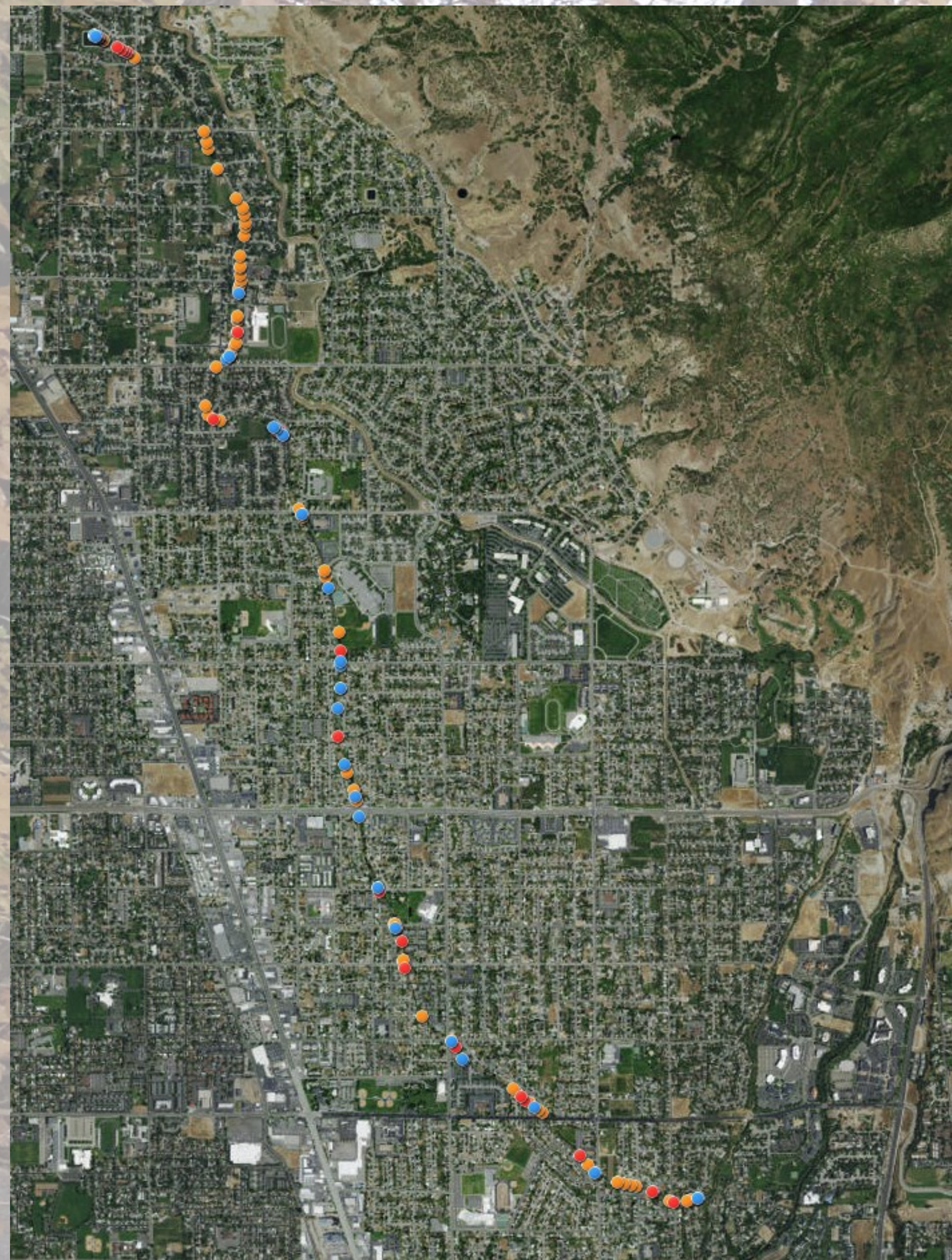


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North Union Canal Feasibility Study



Canal segment is 3.7 miles in length



Siphon structure crossing under Orem Center Street



Block Faulting and erosion undermining canal lining



Debris clogging canal and decaying bridging structure



Overgrown easement encroaching on canal



Severe canal damage in expansive clay soil with temporary fix

**Situation**

Beginning at Palisade Drive in Orem, and running 3.7 miles through Orem, Pleasant Grove, and Lindon, the North Union Canal is operated by landowners in the area from the beginning of April to the end of October. Flow levels generally run about 15-30 cfs. The canal was originally constructed between 1852 and 1864, and was lined with concrete sometime in the 1940's and 50's. Water from the canal currently irrigates about 4000 acres, and when it reaches Lindon, it is fed into the city's pressurized irrigation system.

**Problem**

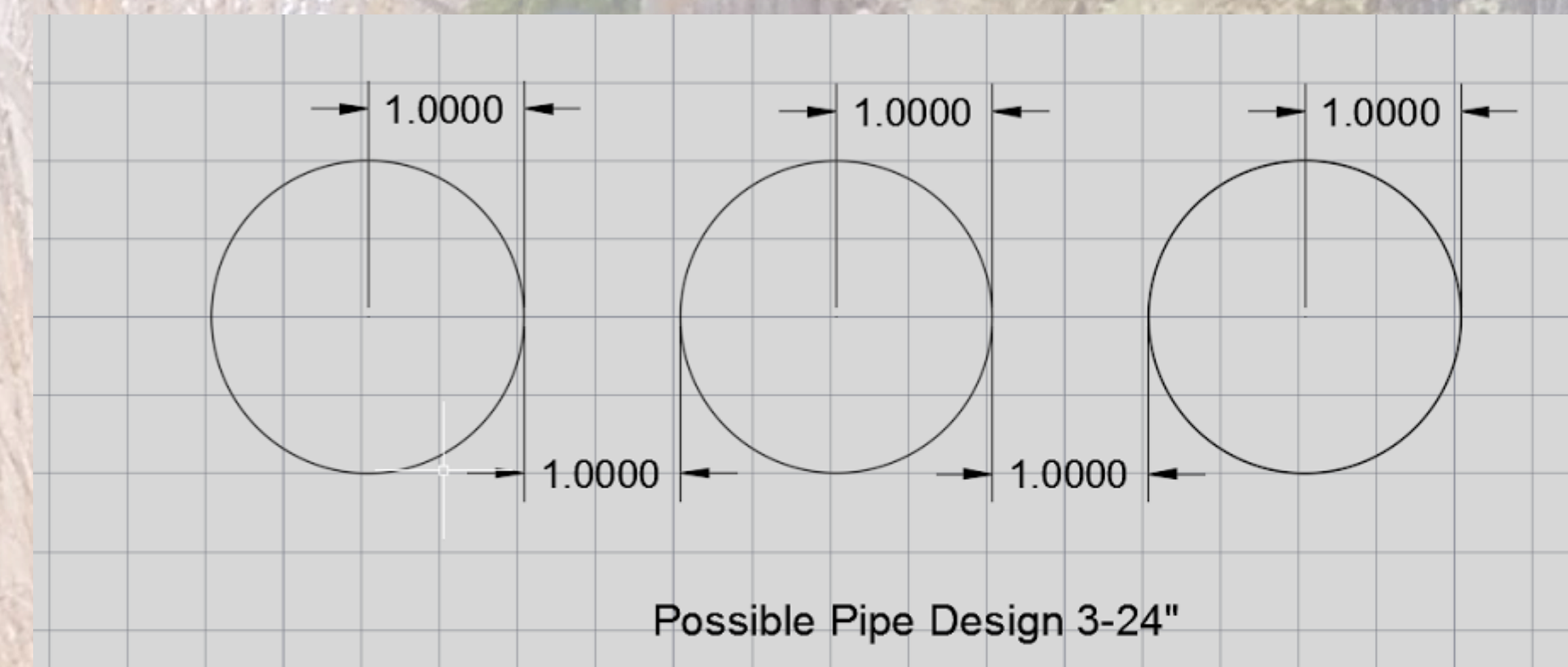
The canal runs through several areas of expansive clays, which have caused significant damage to the concrete lining many times over the last 60 years. Cracking of the lining allows water to escape and further feed the problem with expansive soils, leak into nearby basements, and potentially cause slope stability problems. The current water losses have been measured at over 90%. As an open-top canal, it suffers significant losses due to evaporation, there is a vulnerability to water theft from homes and property lining the canal easement, and there are frequent instances of canal structures being jammed and clogged by illegal dumping of yard waste and trash. Most troubling is the risk to life that the canal presents due to its being an attractive nuisance. Bodies of water are a magnet for the curious, particularly during hot summer months, and the risk of even strong swimmers drowning due to rapidly moving water and various hydraulic structures can be high.

**Solution**

The canal runs through several areas of expansive clays, which have caused significant damage to the concrete lining many times over the last 60 years. Cracking of the lining allows water to escape and further feed the problem with expansive soils, leak into nearby basements, and potentially cause slope stability problems. As an open-top canal, it also suffers significant losses due to evaporation, and there is a vulnerability to water theft from homes and property lining the canal easement. Most troubling is the risk to life that the canal presents due to its being an attractive nuisance. Bodies of water are a magnet for the curious, particularly during hot summer months, and the risk of even strong swimmers drowning due to rapidly moving water and various hydraulic structures can be high.

**Alternative Plans**

There are many plausible alternative solutions to this issue. One is the demolition of the concrete canal and the installation of precast concrete pipes. Alternatively, a box culvert could be installed after demolition of the canal.

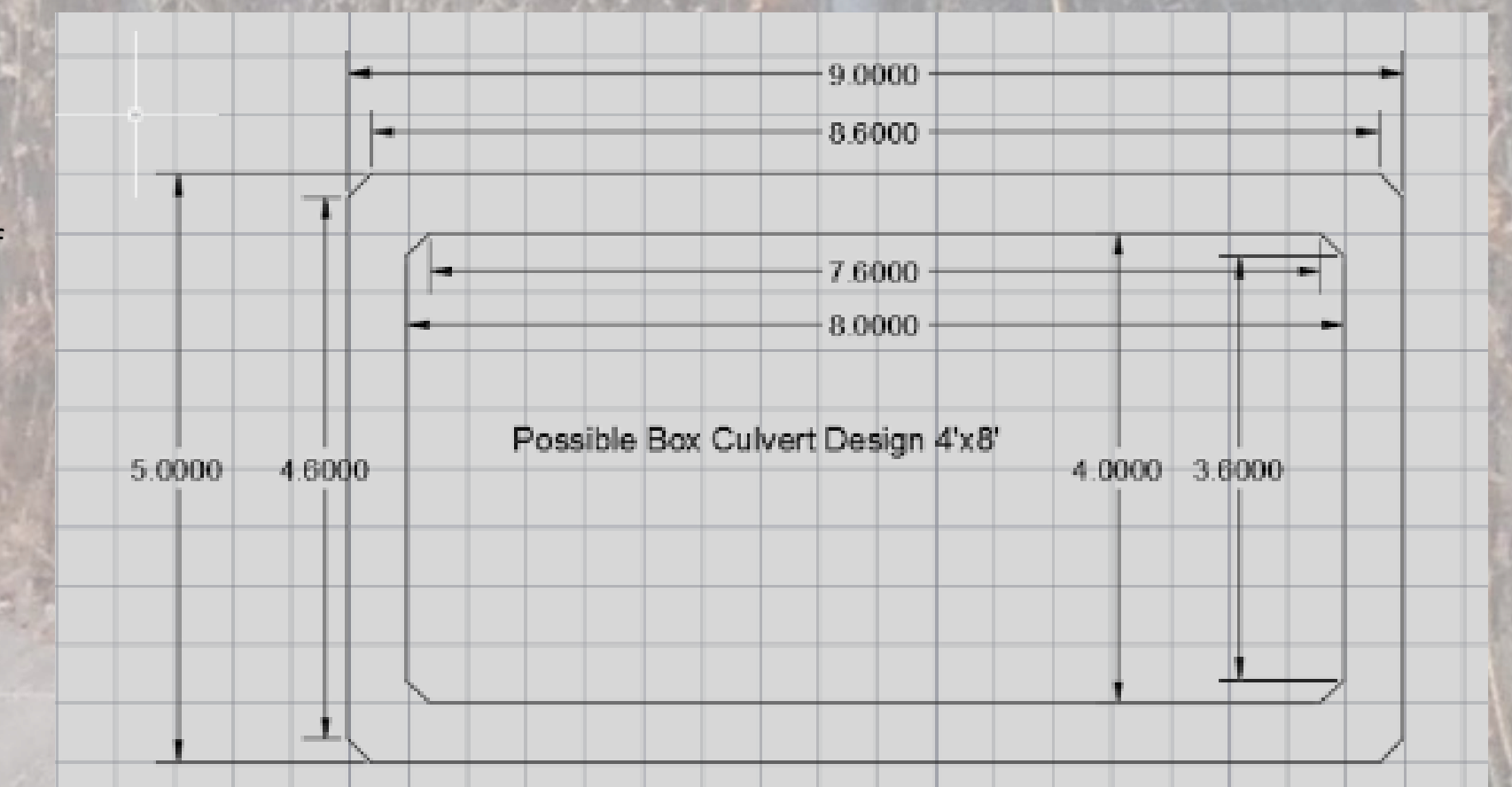


**Concrete Pipe**

Piping the canal is estimated to have an upfront cost of \$3,125,760. Piping is desirable for safety reasons and decreased losses to evaporation and seepage, reducing from 90% losses to around 0.5%. Piping also allows for creation of a trail along the canal. A downside to piping is severely decreased access, complicating future maintenance.

**Box Culvert**

The box culvert is estimated to have an upfront cost of \$2,910,864. Improved safety, elimination of evaporation and seepage, and the possibility of creating a trail make a box culvert desirable. Reducing losses from the current 90% to approximately 0.85%. Additionally, though access is decreased from an open canal, access is superior than that offered by a pipe.



**Cost Estimates of Plans**

The cost estimates of the alternatives is shown in the table below. Costs are based on estimates from Geneva Precast and Harper Precast.

Method of Transport	Cross Section Area (ft <sup>2</sup> )	Cost for Canal Demolition (\$)	Cost of Change (\$/ft)	Cost for Canal Replacement (\$/ft)	Cost for Total (3.7 mile) Canal Replacement (\$/ft)
Repair Canal	40.6	~70	~80	\$150.00	\$2,930,400.00
3-24" Round Pipe	9.42	~70	120	\$160.00 <sup>2</sup>	\$3,125,760.00
4'x8' Box Culvert	32	~70	120	\$149.00 <sup>3</sup>	\$2,910,864.00

**Benefit to community**

Besides the improved safety and efficiency of a replaced canal, use of a pipe or box culvert allows for the creation of a valuable recreational area. "Danger, Keep out" signs ought to cover the canal area as it now stands, but with investment, the canal were piped or enclosed in a box culvert, the easement of the canal could be topped with a multi-use trail for use by the community.

Creation of a trail also may help to defray costs of the project, as federal and state grants for trails may be available.