

# CLIMATE CHRONOGRAPH

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*“Climate Chronograph is a new form of memorialization  
that commemorates the aftermath of the present.”*

Edward T. Linenthal  
Professor of History, Indiana University





# OVERVIEW

Impermanance, Decay, Permanance, Decay





*Figure 1.1 Nilometer dome interior, Rhoda Island, Cairo, Egypt (Bill Hocker Photographs)*



*Figure 1.2 Nilometer basin interior, Rhoda Island, Cairo, Egypt (Berthold Werner)*

The ancient Egyptian Nilometer was both a temple to the sacred indeterminacy of water and a meter for predicting seasonal flood potentials of the Nile River. Reading the Nilometer was a sacred act, imminently tied to state security, and was accordingly reserved for the priestly classes. Ancient Egyptian society’s budgets and taxes were set as a function of the Nilometer’s reading of the annual flood, and the resulting predictions of the state’s impending agricultural fate.<sup>1</sup> Fig 1.4 illustrates how the prosperity of the kingdom hinged upon a few cubits of river height: a mere 18 inches could mean the difference between famine, abundance, or disaster.



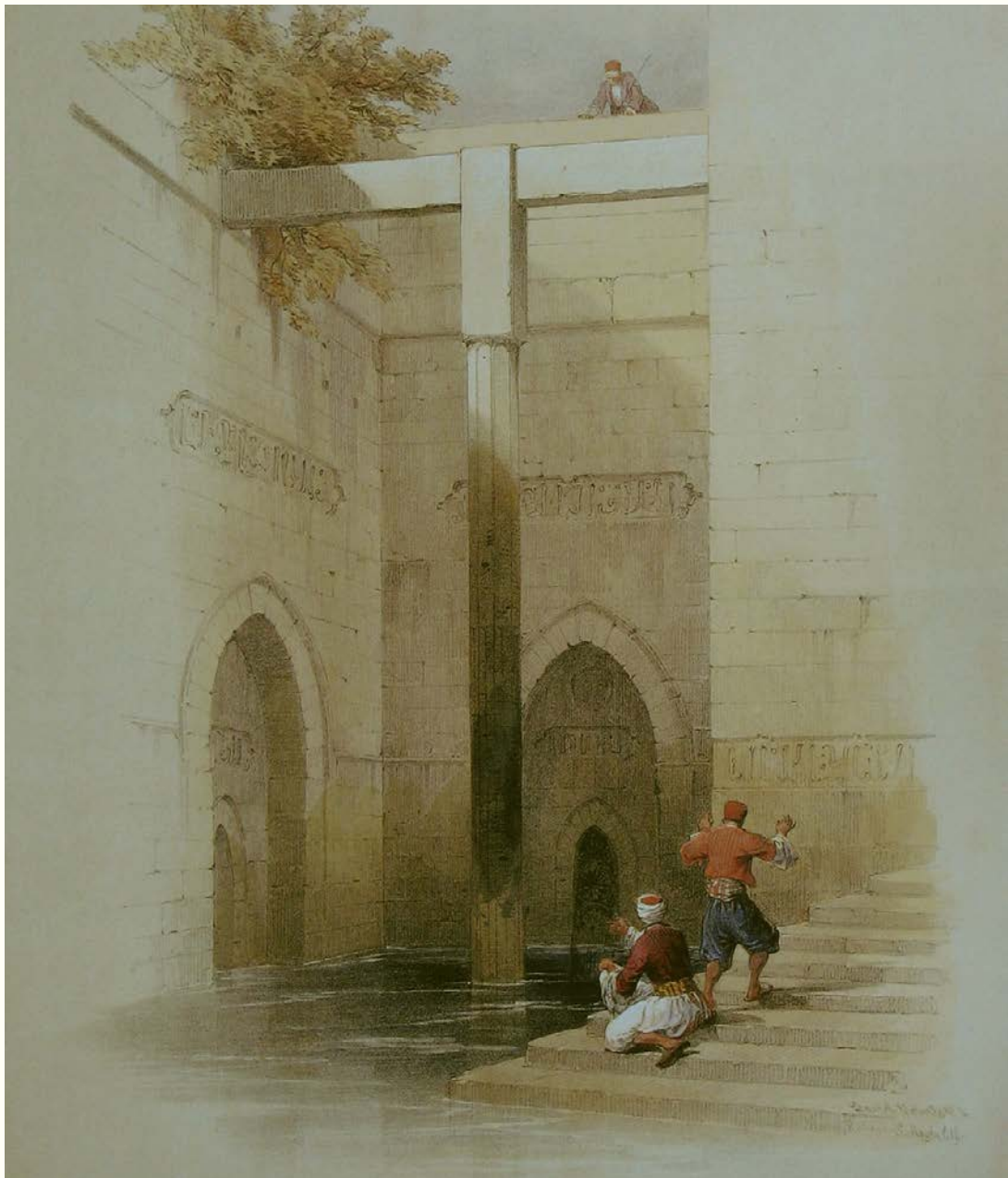


Figure 1.3 View of the Nilometer on the Isle of Rhoda, Cairo, 1838. (David Roberts)

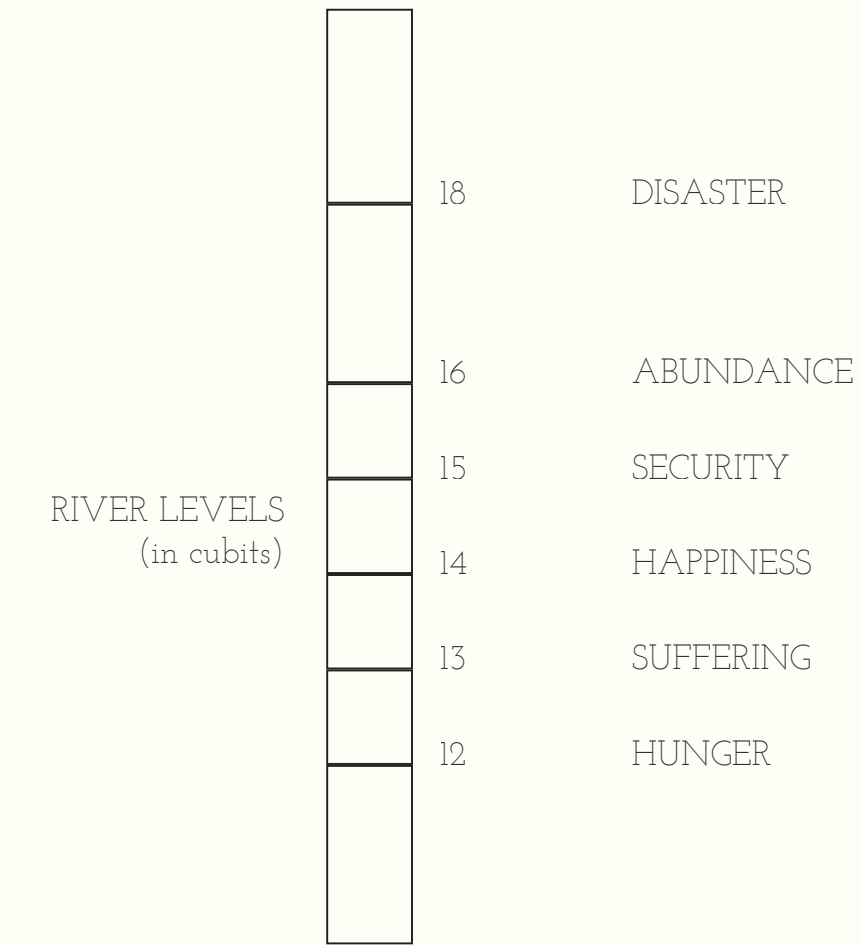


Figure 1.4 A scale of cubits inscribed on the Rhoda Nilometer's central column, showing how small the difference between suffering and security could be.



Figure 1.5 Satellite image of Aswan High Dam dividing the Nile from the Lake Nasser. (NASA Earth Observatory)

Annual flooding of the Nile gave shape to Egyptian life for millenia, but in the late 19th century, the Aswan Dam was built upstream of the agricultural floodplain to regulate the rivers water levels, and reduce its ability to bring feast or famine each year.<sup>ii</sup> Though potent in memory, the cultural and spiritual dimensions of water have accordingly receded.





*From top left, counter-clockwise.*

*Figure 1.6 Superstorm Sandy floods greater New York coastal community (U.S. Air Force photo by Master Sgt. Mark C. Olsen)*

*Figure 1.7 An Ambulance drives through flooded street in Hoboken, New Jersey after Superstorm Sandy. (Flickr, accarrino)*

*Figure 1.8 Superstorm Sandy destruction at Casino Pier in Seaside Heights, New Jersey (U.S. Air Force photo by Master Sgt. Mark C. Olsen)*



Climate change now challenges modernity's assumed control over natural forces and leaves us with a legitimacy crisis in which the old order is no longer adequate for our protection. Superstorms Sandy and Katrina both are indicators for a continued present in which natural events increasingly damage our shared built and natural environments.





*Figure 1.9 Coast Guardsmen rescue stranded residents in severe flooding around Baton Rouge, Louisiana on August 14, 2016. (Coast Guard photo by Petty Officer 3rd Class Brandon Giles)*

While natural disruption hits indiscriminately, recovery resources are often allocated disproportionately. Displacement from storms and floods further strains systemic marginalization of low-income populations. Swelling demand on federal aid often polarizes individuals and communities seeking allied ends of relief and resiliency. Debates over equitable distribution of resources are likely to intensify with increased climate-related disasters. <sup>iii + iv</sup>





Figure 1.10 The New York Times Magazine features Chesapeake Bay's Tangier Island as the United State's first potential community of climate refugees to receive federal funding for relocation. (New York Times Magazine)

A slowly accelerating national crisis, sea-level rise delivers headlines and high tides that approach more and more front doors. Past investments are weighed against future ones, and permanence and control is challenged.



A black and white aerial photograph showing a large area of land, identified as Hains Point in East Potomac Park, completely inundated with floodwater. The water is calm, reflecting the sky. Numerous trees are scattered across the flooded area, their trunks standing like sentinels in the water. In the center of the flooded area, a small, light-colored building with a flat roof and several windows is partially submerged. To the right, a long, narrow strip of land, possibly a path or a small bridge, extends into the water, lined with trees. In the background, the city of Washington, D.C., is visible, including the tall, thin Washington Monument and various government buildings. The overall scene depicts a significant natural disaster affecting a major urban park.

# SITE Hains Point, East Potomac Park

*Aerial view of flooding on Hains Point, 1985 (Library Of Congress)*





Figure 2.1 The 1792 L'Enfant Plan for Washington, D.C. before construction of East and West Potomac Parks. Current location of Hains Point highlighted. (Image property of Library of Congress)

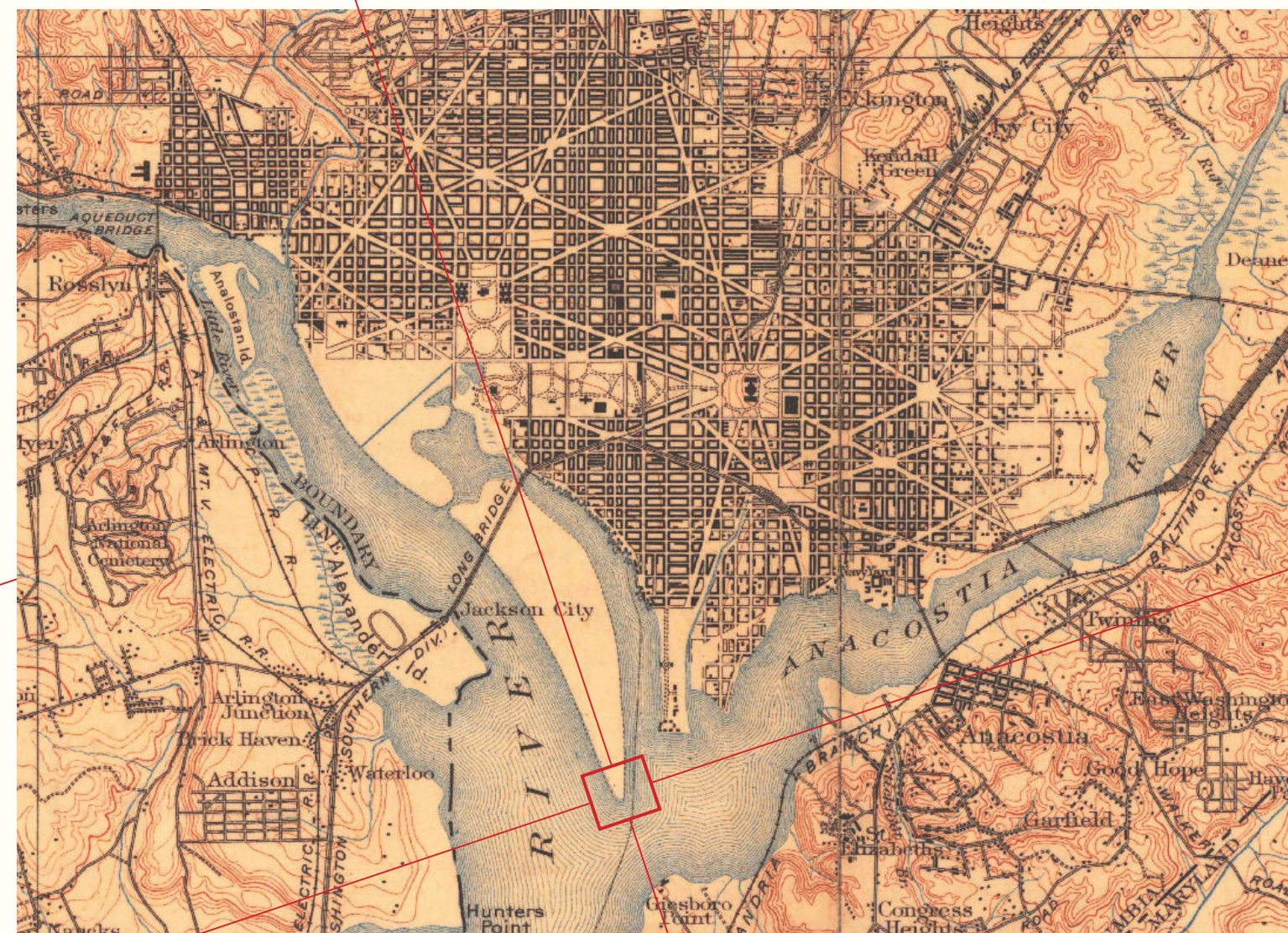


Figure 2.2 The Army Corps of Engineers' constructed East and West Potomac Parks, thereby creating the Tidal Basin and Washington Channel. Hains Point highlighted. (USGS Topographic Map, 1900)

The site of the proposed memorial was river just a century ago. When the low-lying floodplain at the confluence of the Potomac and Anacostia rivers impeded the capital's fledgling development, the Army Corps of Engineers devised elaborate controls for the Potomac's water levels. Sculpted from tidal flats, the engineered Tidal Basin protects the National Mall from floods. The Tidal Basin is contained by man-made East and West Potomac Parks, themselves built up from river bottom dredge material. The southern apex of East Potomac Park is named Hains Point in honor of the project's lead engineer, Peter Conover Hains. Both parks are property of the National Park Service.<sup>v</sup>





Figure 2.3 A map projecting a two-foot rise in sea-level on Washington, D.C. that reveal continued flooding at Hains Point and similar low elevation zones (Climate Central<sup>vi</sup>)

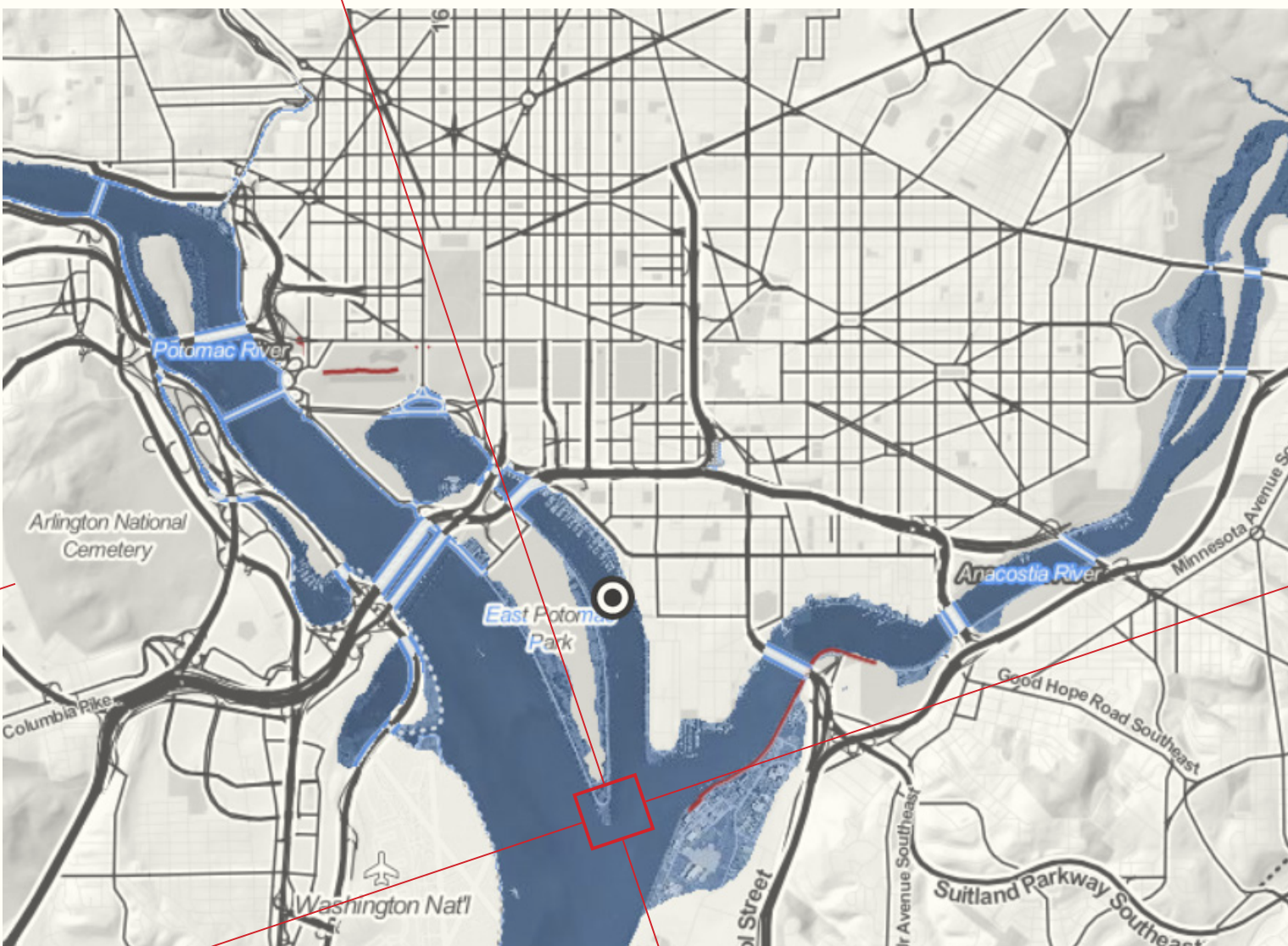


Figure 2.4 A map showing a projected four-foot rise in sea levels indicate that Hains Point will be subject to intense flooding. (Climate Central<sup>vi</sup>)

The Potomac Parks, keystones of the Army Corps of Engineers' flood control system, are themselves flooding with increasing regularity. High tide submerges perimeter walkways and benches of East Potomac Park nearly daily. Predictive maps for the region reveal continued amplification of today's inundation trends. As sea-level rise surpasses the Tidal Basin's engineered capacity, it is an open question whether necessary political, financial and engineering solutions will keep apace.





Figures 2.5 + 2.6 *High tide flooding along East Potomac Park's perimeter promenade (flicker J. Sonder + Along the Gradyent blog)*

Climatic changes present new questions in upholding American legacy. These national and global questions are poignantly distilled in the National Park Service's dilemma with their expressed non-arbitration strategy of their mission to "preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations." Maintaining preservation loyal to historic conditions will likely require more active stewardship and intervention than the mission permits. Yet, fear of loss calls into question the faith in natural succession upon which the mission was founded.<sup>vii</sup>





*Figures 2.7 + 2.8 Seawall Restoration repairs to the Jefferson Memorial's sinking plaza at the northern shoulder of East Potomac Park (Trust for the National Mall)*

Urban parks further challenge the National Park Service's stewardship dilemma, with cultural factors often with cultural factors often compounding natural resource management decisions. The Trust for the National Mall recently spent \$150 million on National Mall restoration projects, including approximately \$16 million for seawall repair at the Jefferson Memorial. Discovery of rapid subsidence of the memorial's plaza at eight inches per year expedited retrofits for approximately a quarter of a mile of seawall. Expensive and of a fixed height, the lifespan and investment horizon for such repairs are limited.<sup>viii</sup>





**Station 148+50 Open Joints, Missing Blocks**



**Station 151+00 Walkway Collapse, Washout under Slab**



**Station 150+00 Wall Collapse, Washout**

*Figure 2.9 Hains Point Seawall Condition Photo Documentation shows wall collapse and washouts (National Park Service)*

The remaining approximate 5 miles of East Potomac Park’s seawall has yet to be restored. Recent assessment of its condition found washouts, wall collapse, and like failures around almost the entirety of the perimeter. The National Parks Service has begun research into coastal armoring solutions for the island, including seawall height increases and living shoreline strategies. Yet funding and philosophical questions remain and no design or financing plans have been finalized.





From top left, clockwise.

*Figure 2.10 + 2.11 Above the failing seawall around Hains Point, nature is writing its advancement through a poetic collection of sticks and detritus. As high tide over-topping comes with daily regularity, this waterline is becoming a permanent herald of the impermanence of Hains Point.*

*Figure 2.12 + 2.13 Emergent wetland is made evident by indicator species such as Arrow Arum (*Peltandra virginica*). Hooked Mussel (*Ischadium recurvum*) suggests lawn puddles are actually tide pools expressing a message of indeterminacy into the highly controlled landscape. ix*





# PROPOSAL

## Concept and Construction





Figure 3.1 *View of potential future sea-level rise inundation of Climate Chronograph's cherry tree bosque.*

# Unknown Futures

The proposed memorial is a public record of rising sea levels, a living observatory for an emergent process. Nature will write our story, our choices, into the landscape as we face this most vulnerable moment.



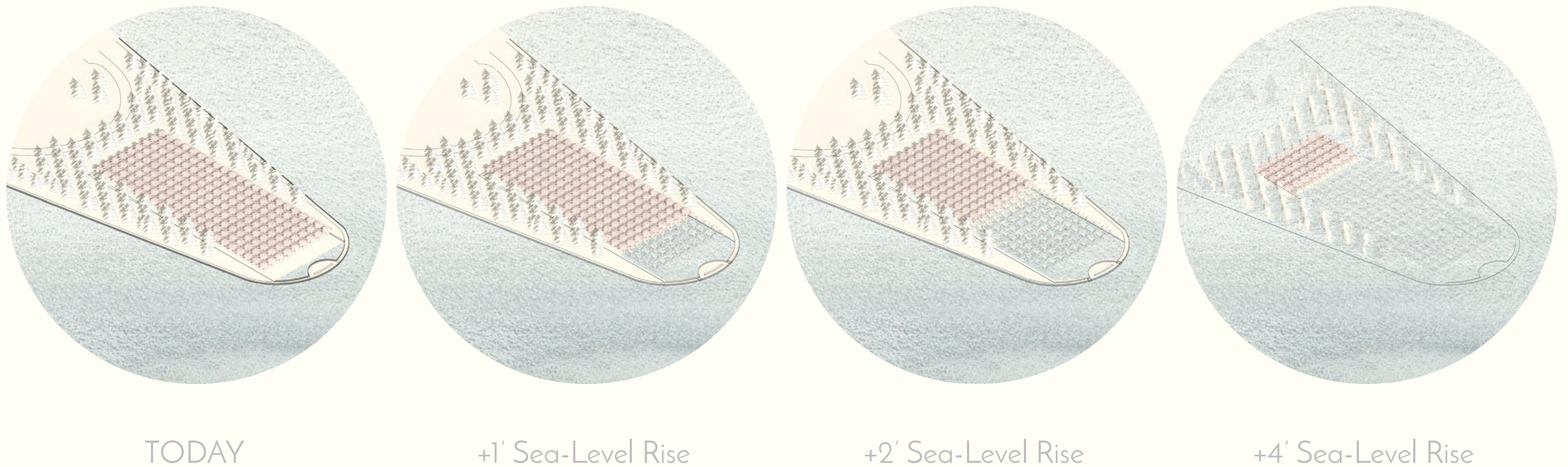


Figure 3.2 Axonometric series illustrating sea-level rise inundation of Climate Chronograph's cherry tree bosque.

## A Memorial Authored By Rising Seas

Small vertical changes in sea level are allowed to write a spatial record across a proposed tilted plane of land extending to the waterline. Cherry trees are planted in band across the gradual slope. As waters rise, tides encroach on the land and the trees die in place, row by row, becoming bare-branched rampikes delineating shorelines past. With every fourth row of trees marking one foot of elevation, the composition becomes a processional tidal gauge. A record.



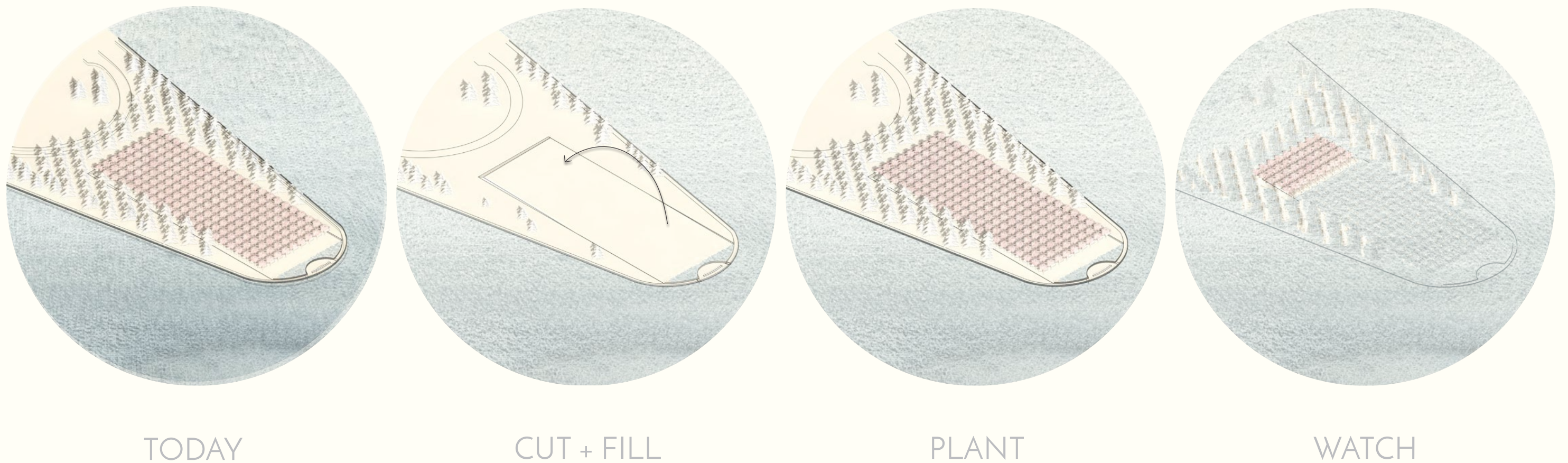


Figure 3.3 Axonometric series illustrating minimal intervention strategy to create the proposed Climate Chronograph memorial.

## In the Making

The memorial offers a new paradigm for the creation of monumentality and restraint in the face of indeterminacy. A light human hand sustainably generates a profound result. The restraint of its design emboldens the possibility of its construction – a minimal composition of earthwork and a tree culturally ubiquitous to Washington, D.C.. Cut and fill is balanced as earth from the lower shaved plane is used to fill the ascending slope. The built work is a pastoral meditation offering counterpoint to the heavily constructed National Mall.



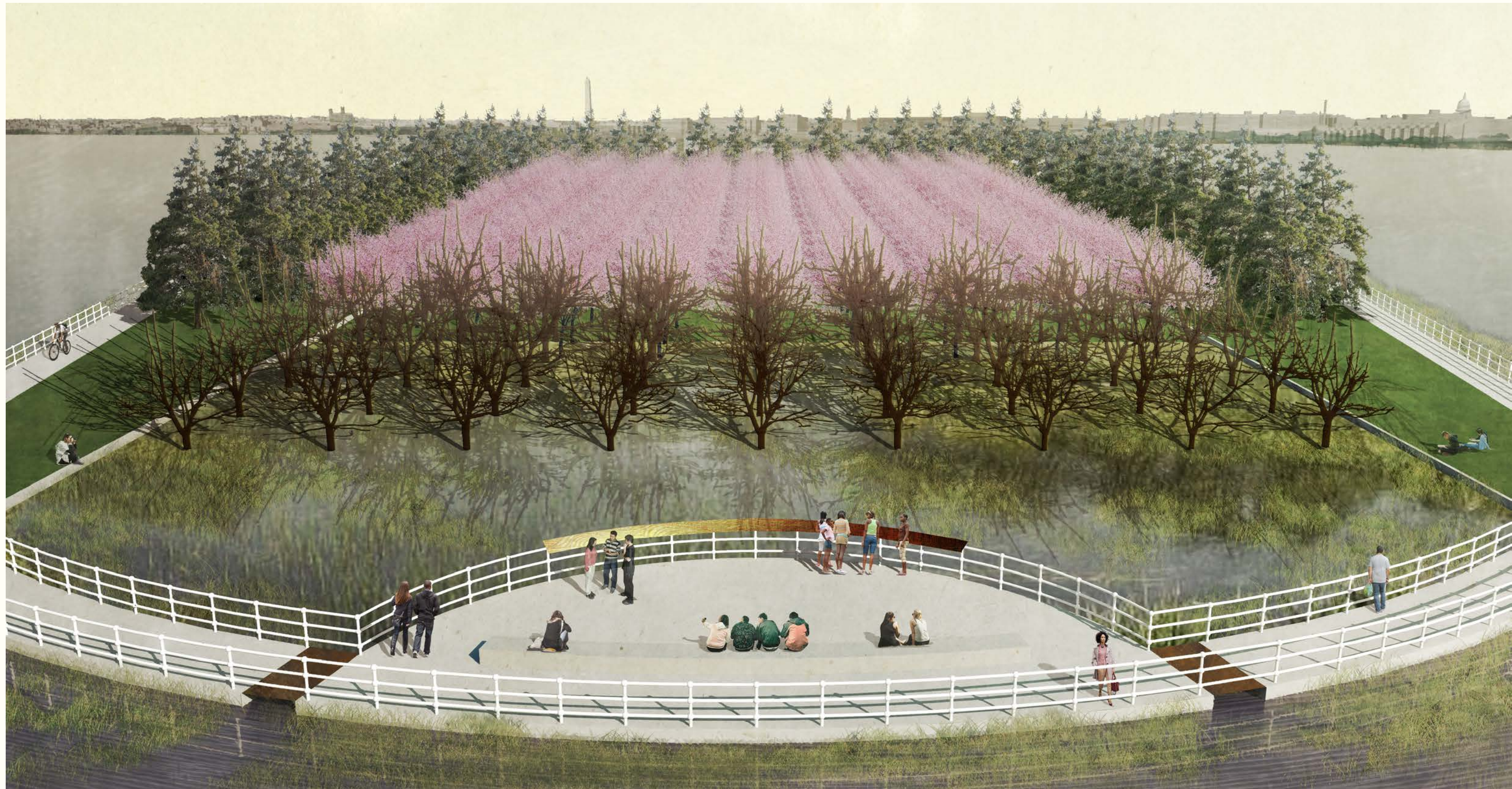


Figure 3.4 Bird's-eye view of the tip of Climate Chronograph from the conflux of the Potomac and Anacostia Rivers and the Washington Channel.

One foot of sea level rise renders four rows of trees dead, bare-branched delineations of shorelines past.





*Figure 3.5* Longitudinal section of Climate Chronograph at the tip of Hains Point illustrating a gradient of inundation at a predicted future state of three feet of sea-level rise. The gradient moves from an emerging wetland at the intertidal zone through to the healthy, mature cheery trees at the highest point on the slope.

## A Memorial of Decay + Natural Succession

Conceptually straddling the successes and failings of American ingenuity, the memorial records our questions about a coming epoch of potentially irrevocably altering challenges in a Tidal Basin that is an embodiment of traditional control-driven engineering. The memorial cedes control to natural succession and decay at the tip of an island that serves as a keystone of the National Mall's flood control system. Retaining East Potomac Park untouched past Ohio Drive, the memorial's limited intervention and maintenance regime becomes a poignant yet apolitical datum for today's climate challenges and questions.



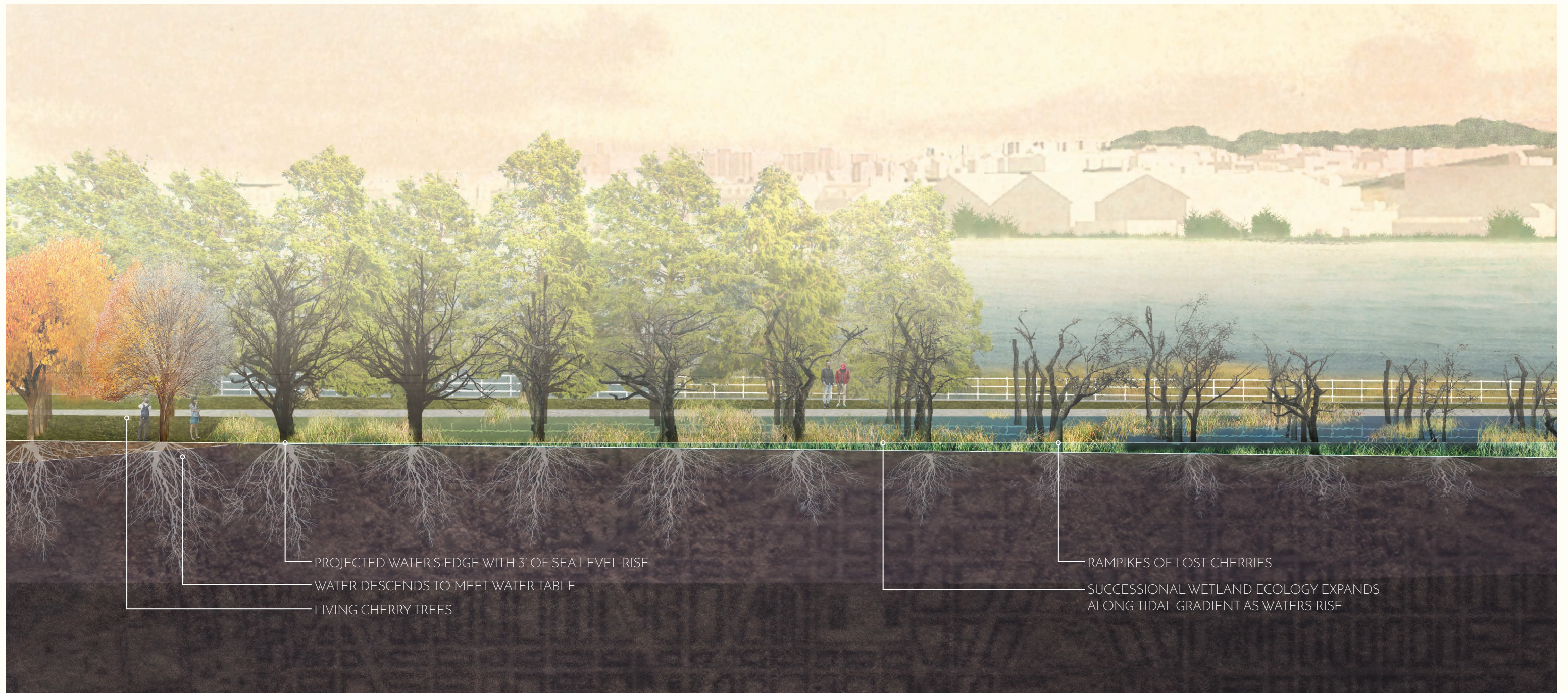


Figure 3.6 Enlargement of Fig 3.5 showing sculptural quality of predicted decay.

The clear rectilinear bosque of trees is left to live or die without intervention or repair other than that required for public safety and access. Their survival and death patterning will make legible whatever graduated or idiosyncratic forces, of tempestuous or incremental inundation, act upon them. The memorial is a living sculpture to natural and cultural history in the making.



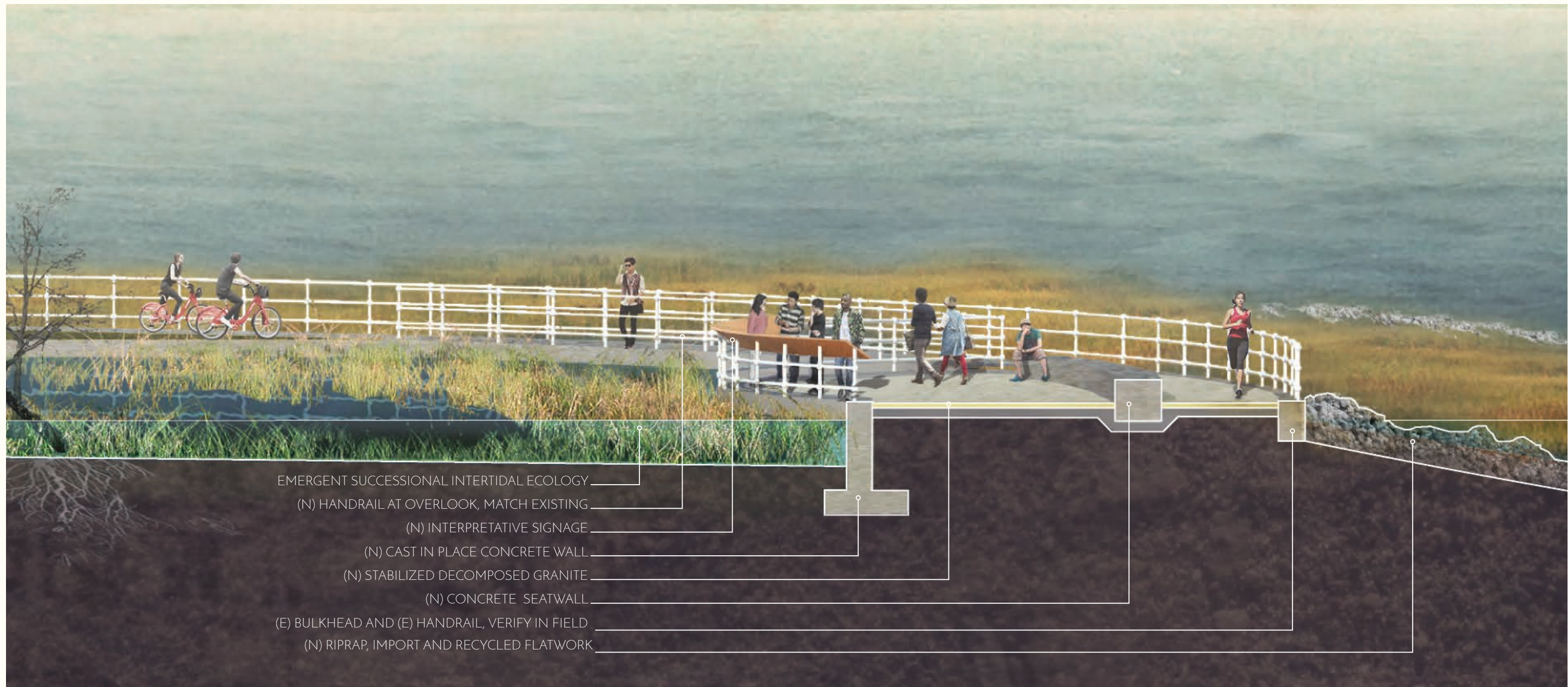


Figure 3.7 Enlargement of Fig 3.5 showing memorial apex construction and activation as a profoundly rich through its simplicity.

The existing bulkhead is shored with rip rap which will stabilize against erosion while aiding accretion of sediment and wetland ecologies. The existing concrete flatwork at hains point would be recycled and form part of the required tonnage for the rip rap retrofit. A new path, using the existing bulkhead along with a new interior header (shown in Fig 3.7 as a retaining wall, but in other locales a simple curb) for containment, is a simple and elegant stabilized decomposed granite. Similarly, the existing site rail is left in place and the language is extended to rim of the overlook, meeting code and allowing a sculptural cast bronze sign to anchor the main overlook onto the site.





# A Day in the Park





*Figure 3.8 View of pick-up soccer game on retained field at Hains Point, looking from Ohio Drive through the threshold of bald cypress into the cherry tree bosque beyond.*

The memorial intensifies Hains Point’s existing functional and non-programmed field condition. Recreation, sport, and contemplation are amplified on the tip of the park that has become pastoral respite for Washington, D.C. locals.





Figure 3.9 *View of picnicking locals within the memorial bosque.*

The pastoral sanctuary that is currently a favorite local haunt is overlaid with meaning and metaphor of the intended memorial. Hains Point remains a destination for D.C. locals and becomes a new one for visitors, offering respite from the urban core to all.





Figure 3.10 View of local fishermen, cyclists, kayakers, and artists sharing the new memorial landscape.

The simplicity and clarity employed in its design invites a multiplicity of users and uses. Its open form seeks to embrace, not displace, the local public while adding an additional cultural overlay of memorialization. Cycling and fishing along Hains Point perimeter are among the popular activities that will continue to be welcomed at the new memorial.





Figure 3.11 View of a National Park Service tour using interpretive signage at the memorial's apex.

Curated and self-guided group tours of Washington, D.C.'s memorial core can be extended to Hains Point's new Climate Chronograph, where interpretive signage illustrates the site's history, the memorial's concept, and the slow successional processes at work.





Figure 3.12 *View of self-directed exploration of an advancing waterline up the memorial's gentle slope.*

The advancing water's edge becomes a fecund place for exploration, observation, and learning. The memorial's contained perimeter creates a sheltered cove for discovery and research of an emergent wetland ecosystem.





Figure 3.13 Underwater view of emergent wetland maturing as complementary fulcrum of the memorial experience.

As dry land yields to rising seas, a thriving wetland emerges. Marine Eel Grass (*Zostera marina*) pioneer habitat for species such as Common Carp (*Cyprinus carpio*), Spotted Turtle (*Clemmys guttata*), and the Blue Crab (*Callinectes sapidus*).<sup>viii</sup>



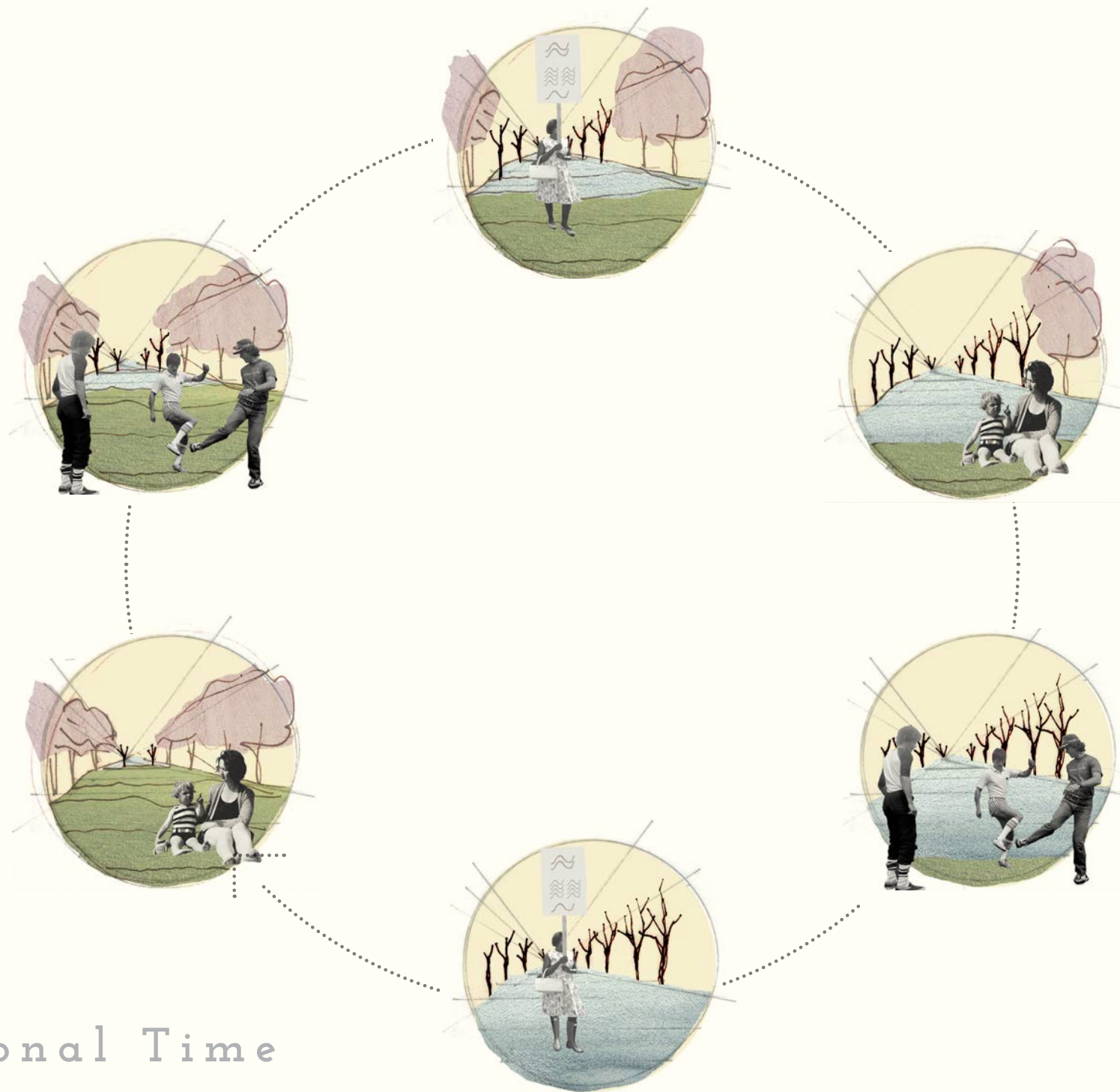


*Figure 3.14 View of a potential community meeting discussing stewardship of the memorial.*

## Public Witness

The memorial represents a counter narrative in a society where techno-utopianism assumes the future changes will be solved same as the past. The memorial emerges from the premise that climate change will necessarily alter the landscape, and possibly society. Because communities that are poor, marginalized, and rural will suffer disproportionately from the dramatic climatic changes, the memorial becomes an important and visible reminder of the reality of sea level rise for those who are better able to insulate themselves from its ravages. It becomes a place for contemplation, from private reflection to collective gathering and discussion.





## Intergenerational Time

Climate Chronograph is slow, offering us an opportunity to shift our current, accelerationist thinking into a longer multi-generational time frame. Locals may witness a gradual progression of rising seas, whereas out-of-town visitors may never experience the same memorial twice. Imagine a young American's staple eighth-grade trip to Washington, D.C.: one row of inundated trees. During a college protest: three flooded rows. When she returns later in life with her children: seven rows of rampikes. Transformation of the memorial mirrors transformation in the world, and bears witness to the changes wrought on a landscape over time. When our children and our children's children visit, it becomes a legible demonstration of generationally-paced change.

Figure 3.15  
*Diagram of cyclical generational experience of the memorial through time.*







## A MEMORIAL TO THE PRESENT + FUTURE

Continually becoming, the memorial commemorates present and future conditions. Climatic changes are poignant reminders of the generational impacts of our daily actions. The memorial spatializes this moment of uncertainty and challenge. A place to mark today's shoreline as a function of past actions and marking future choices, the memorial both extends and contracts our human experience of the temporal. Nature's slow pace has a long unfolding, and simultaneously, the past, present, and future are forever embedded together.



## A MEMORIAL OF DECAY

An embrace of indeterminacy, Climate Chronograph matures as it decays and evolves with natural succession. By ceding control the tip of an island that serves as a keystone of flood control and owned by a steward expressly committed to non-intervention, the memorial sacrifices itself to what will be. Its entropy makes legible in the scale of inches and feet the global effects of rising seas.



## PUBLIC PARK + PUBLIC WITNESS

As climate change effects us all regardless of ethnicity or creed, so too, the memorial holds equitable, inclusive space for daily use and existential contemplation. The new memorial is inclusive to all, aggregating new and current users, uses, and meaning. Brining a democratic lens in its return of the sacred to the reading of natural events, Climate Chronograph offers an apolitical datum for today's climate challenges and questions.



## AFFORDABILITY

Humble construction techniques and materials make for a relatively affordable memorial on a landscape that would likely otherwise require expensive armoring. The designers' preliminary opinion of cost projects memorial construction expenses at approximately \$2.5 million (see Appendix). And, intended to mature through time's decay, the memorial requires negligible maintenance beyond tree pruning or trimming of the lawn beneath it, maintenance that is already routine at Hains Point.

Climate Chronograph is an inexpensive alternative to historic memorialization expenditures. Its budget is a small fraction of the recent \$120 million Martin Luther King Jr. Memorial.<sup>x</sup> The affordability and universality of its narrative lends the memorial to funding that could readily be achieved through individuals, foundations, and crowd-sourcing.















Opinion of  
Probable Cost

ITEM DESCRIPTION	QTY	UNIT	UNIT COST	ITEM TOTAL	SUBTOTAL	COMMENTS
<u>SCOPE</u>						
Treatable Surface Area	190,980	SF				
Hardscape	12980	SF				
Softscape	178,000	SF				
					+/- 4 Acres	
<u>MOBILIZATION/SITE PREPARATION</u>						
Mobilization		Allowance	\$60,000.00	\$60,000.00		
Softscape Demolition and Selective Pruning	178,000	SF	\$0.15	\$26,700.00		
Hardscape Demolition	11620	SF	\$5.00	\$58,100.00		
					\$144,800.00	
<u>SOIL PREPARATION</u>						
Soil Amendments - All planting and sod areas	178000	SF	\$0.50	\$89,000.00		
Fine Grading	86500	SF	\$0.85	\$73,525.00		
Rough Grading (No Import)	24028	CY	\$8.00	\$192,224.00		
					\$354,749.00	
<u>PLANTING</u>						
Yoshino Cherry Trees - 4" Caliper, Min 32" Dia Ball	198	EA	\$3,000.00	\$594,000.00		Field Grown
Bald Cypress Trees - 2" Caliper	60	EA	\$800.00	\$48,000.00		
Native No-Mow Native Sod	178000	SF	\$1.00	\$178,000.00		
Mulch at Trees - 2" Depth	3096	SF	\$1.70	\$5,263.20		
					\$825,263.20	
<u>HARDSCAPE</u>						
Stabilized Decomposed Granite	10260	SF	\$8.00	\$82,080.00		Overlook, Paths
Corten Steel Grate	92	SF	\$100.00	\$9,200.00		Spanning Water Inlets
Concrete Retention Wall At Overlook	230	LF	\$250.00	\$57,500.00		Interior Edge of Overlook
Concrete Headers, Honed Finish	1350	LF	\$15.00	\$20,250.00		Interior Edge of Perimeter Path
Concrete Seat Wall, Integral Color, Specialty Finish	46	LF	\$175.00	\$8,050.00		Overlook
RipRap Stabilization, Recycled and Import	5440	CY	\$25.00	\$136,000.00		Reinforcing (E) Perimeter Bulkhead
Painted Steel Fence, Match Existing Fit and Finish	218	LF	\$200.00	\$43,600.00		Interior Edge of Overlook, Where Necessary



Opinion of  
Probable Cost

ITEM DESCRIPTION	QTY	UNIT	UNIT COST	ITEM TOTAL	SUBTOTAL	COMMENTS
Lighting		Allowance	\$200,000.00	\$200,000.00		Required for Accessibility
Signage		Allowance	\$150,000.00	\$150,000.00		Wayfinding and Interpretative
					\$706,680.00	
<b><u>IRRIGATION</u></b>						
Retrofit Existing Irrigation System	174904	SF	\$1.00	\$174,904.00		
Tree Bubblers	258	EA	\$35.00	\$9,030.00		
					\$183,934.00	
<b><u>LANDSCAPE ESTABLISHMENT</u></b>						
120 Day Maintenance Period	178000	SF	\$0.30	\$53,400.00		
<b><u>TOTAL</u></b>				Subtotal	\$2,268,826.20	
				10% Contingency	\$226,882.62	
				<b>TOTAL</b>	<b>\$2,495,708.82</b>	
				Cost/SF	\$13.07	

Notes

1. Estimate is based upon drawings prepared for this competition, dated 08/01/2016. Gross square footage totals are approximate and do not represent actual field conditions. We recommend further development of concept through a complete feasibility study, along with enlisting the services of a licensed surveyor to achieve an accurate site plan and budget opinion.
2. The design team has no control over the cost of labor, materials, equipment, contractor's methods of price determination, competitive bidding or market conditions. This cost estimate is made on the basis of professional experience and qualifications only.