

# Proposed Low Groundwater Solution

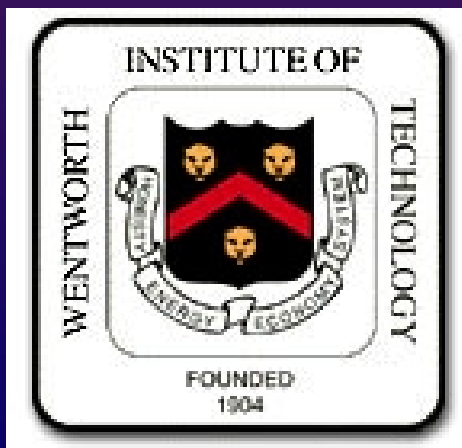
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*Civil & Construction  
Engineering*



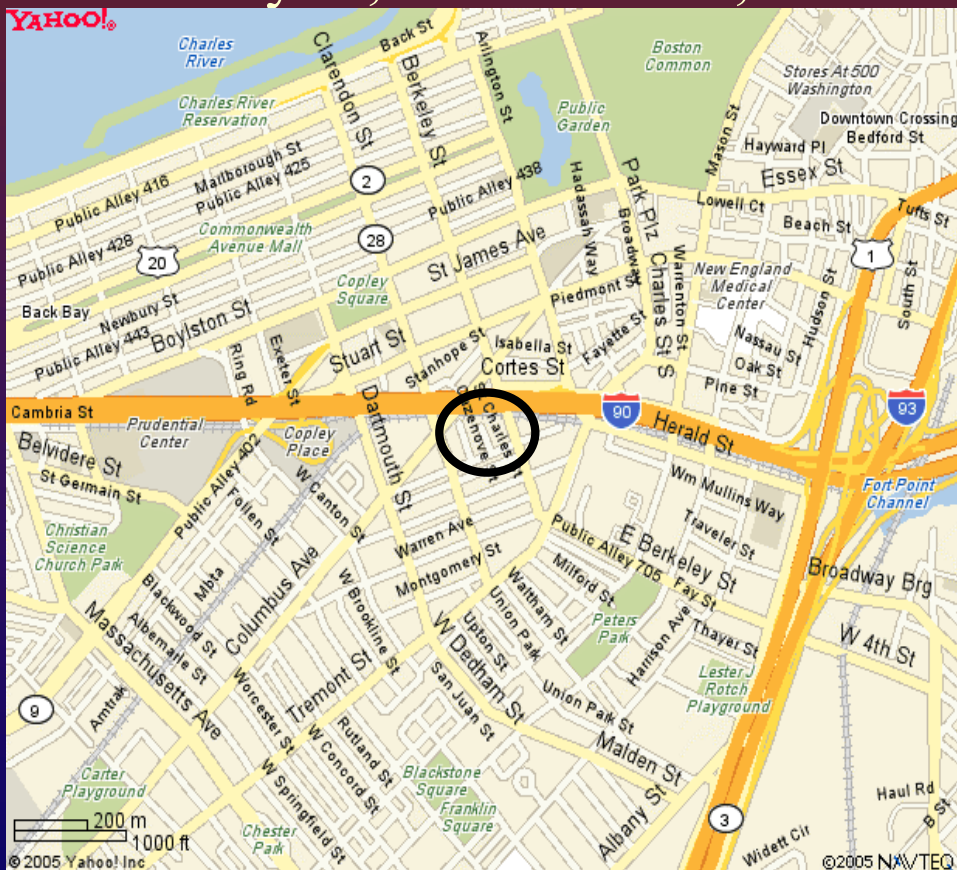
# City of Boston 1670 Shoreline outline

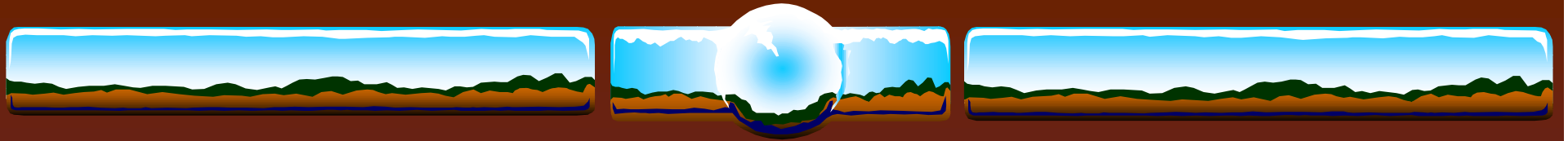


# Neighborhood Location- South End, Boston

- ❖ Next to Back Bay Station & Mass Pike
- ❖ Berkeley St, Clarendon St, and Chandler St.

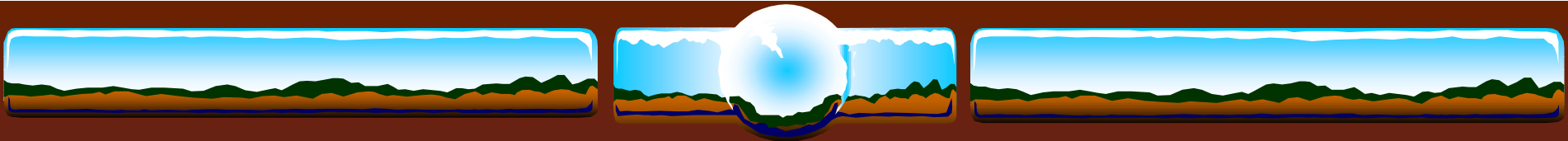
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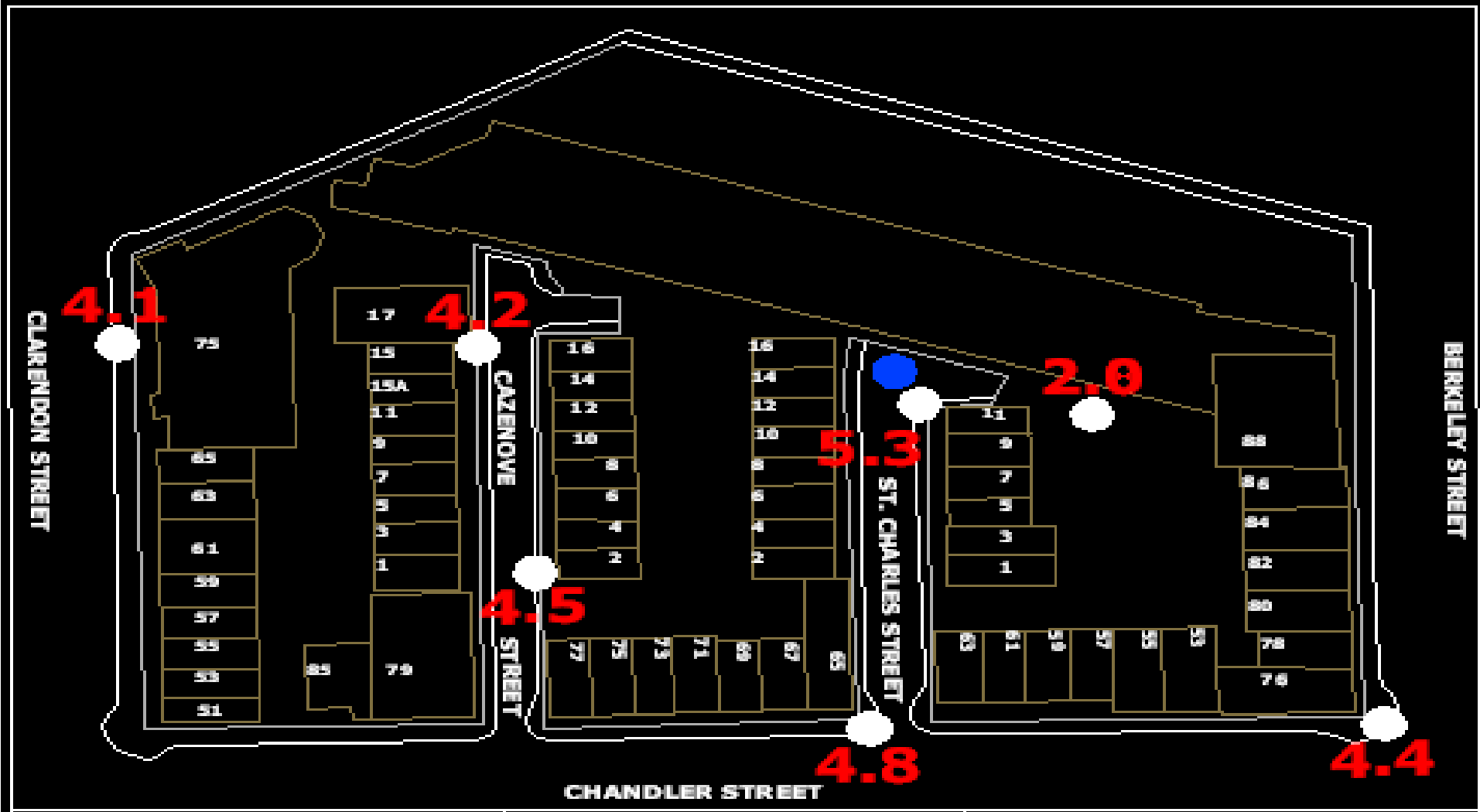


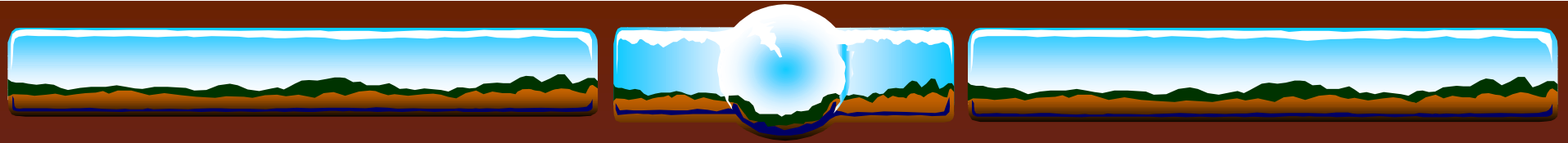
## The Problem

- ❖ Area of design project has a persistent problem of low groundwater
- ❖ A recharge system has been set at St. Charles St.
- ❖ Wood pile tops will rot if not submerged under groundwater

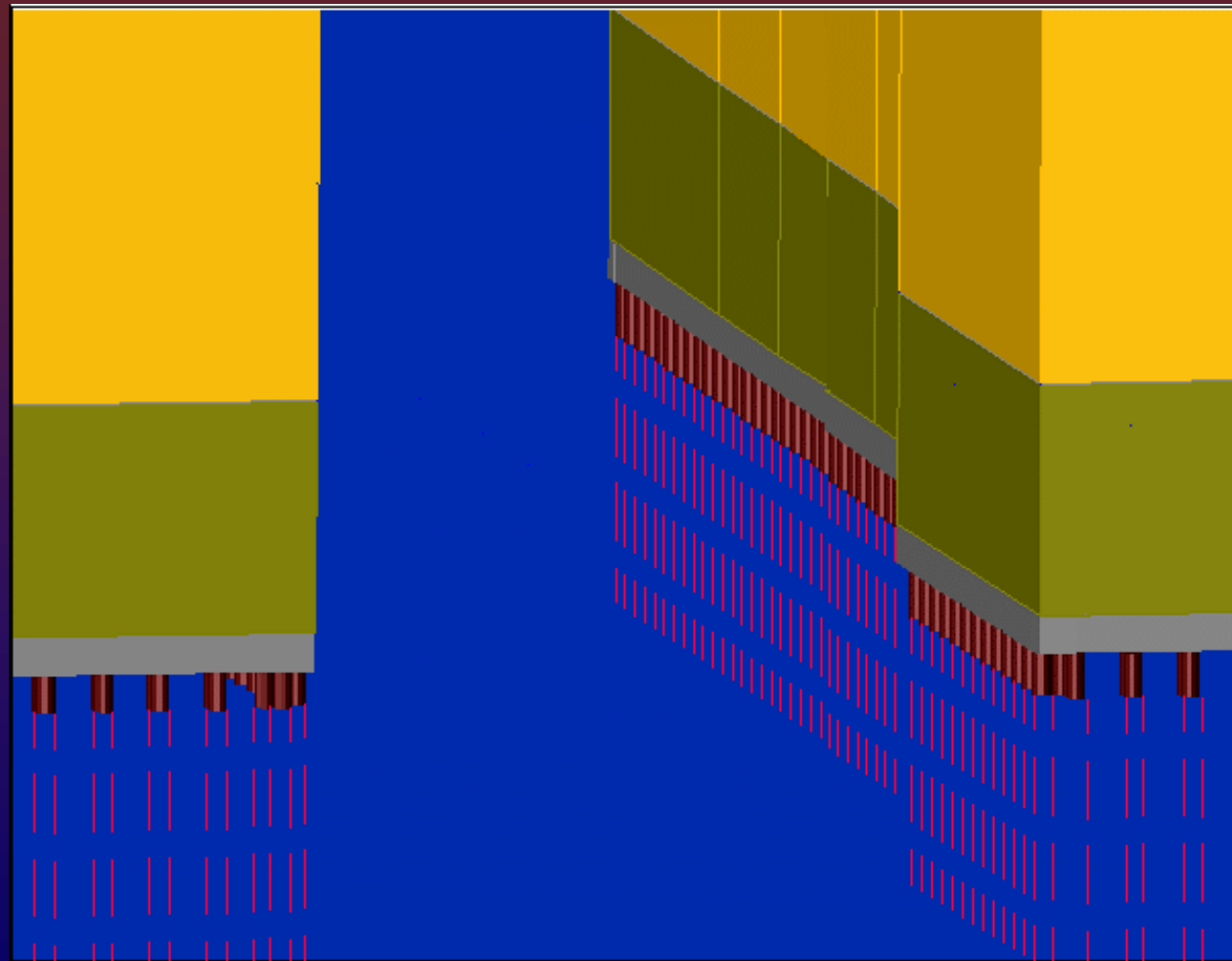


# Current Groundwater Elevations





# Exposed Piles & Low Groundwater



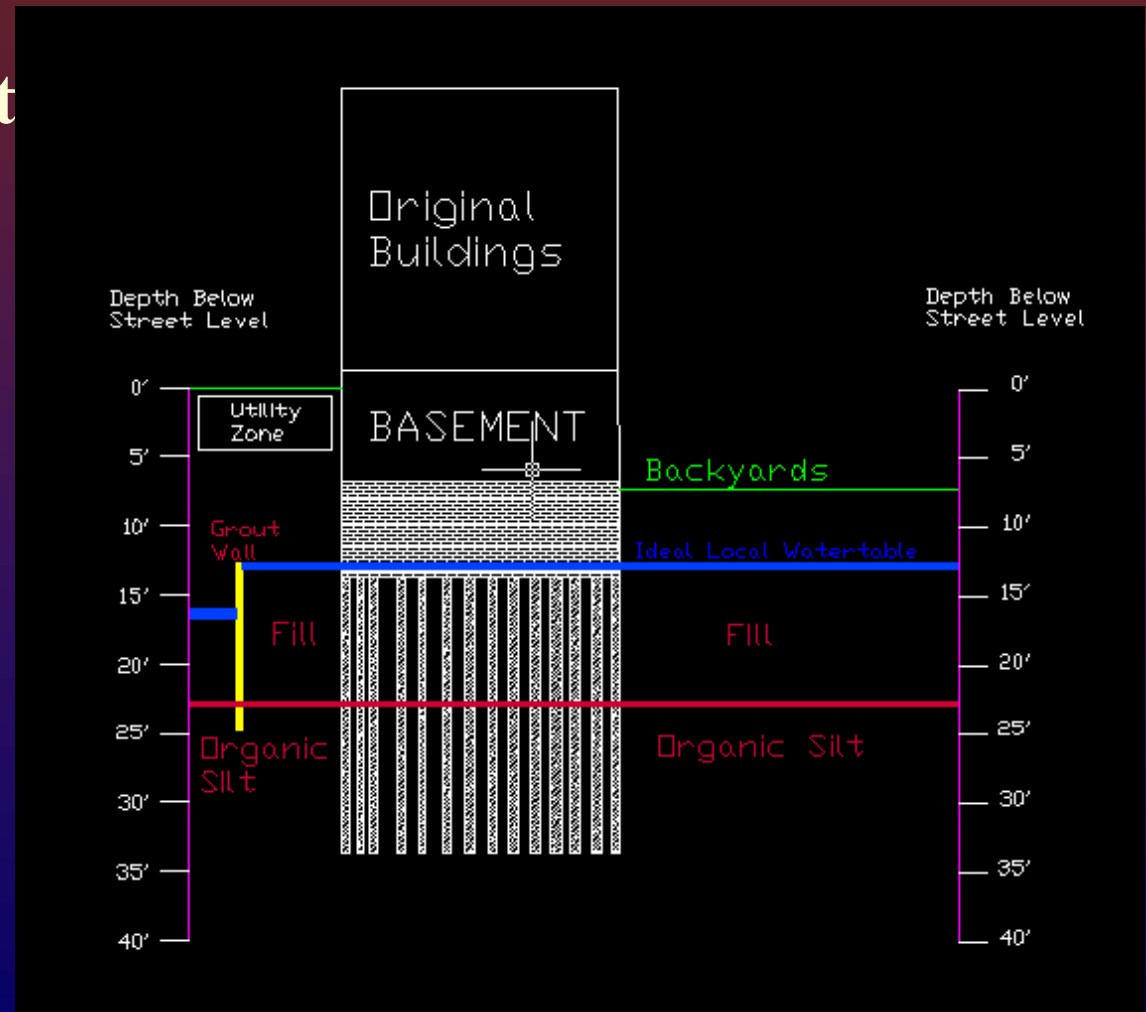


# Solutions

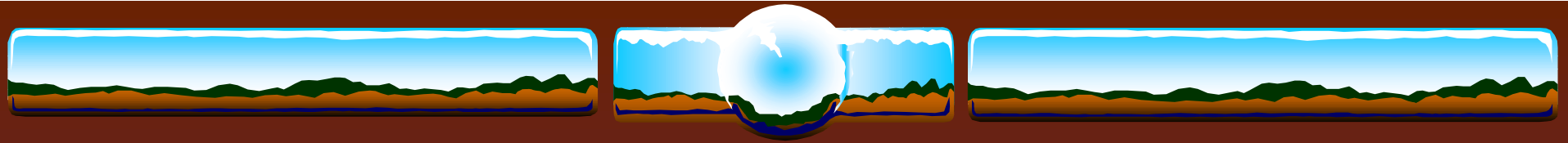
- ❖ Underpin all 55 houses within project design area  
(eventual cost \$15-20 million)
- ❖ Fix leak at MBTA/railroad structure  
(\$8-10 million not including cost of disruption to railroad traffic)
- ❖ Permanent recharge from hydrants:  
current hydrant at 6 gal /min = 3,153,600 gal/year = \$30,000/yr.
- ❖ Enclose the design area within a grout curtain creating a  
“bath tub” to retain groundwater within the curtain wall

# Typical Profile

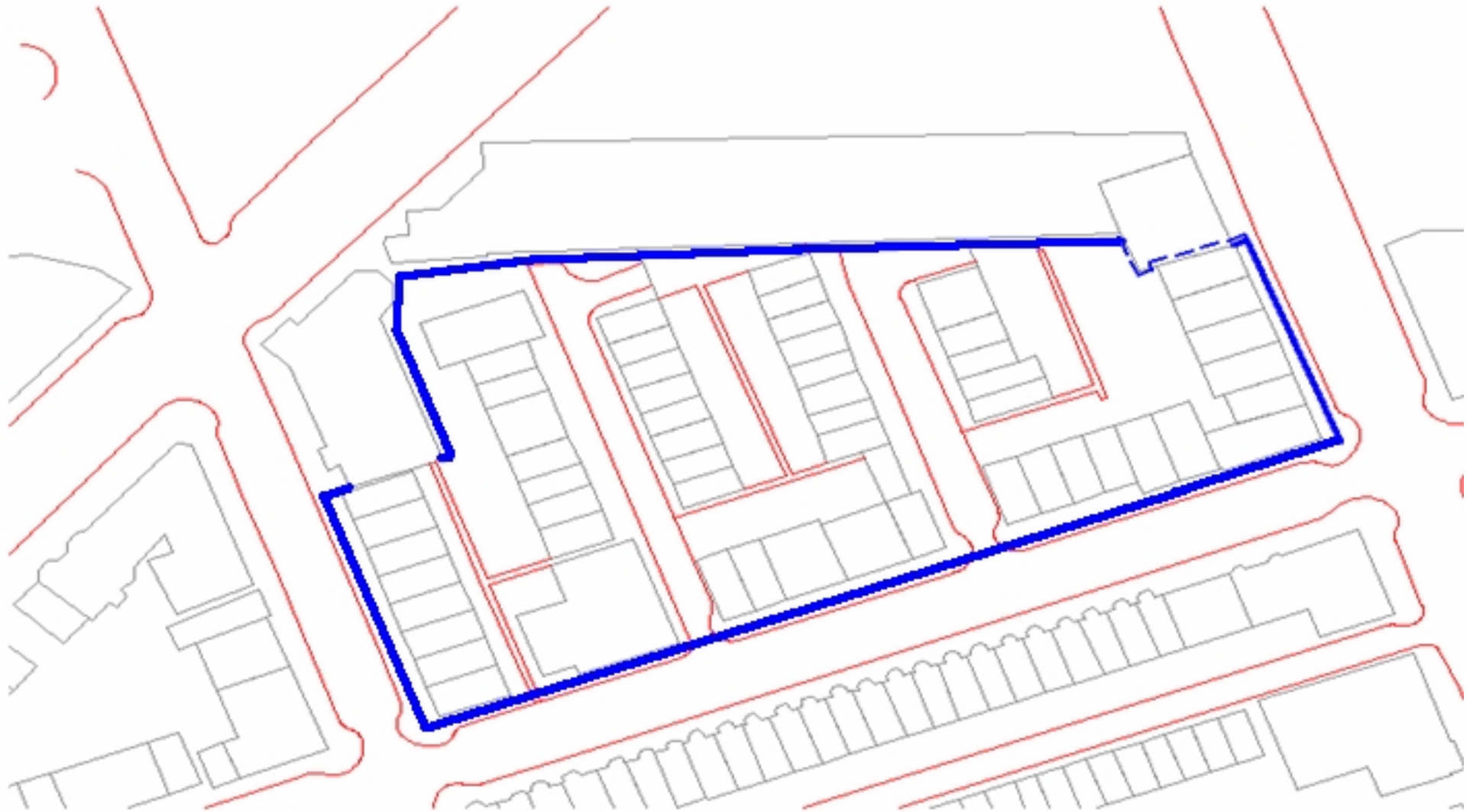
- ❖ Depths Below Street
- ❖ Basement: 6'
- ❖ Top of Piles: 14'
- ❖ Organic Silt: 22'
- ❖ Grout Wall
  - ❖ Top: 13' & 12'
  - ❖ Bottom: 25'

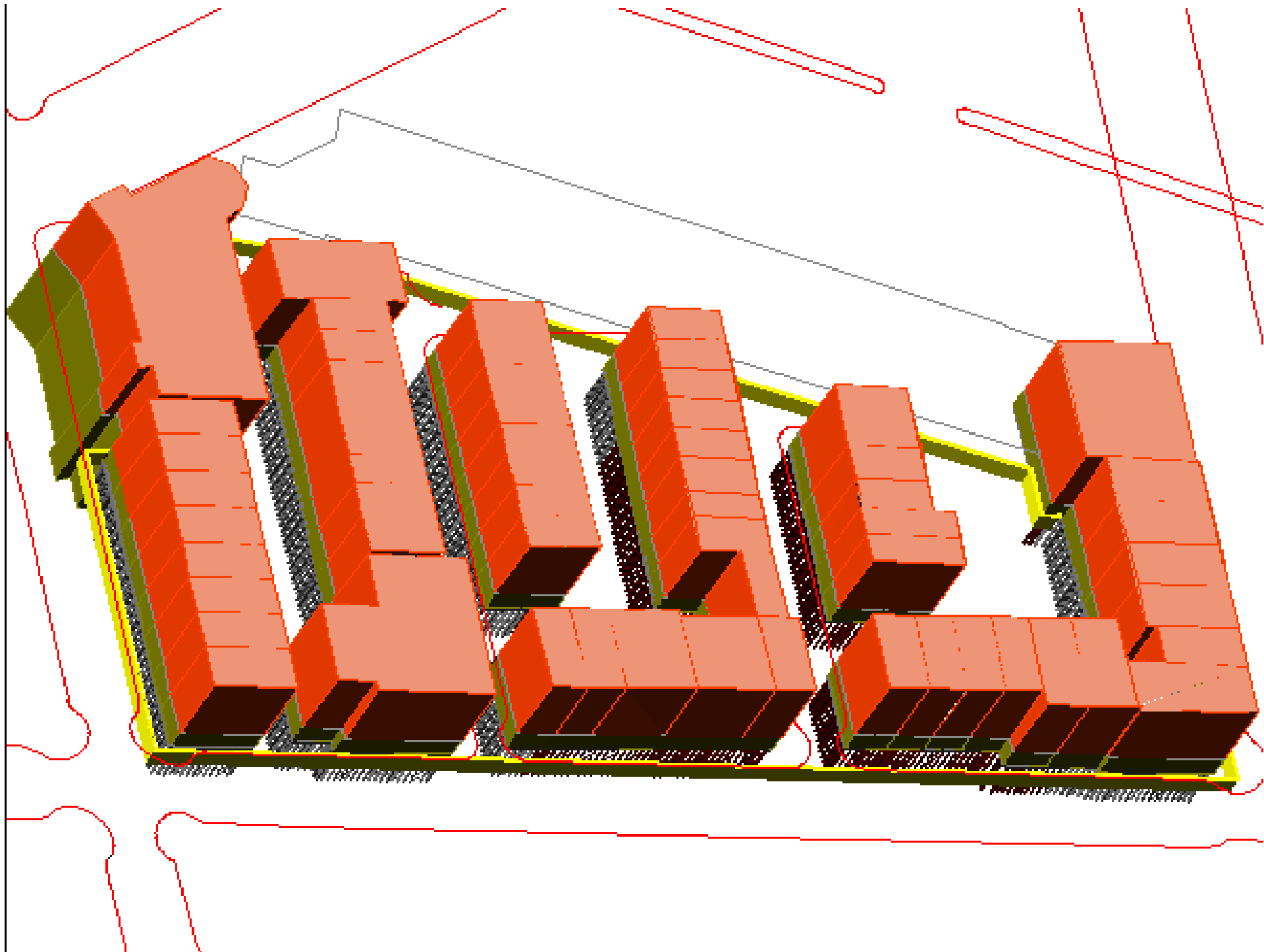


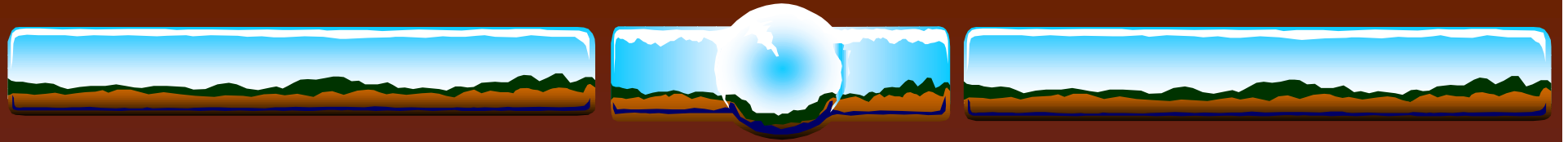




# Grout Curtain Routing





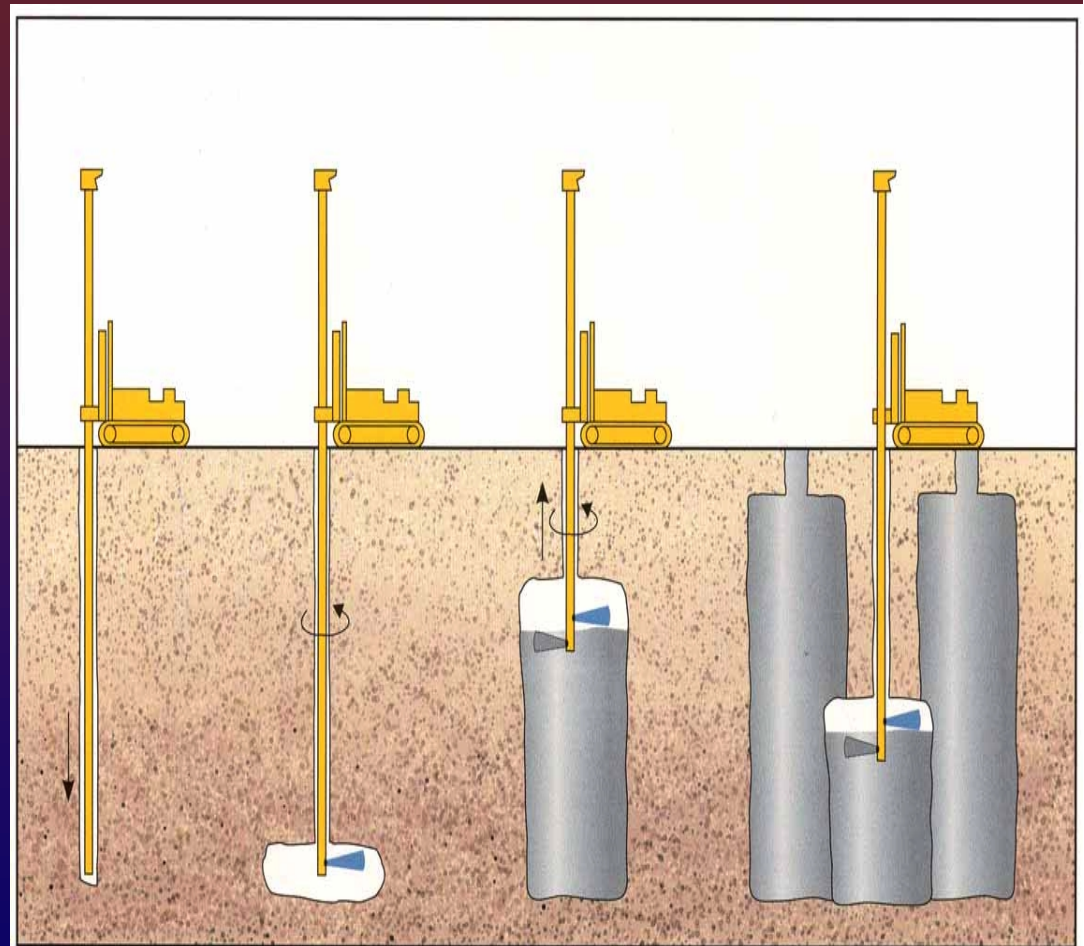


# Demonstration of Grout Curtain

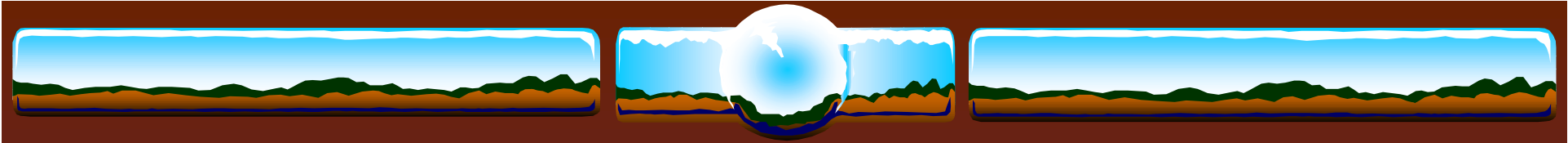
Photo courtesy of  
Hayward Baker

# Installation-Jet Grout

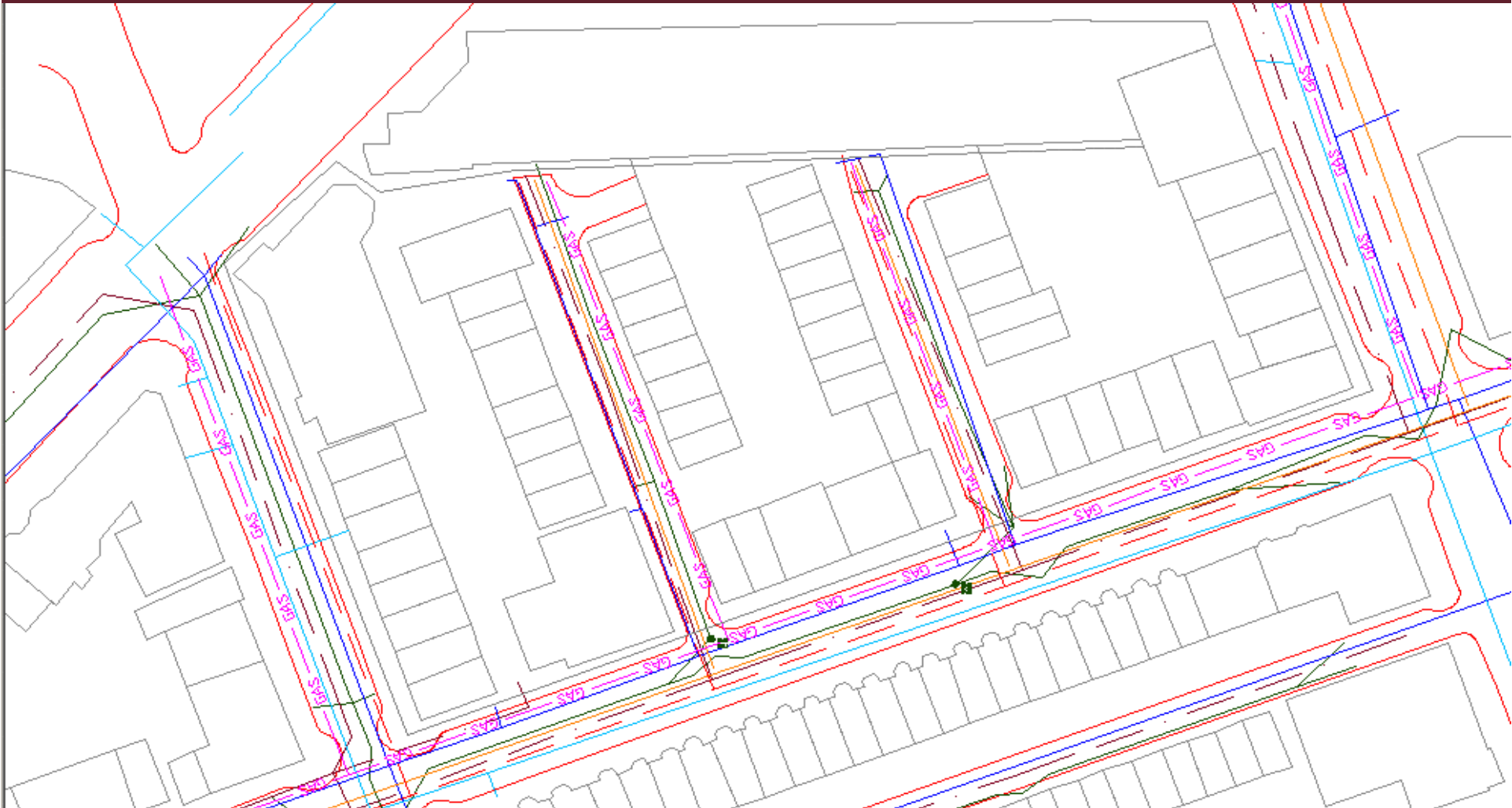
- ❖ 4" dia. installation holes drilled to desired bottom elevation every 4' +/-
- ❖ Curtain started @ desired depth
- ❖ Curtain is formed up to desired top elev.
- ❖ Wall sections installed incrementally

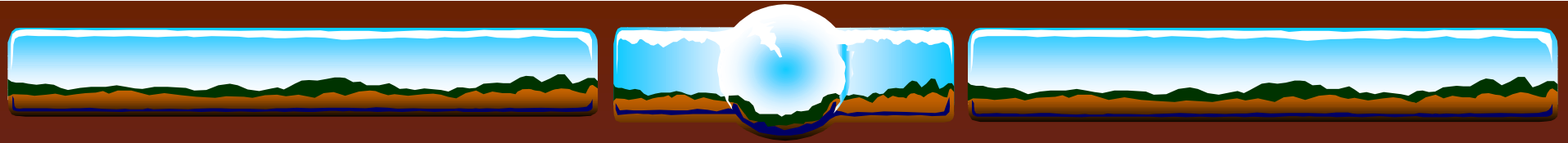


Hayward Baker

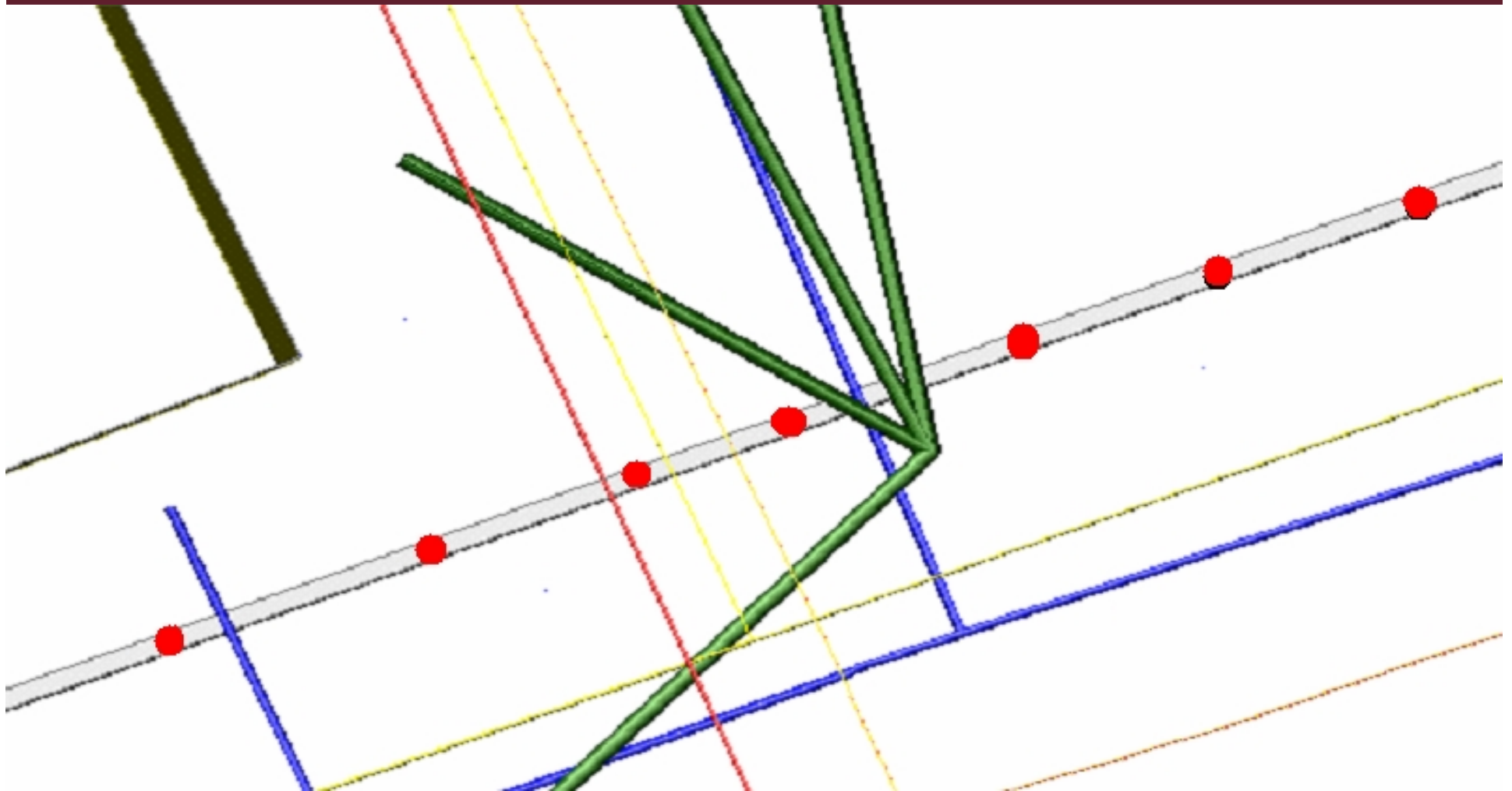


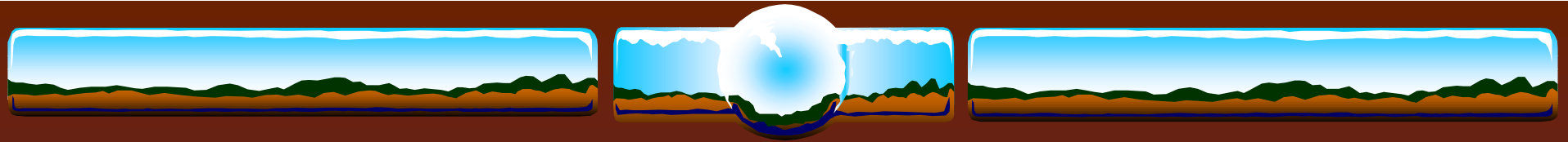
# Main Utilities



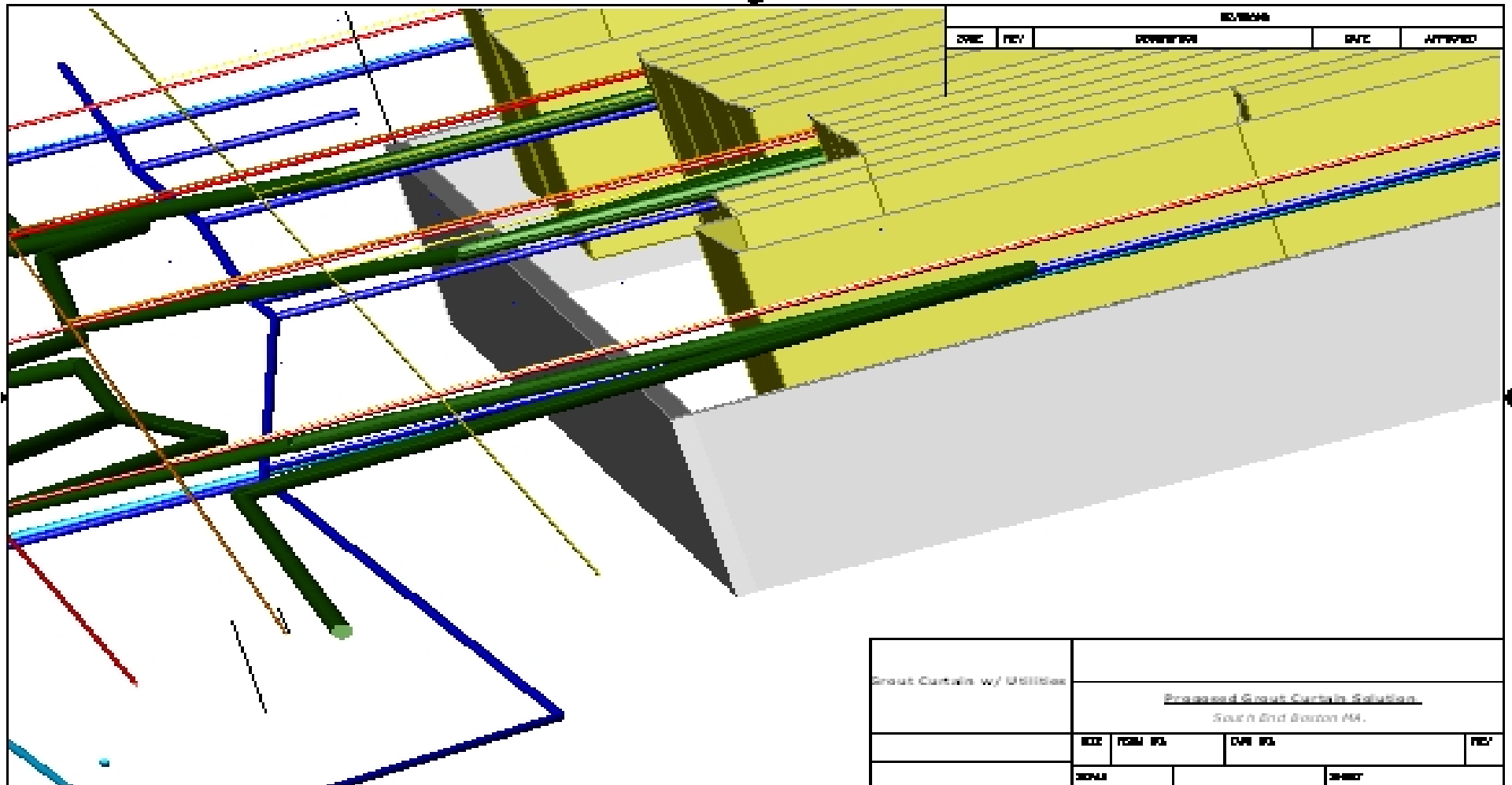


# Grout Curtain w/ Utilities



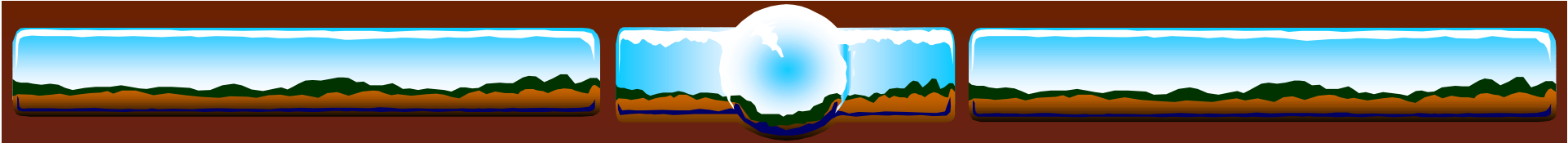


# Grout Curtain Under Utilities

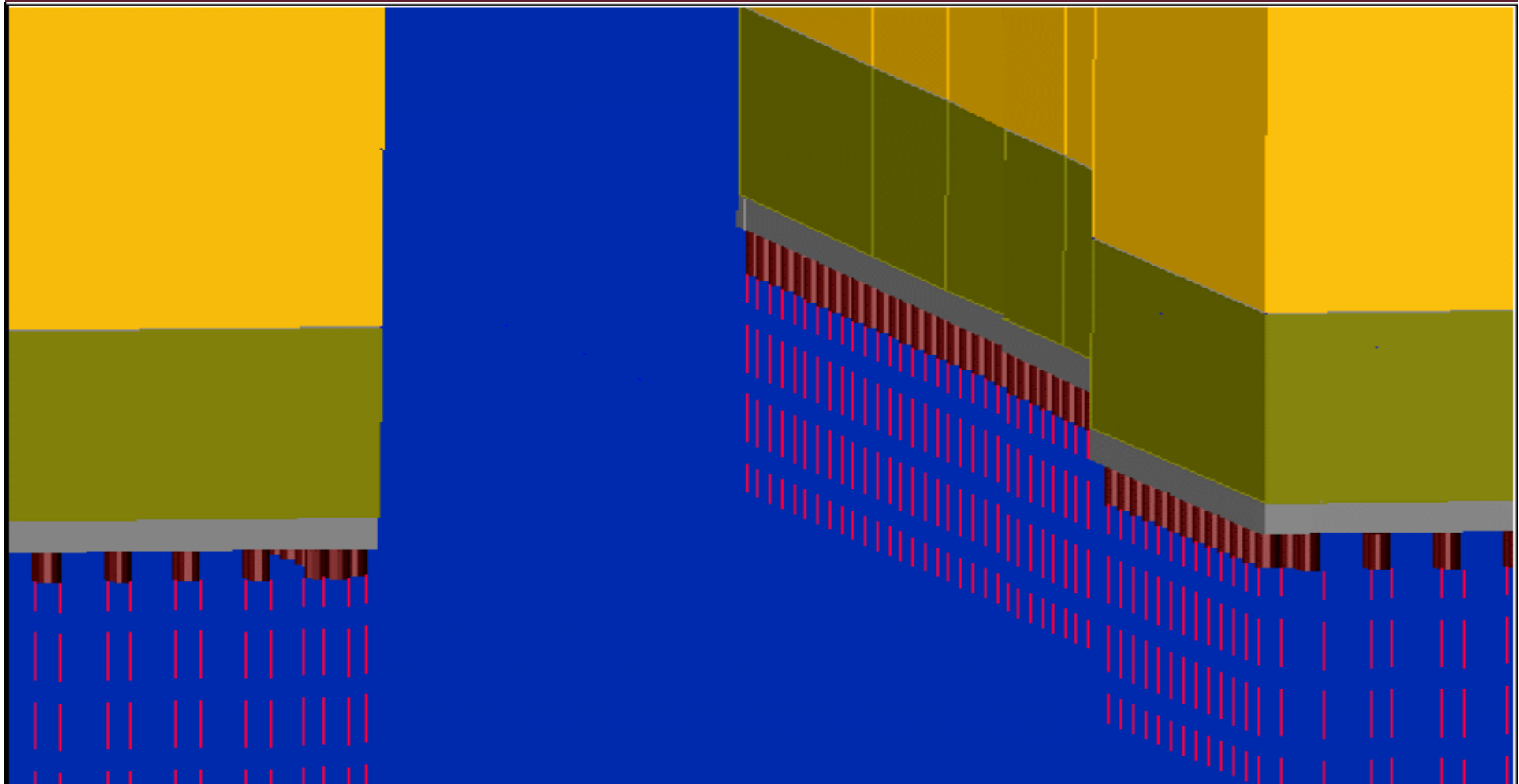


| REVISION |     |           |      |          |
|----------|-----|-----------|------|----------|
| DATE     | REV | POWER PPL | DATE | APPROVED |

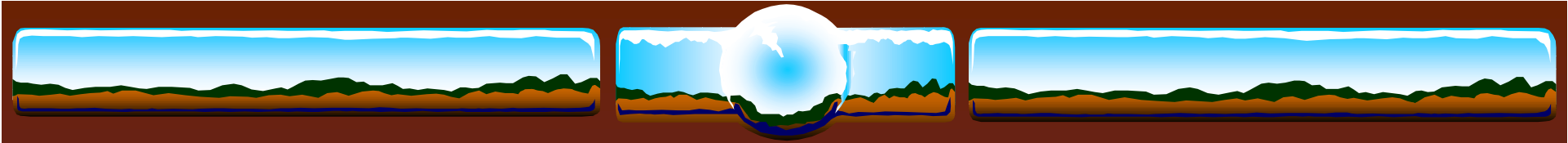
|                            |   |          |         |         |
|----------------------------|---|----------|---------|---------|
| Grout Curtain w/ Utilities | Proposed Grout Curtain Solution<br>South End Boston MA. |          |         |         |
|                            | REV   | FORM PPL | CUR PPL | REV     |
|                            | 3/20/11   |          |         | 3/20/11 |



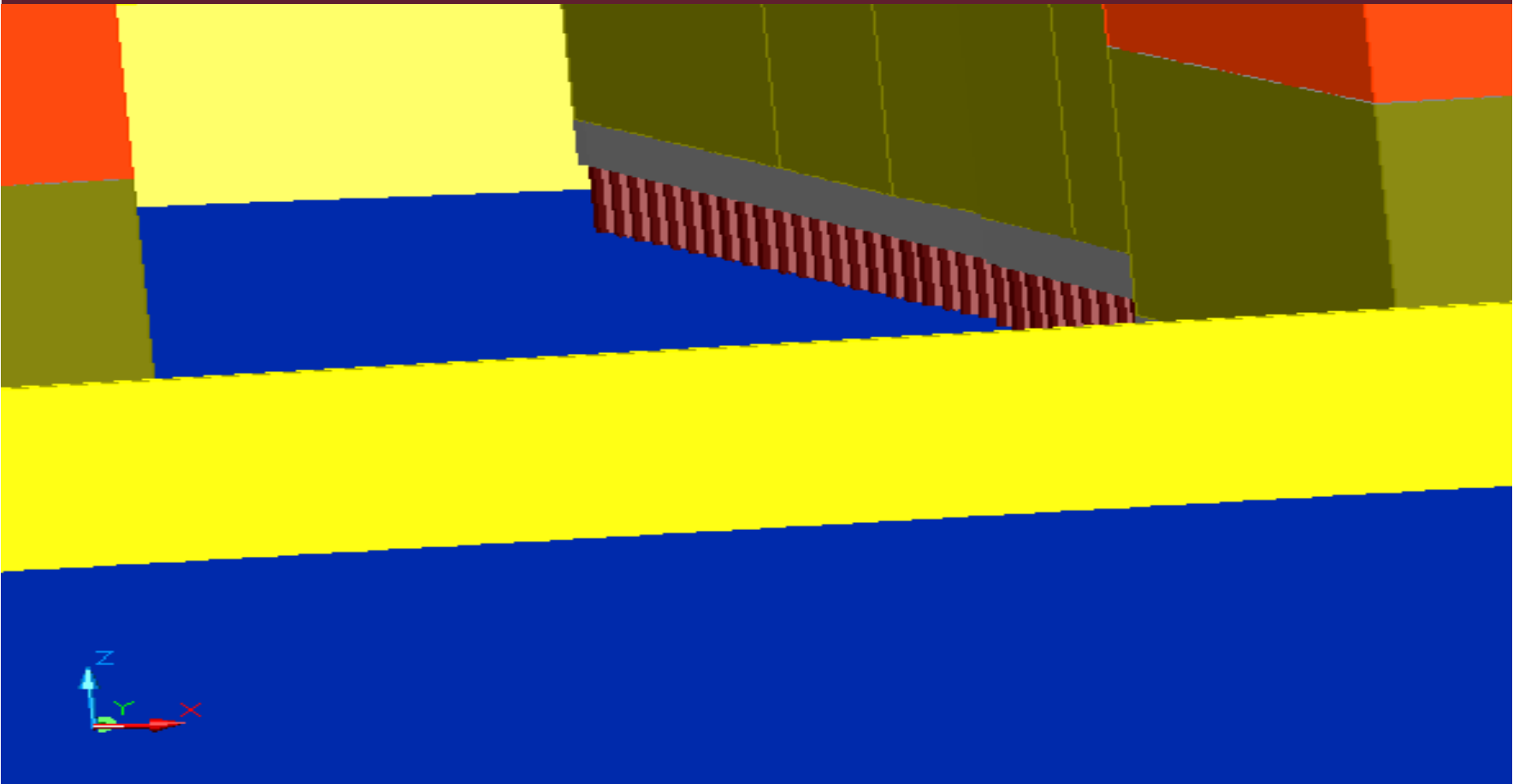
# Today - Exposed Piles

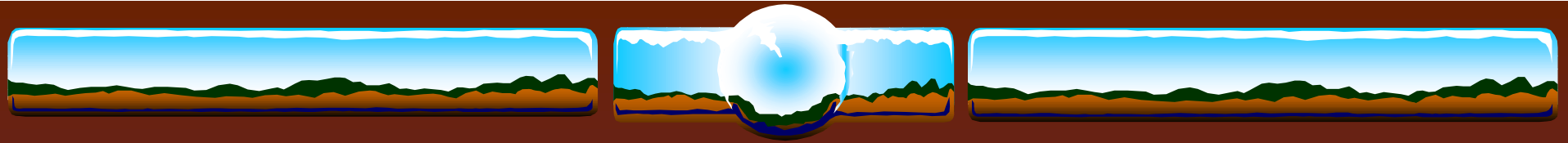




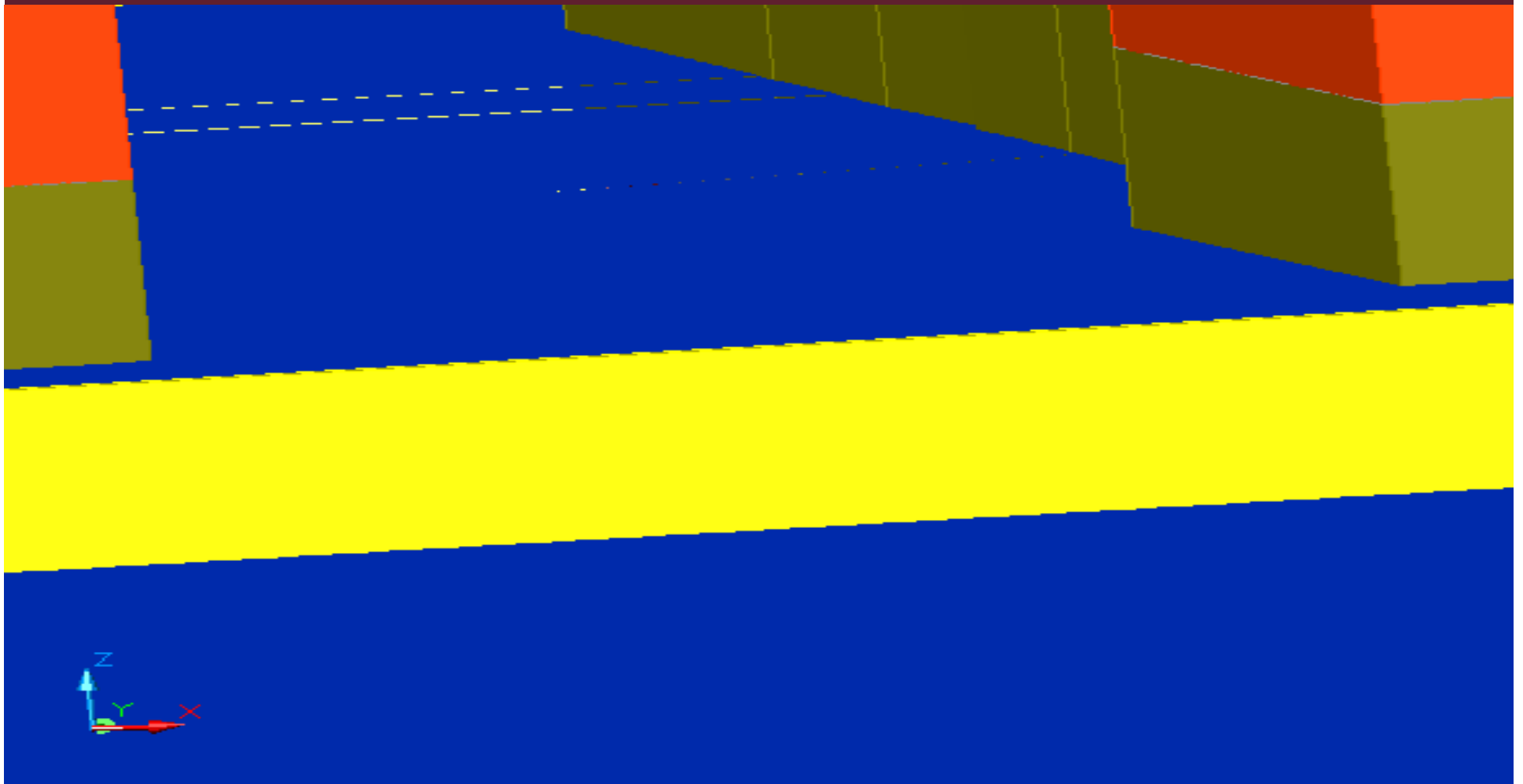


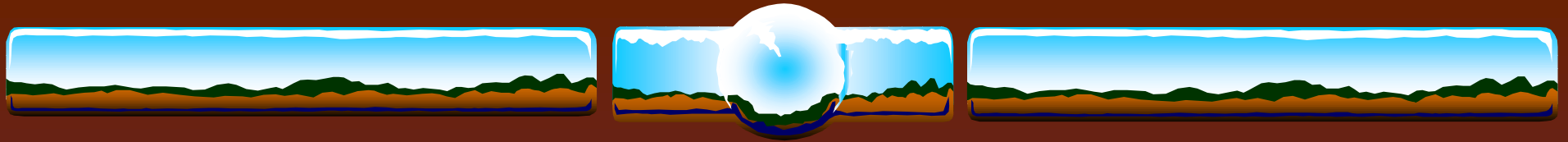
# Install Grout Curtain





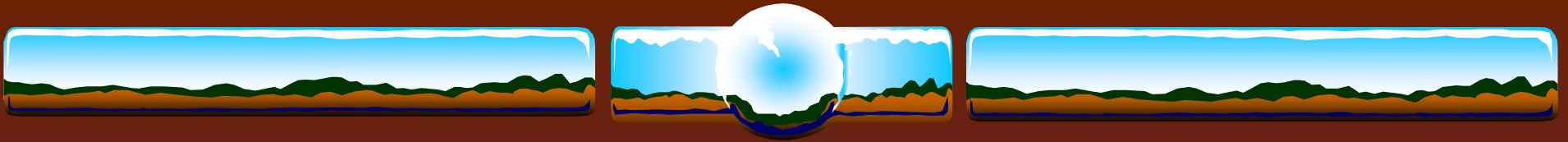
# Raised Groundwater Submerges Piles





## Advantages of Grout Curtain

- ❖ Cost effective solution
- ❖ Structures within walls of curtain unaffected by groundwater level drops outside of walls
- ❖ Sidewalk readily restored to existing conditions
- ❖ Small machine used to place grout curtain
- ❖ Grout curtain will be placed on public property
- ❖ Unaffected by future sidewalk / utility reconstruction
- ❖ No future maintenance



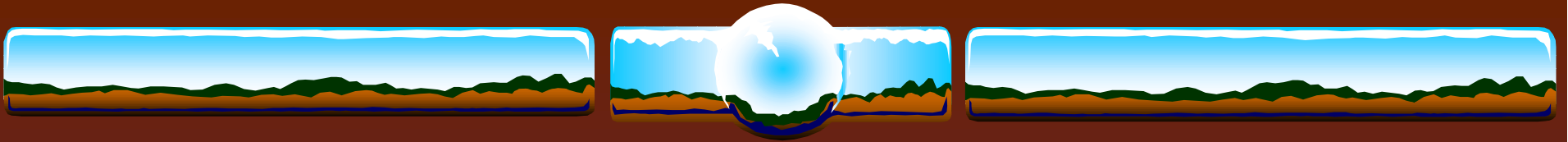
## Disadvantages to Grout Curtain

- ❖ Once installed, no disadvantages
- ❖ During construction-small local messes, cleaned daily
- ❖ General construction inconveniences (blocked sidewalks, operating noise from installation rig)
- ❖ Daytime parking within path of installation may be affected (overnight parking, generally available)



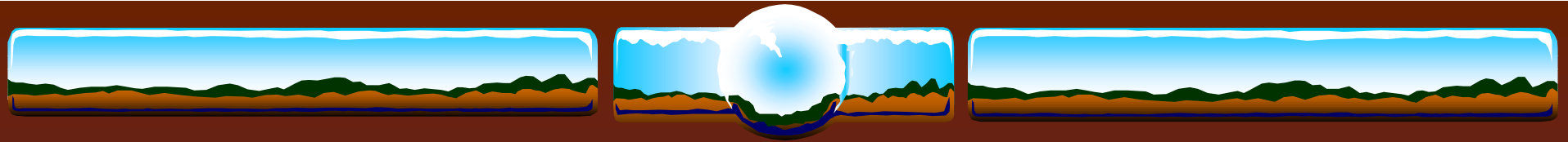
# Cost Estimate

|   |  |                 |
|---|--|-----------------|
| Design engineering                          |  | \$250,000       |
| Test pits, etc.                             |  | \$125,000       |
| Jet grout wall:                             | Mobilization/<br>De-mobilization             | \$20,000        |
| 18,500 ft <sup>2</sup> of wall              | \$60/ ft <sup>2</sup> (Hayward Baker)        | \$1,110,000     |
|   | 25% Contingency                              | \$277,500       |
|   | Police detail, permits,<br>utility clearance | Allow \$200,000 |
|   | Total jet grout                              | \$1,607,500     |
| Surface reconstruction (if required by DPW) |  | ?               |
| Total estimated cost                        |  | \$1,982,500     |



## Time to Install

|                     |            |
|---------------------|------------|
| Site Preparation    | 1 month    |
| Jet Grouting        | 2-3 months |
| Surface Restoration | 1-2 months |
| Total               | 6-8 months |



## Summary

- ❖ Grout curtain:
  - ❖ Cost effective, relatively non-intrusive, and rapidly constructed
  - ❖ Zero maintenance cost
  - ❖ Neighborhood appearance unaffected
  - ❖ Eliminates need for future recharge systems