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# Relocating the Town Brook Culvert



*Neglected Past - Green Future*





# Relocating the Town Brook Culvert

## Town Brook Overview.

1. Originates in Braintree as a tributary to the Old Quincy Reservoir & flows through Quincy discharging into Town Brook Bay.
2. Has a contributing watershed of approximately 3,000 acres of which downtown Quincy represents less than 2%.
3. Constructed in sections between the 1890's & the 1970's using various combinations of stone, concrete, & corrugated metal pipe.
4. Regulates flow via weirs at the Center Street junction box & the USACOE deep rock tunnel inlet behind Star Market.



# Relocating the Town Brook Culvert

## Town Brook Overview.

5. Has an average flow rate of 2.2 cfs as measured at USGS gauging station between Bigelow & Miller Stile.
6. Documented flooding problems on file at Quincy DPW dating back to 1886.
7. Following the installation of the ACOE tunnel in the late 1990's, annual flooding complaints decreased from 14 to 1 after virtually identical 25-year storm events 2 years apart.



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# Relocating the Town Brook Culvert

## Environmental Concerns.

1. The rainbow smelt spawning in Town Brook has significantly decreased over the last decade:
  - a) The spawning habitat of the rainbow smelt is dependent on certain flow rates & the ACOE tunnel is believed to have created a reduced flow condition that negatively impacted the smelt spawning conditions.
  - b) High levels of sedimentation from stormwater runoff have also impacted the flow rate.
  - c) The US EPA has consistently classified the Town Brook as an "impaired waterway" due to high levels of pathogens since 2002.

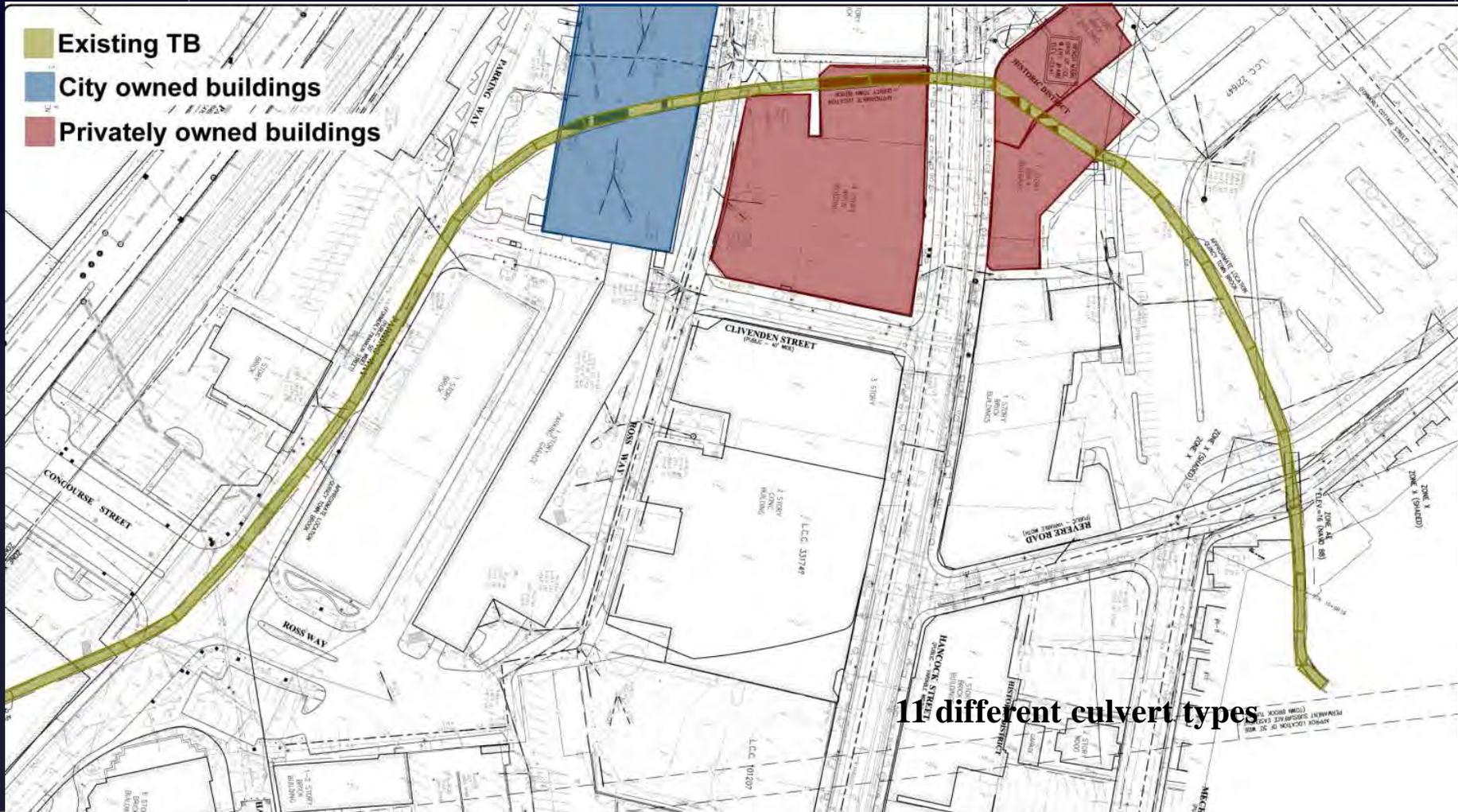




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# Relocating the Town Brook Culvert

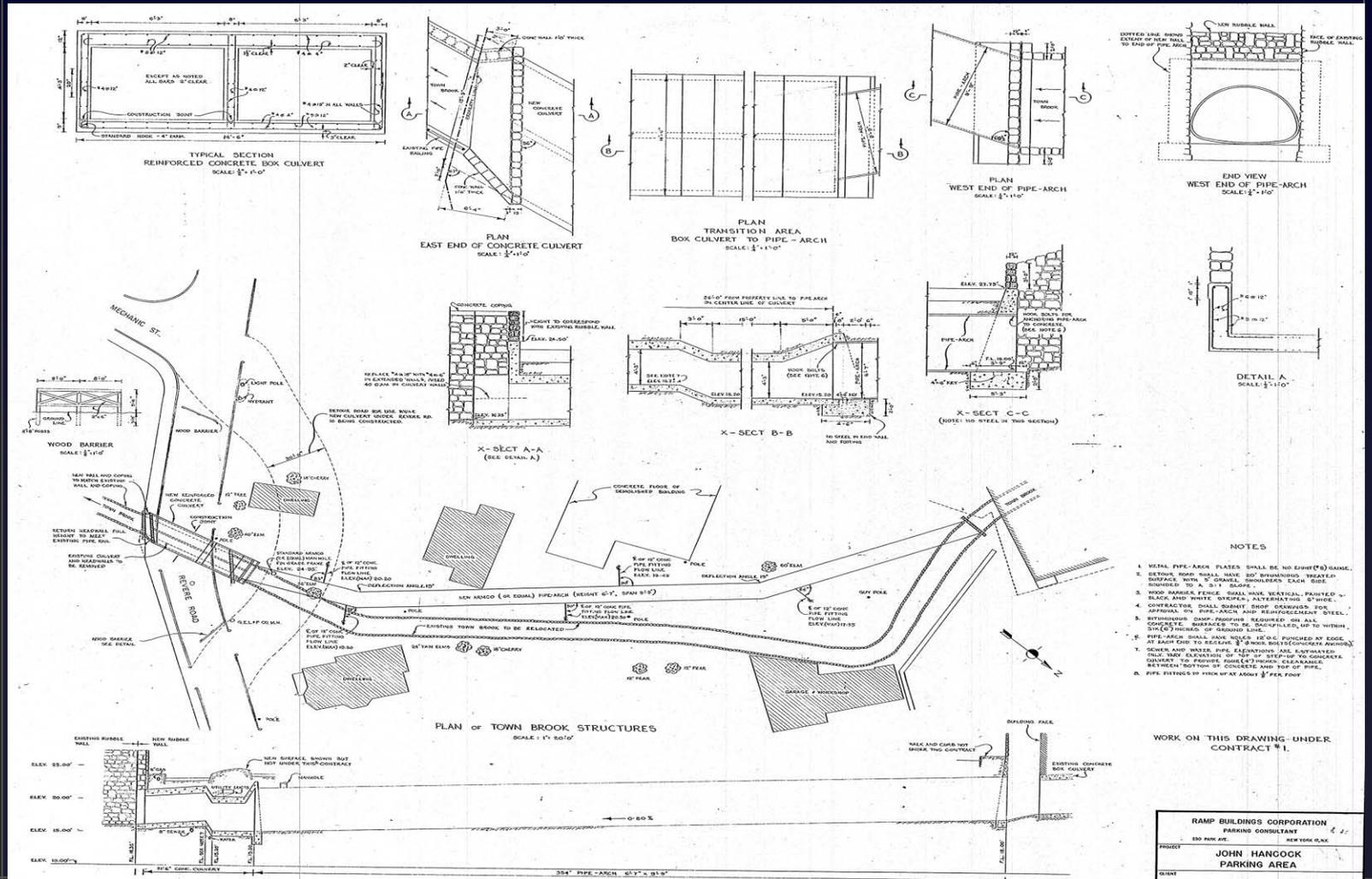
Existing Layout.





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# Relocating the Town Brook Culvert Many Alterations Since 1950's.





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# Town Brook Current Reality

Photo-Journal.

The following images were extracted from the video recording of the Town Brook walkthrough conducted by Tunnel Vision on July 8, 2008.



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# Town Brook Current Reality

Structurally Compromised.





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# Town Brook Current Reality

Structurally Compromised.





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# Town Brook Current Reality

Open to Buildings Above.





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# Town Brook Current Reality

Open to Buildings Above.





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# Town Brook Current Reality

'Windows' Into Adjacent Buildings.





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# Town Brook Current Reality

'Windows' Into Adjacent Buildings.





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# Town Brook Current Reality



Utility Conflicts.



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# Town Brook Current Reality



Utility Conflicts.



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# Town Brook Current Reality



Damaged Lines.



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# Town Brook Current Reality

Damaged Lines.





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# Town Brook Current Reality

Illicit Sewer Connection.





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# Town Brook Current Reality



Illicit Sewer Connection.



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# Town Brook Current Reality

## Clogged and Collapsed Sewer Drains.





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# Relocation Options



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# Relocation Options

Three Options.

1. Leave Town Brook as-is & redevelop downtown around it.
2. Repair downtown portion of Town Brook in place & redevelop around it.
3. Coordinate relocation of downtown portion of Town Brook with future redevelopment in mind.



1. Leave as-is & redevelop downtown around it:
  - Insufficient stormwater capacity.
  - Poor water quality remains.
  - Structural issues continue to worsen.
  - Environmental permitting virtually impossible.
  - Significant conflicts with below grade parking & underground utilities.
  - Impacts the City's redevelopment goals for Quincy Center



# Relocation Options

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  - Insufficient stormwater capacity.
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  - Structural issues continue to worsen.
  - Environmental permitting virtually impossible.
  - Significant conflicts with below grade parking & underground utilities.
  - Impacts the City's redevelopment goals for Quincy Center
  - Not a viable option.



2. Repair downtown portion of Town Brook in place & redevelop around it:
  - Design to current regulatory standards.
  - Significant conflicts with below grade parking & underground utilities remain.
  - Likely eminent domain of private property.
  - Financing & insurance concerns for private property locations (for any redeveloper).
  - Negative impact on development yield.
  - Negative impact on phasing (similar to CA/T project).



2. Repair downtown portion of Town Brook in place & redevelop around it:
  - Design to current regulatory standards.
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  - Negative impact on development yield.
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  - Not a viable option.



3. Coordinate relocation of downtown portion of Town Brook with future redevelopment in mind:
  - Design to current regulatory standards.
  - Minimize underground conflicts.
  - Eliminate private property concerns.
  - Opportunity for open channel sections to enhance fisheries habitat & creation of open space / public amenity.
  - Allows redevelopment density consistent with URDP recommendations.



3. Coordinate relocation of downtown portion of Town Brook with future redevelopment in mind:
  - Design to current regulatory standards.
  - Minimize underground conflicts.
  - Eliminate private property concerns.
  - Opportunity for open channel sections to enhance fisheries habitat & creation of open space / public amenity.
  - Allows redevelopment density consistent with URDP recommendations.
  - **Where?**



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# Relocation Alternatives Analysis



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# Relocation Alternatives Analysis

## Nine Alternatives Were Evaluated

- No-Build
- Re-construct along existing alignment
- Alignment Alternatives A through G

## Evaluation Metrics

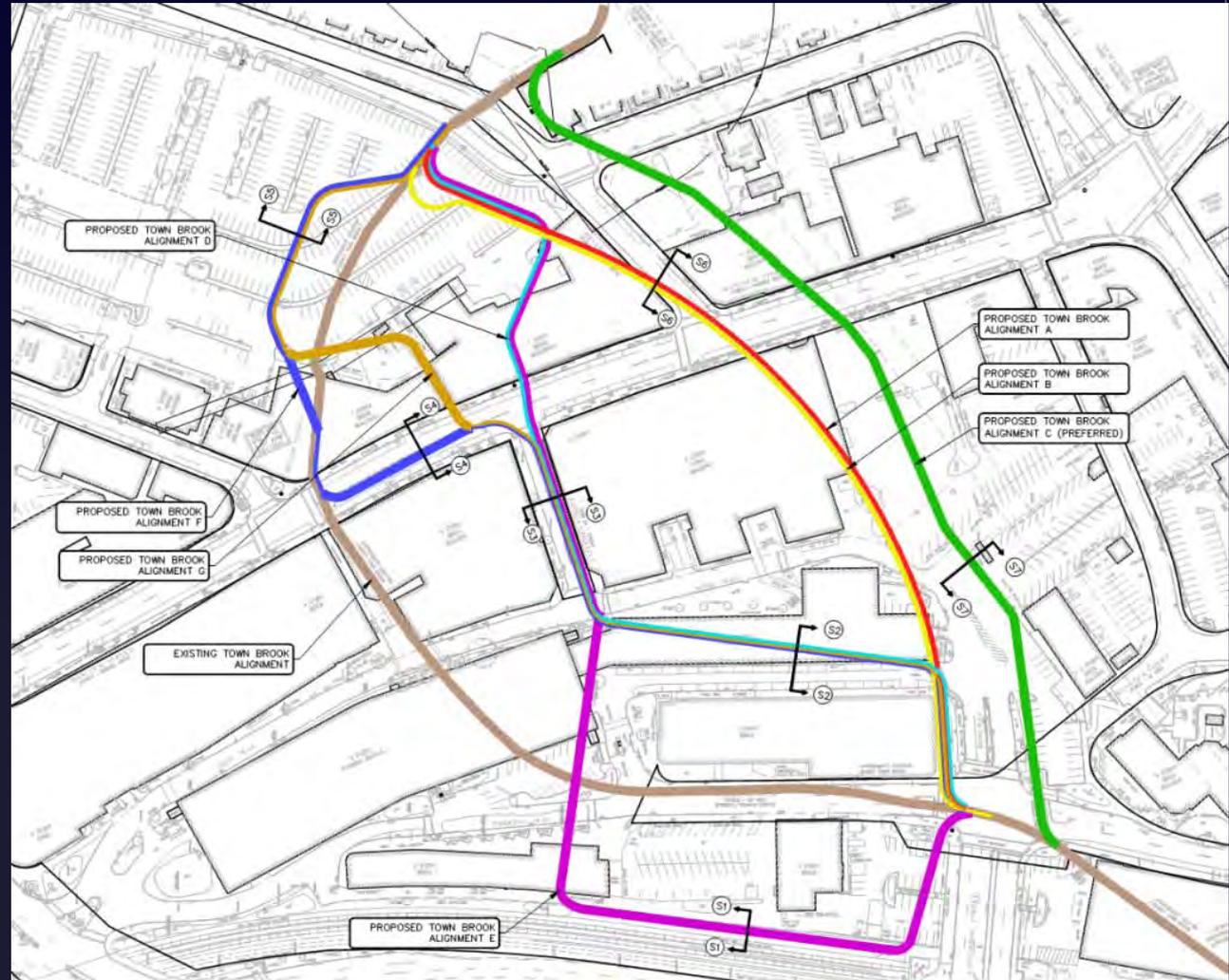
- Flood Control
- Underground Conflicts
- Property Constraints (Property Control)
- Open Channel/Public Amenity
- Enhance Smelt Fisheries Habitat
- Impacts to URDP Density Objectives
- Construction Schedule & Phasing
- Cost
- Environmental Enhancements
- Code Compliance



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# Relocation Alternatives Analysis

## Existing Conditions Evaluation.



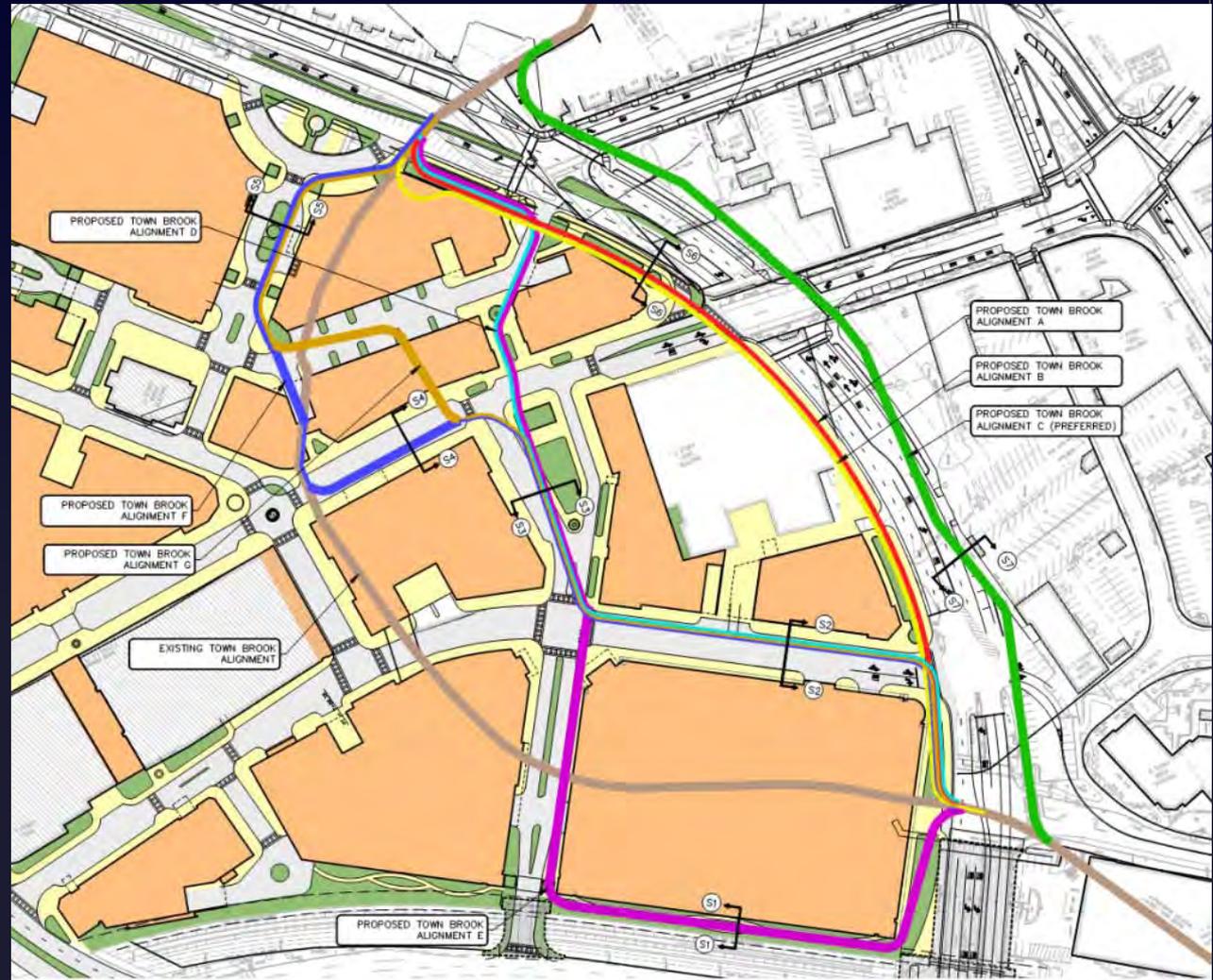
Nine Town Brook Alignment Alternatives Were Evaluated



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# Relocation Alternatives Analysis

## Proposed Conditions (URDP) Evaluation.

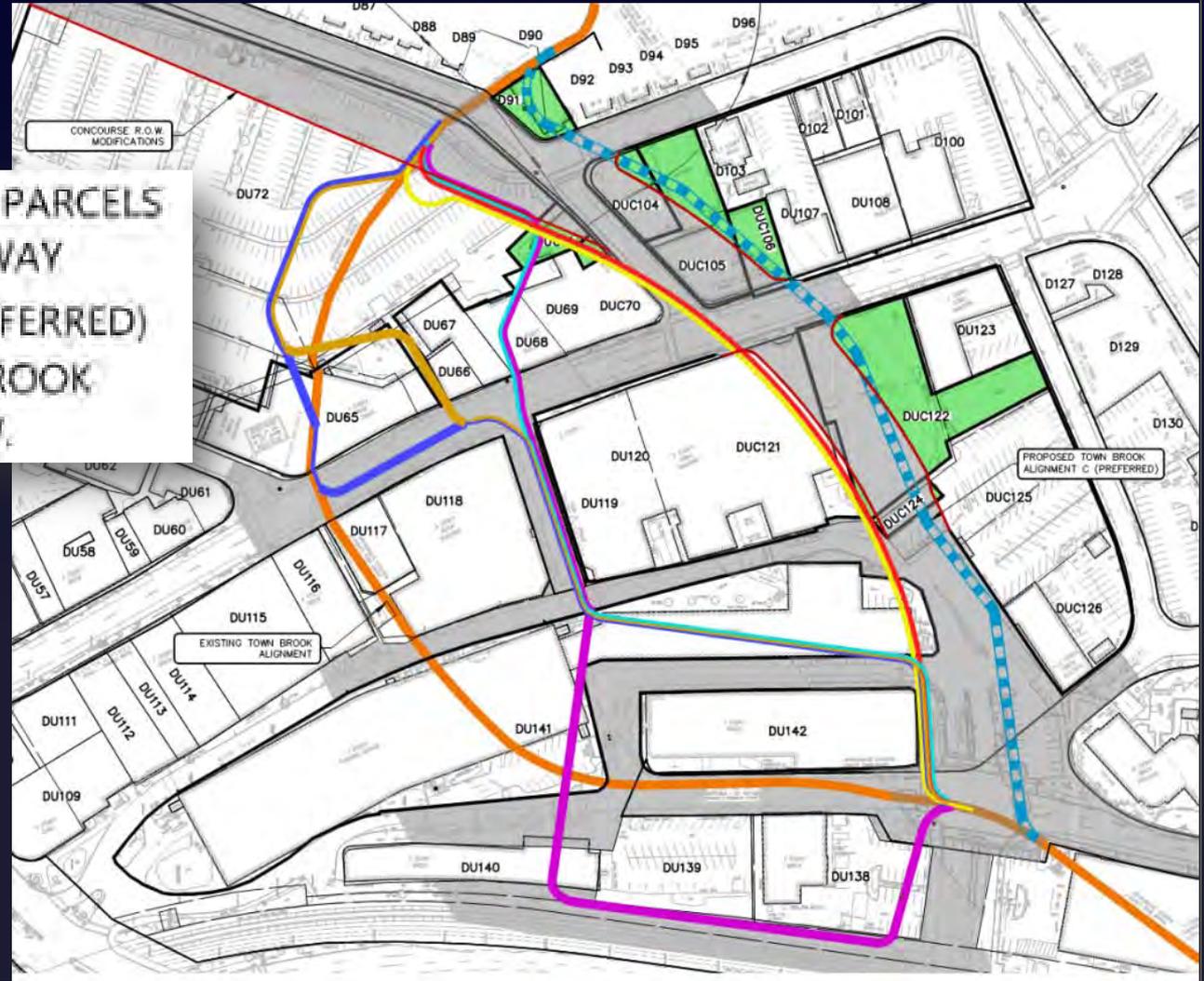


Nine Town Brook Alignment Alternatives Were Evaluated



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# Relocation Alternatives Analysis Property Control Evaluation.



Nine Town Brook  
Alignment  
Alternatives Were  
Evaluated



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# Relocation Alternatives Analysis

## Section Analysis At MBTA Trench.



### Section S1-S1 – Alternative E

- Close proximity to MBTA structural wall system
- Longer length of Town Brook adversely impacts base flow



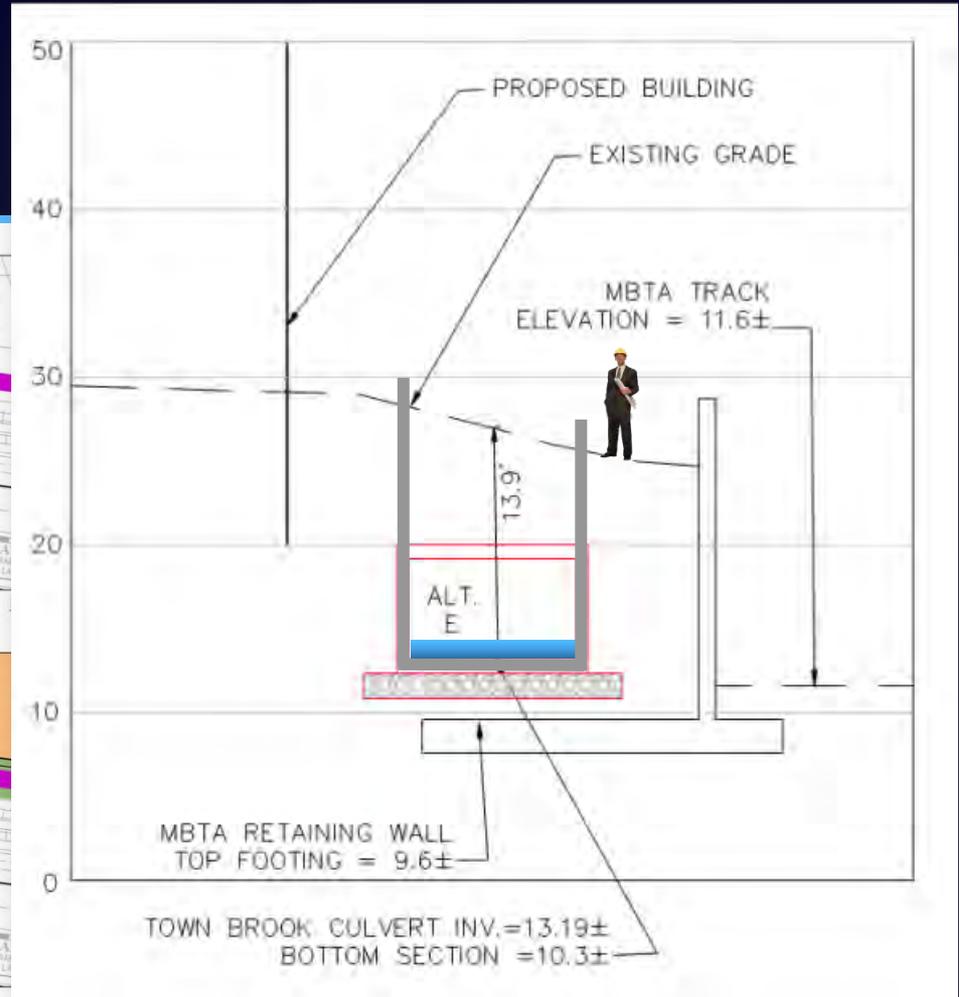
# Relocation Alternatives Analysis

## Section Analysis At MBTA Trench.



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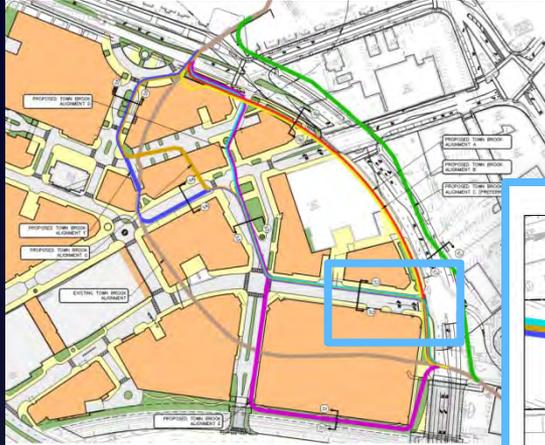




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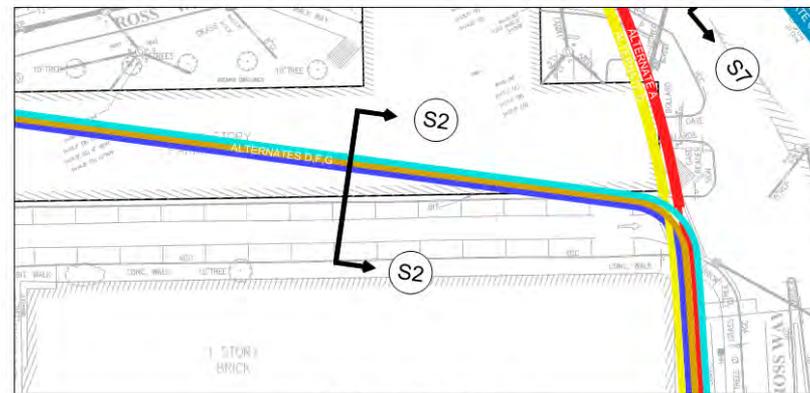
# Relocation Alternatives Analysis

## Section Analysis New Ross/Concourse.



Section S2-S2 –  
Alternatives D, F & G

- Property control
- Utility Conflicts



EXISTING CONDITIONS



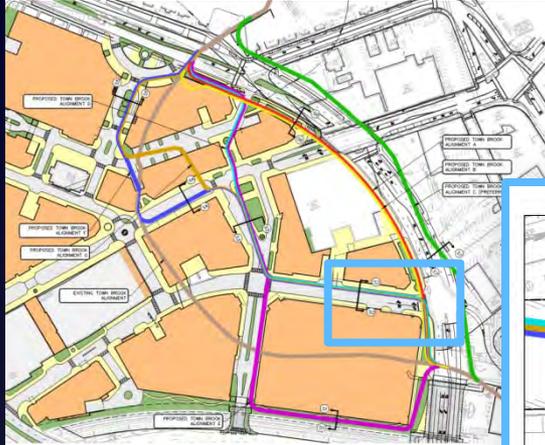
FUTURE CONCEPT



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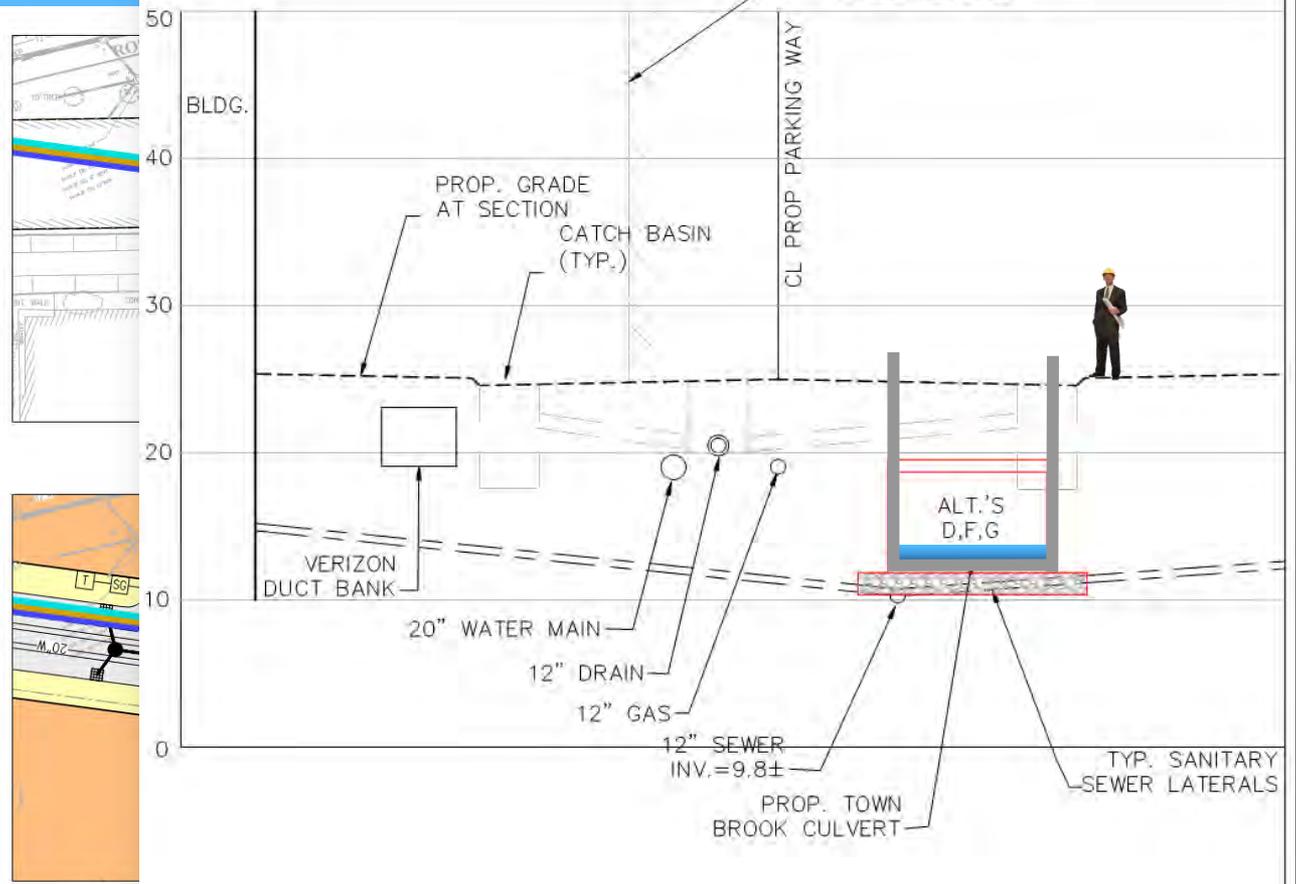
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FUTURE CONCEPT





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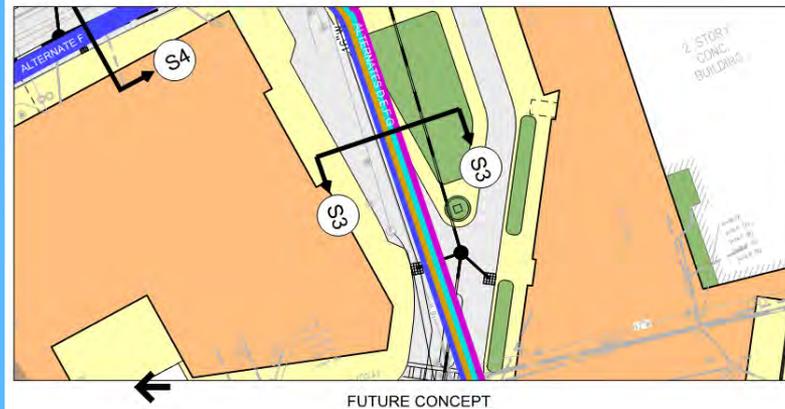
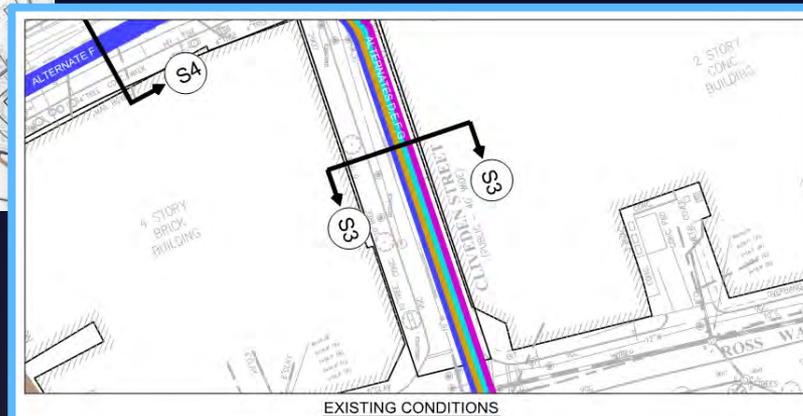
# Relocation Alternatives Analysis

## Section Analysis Clivenden.



### Section S3-S3 – Alternative D, E, F & G

- Property Control
- Constructability
- Construction Phasing





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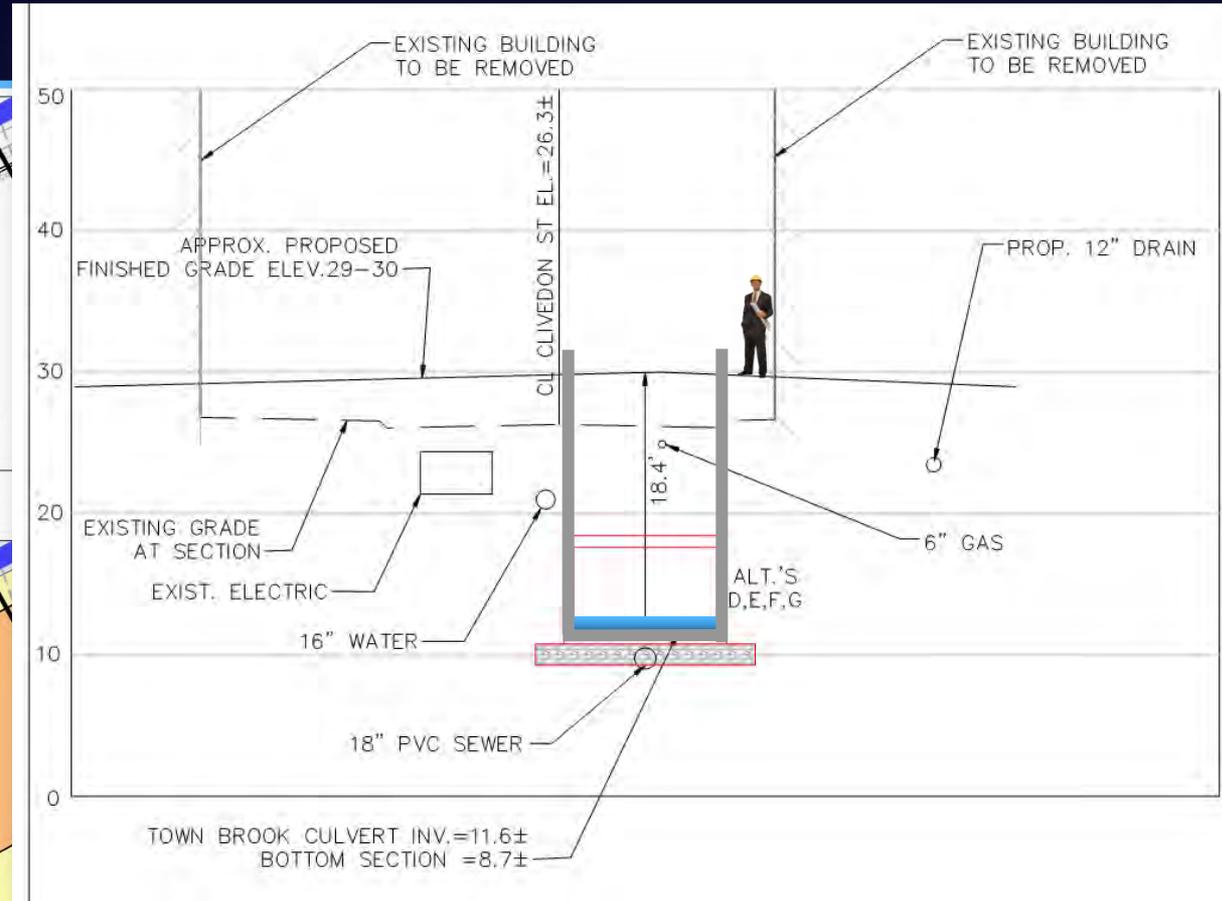
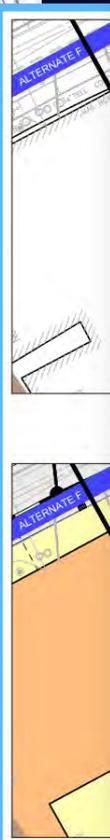
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Section S3-S3 –  
Alternative D, E, F & G

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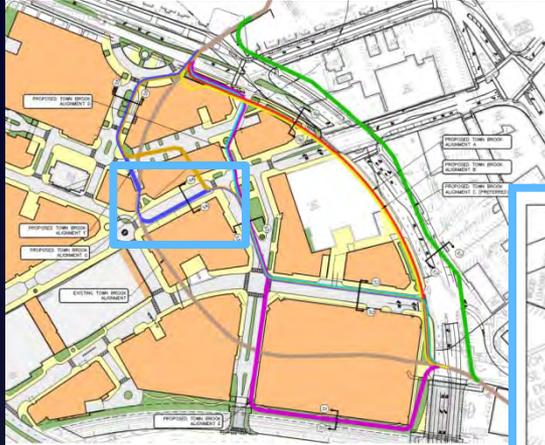
FUTURE CONCEPT



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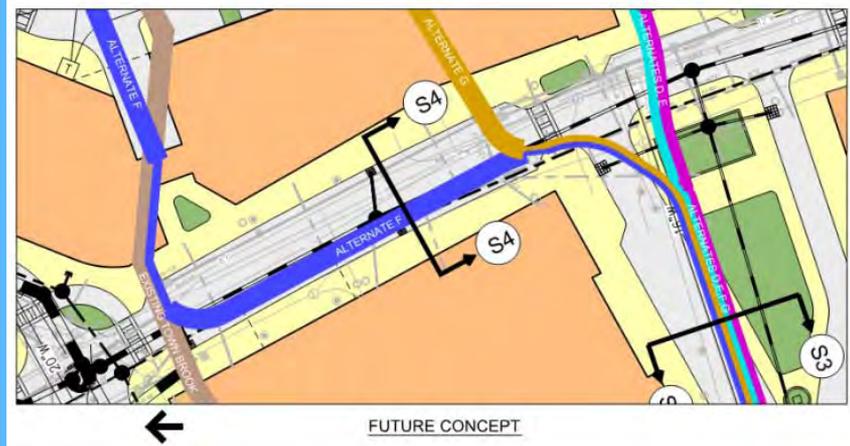
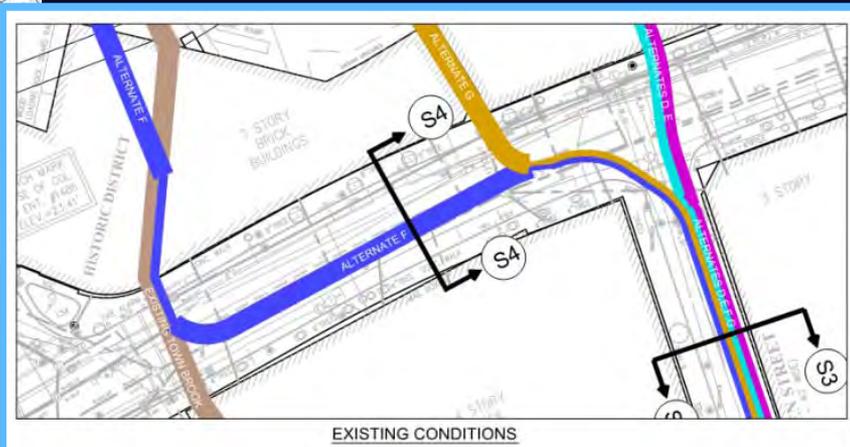
# Relocation Alternatives Analysis

## Section Analysis at Hancock.



### Section S4-S4 – Alternative F

- Constructability  
(Hancock St is major utility corridor)
- Building impacts

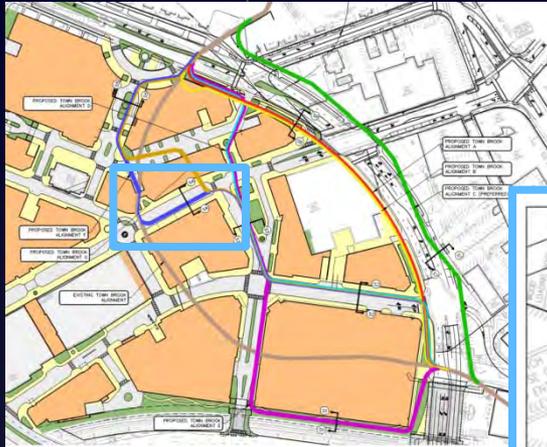




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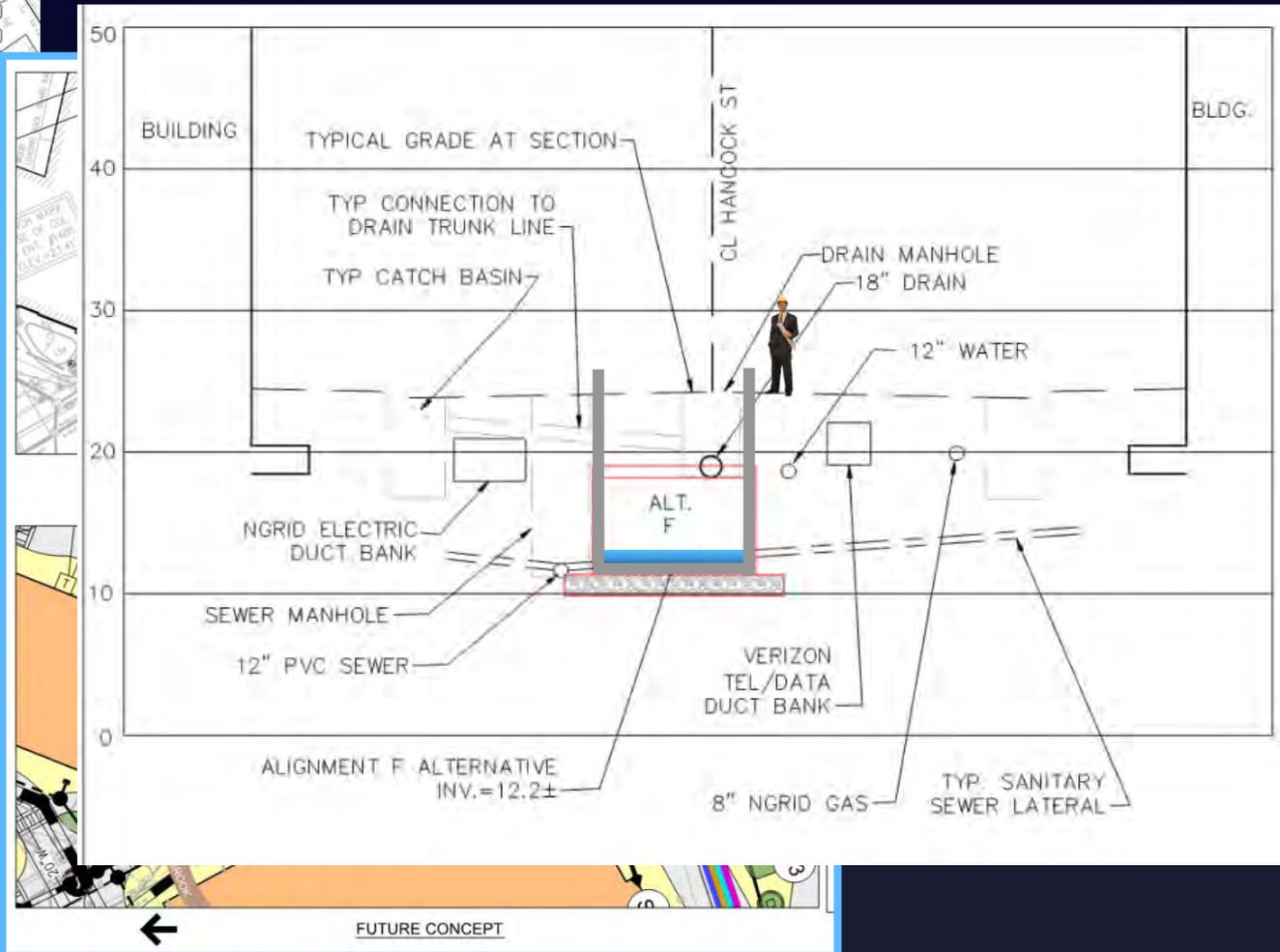
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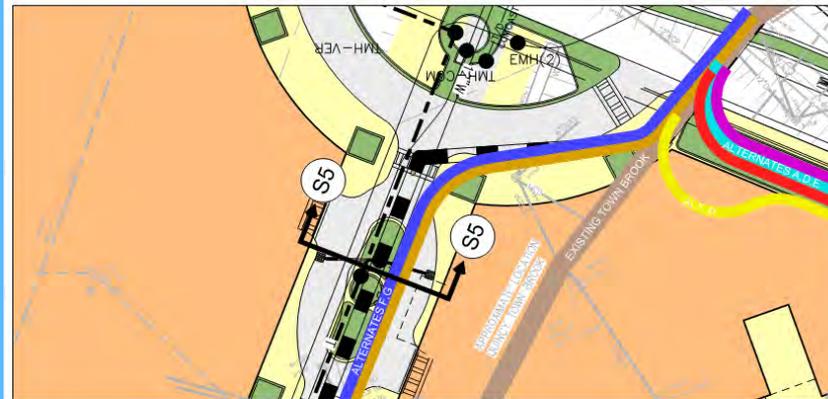
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# Relocation Alternatives Analysis

## Section Analysis at Concourse.



EXISTING CONDITIONS



FUTURE CONCEPT

Section S5-S5 –  
Alternatives F & G

- Building Impacts



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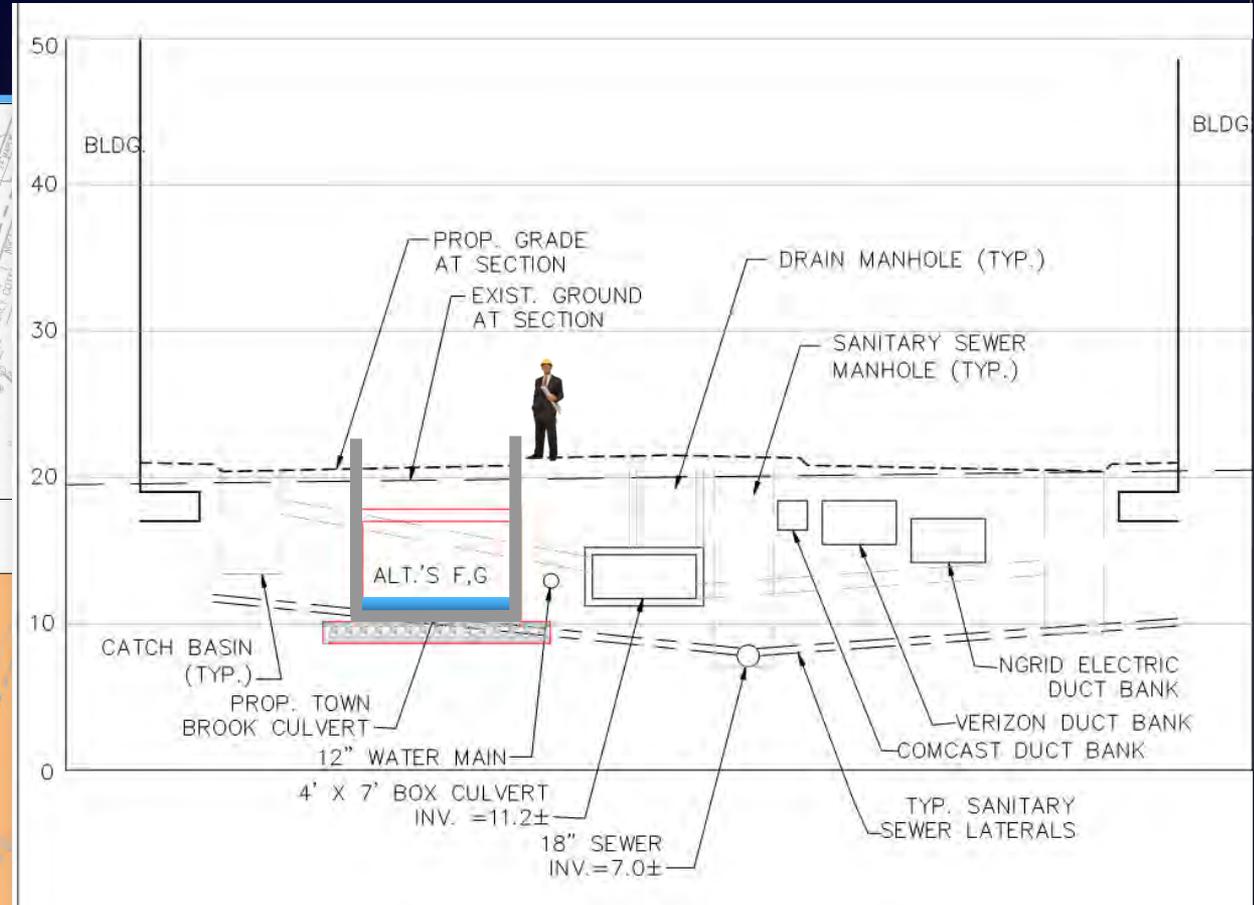
# Relocation Alternatives Analysis

## Section Analysis at Concourse.



Section S5-S5 –  
Alternatives F & G

- Building Impacts



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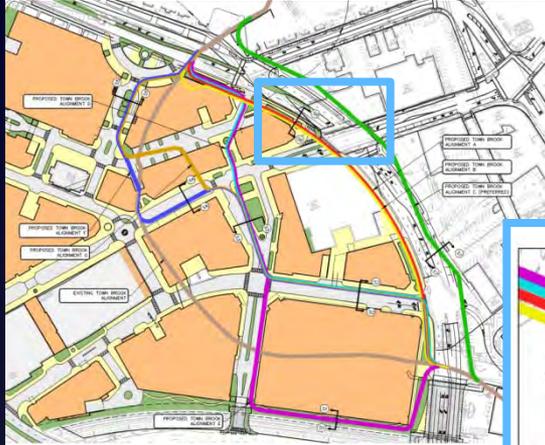




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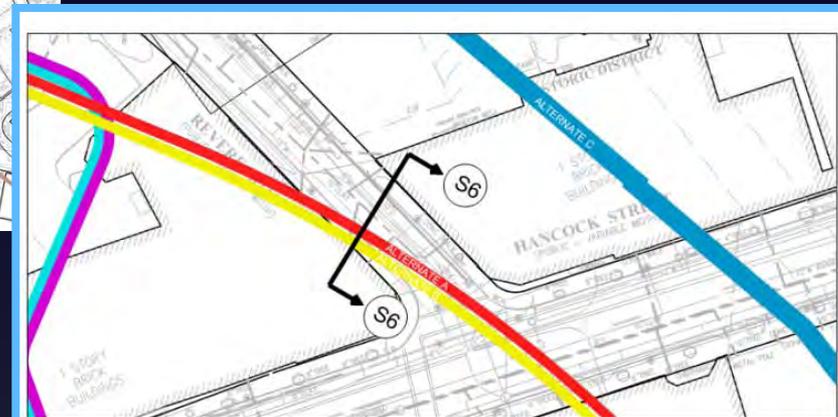
# Relocation Alternatives Analysis

## Section Analysis Along Concourse.

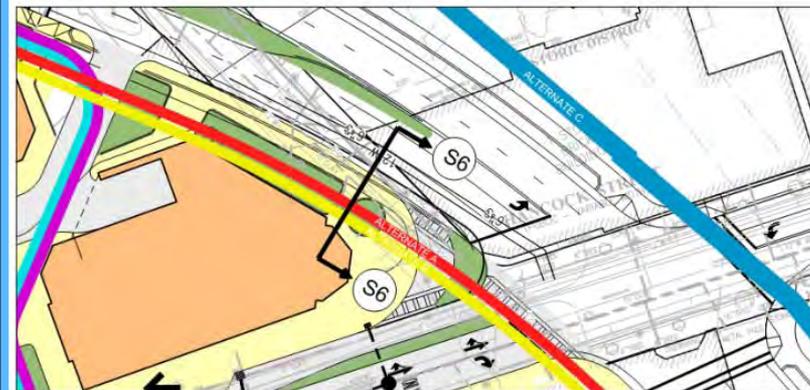


Section S6-S6 –  
Alternatives A & B

- Property control
- Concourse impacts



EXISTING CONDITIONS



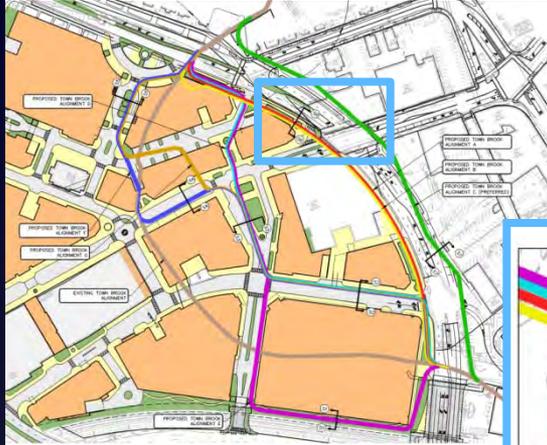
FUTURE CONCEPT



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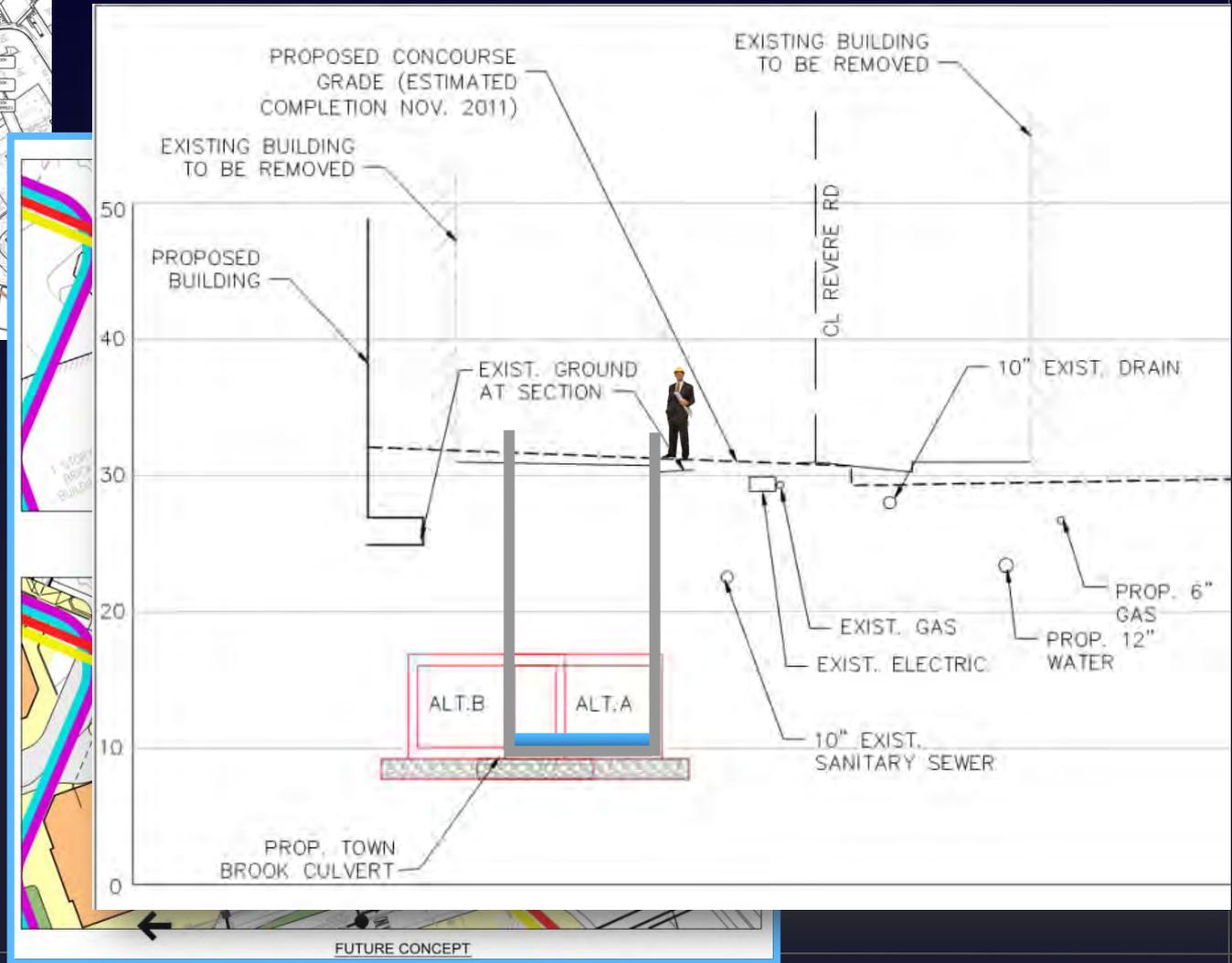
# Relocation Alternatives Analysis

## Section Analysis Along Concourse.



Section S6-S6 –  
Alternatives A & B

- Property control
- Concourse impacts





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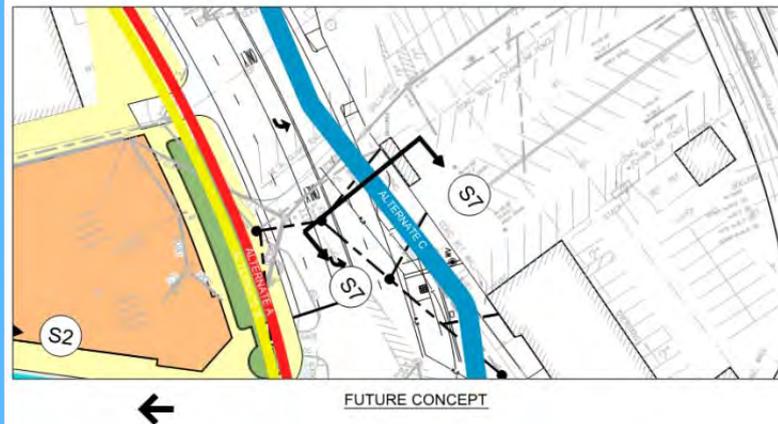
# Relocation Alternatives Analysis

## Section Analysis Along Concourse.



### Section S7-S7 – Alternative C (Preferred)

- Minimal utility conflicts
- Partial concurrent construction with Concourse Roadway Improvement Project
- Multiple benefits for environment and public





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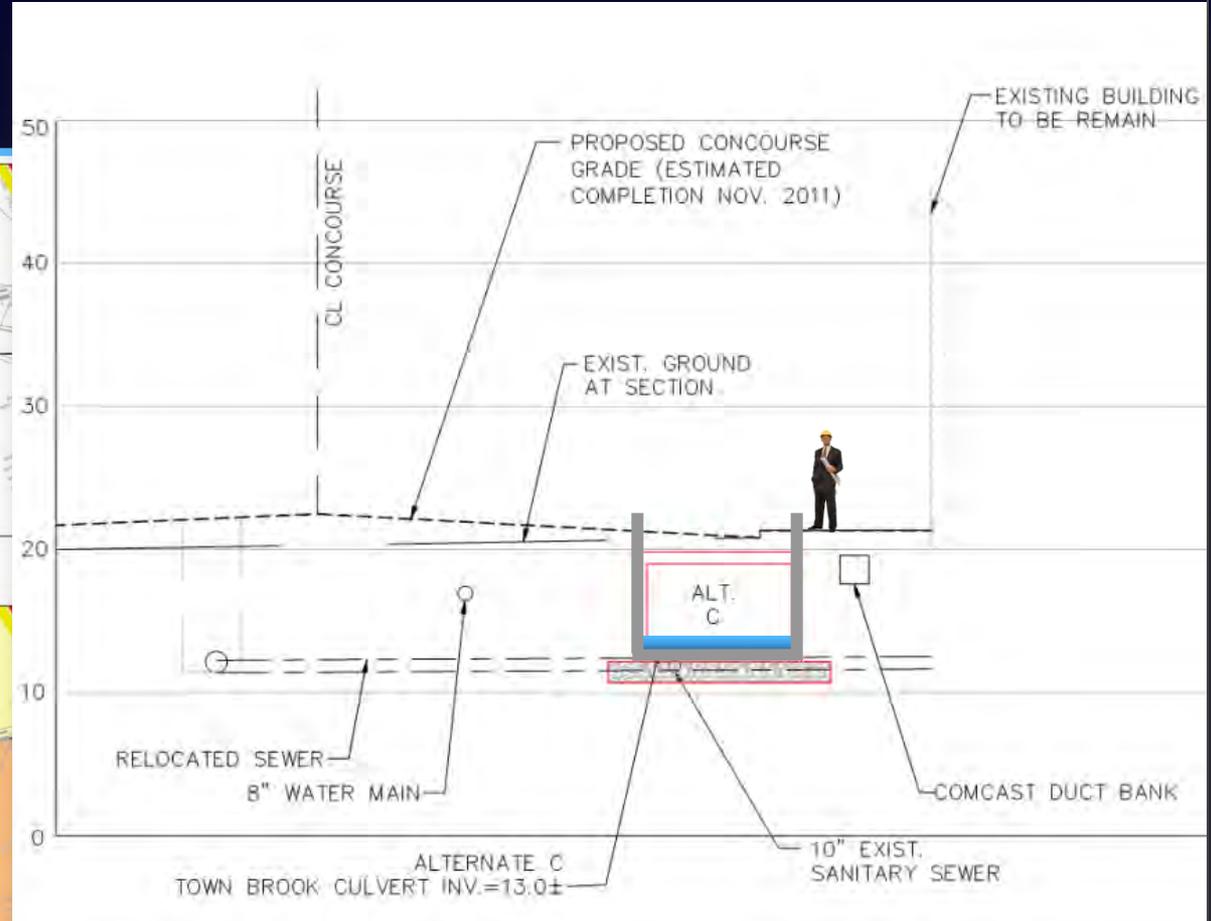
# Relocation Alternatives Analysis

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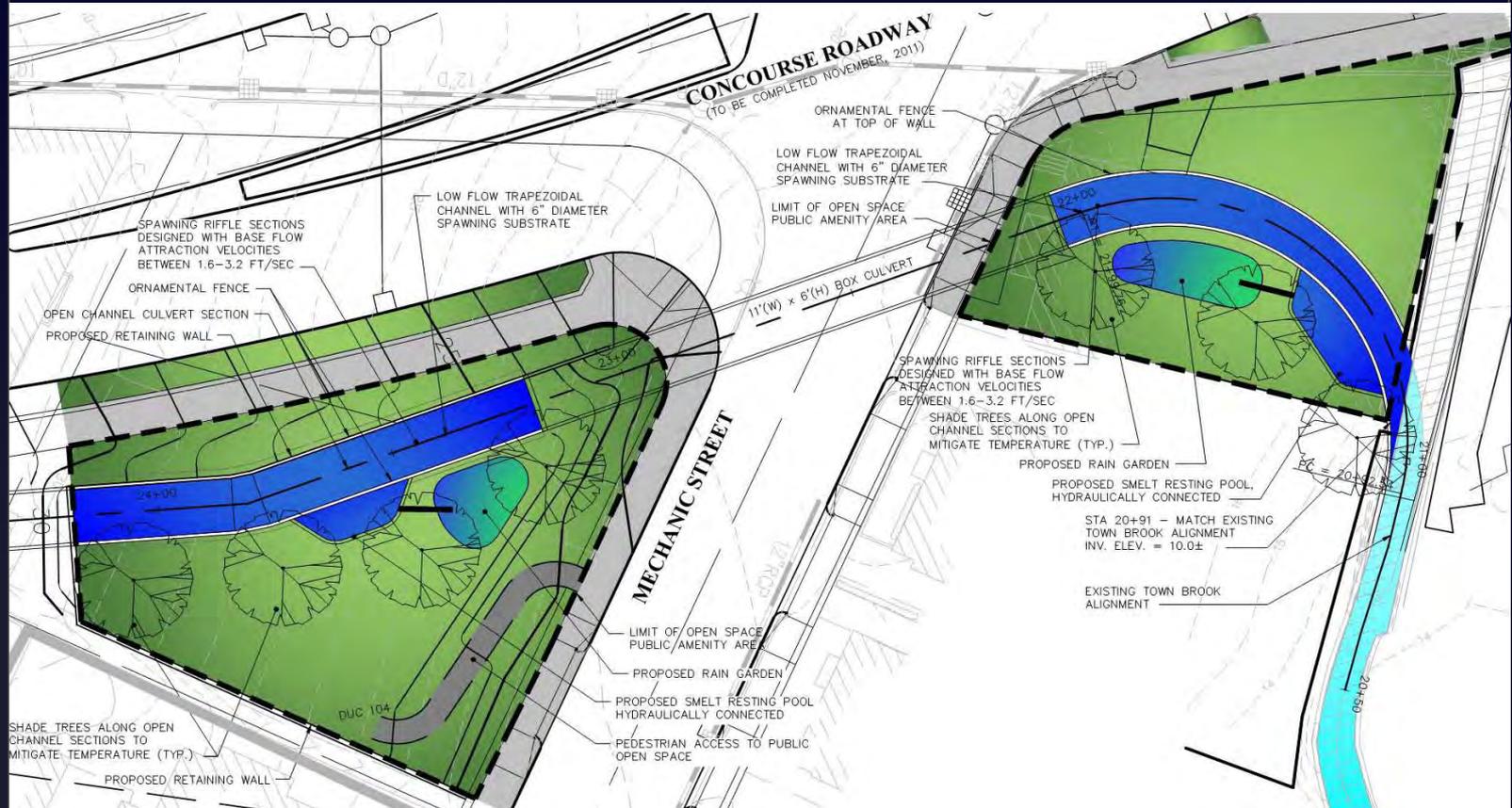


FUTURE CONCEPT



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# Relocation Alternatives Analysis Environmental Enhancements.



- New smelt spawning areas including spawning riffles and resting pools
- Over 180' of open channel flow (only 16' existing open channel)

# Relocation Alternatives Analysis

## Evaluation Metrics/Ratings of Alternatives.

**Table 2.1**  
**Evaluation Metrics Ratings**

| Evaluation Metric                     | No-Build  | Reconstruct Along Existing Alignment | Alternative A | Alternative B | Alternative C | Alternative D | Alternative E | Alternative F | Alternative G |
|---------------------------------------|-----------|--------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Flood Control                         | 1         | 9                                    | 9             | 9             | 9             | 9             | 9             | 9             | 9             |
| Underground Conflicts                 | 2         | 1                                    | 8             | 7             | 9             | 5             | 6             | 3             | 4             |
| Property Constraints                  | 1         | 1                                    | 1             | 1             | 9             | 1             | 1             | 1             | 1             |
| Open Channel/<br>Public Amenity       | 1         | 2                                    | 8             | 7             | 9             | 3             | 4             | 5             | 6             |
| Enhance Smelt<br>Fisheries Habitat    | 1         | 2                                    | 8             | 7             | 9             | 3             | 4             | 5             | 6             |
| Impacts to URDP<br>Density            | 1         | 2                                    | 8             | 7             | 9             | 6             | 5             | 4             | 3             |
| Construction<br>Schedule &<br>Phasing | 8         | 1                                    | 6             | 7             | 9             | 3             | 2             | 5             | 4             |
| Cost                                  | 9         | 1                                    | 6             | 7             | 8             | 5             | 2             | 3             | 4             |
| Environmental<br>Enhancements         | 1         | 2                                    | 5             | 6             | 9             | 3             | 4             | 8             | 7             |
| Code Compliance                       | 1         | 1                                    | 9             | 9             | 9             | 9             | 9             | 1             | 9             |
| <b>Total:</b>                         | <b>26</b> | <b>22</b>                            | <b>68</b>     | <b>67</b>     | <b>89</b>     | <b>47</b>     | <b>46</b>     | <b>44</b>     | <b>53</b>     |

| Ranks | Alternative | Total Points |
|-------|-------------|--------------|
| 1     | C           | 89           |
| 2     | A           | 68           |
| 3     | B           | 67           |
| 4     | G           | 53           |
| 5     | D           | 47           |
| 6     | E           | 46           |
| 7     | F           | 44           |
| 8     | No-Build    | 26           |
| 9     | Reconstruct | 22           |

- Based on ratings using metrics, alternative C is the preferred alternative

# Relocation Alternatives Analysis

## Mitigation Summary.

1. Riverfront Area enhancements – Active public open space adjacent to open channel sections of the Brook on City owned land
2. Increasing the extent of Open Channel Sections in Town Brook, proposing 185 linear feet of open channel
3. Fish Run - Rainbow Smelt Habitat enhancements
  - a) Design of culvert with low flow trapezoidal channel (coordinated with Centre Street Junction Box modifications to increase low base flow) to achieve a flow depth of at least 6 inches to 12 inches
  - b) Spawning substrate in low flow trapezoidal channel, proposed 6" diameter rounded stone substrate for smelt eggs to adhere to
  - c) Spawning riffles achieved by designing the culvert to achieve attraction velocities of between 1.6 and 3.2 feet per second during low base flow conditions
  - d) Smelt Resting Pools off-line and adjacent to spawning riffle sections
  - e) Temperature mitigation - proposing shade trees adjacent to open channel sections



# Relocation Alternatives Analysis

## Mitigation Summary.

4. Flood Control – BLSF mitigation achieved by provided a larger proposed culvert section (11'wide x 6' deep) to compensate for lost storage due to reduction in length
5. Water Quality improvements – Proposed rain gardens in open space parcels on east and west sides of Mechanic Street to treat surface runoff
6. Removal of illicit sanitary sewer connections within the project area



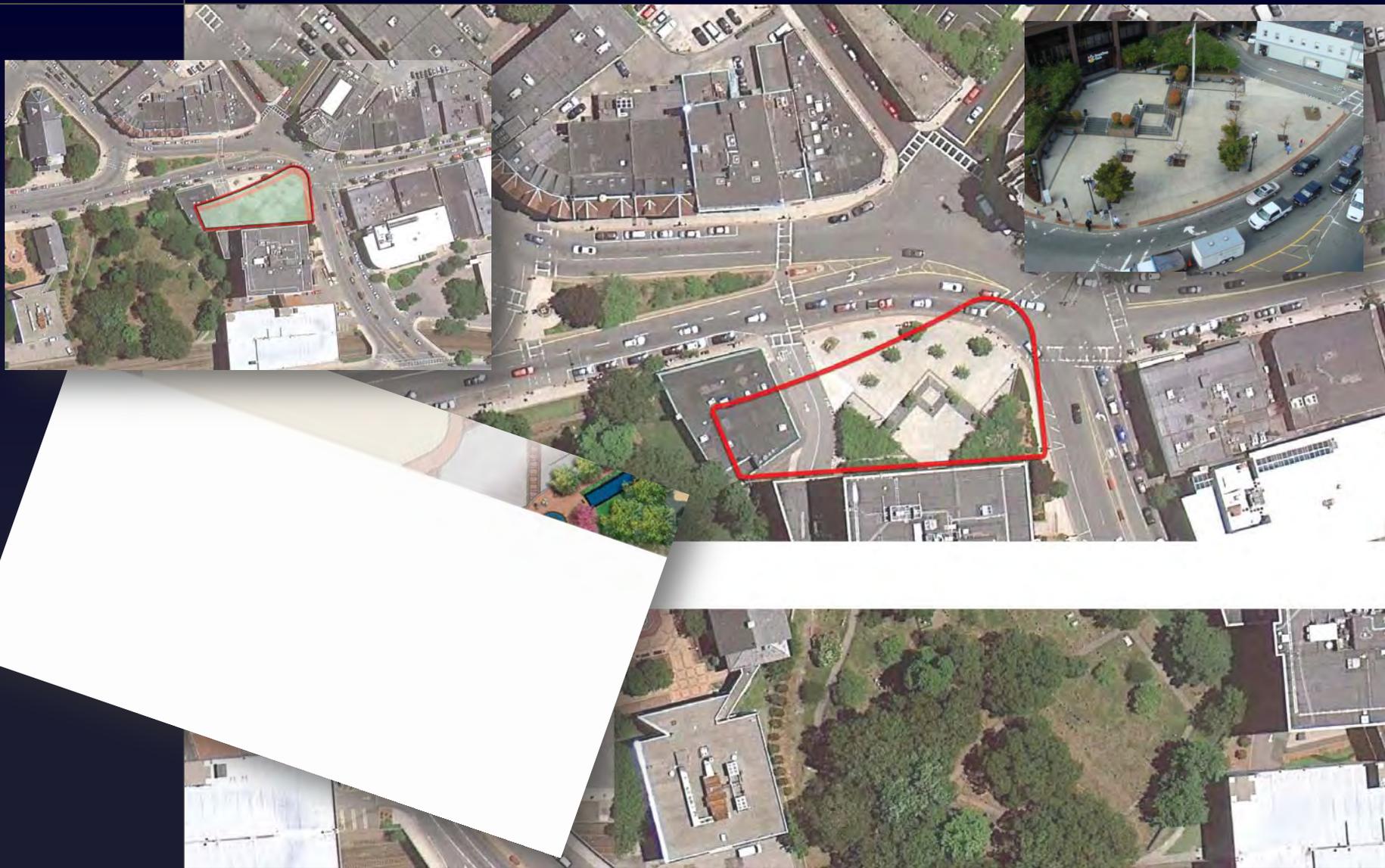
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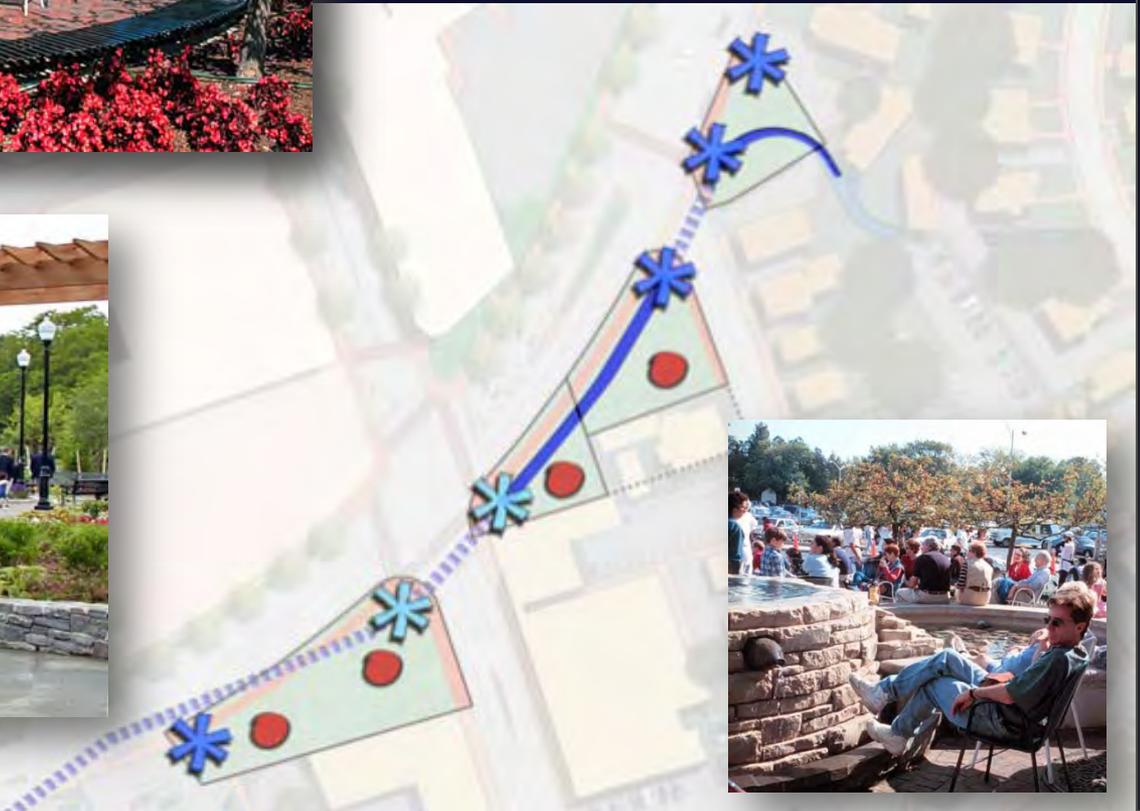
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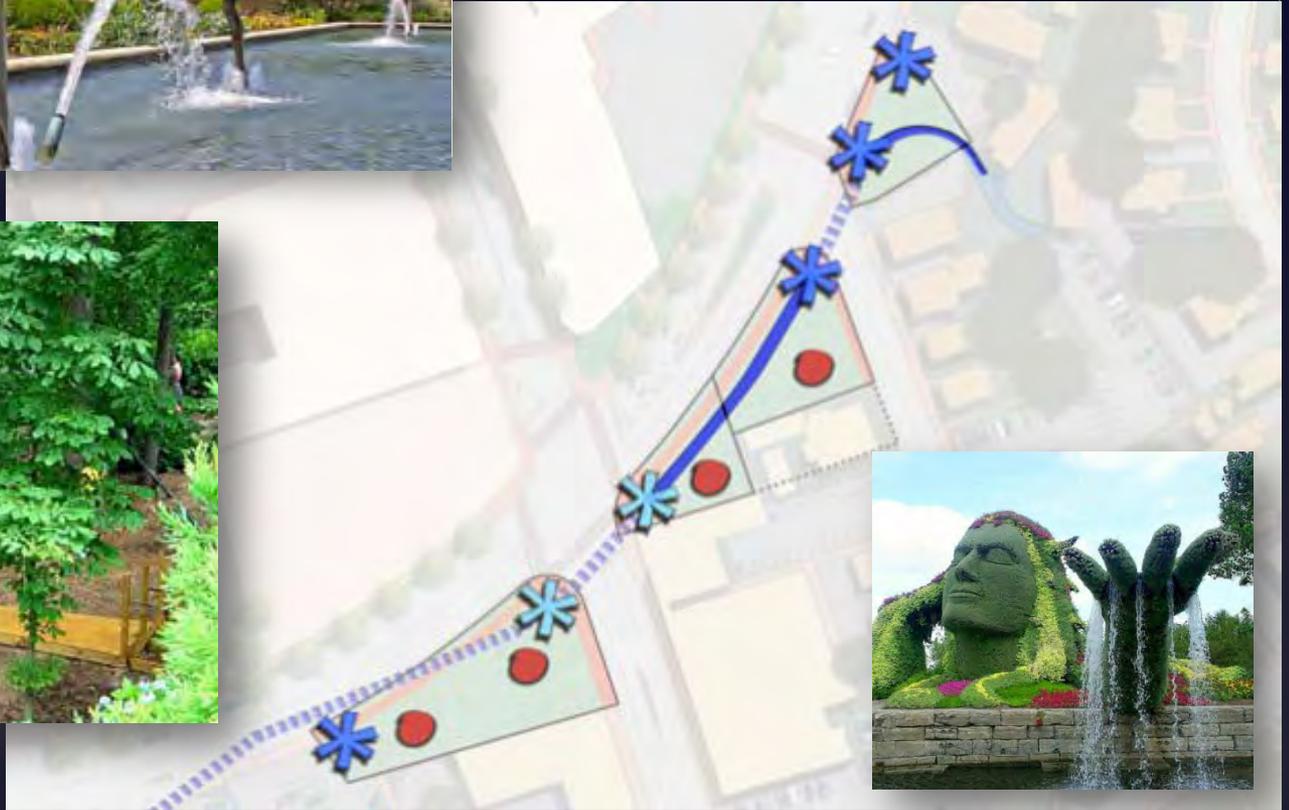
# Relocating the Town Brook Culvert





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American Legion Site.

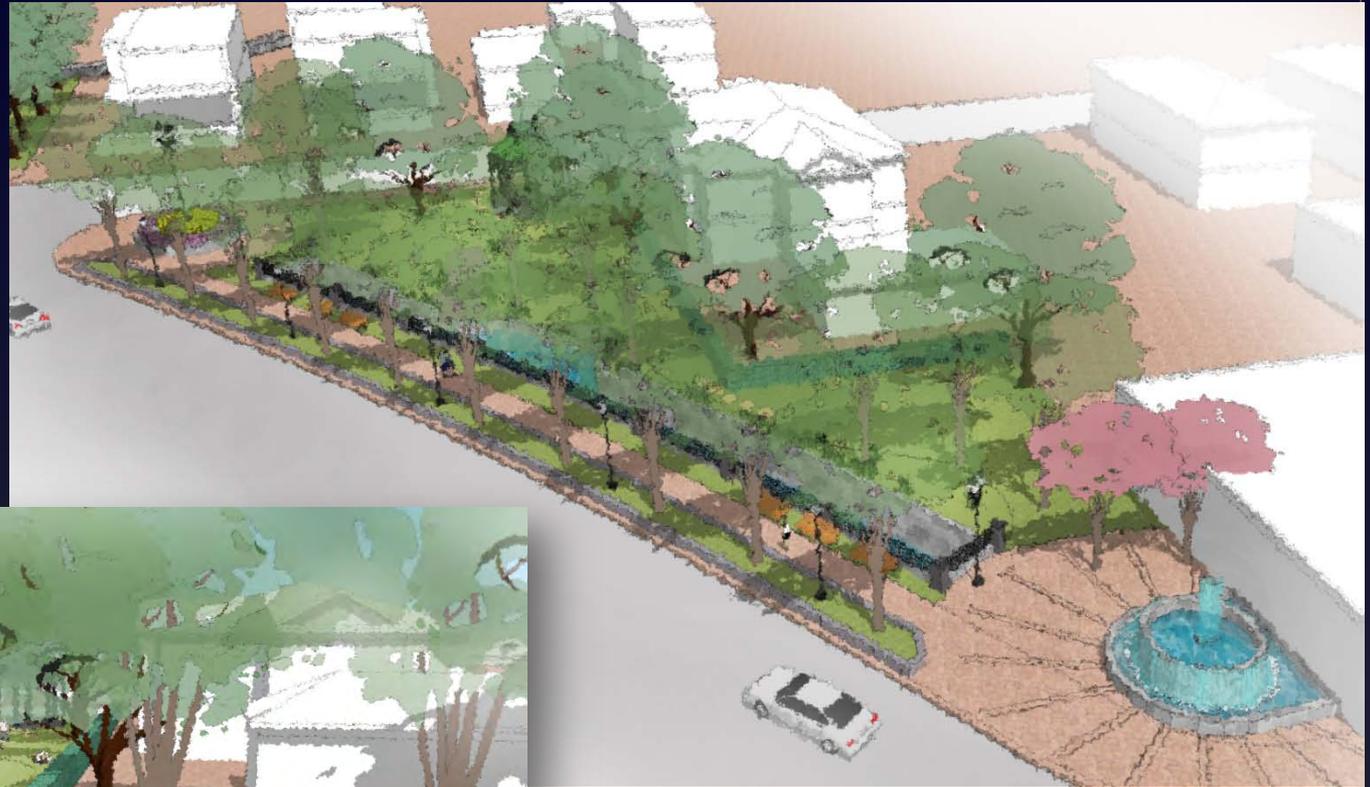




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# Relocating the Town Brook Culvert

## Town Brook Waterway.





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# Relocating the Town Brook Culvert

Hancock Gateway.





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# Relocating the Town Brook Culvert

## Permitting and Approvals.

1. MEPA
2. Quincy Conservation Commission
3. MA Dept of Environmental Protection
4. Army Corps of Engineers
5. Federal Emergency Management Agency
6. U.S. Environmental Protection Agency
7. U.S. Fish & Wildlife Service
8. MA Division of Marine Fisheries
9. Quincy Department of Public Works



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# Relocating the Town Brook Culvert

Schedule and Budget.

- File ENF March 15, 2011
- 14 month permitting schedule
- Subject to City procurement regulations
- Start construction 2Q 2012
- 15 month construction schedule
- Hard cost budget \$11 M

Total Budget \$14.9M