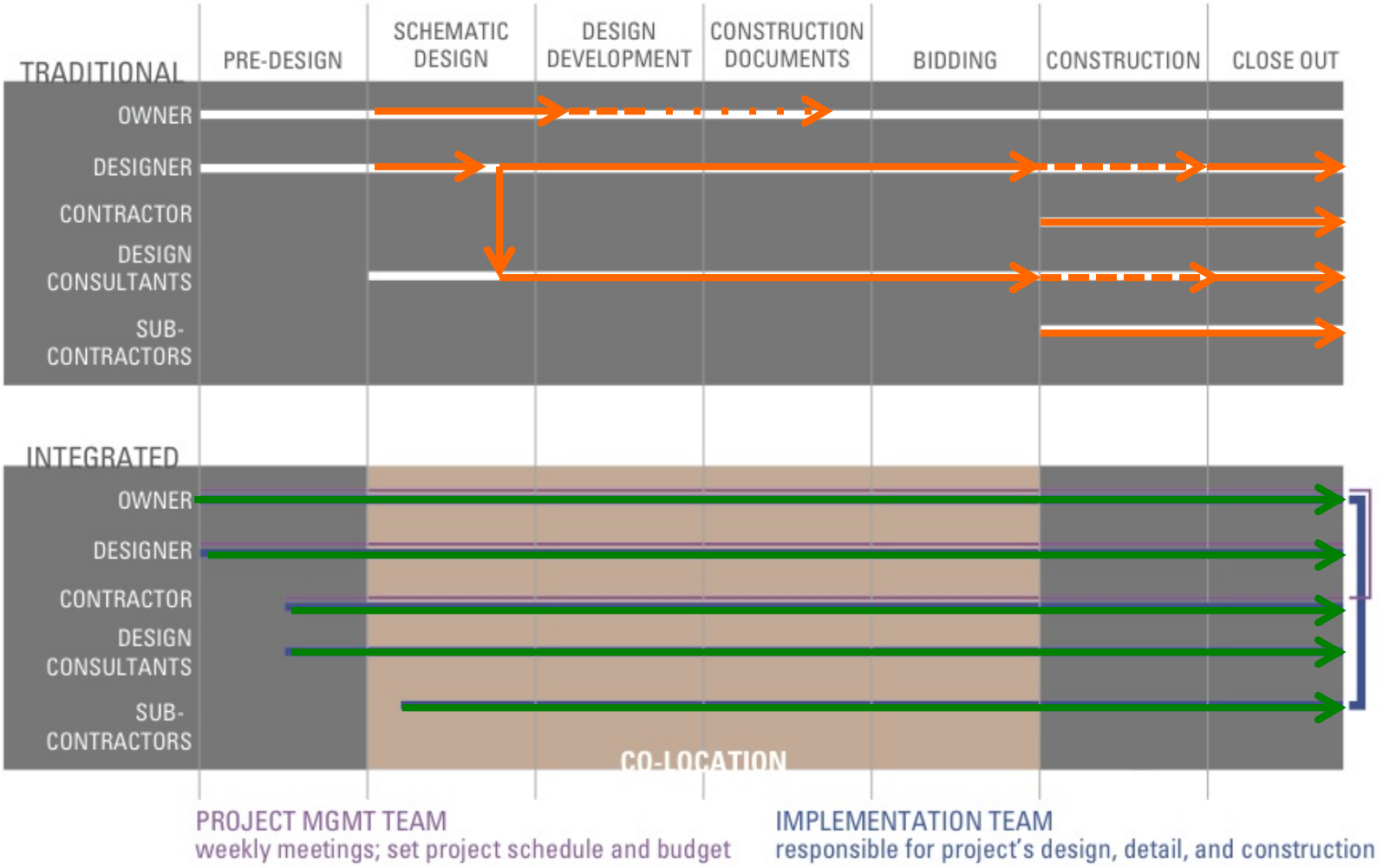

graphic courtesy Sara Tepfer

UO Zebrafish
Core Facility Expansion

Collaborative planning | Build the team

Owners

Designers

Builders

all involved -

early in parallel collaborative open critical brainstorming

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Owners: users tech. staff maintenance staff Campus Planning Committee

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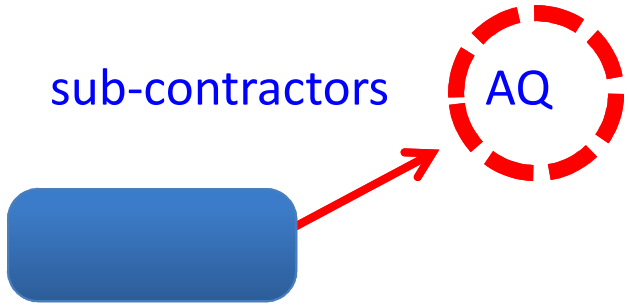

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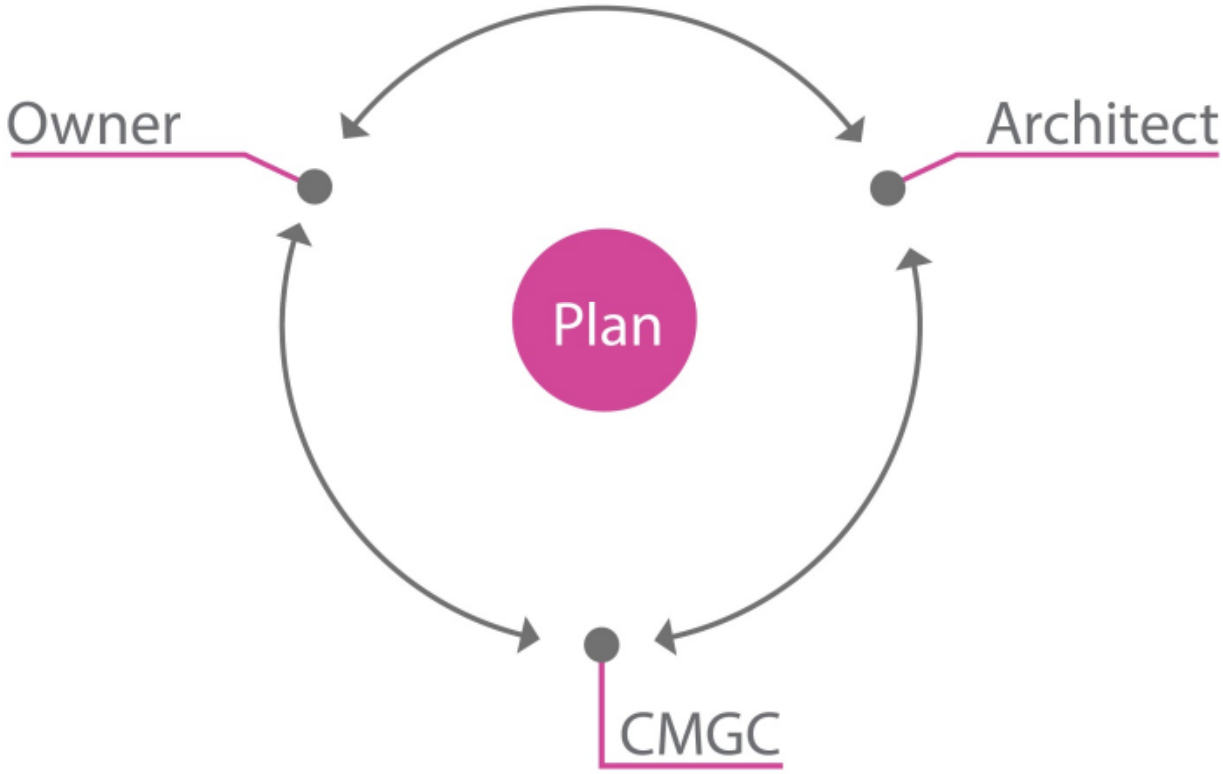
“Occupied” Project

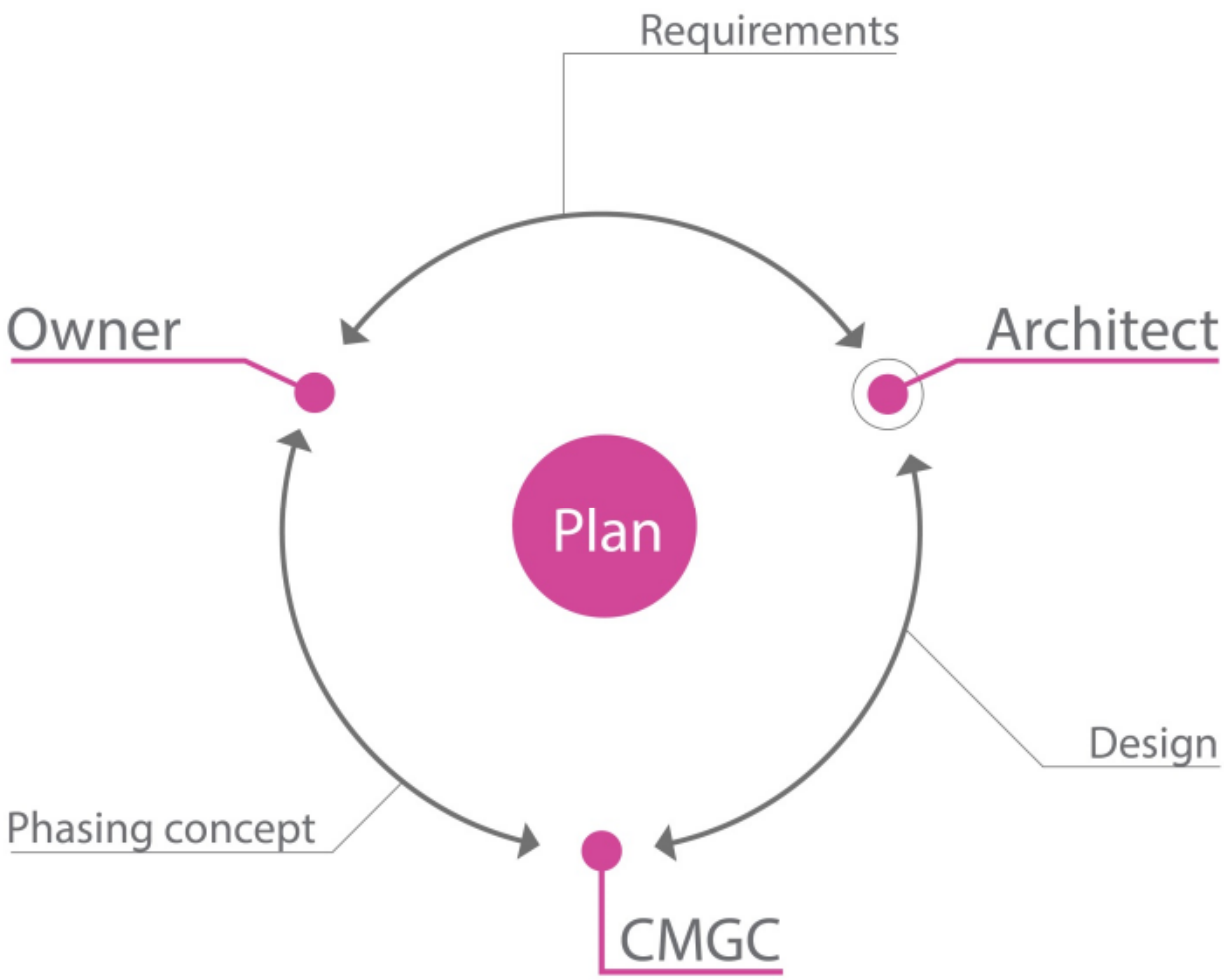
Project Phasing | Process



UO Zebrafish
Core Facility Expansion

BIM
Project Path
Critical communication

Project Phasing | Process



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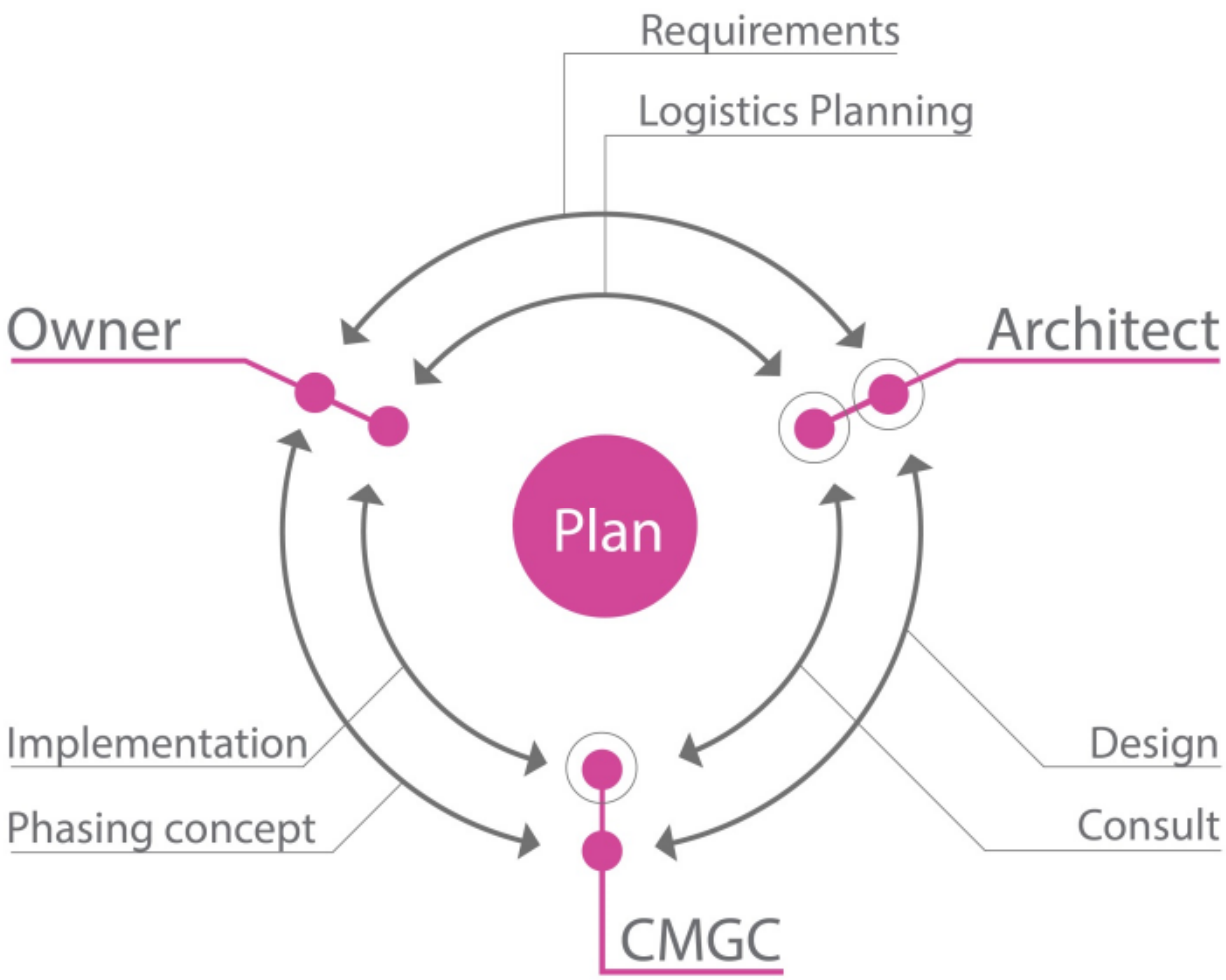

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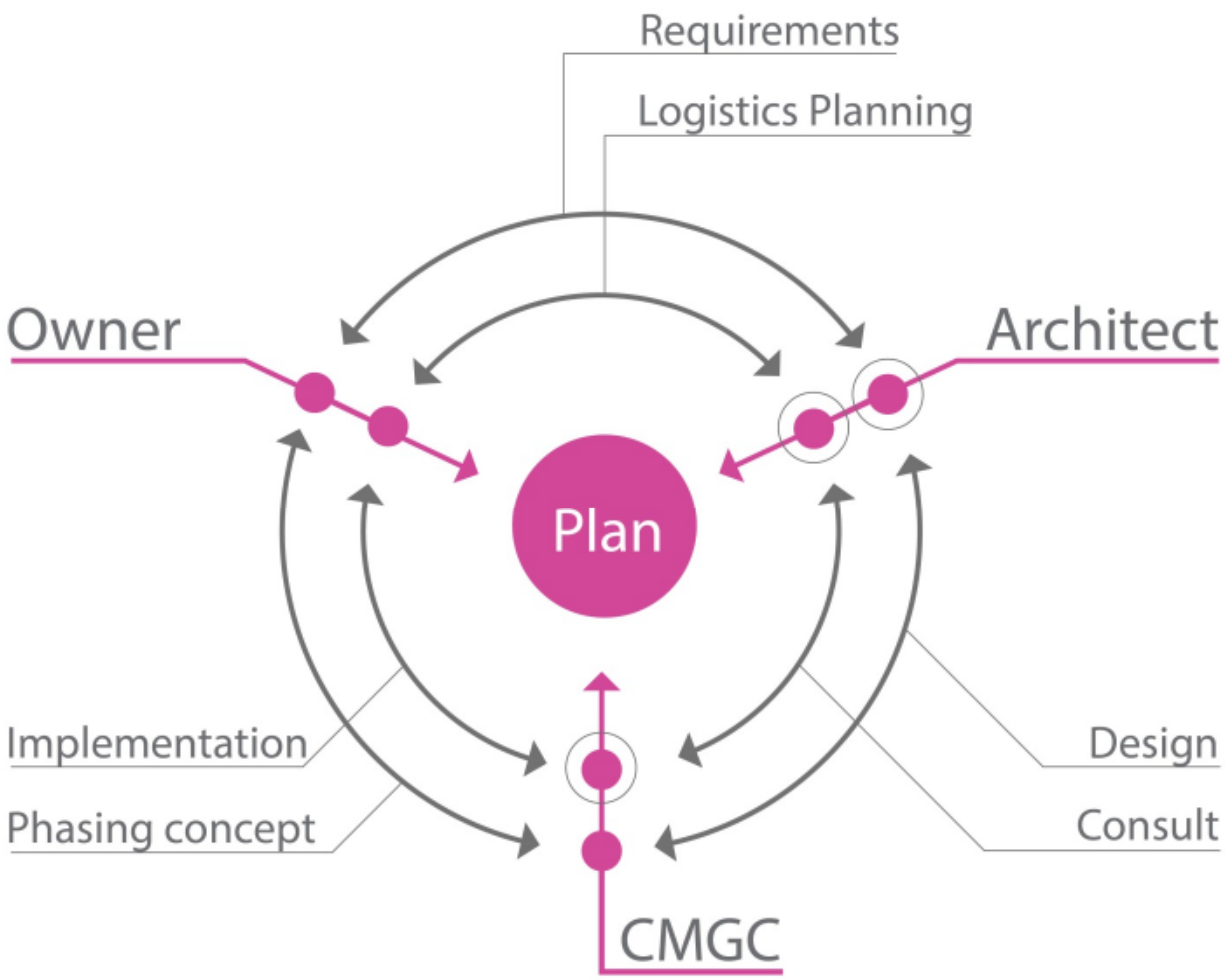

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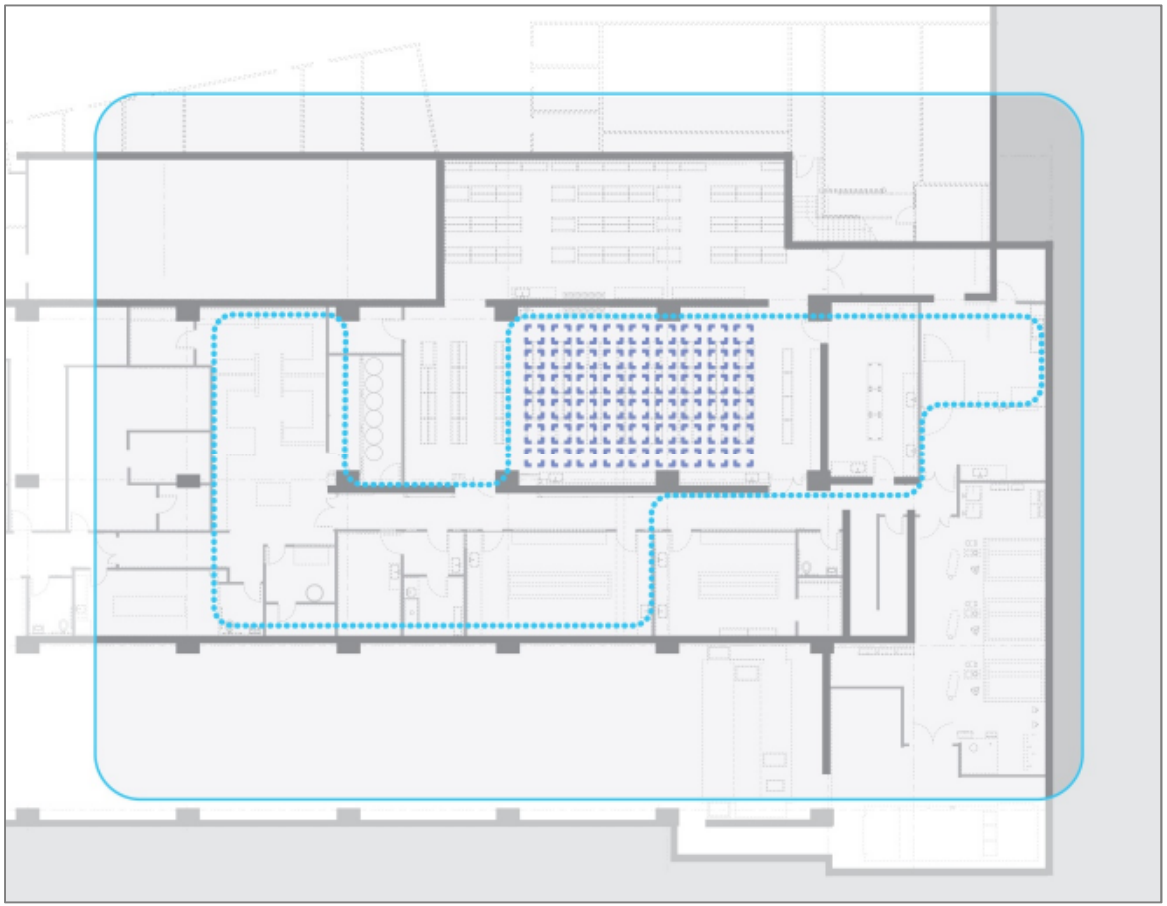
Project Phasing | Implementation

Original Facility



Overall Capacity

60% 100% 300%

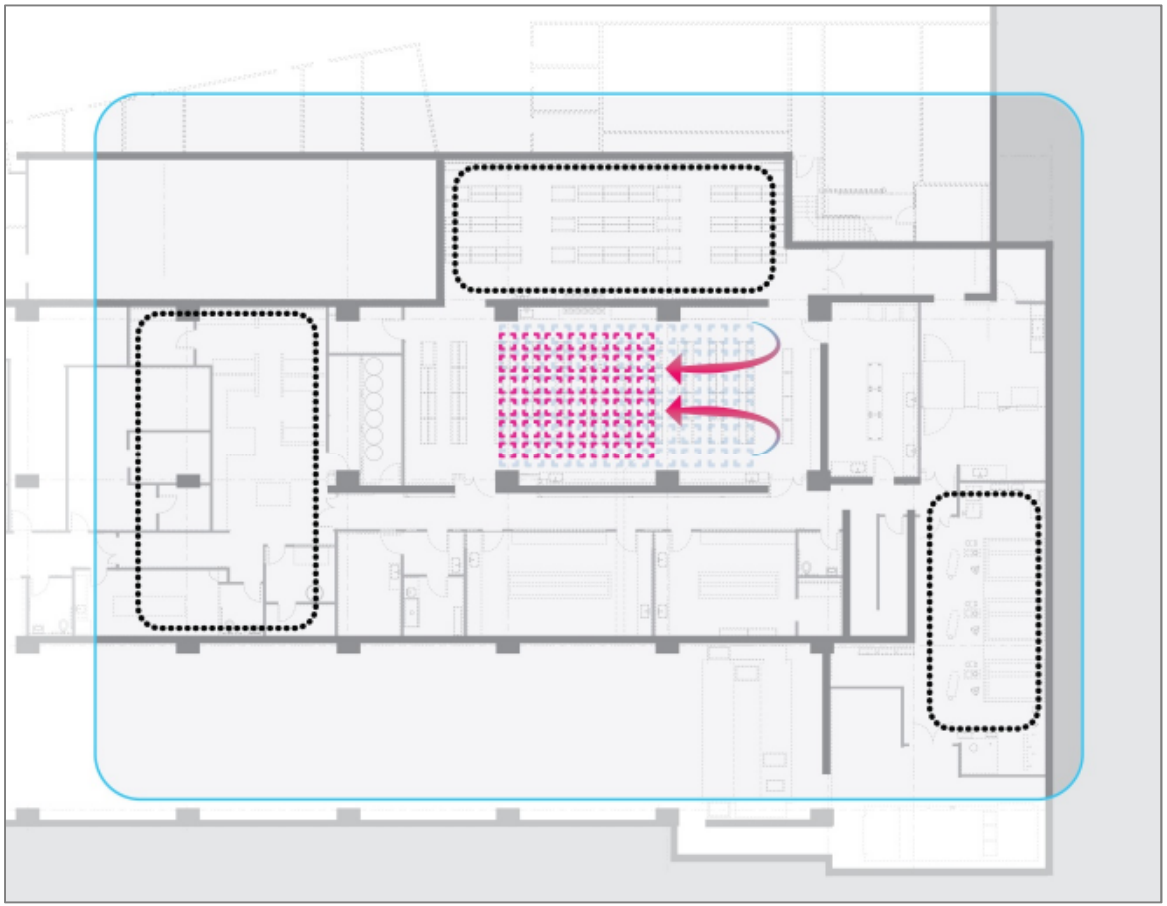
Population Density/ft²

UO Zebrafish
Core Facility Expansion

Project Phasing | Implementation

Phase 0 “Downsizing”

- Coordinated Research Planning
- Population Management



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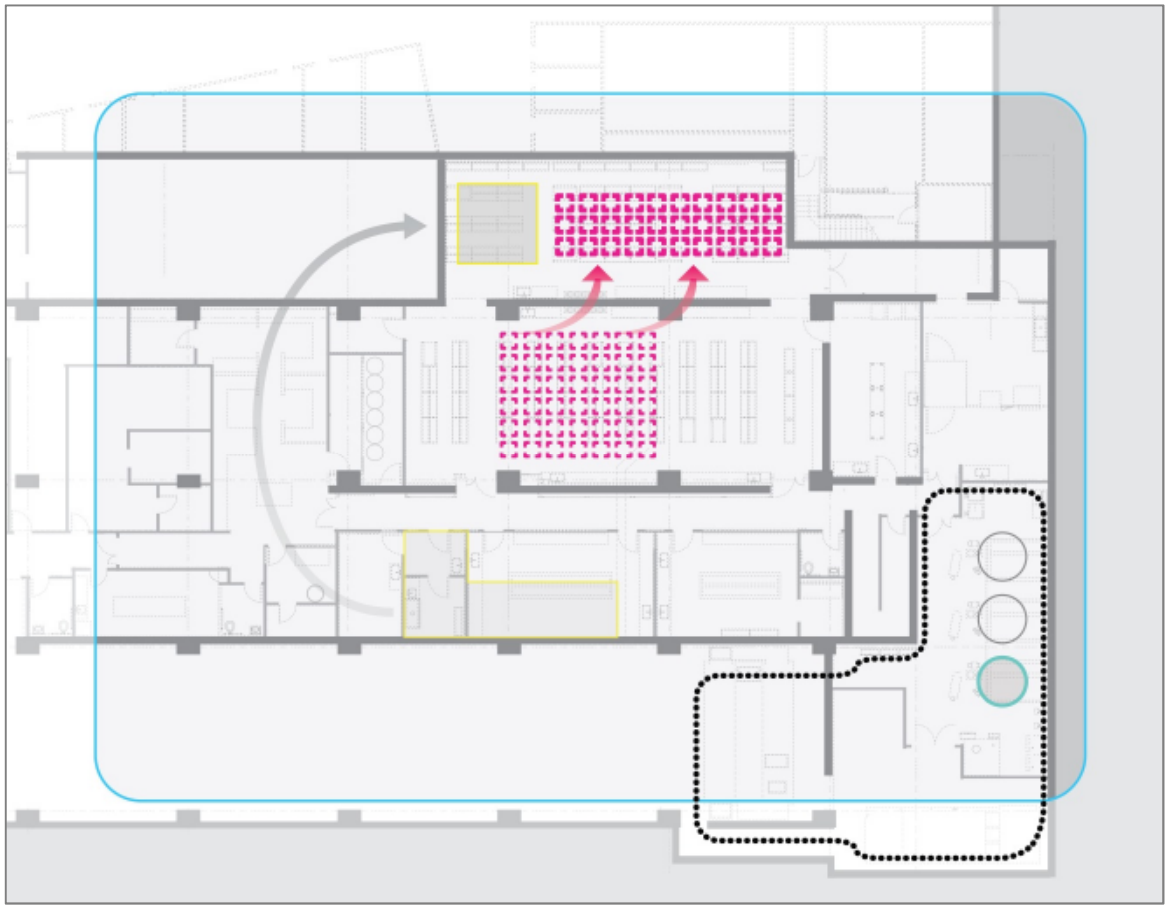
Core Facility Expansion

Project Phasing | Implementation

Phase 1 “Compression”

- High Density Racks
- Multi-purpose Room
- Enhanced Water System Quality
- Time Sensitive Phase



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Population Density/ft²

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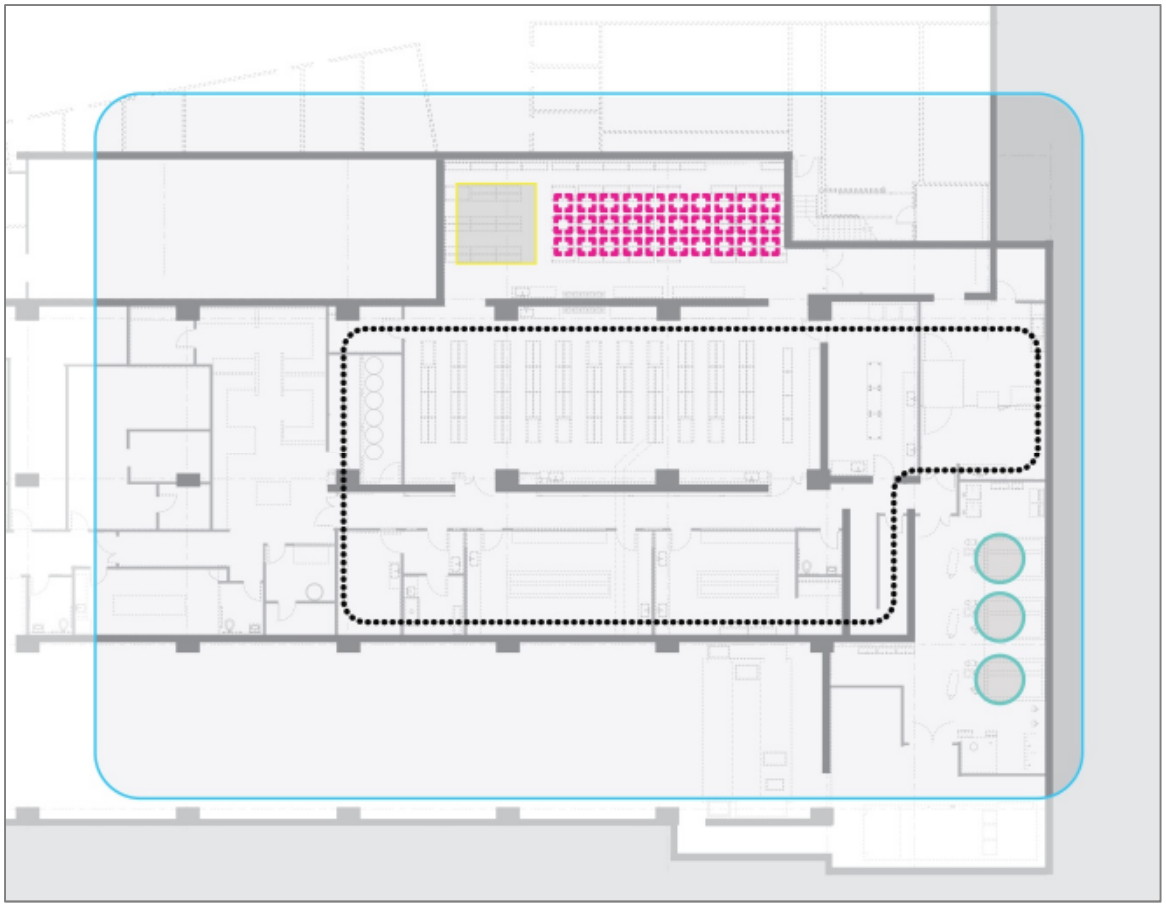
Project Phasing | Implementation

Phase 2 “Build Out”

- Sustained Operation
- Temp Air



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Core Facility Expansion

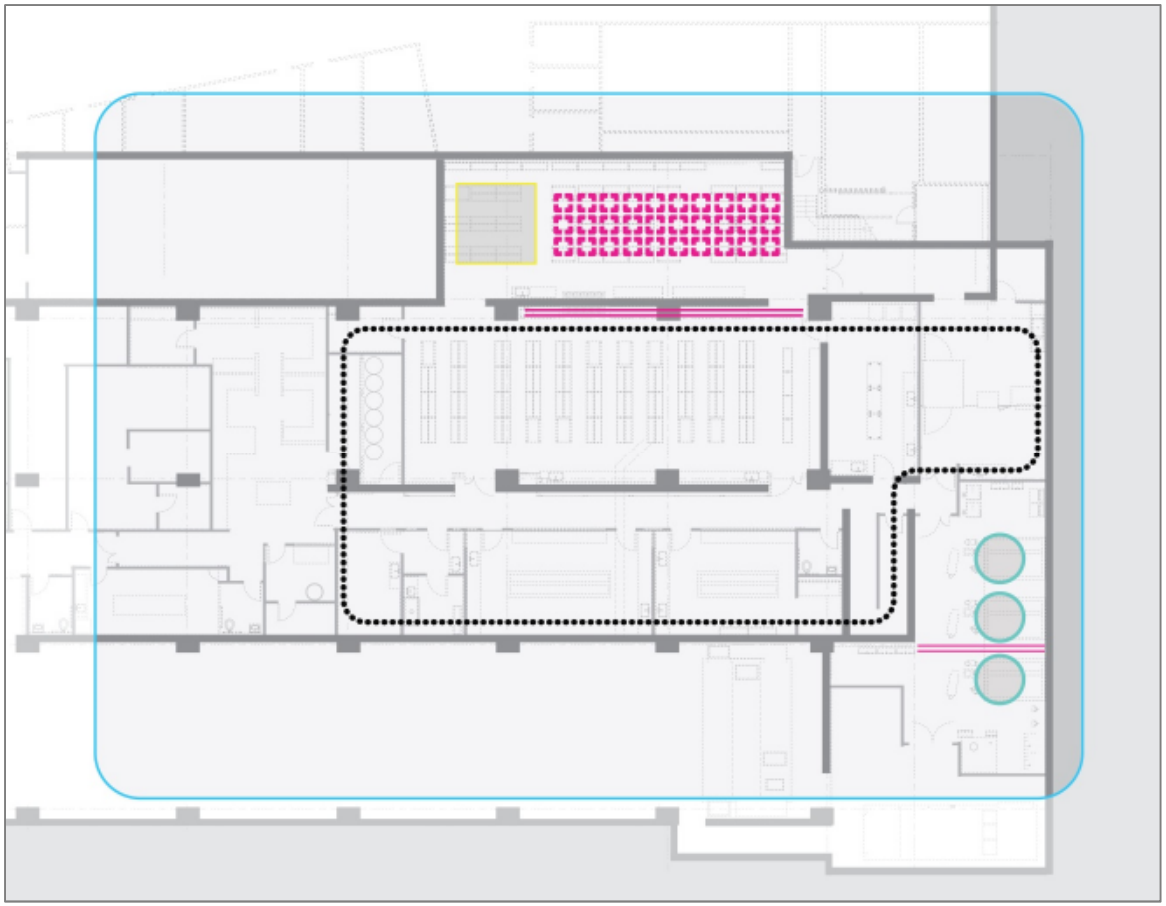
Project Phasing | Implementation

Phase 2 “Build Out”

- Sustained Operation
- Temp Air

Pathogen Issues

- Barrier Separation
- Discrete Circulation
- Decontamination Process



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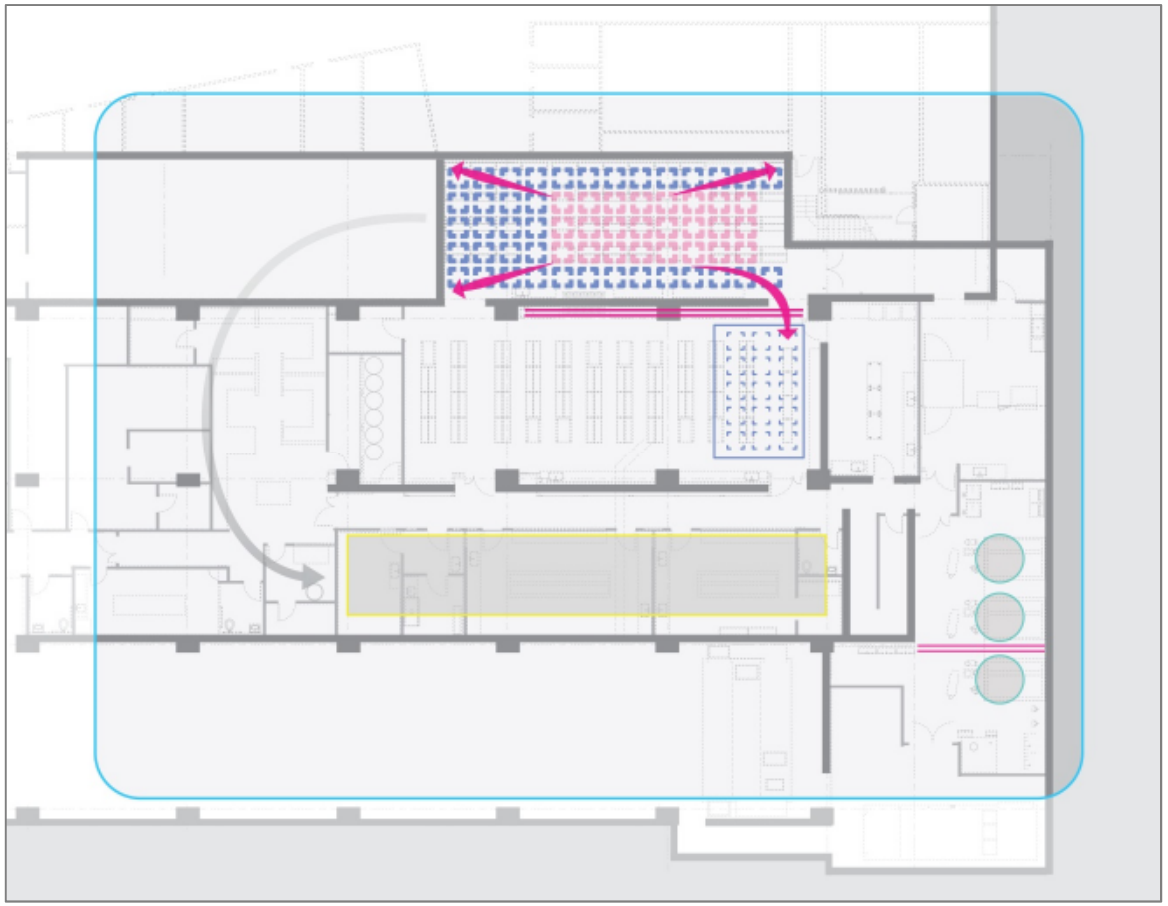
Project Phasing | Implementation

Phase 3 “Migration”

- Isolated Nursery and Food Preparation
- Isolated Water Systems
- Full Use of Support Space
- Strategic Quarantine Process to Re-establish a Pathogen-Free Population



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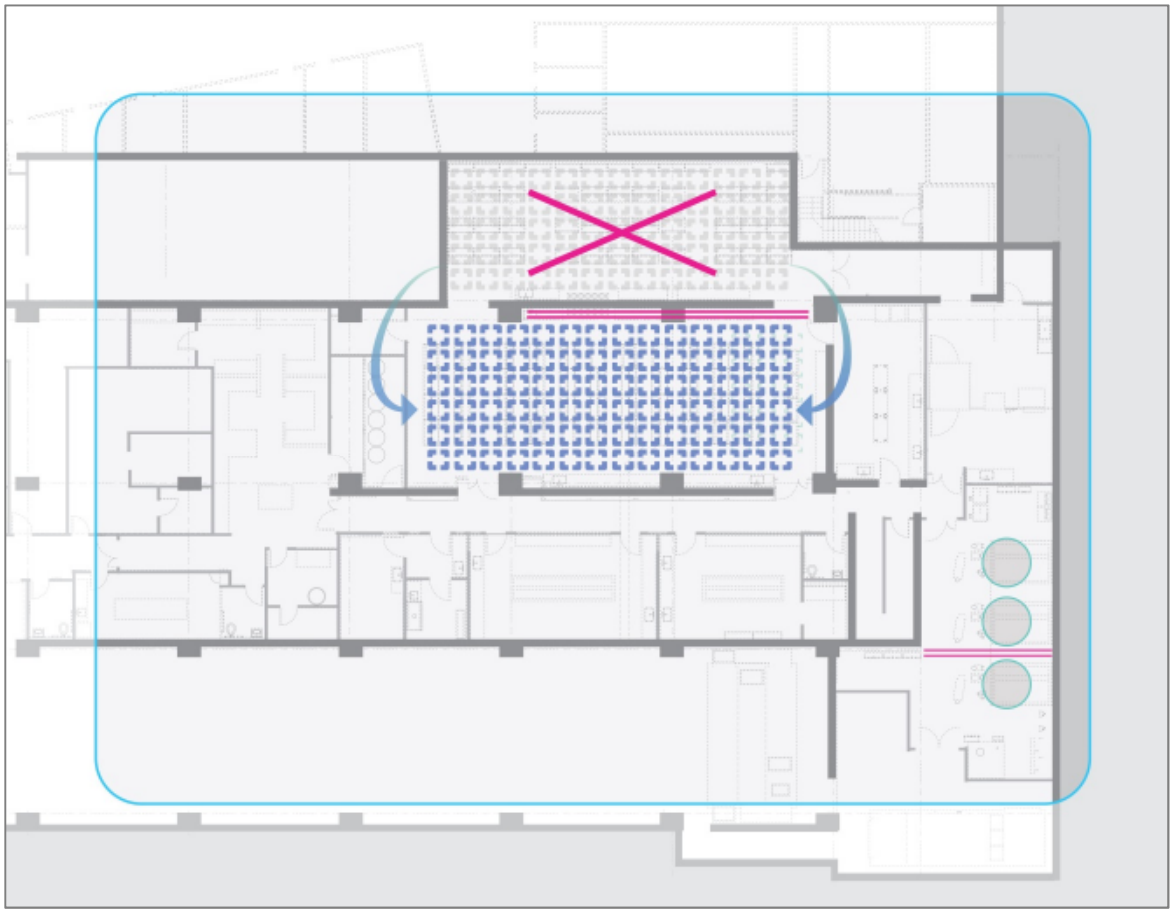
Population Density/ft²

UO Zebrafish
Core Facility Expansion

Project Phasing | Implementation

Phase 4
“Decontamination”
(1+ year out)

- Complete Sterilization of Phase 1 Facility



Overall Capacity

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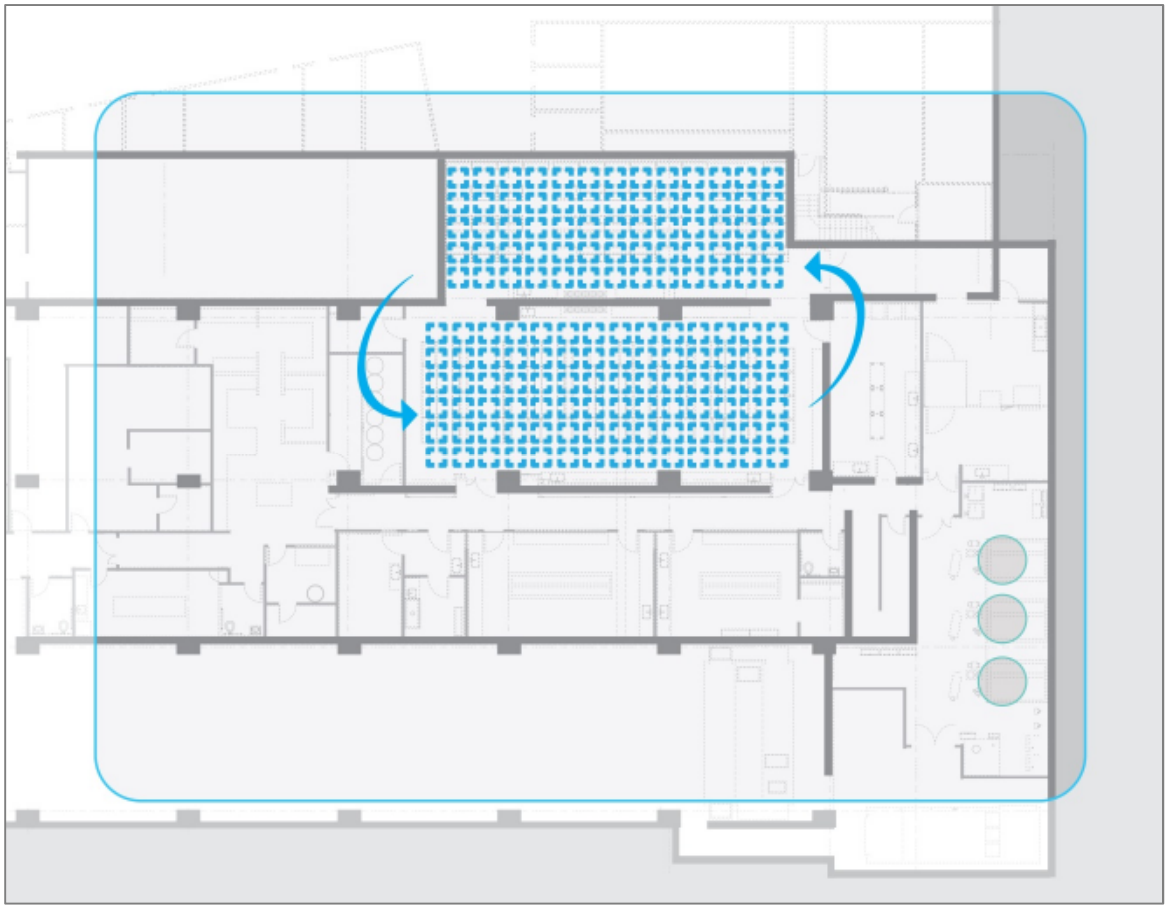
Population Density/ft²

UO Zebrafish
Core Facility Expansion

Project Phasing | Implementation

Phase 5 “Full Expansion”
(3+ years out)

- Full Use of Facility
- Water Systems Fully Combined
- Redundancy Restored



Overall Capacity

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Population Density/ft²

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Core Facility Expansion

Opportunity Making

Opportunity = Planning + Discovery

Opportunity Making | Local & District

Building-wide system improvements

- **laboratory exhaust system:** replace small low-exhaust velocity fans with ganged dilution fans

Opportunity Making | Local & District

Building-wide system improvements

- **HVAC balancing:** adding full-building rebalance enhanced lab safety, saved energy, identified critical deferred maintenance items

Opportunity Making | Local & District

Building-wide system improvements

- security: fish facility security upgrades extended to upper floor lab access.

Opportunity Making | Campus

Extendable system improvements:

- domestic water/industrial water separation
- water piping replacement

Opportunity Making | Aquatics

Reverse Osmosis Purified Water Plant

"Turning Demand into Supply"

- Campus research R.O. water originally supplied from aging centralized system.
- The zebrafish Recirculating Aquaculture System (RAS) was will replace approximately 15% of its volume daily with purified water.
- This design parameter elevated the facility's demand to almost 3 times the existing campus research demand.
- The new R.O. Central Plant associated with the Zebrafish Aquaculture System was upsized to accommodate the entire demand for the research complex.

  Benefits:
  - Increased Oversight
  - Full Redundancy
  - Equipment Upgrade
  - Future conversion to fully pressurized distribution now possible

Opportunity Making | Aquatics

Reverse Osmosis Purified Water Plant

"Turning Waste into Supply"

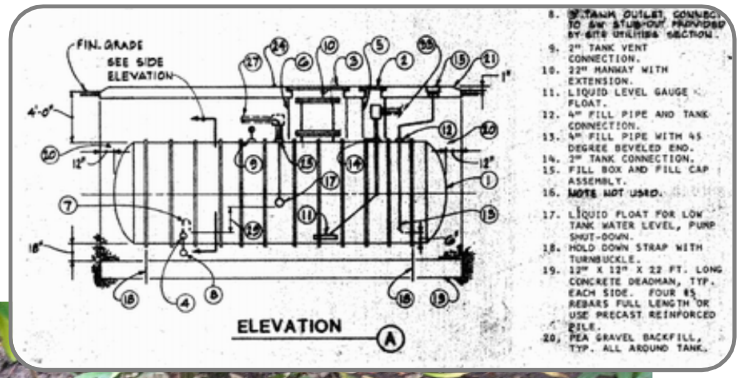
- R.O. production can typically reject between 40-70% of supply water.
- The original R.O supply plant and the original Zebrafish Facility were discharging this waste down the drain.
- Goal: to capture the reject water from the R.O. production and use for graywater applications in the project and adjacent buildings.

Opportunity Making | Aquatics

Reverse Osmosis Purified Water Plant

*"Turning **Waste** into Supply"*

- Cost offset by reuse of abandoned underground Sea Water storage tank.
- Sea Water tank was cleaned and refurbished.
- The new graywater re-use system supplies all flush fixtures for the Zebrafish Facility as well as 100% of the flush fixtures for the recently completed Lewis Integrative Science Building adjacent to the project.



Opportunity Making | Aquatics

Environmental Control

"Balanced HVAC and Aquaculture Systems"

- Traditional Aquaculture Systems include fully independent temperature control.
  - Leads to HVAC and Aquaculture expending energy to counterbalance each other.

- Integrated Approach – "Symbiotic Relationship":
  - "Building provides preheated water to system to optimize R.O.
  - AQ system provides some preheat for that incoming water via reject water heat exchange.
  - HVAC controls ambient temp (83degF) accounting for equipment loads, and outside air conditioning
  - This allows an optimized electric heat source controlled by the aquaculture system to fine tune the water temp (4degF delta)
  - Counterbalancing is minimized

Opportunity Making | Aquatics

Environmental Control

“Redefining Aquatic Facility Standards”

- Traditional Animal Facilities are provided with 100% OSA (dictated by NIH Guidelines)
  - Aquatic Facilities however do not have significant airborne particulate or pathogen issues
  - The fish housing rooms, by necessity, are low chemical use areas
  - Air exchange is driven primarily by humidity control

- By allowing the HVAC to optimize % of OSA based primarily on humidity control the facility is allowed to retain most of its embodied heat.

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Questions?

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