Preliminary Report

Value Engineering Study

City of New York
Office of Management and Budget

East Side Coastal Resiliency Project

New York City, NY

April 2018

Strategic Value Solutions, Inc.
Value Improvement Specialists

Preliminary

Value Engineering Study Report

for

East Side Coastal Resiliency Project

New York, NY

April 2018

Prepared for:

City of New York Office of Management and Budget
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Acknowledgements

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In addition, we would like to thank the members of the AKRF/KSE JV design team for sharing their knowledge about the project and for their responsiveness to our questions and requests throughout this Value Engineering study.

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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

This report presents the results of a Value Study conducted by Strategic Value Solutions, Inc. (SVS) on the design of the East Side Coastal Resiliency (ESCR) project for the City of New York, Mayor's Offices of Resilience & Recovery (ORR), and OMB. Also participating in the workshop were Department of Parks and Recreation (DPR), NYC Department of Transportation (NYCDOT), DDC, and DEP. The project was reviewed at 40 percent design completion.

The Value Study included a one-day orientation meeting and site visit on Feb 22, 2018 followed by a 5-day (40-hour) value methodology workshop that was conducted with a multidisciplinary team in New York, NY on March 5-9, 2018.

Project Description Summary

In response to future risk caused by coastal flooding and climate change, and as part of the Rebuild by Design competition, New York City was awarded $335 million in US Department of Housing and Urban Development (HUD) Community Development Block Grant – Disaster Recovery (CDBG-DR) funding to implement the first phase of the winning concept. This concept forms the basis for the East Side Coastal Resiliency Project, which is a series of levees and flood walls spanning 2.4 miles of the lower east side of Manhattan, from Montgomery Street in the south to East 25th Street in the north. The project raises the grade in some areas of East River Park and restores the East River Park playing fields and activity areas, except for the newly rebuilt soccer field.

In order to construct the flood wall and levees on the west edge. A large tunnel will be constructed around multiple Con Ed transmission lines to avoid relocation of the lines.

As part of the project, two pedestrian bridges at 10th Street and Delancey Street are to be reconstructed to improve access to the park's facilities for the local community. The project also includes modifications to the interior drainage of lower Manhattan to avoid sewer backups during high water events.

Cost Reconciliation

Slocum Construction Consulting (Slocum) prepared the independent cost estimate for the project prior to the workshop based upon Draft 40% design documents, dated November 10, 2017. The differences between the estimate prepared by AKRF/KSE JV and Slocum were reconciled between Slocum's estimator and AKRF/KSE JV's estimator to arrive at a total estimated project construction cost of $988,463,300. The reconciled estimate includes the Con Edison tunnel, tree mitigation expense and DEP interior drainage work, as well as the work required under the ESCR construction contract. The estimate includes the following markups:

General Conditions	*10%*
Overhead & Profit	*15%*
Bond & Insurance	*2%*
Escalation	*4% per year*
Contingency	*30%*

Cost Models

Further analysis of the project cost and schedule was conducted using cost models. These models gave the team a better perspective on how the costs are distributed through the project. In particular, the team was looking for those aspects of the project which account for the largest shares of the total cost. This analysis indicated that the work with the highest construction value (flood wall, utilities, general requirements) is being performed last in the sequence of work. This strategy makes it more difficult to meet the requirement for expenditure of the HUD grant by April 2022.

Workshop Results

With an understanding of the functional requirements, the Value Team transitioned to the Creative Phase of the workshop and brainstormed on all the possible ways to accomplish each of those functions. The team generated 205 ideas for potential changes to the current design.

Based on the team members' professional judgment and input from ORR, DPR, DOT, DDC, DEP, NYC, and OMB, 26 of these ideas were selected for development into Value Alternatives.

In addition to the Value Alternatives, the team also identified eight design suggestions. These are suggestions for changes or clarifications to the project documents that did not have an identifiable or quantifiable cost impact that could be determined within the scope of the workshop.

Organization of Alternatives

The Alternatives and Design Suggestions presented on the following pages are organized by project or functional categories, and then numerically within each of those categories. The divisions used to organize the alternatives are as follows:

AD Assure Dependability

C Construction

IA Improve Access

LI Limit Inundation

These designations have been used throughout the VE process to organize the ideas.

Significant Proposals

Among the recommendations developed by the VE team, the following are worthy of highlighting.

- **AD-10 Move the manholes off FDR:** Under the current plan, manholes will be installed in the roadway of FDR Drive to provide access to the CSO lines leading to the river. Moving the manholes to a location that is not in the roadway will provide greater accessibility for DEP to gain access without stopping traffic on FDR Drive. This proposal has a cost reduction of $6.7 million.

- **AD-23 Eliminate isolation chambers and direct flow to interceptors:** The current design incudes installation of 12 new isolation chambers to allow diversion of the combined sewer flow to the 108-inch interceptor during an extreme event. Constructing isolation chambers brings the risk that, if not maintained, they will not operate in the future. Eliminating the isolation chambers and directing flow from the combined sewer lines to the interceptor would eliminate this risk and reduce cost by $9.9 million. The consequence would be that the 108-inch interceptor may surcharge during a high-water event and create a backup in the combined sewer system.

- **C-04 Close park entirely during construction.** The current phasing plan keeps the East Side Park and the shared use path open during construction of the flood wall and reconstruction of the fields. To reduce safety concerns and to expedite construction, this recommendation suggests closing the park while construction is underway. This will also free up additional space to be used for laydown and staging during construction. This would reduce cost by $11.2 million.

- **C-20 Precast the tunnel as a U-shape and place on tunnel slab:** The present design reflects a cast-in-place tunnel configuration for the length of the Con Ed tunnel. By using pre-cast U-sections to complete the top of the tunnel, construction of the tunnel will be quicker and minimize the exposure of workers to the high voltage lines. This would reduce cost by $19.3 million.

- **C-40 Use southbound service road as part of FDR mainline and shift traffic west:** Shifting all lanes of FDR to the southbound service road (10 feet to the west) allows 24/7 construction activity to occur, reducing the schedule and disruption to the local community. This change could save $29.3 million.

- **IA-03 Rebuild Houston Street pedestrian ramps to hand HS-20 loads:** The Houston Street ramps currently do not support HS-20 loads, even though the bridge deck does. Rebuilding the ramps to handle HS-20 loads to permit access by emergency vehicles and park maintenance trucks will give a secondary access

for emergency situations improving the response time. This would add cost of $4.5 million.

- **LI-29 Elevate park high enough to eliminate wall:** Under the current plan, the area is protected by a series of walls and levees. By raising the elevation of the park, the same level of protection can be achieved, eliminating the need for walls, levee, and sheet piling. This change is a more sustainable solution, eliminates operations and maintenance associated with the flood wall, and increases the attractiveness of the area. This approach could reduce cost by #319 million [redacted]

- **LI-30 Realign flood wall to east edge of East River Park in combination with levees:** Moving the flood wall away from FDR and placing it along the landside of the promenade. Adding a series of gates along this wall will give access to the promenade and increase the viewshed to the river. With this approach, cost may be reduced by $100 million and the park utilities can remain in place and the Con Ed tunnel will not be required.

- **LI-35 Shift all construction to the east to avoid closures on FDR**: The current plan includes constructing the flood wall close enough to the existing traffic barrier on FDR that this barrier will be replaced. Shifting the construction even as little as 3 feet will eliminate replacement of the traffic barrier along with eliminating impacts to FDR during wall construction. This change would reduce cost by $30 million.

- **LI-38 Use only I-wall the entire length**: Replacing the designed flood wall along the entire length of the protected area with I-wall will eliminate the Con Ed tunnel and levee construction. Embankment will still be required at the pedestrian bridges in order to make them handicapped accessible. This would reduce cost by $102.6 million.

- **LI-61 Tie flood wall into either side of the Con Ed intake structure and keep the floodwall on the east side of the FDR:** The current plan is for the flood wall to cross FDR Drive with a swing gate at the Con Ed intake structure, tie into the Con Ed building, then travel to Avenue C, crossing back across FDR Drive to tie in at Stuyvesant Cove Park. The alternative recommends tying in to the Con Ed intake structure, thereby keeping the wall on the East side of FDR for the entire length. This not only eliminates two swing gates, 4 pedestrian and roller gates, and 4 swing and roller gates at Avenue C, but it also keeps FDR protected the entire length of the project. This would reduce cost by $19.8 million.

Additionally, the Value Team detailed several recommendations that have minor or no cost implications. These recommendations facilitate the expenditure of the HUD grant prior to its expiration and/or reduce risk and its potential impact to the project. Among those provided in the report are:

- **C-08 Modify construction sequencing to facilitate use of HUD money:** The current construction phasing and sequencing plan has the work scheduled in such a manner that Segments 2, 3, and 4 must be completed in order to meet the spending deadline for the HUD grant. The critical path of the project is through the flood wall, which is fraught with risk. This schedule is quite aggressive and does not build in any float or margin for delays that could impact meeting this deadline. Adjusting the schedule to account for more realistic time frames, using early, or advance, contracts to complete work that is independent of the flood wall, and consider using parallel contracts for specific work in order to ensure the HUD spend-down deadline is met.

- **C-19 Advance order long-lead items to improve schedule and use HUD money:** Given the time constraints for using the HUD money, ordering long-lead items, will provide for advancement of the schedule and, at the same time, help in meeting the deadline for expenditure of the HUD grant. Items that could be advance purchased include sheet piles, pre-cast concrete items, and flood gates. This work could encumber $41.5 million.

- **C-35 Complete bulkhead repairs as an early package and part of this project:** The VE team suggests accelerating the inspection and including repairs to the bulkhead under the East Side Coastal Resiliency Project. This will allow the contractor to begin using the bulkhead earlier and perhaps help in meeting the expenditure timeline for the HUD grant. By encumbering $9.05 million.

- **C-58 Evaluate project schedule with regard to risk**: The current schedule is a very aggressive schedule and does not appear to take into consideration all of the risks that may be encountered during execution. Consideration of the potential risks now would allow for mitigation strategies to minimize impact to the project.

- **C-60 Focus the HUD scope of work on CSO construction and park utilities as an early contract:** Another option provided for consideration is to advance the CSO and award that work, along with the park utilities work, early. This will get the deep excavation and work that could otherwise hold up construction of the flood wall and sports fields off the critical path and encumber $149 million.

Value Study Team

The team members that comprised this multidisciplinary Value Team are listed in Table 1-1 at the end of this section. All other participants of the study are provided in the Appendix.

Table 1-1
Value Study Team

Value Team Leadership

[redacted]	Strategic Value Solutions, Inc. (VETC)
[redacted]	Strategic Value Solutions, Inc. (AVETC)
[redacted]	Strategic Value Solutions, Inc. (Technical Assistant)

Technical Team Members

Name	Organization	Role
[redacted]	Michael Van Valkenburgh Associates Inc.	Landscape Resiliency Architect
[redacted]	COWI Marine, North America	Construction Manager
[redacted]	Lazarev Engineering, LLC	Electrical Engineer
[redacted]	NV5	Traffic Engineer
[redacted]	Strategic Value Solutions, Inc.	Geotechnical Engineer
[redacted]	Water Resources Associates	Hydraulic Engineer
[redacted]	NAIK Consulting Group, PC	Bridge Structural Engineer
[redacted]	HDR, Inc.	Civil/Site Engineer
[redacted]	Tetra Tech	Flood Control Engineer
[redacted]	Slocum Construction Consulting, Inc.	Cost Estimator
[redacted]	Slocum Construction Consulting, Inc.	Cost Estimator

Table 1-2
Summary of Alternatives

Alt. No.	Description	First Cost Savings
AD - Assure Dependability		
AD-06	Replace interceptor isolation gates with adjustable orifice gates or weirs to maximize storage capacity	No Cost Change
AD-10	Move manholes off FDR	$6,690,000
AD-19	Standardize roadway and pedestrian gates' sizes and hardware to facilitate maintenance	Design Suggestion
AD-23	Eliminate isolation chambers and direct flow to interceptor	$9,950,000
AD-41	Do not expose and wrap the Con Ed lines	$6,086,000
AD-59	Optimize tunnel electrical	($5,224,000)
AD-60	Optimize park electrical	($277,000)
C-04	Close park entirely during construction	$11,245,000
C-08	Modify construction sequencing to facilitate use of HUD money	No Cost Change
C-10	Delay Pier 42 Phase 1B Park opening until ESCR is complete in that area	Design Suggestion
C-12	Use pre-cast concrete wall panels	$1,621,000
C-15	Leave area in north end open to allow trucks to access FDR to Exit 7 during construction	($478,000)
C-19	Advance order long-lead items to improve schedule and use HUD money	Design Suggestion
C-20	Pre-cast U-shape and place on tunnel slab	$19,362,000
C-35	Complete bulkhead repairs as an early package and part of this project	Design Suggestion
C-36	Use A + B bidding	Design Suggestion
C-38	Keep landscape packages small enough to encourage competition	Design Suggestion
C-40	Use southbound service road as part of FDR mainline and shift traffic west	$29,281,000
C-50	Use landing barge or floating dock to allow landing in shallow areas	($8,772,000)

Alt. No.	Description	First Cost Savings
C-51	Allow a construction access (road) by building a temporary berm at Houston Street for construction access into the park	($11,358,000)
C-58	Evaluate project schedule with regard to risk	Design Suggestion
C-60	Focus the HUD scope of work on CSO construction and park utilities as an early contract	Design Suggestion
IA-03	Rebuild Houston Street pedestrian ramps to handle HS-20 loads	($4,524,000)
IA-04	During construction, remove FDR jersey barrier in several places to facilitate night time construction vehicle access	($956,000)
IA-16	Use a pre-fab bridge design at pedestrian bridge crossings	$16,388,000
LI-06	Lower the final park elevation by 1 foot and reduce the cross section of the horticultural soil	$3,955,000
LI-14	Simplify levee and use a high-performance erosion control mat in lieu of clay	$508,000
LI-29	Elevate park high enough to eliminate wall	$319,112,000
LI-30	Realign flood wall to east edge of East River Park in combination with levees	$105,704,000
LI-35	Shift all construction to the east to avoid closures on FDR	$30,036,000
LI-38	Use only I-wall the entire length	$102,590,000
LI-41	Use bottom-hinged gates at road closures	$6,254,000
LI-43	Use lightweight fill and eliminate deep foundations for the tunnel	$309,000
LI-61	Tie floodwall into either side of the Con Ed intake structure and keep the floodwall on the east side of the FDR	$19,782,000

SECTION 2

VALUE ALTERNATIVES

SECTION 2
VALUE ALTERNATIVES

The results of this Value Study represent the value improvement opportunities that can be realized on this project. They are presented as individual alternatives for specific changes to the current design.

Each alternative includes:

- A summary of the original concept
- A description of the alternative concept
- A brief narrative comparing the original design and the recommended change
- Sketches, where appropriate, to further explain the alternative
- Calculations, where appropriate, to support the technical adequacy of the alternative
- A capital cost comparison
- And a life cycle cost analysis, if appropriate

Cost was the primary resource that was compared to the functions being accomplished in the project. To ensure that costs were compatible within the Value Alternatives proposed by the team, the reconciled cost estimate was used as the basis of cost.

Evaluating the Value Alternatives

Each part of a Value Alternative should be evaluated on its own merit, rather than discarding an entire Value Alternative because of concern over a particular aspect of the proposed change. Furthermore, ORR, AKRF/KSE JV, OMB and other agency representatives are encouraged to review all the ideas shown in the creative idea listing in the Appendix. Since the Value Team was constrained by a finite duration for the workshop and the production capacity of the team not all ideas were developed. Therefore, there may be other ideas in that list that would provide additional value improvement opportunities for the project.

Organization of Alternatives

The alternatives presented on the following pages are organized by project or functional categories, and then numerically within each of those categories. The divisions used to organize the alternatives are as follows:

Assure Dependability (AD)

Constructability (C)

Improve Access (IA)

Limit Inundation (LI)

These designations have been used throughout the VE process to organize the ideas.

ASSURE DEPENDABILITY (AD)

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	AD-06
Replace interceptor isolation gates with adjustable orifice gates or weirs to maximize storage capacity	
Description of Original Concept:	
The original concept is to construct two interceptor isolation gates, a north and south gate, and the isolation gate at M-39, to eliminate flow into the 108-inch interceptor between the three gates during extreme events in order to provide storage capacity in the 108-inch interceptor for combined sewer flow from the drainage area that is unable to discharge through the CSO outfalls because of the high river stages.	
Description of Alternative Concept:	
In advance of a major coastal storm, initiate operational actions to manage flows in the sewer system that will reduce flooding. This will obviate the need for interceptor isolation gates, which can be a long-term maintenance issue.	

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	No Cost Change		
Alternative Concept			
Savings			

Advantages of Alternative Concept	Disadvantages of Alternative Concept
• [redacted]	• [redacted]

Discussion

Alternative No.: AD-06

[redacted]

The Manhattan Pump Station was upgraded in 2011 to pump an average daily flow of 155 MGD. However, the peak rated capacity of the station is 400 MGD. This excess capacity can be used to drain the 108 -inch interceptor during extreme storm events.

[redacted]

Sketch

Alternative No.: AD-06

■ Original ■ Alternative

Sketch

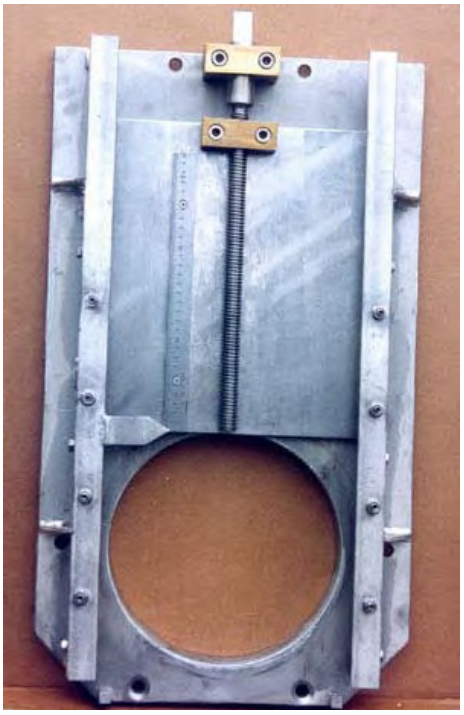
Alternative No.: AD-06

■ Original ■ Alternative

Sketch

Alternative No.: AD-06

■ Original



Example of an Orifice Gate

■ Alternative

Example of an Adjustable Weir Gate

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	AD-10
Move manholes off FDR	
Description of Original Concept:	
The current concept is that, due to the construction of the Con Ed Tunnel and the floodwall/fill adjacent to the FDR Drive, approximately 11 conduits which convey combined sewer flow from the CSO regulators in the sewer system to the discharge points in the East River will require a new manhole to be built in FDR Drive. This will be required to allow DEP to access the existing or reconstructed/replaced CSO conduits leading to the River. The concept was conveyed to the VE Team as a very recent requirement that has not been included in the designs or cost estimate to date. There are also three locations at which new storm sewer manholes and/or storm drains have been located on the north bound lane of FDR Drive for drainage purposes.	
Description of Alternative Concept:	
The alternative concept is to locate the required new manholes and storm drains in locations other than directly in FDR Drive.	

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$10,513,000	$0	$10,513,000
Alternative Concept	$3,823,000	$0	$3,823,000
Savings	$6,690,000	$0	$6,690,000

Advantages of Alternative Concept	Disadvantages of Alternative Concept
• [redacted]	• [redacted]

Discussion

Alternative No.: AD-10

Sketch

Alternative No.: AD-10

■ Original ■ Alternative

Sketch

Alternative No.: AD-10

■ Original ■ Alternative

Sketch

Alternative No.: AD-10

■ Original ■ Alternative

Sketch

Alternative No.: AD-10

■ Original ■ Alternative

Sketch

Alternative No.: AD-10

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: AD-10

			Original Concept (Deletions)		Alternative Concept (Additions)	
Item	**Unit of Meas**	**Unit Cost**	**Qty**	**Total**	**Qty**	**Total**
Manholes, Constructed in FDR	EA	550,000.00	10	$5,500,000		
Reconstruct of Manholes outside of FDR Roadway	EA	200,000.00			10	$2,000,000
Total Markup	91.14%			$5,012,622.48		$1,822,771.81
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$10,513,000.00		$3,823,000
NET SAVINGS						$6,690,000

Design Suggestion

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	AD-19
Standardize roadway and pedestrian gates' sizes and hardware to facilitate maintenance	
Discussion	

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	AD-23
Eliminate isolation chambers and direct flow to interceptor	
Description of Original Concept:	
The original concept is to install 12 manually operated isolation chambers in the sewer shed west of the floodwall to divert combined sewer flow during extreme rainfall events to the 108-inch interceptor in order to reduce street flooding due to surcharging of the combined sewers. The isolation chambers prevent backflow from the interceptor into the combined sewer conduits.	
Description of Alternative Concept:	
The alternative concept is to eliminate the 12 isolation chambers and direct flow from the surcharged combined sewer pipes directly to the interceptor.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
• [redacted]	• [redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$114,178,000	$0	$114,178,000
Alternative Concept	$104,228,000	$0	$104,228,000
Savings	$9,950,000	$0	$9,950,000

Advantages of Alternative Concept	Disadvantages of Alternative Concept
• [redacted]	

Discussion

Alternative No.: AD-23

Sketch

Alternative No.: AD-23

■ Original ■ Alternative

Sketch

Alternative No.: AD-23

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: AD-23

			Original Concept (Deletions)		Alternative Concept (Additions)	
Item	**Unit of Meas**	**Unit Cost**	**Qty**	**Total**	**Qty**	**Total**
Gated Isolation Chamber	EA	400,000.00	12	$4,800,000		
Extend Piping	LF	2,500.00			240	$600,000
Maintenance & Protection of Traffic	LS	25,000.00	1	$25,000		
Duration Savings	MO	980,546.00	56	$54,910,576	55	$53,930,030
Total Markup	91.14%			$54,442,161.99		$49,697,900.74
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$114,178,000.00		$104,228,000
NET SAVINGS						$9,950,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	AD-41
Do not expose and wrap the Con Ed lines	
Description of Original Concept:	
The original concept includes exposing the existing Con Edison transmission lines near the flood wall and wrapping with carbon fiber.	
Description of Alternative Concept:	
The alternative concept is to not to wrap the Con Edison transmission lines thereby eliminating the requirement to excavate and expose the lines.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
• [redacted]	• [redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$110,104,000	$ 0	$110,104,000
Alternative Concept	$104,018,000	$ 0	$104,018,000
Savings	$6,086,000	$ 0	$6,086,000

Discussion

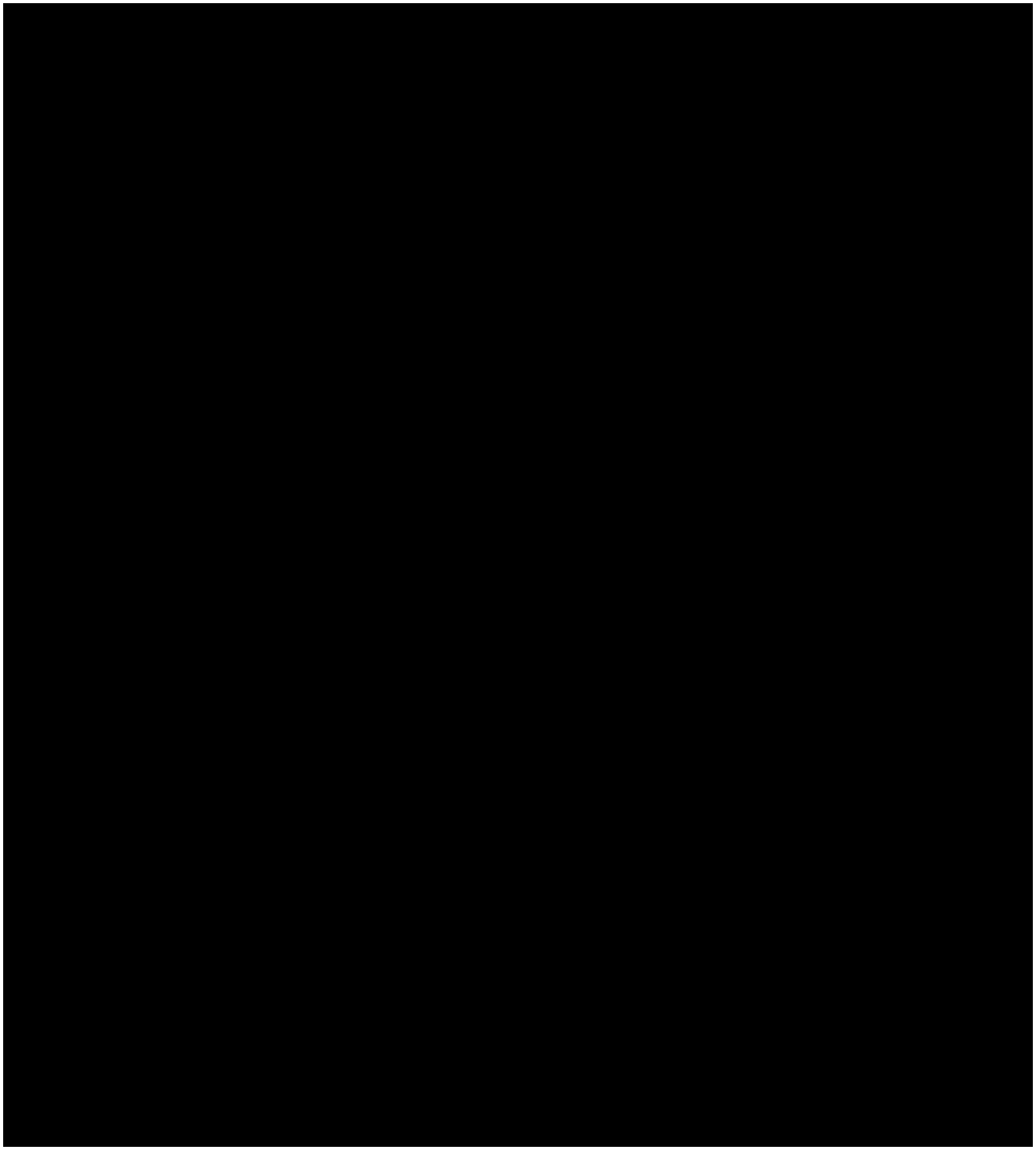
Alternative No.: AD-41

[redacted]

Sketch

Alternative No.: AD-41

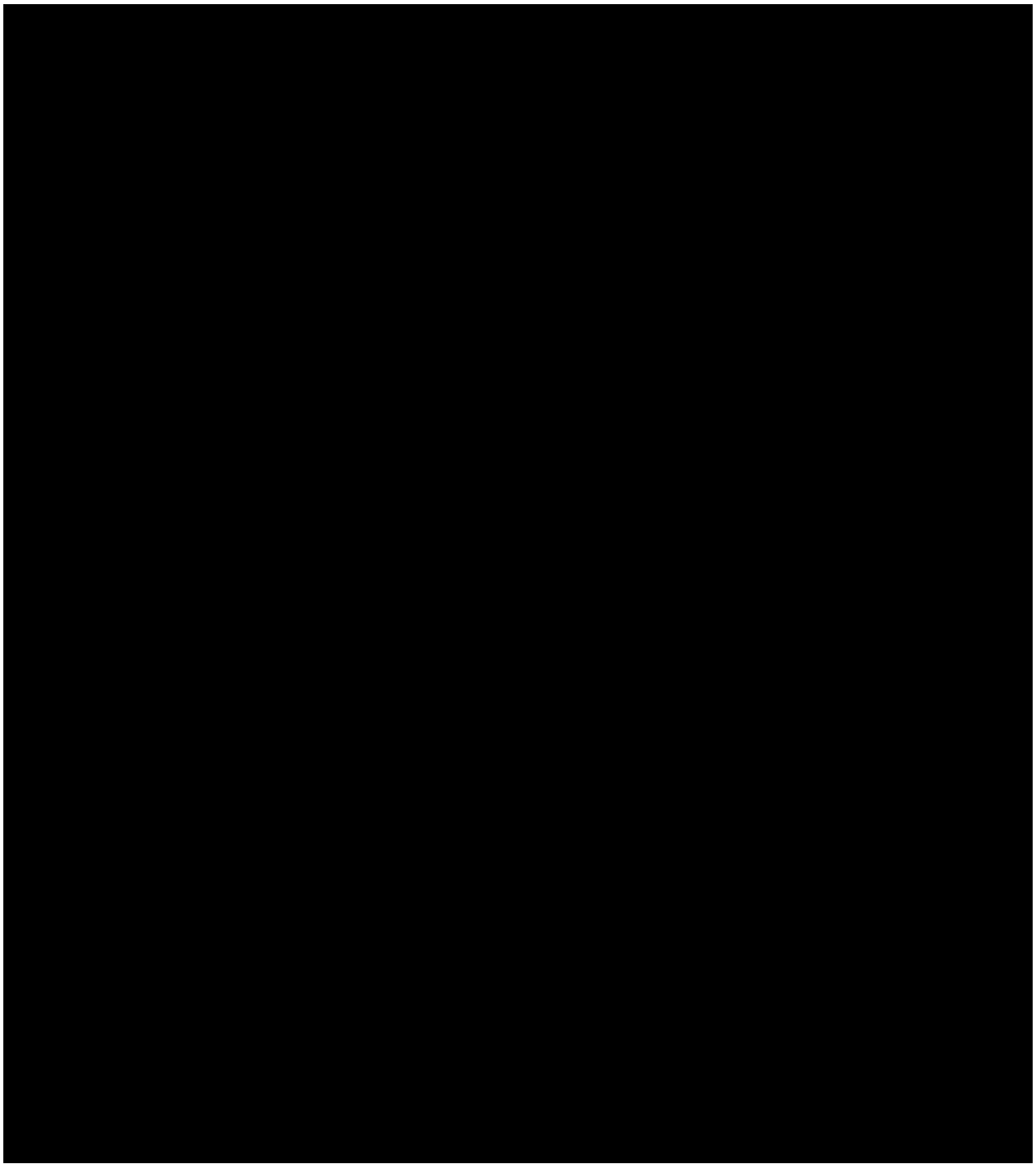
■ Original ■ Alternative



Sketch

Alternative No.: AD-41

■ Original ■ Alternative



Construction Cost Estimate

Alternative No.: AD-41

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Carbon Fiber Wrapping at Conduit	LF	63.80	10,328	$658,896		
Excavation, Structural Fill, Compaction, Hauling	CY	90.28	22,538	$2,034,731		
Duration Savings	MO	980,546.00	56	$54,910,576	55.5	$54,420,303
Total Markup	91.14%			$52,499,658.68		$49,597,897.10
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$110,104,000.00		$104,018,000
NET SAVINGS						$6,086,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	AD-59
Optimize tunnel electrical	
Description of Original Concept:	
Some of the electrical solutions shown at this stage of the project are not yet fully developed.	
Description of Alternative Concept:	
Optimize the tunnel electrical design to delete the fire alarm system, reduce the number of lighting fixtures, add exit signs, use 480/277 V throughout, positive ventilation control, using aluminum conduits, using NEMA 6P equipment, raising the height of the tunnel to provide safe clearance.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
• [redacted]	• [redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$137,415,000	$0	$137,415,000
Alternative Concept	$142,415,000	$0	$142,415,000
Savings	($5,224,000)	$0	($5,224,000)

Discussion

Alternative No.: AD-59

A. [redacted]

[redacted]

B. [redacted]

1. [redacted]

Advantages:

- [redacted]

[redacted]

Disadvantages:

- [redacted]

2. [redacted]

Advantages:

[redacted]

Disadvantages:

- [redacted]

[redacted]

[redacted]

Advantages:

- [redacted]
- [redacted]
- [redacted]

Disadvantages:

- [redacted]

[redacted]

C. [redacted]

[redacted]

D. [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

E. [redacted]

[redacted]

F. [redacted]

[redacted]

Sketch

Alternative No.: AD-59

■ Original ■ Alternative

EXIT SIGNS

Reflective Glow Exit Sign Cyalume 9-30070

Reflective glow exit signs clearly identify exit areas in your facility during a power failure.

Exceed NFPA standards 5x for bright white visibility in a power outage.

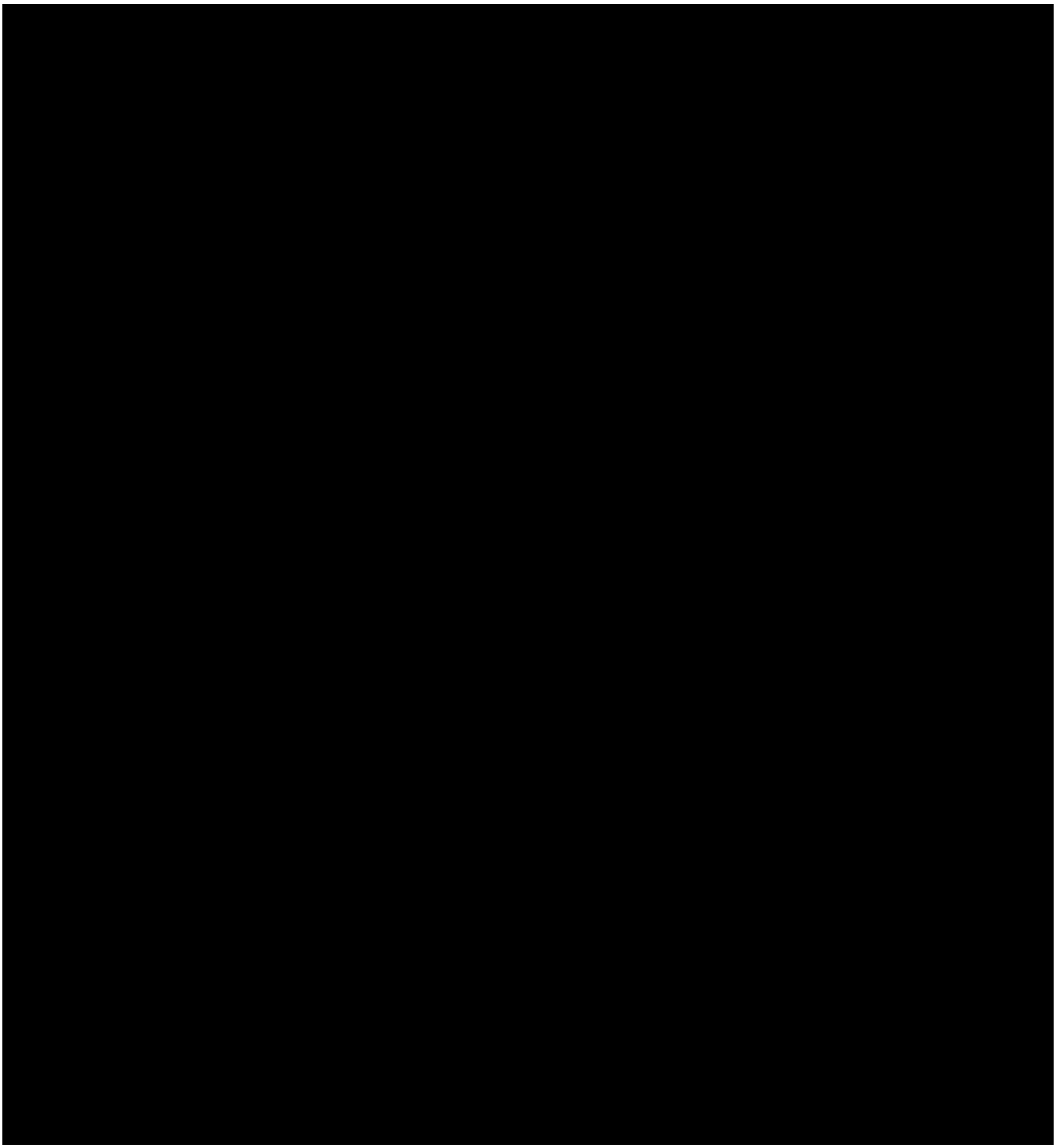
Self-adhesive exit sign with water-resistant backing.

Easily mark floors, stairways, floors, exit routes and fire equipment.

Patented material glows brighter than standard glow-in-the-dark materials.

Sketch

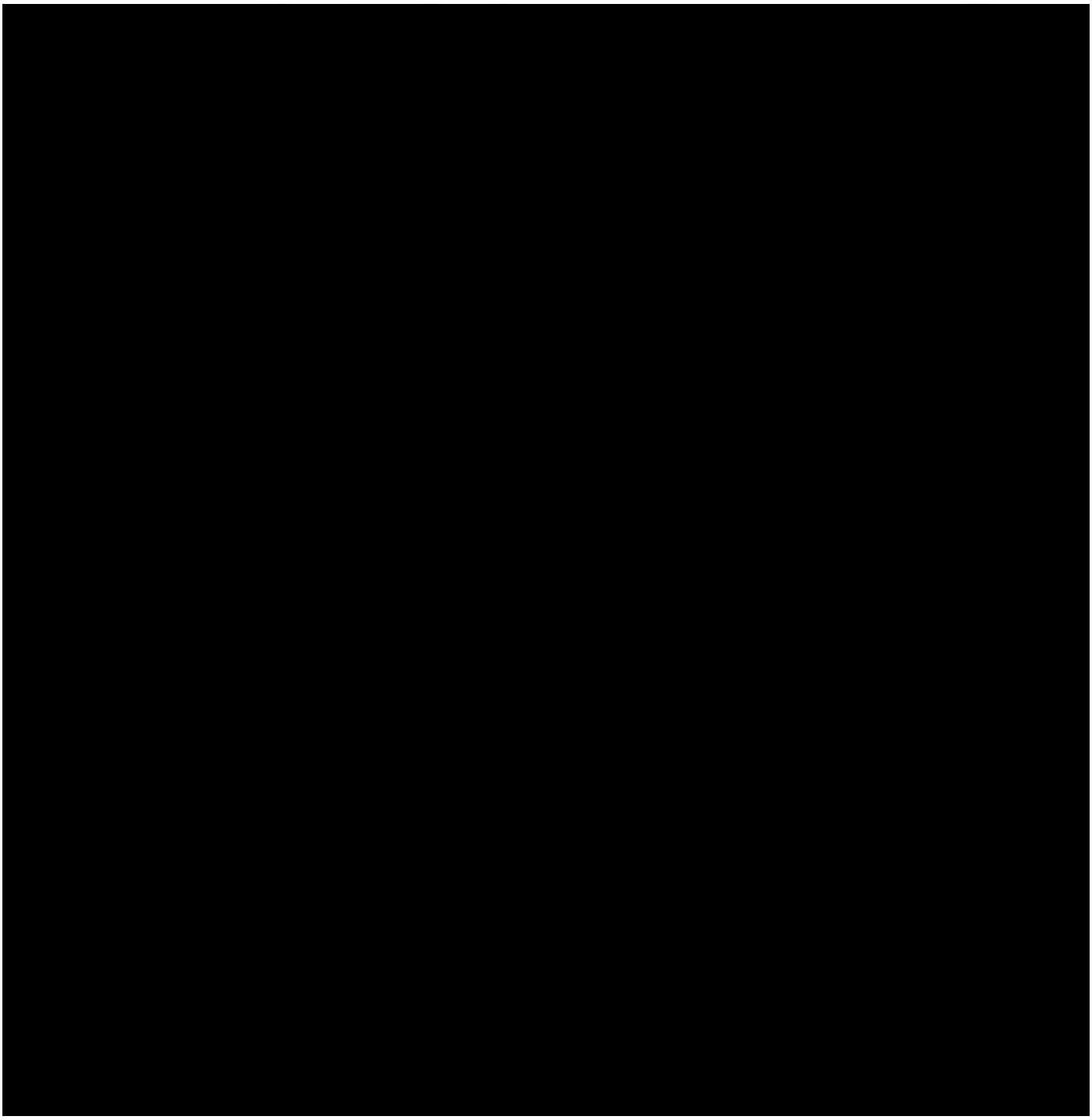
Alternative No.: AD-59



Sketch

Alternative No.: AD-59

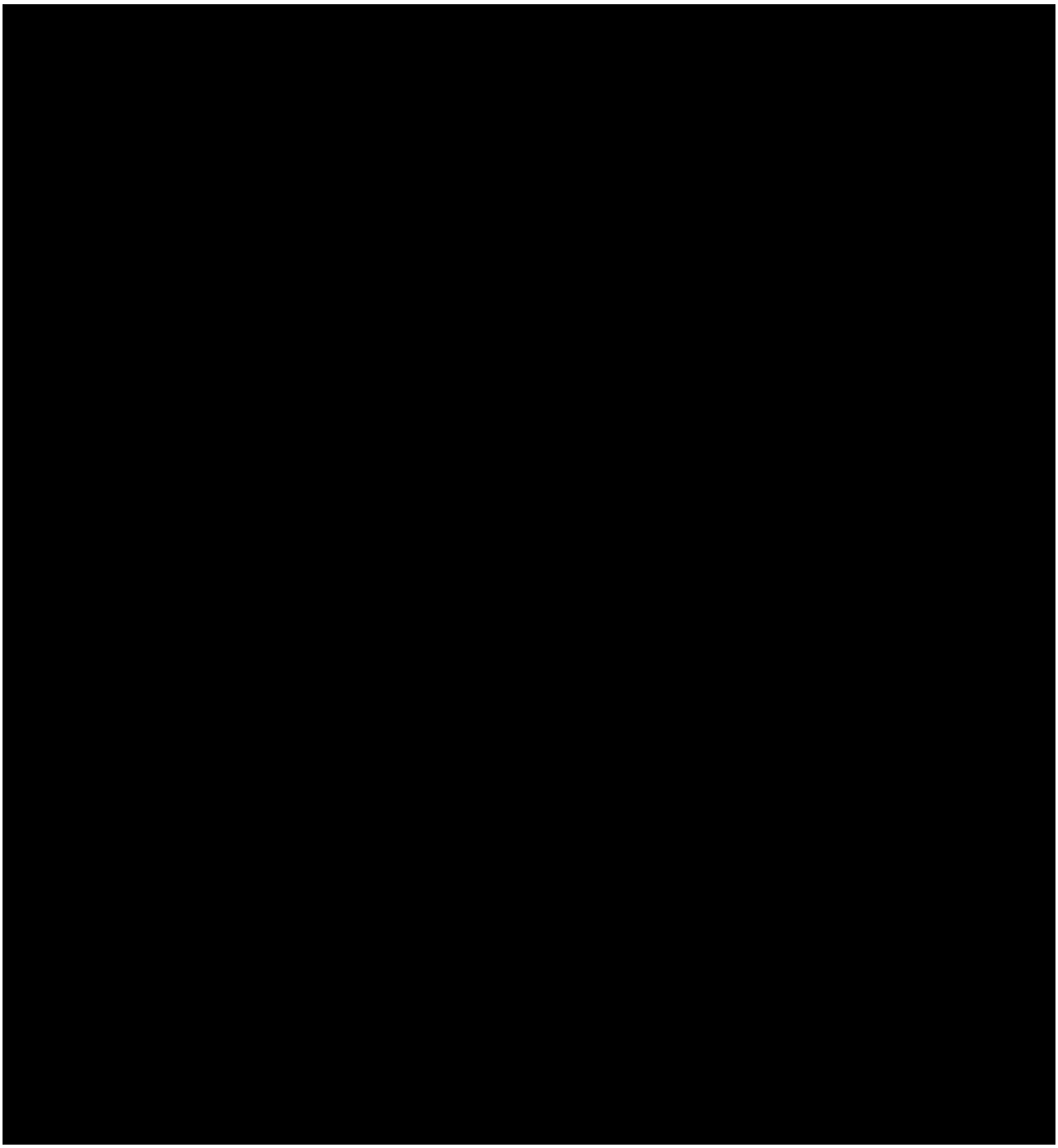
■ Original ■ Alternative



Sketch

Alternative No.: AD-59

■ Original ■ Alternative



Construction Cost Estimate

Alternative No.: AD-59

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
A. Fire Alarm						
Central Station	EA	50,000.00	1	$50,000		
Fire detection devices	EA	400.00	420	$168,000		
Conduit & Wire	LF	18.00	4,500	$81,000		
Aux. Equipment	LS	20,000.00	1	$20,000		
B. Tunnel Lighting						
Lighting Fixture	EA	450.00	410	$184,500	205	$92,250
Regular Lighting / Conduit & Wire	LF	18.00	4,500	$81,000	4,500	$81,000
Exit Signs	EA	550.00	300	$165,000	15	$8,250
Exit Sign Conduit & Wire	LF	18.00	4,500	$81,000	4,500	$81,000
30 KVA, 480/277 V - 120/208 V XFMR	EA	6,000.00	4	$24,000		
150 KVA, 120/208 V - 480/277 V XFMR	EA	20,000.00	2	$40,000		
400 A Disconnect Switch	EA	800.00	2	$1,600		
Conduit & Wire	LF	25.00	4,500	$112,500		
1" PVC Coated RGS conduit, Installed in Trench	LF	15.00	22,500	$337,500		
1" Aluminum conduit, installed in trench	LF	12.00			22,500	$270,000
Increase Tunnel Headroom	LS	70,329,632.00	1	$70,329,632	1.05	$73,846,114
Substitute NEMA 4X Enclosures for NEMA 6P Enclosures	LS	100,000.00	1	$100,000	1.30	$130,000
Total Markup	91.14%			$65,415,390.47		$67,906,100.60
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$137,191,000.00		$142,415,000
NET SAVINGS						($5,224,000)

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	AD-60
Optimize park electrical	
Description of Original Concept:	
Electrical project is in early stages of development and all details are not yet shown.	
Description of Alternative Concept:	
The alternative concept encourages items to improve the electrical distribution throughout the park, including hardening of the electrical and use of NEMA 6 type enclosures for temporary submergence, downsizing transformers throughout the project, using LED lighting in lieu of metal halide fixtures, use of 277 V for low light poles and 480V for high masts, reusing existing raceways where possible, and using PVC conduit in lieu of RGS for park lighting.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
• [redacted]	• [redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$136,903	$0	$136,903
Alternative Concept	$287,000	$0	$287,000
Savings	($277,000)	$0	($277,000)

Discussion

Alternative No.: AD-60

A. [redacted]

The park lighting poles have handholes for the wire connections that are located close to the grade level. [redacted]

B. [redacted]

C. [redacted]

[redacted]

D. [redacted]

[redacted]

[redacted]

[redacted]

Advantages:

- [redacted]

Disadvantages:

- [redacted]

[redacted]

E. [redacted]

[redacted]

F. [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Advantages:

- [redacted]
- [redacted]
- [redacted]

Disadvantages:

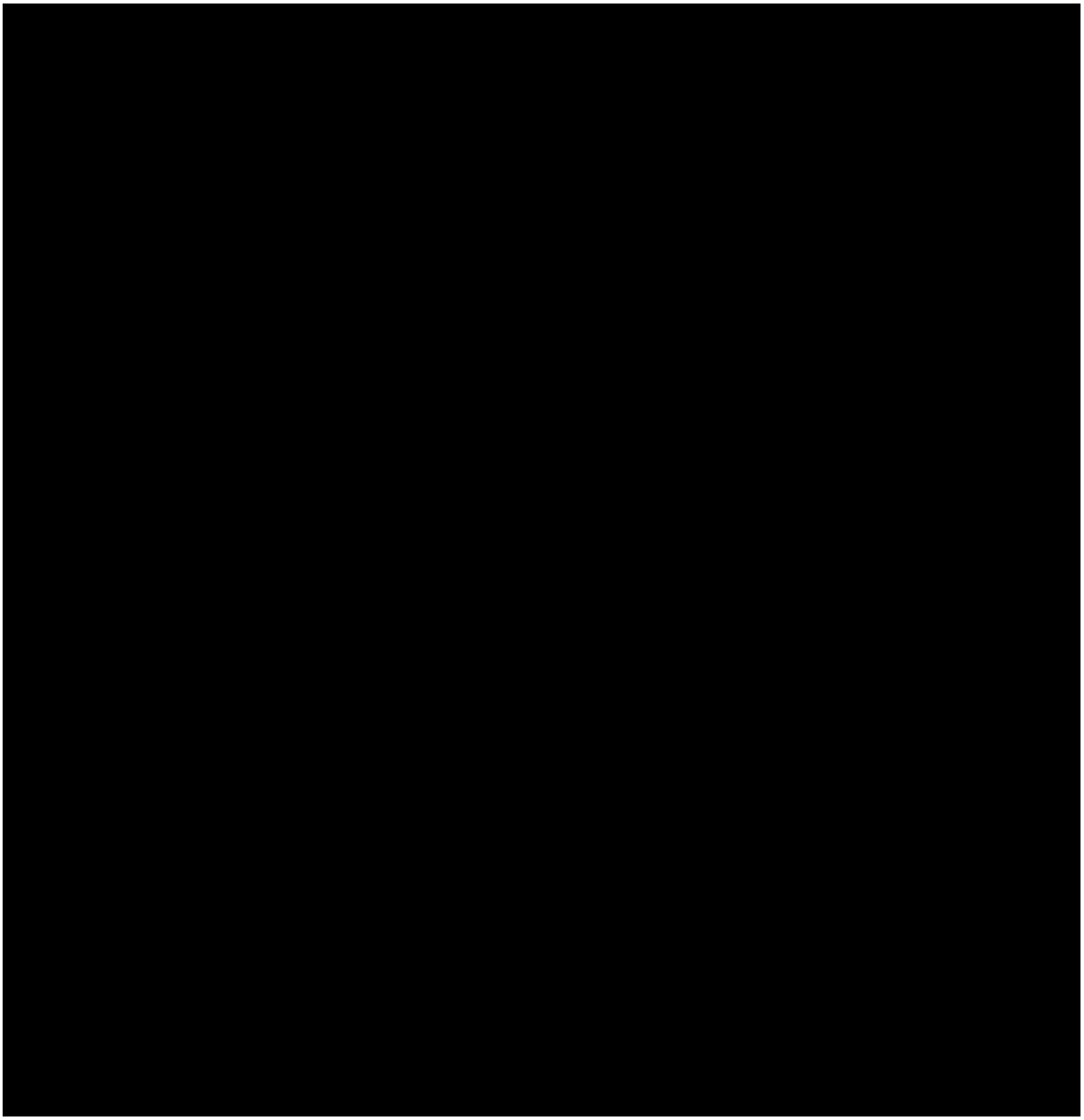
- [redacted]

[redacted]

Sketch

Alternative No.: AD-60

■ Original ■ Alternative



Sketch

Alternative No.: AD-60

■ Original ■ Alternative

Sketch

Alternative No.: AD-60

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: AD-60

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Change out Luminaires at Field Lighting Towers, Fields 5 & 6 (AD-47)	EA	20,000.00			8	$160,000
Higher Voltage for Lighting						
Underground 3" RGS Conduit	LF	42.00	1,000	$42,000		
Underground 1.5" RGS Conduit	LF	20.00			1,000	$20,000
600 V, 2/0 XHHW Copper Wire	LF	7.00	4,000	$28,000		
600 V, #4 XHHW Copper Wire	LF	3.00			4,000	$12,000
1" PVC	LF	8.00			1,000	$8,000
1" RGS PVC	LF	15.00	1,000	$15,000		
Additional Cost for Hardening System	LS	50,000.00			1	$50,000
750 KVA Transformer	EA	65,215.00	1	$65,215		
500 KVA Transformer	EA	45,090.00			1	$45,090
Total Markup	91.14%			$136,903.83		$268,940.87
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$287,000.00		$564,000
NET SAVINGS						($277,000)

CONSTRUCTION (C)

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-04
Close park entirely during construction	
Description of Original Concept:	
The original concept is to keep portions of East River Park and the entire Shared Use Path open throughout the duration of construction. Portions of the park will be closed for construction, while some facilities are to remain open.	
Description of Alternative Concept:	
The alternative concept is to close entire sections of East River Park and the Shared Use Path throughout the duration of construction, thereby allowing use by the contractor of the entire work areas.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
• [redacted]	• [redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$104,955,000	$0	$104,955,000
Alternative Concept	$93,710,000	$0	$93,710,000
Savings	$11,245,000	$0	$11,245,000

Advantages of Alternative Concept	Disadvantages of Alternative Concept
• [redacted] • [redacted]	

Discussion

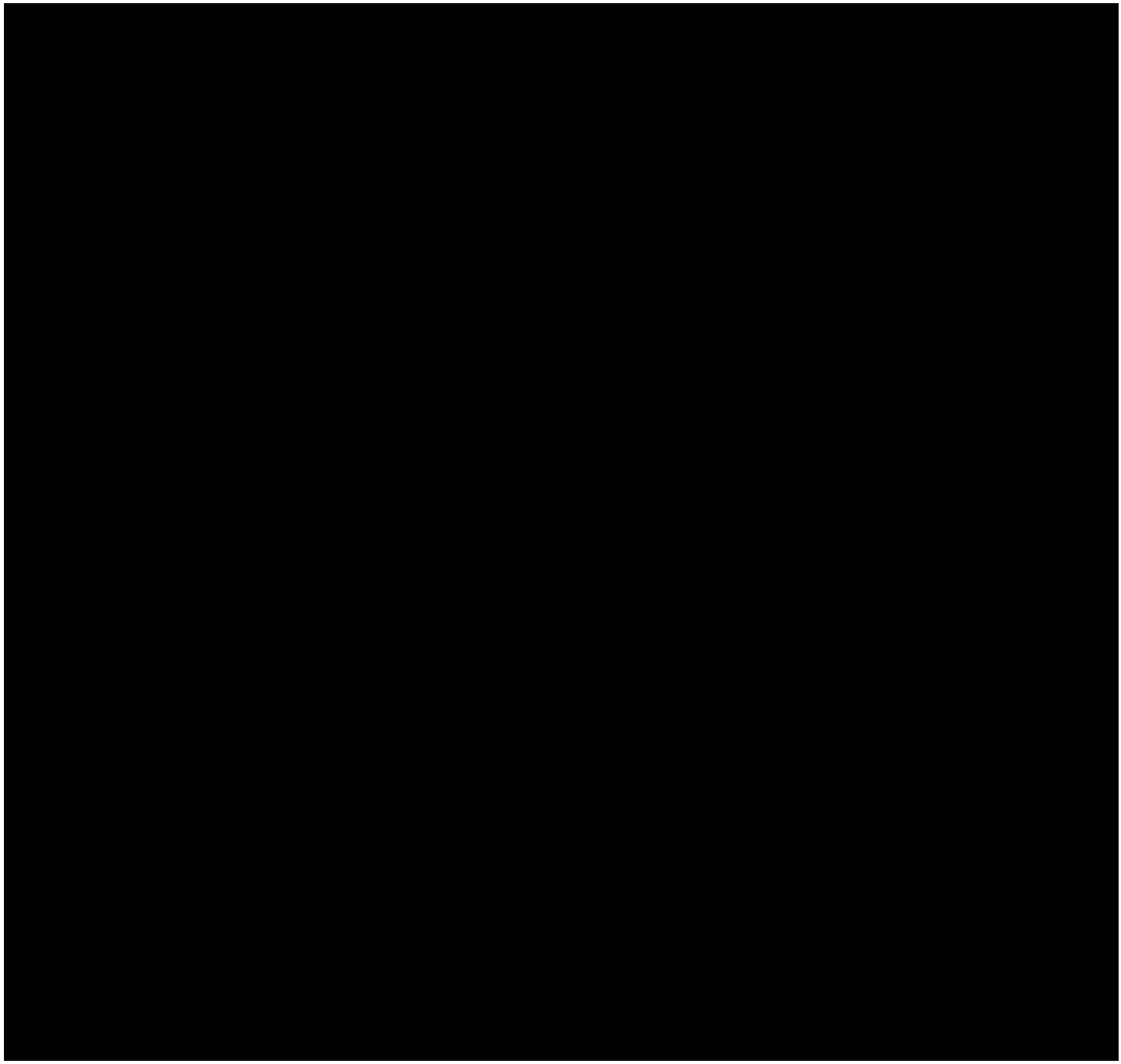
Alternative No.: C-04

[redacted]

Sketch

Alternative No.: C-04

■ Original ■ Alternative



Sketch

Alternative No.: C-04

■ Original ■ Alternative

Sketch

Alternative No.: C-04

■ Original ■ Alternative

Sketch

Alternative No.: C-04

■ Original ■ Alternative

Sketch

Alternative No.: C-04

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: C-04

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Enables 3 Shift Work						
Duration Savings	MO	980,546.00	56	$54,910,576	50	$49,027,300
Total Markup	91.14%			$50,044,725.00		$44,682,790.18
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$104,955,000.00		$93,710,000
NET SAVINGS						$11,245,000

Design Suggestion

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-08
Modify construction sequencing to facilitate use of HUD money	

Discussion:

[redacted]

[redacted]

The utilities and CSO work in the Park is approximately $149M.

[redacted]

Costs associated with this work are assumed to be $15-20M [redacted]

[redacted]

[redacted] This has been estimated to cost $11M. ([redacted] is also an enabling contract worth approximately $4.5M that could be performed as an early contract [redacted]

[redacted] Approximately $16M is being carried in the estimate for the prefabricated pedestrian bridge spans [redacted] Some or all of the full cost of the pedestrian bridges, estimated at approximately $79M may also be eligible.

[redacted] Costs for these items total roughly $77M.

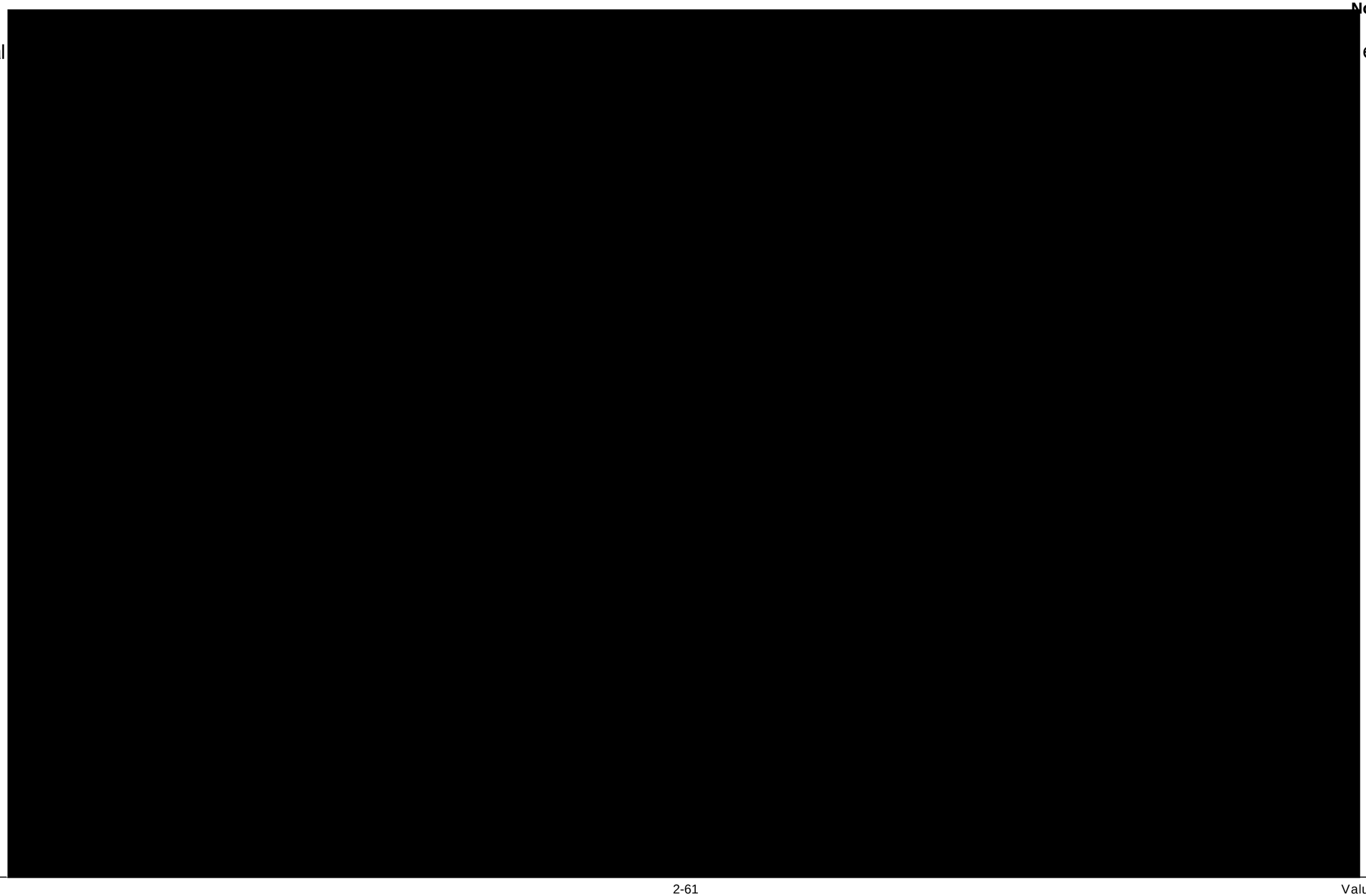
[redacted] it carries a separate, preliminary estimate of $161M.

[redacted]

Sketch

No.: C-08

■ Original



ernative

Sketch

Alternative No.: C-08

■ Original ■ Alternative

Sketch

Alternative No.: C-08

■ Original ■ Alternative

Sketch

Alternative No.: C-08

■ Original ■ Alternative

Alternative No.: C-08

■ Original

■ Alternative

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-10
Delay Pier 42 Phase 1B Park opening until ESCR is complete in that area	
Discussion	
Pier 42 is currently a temporary shed used for events like the planned Summer Waterfront Celebration and Salsa Concert in August 2018. [redacted]	

[redacted]

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-12
Use pre-cast concrete wall panels	
Description of Original Concept:	
The original concept was to cast all concrete in-place for a concrete pile cap on the l-wall sections of the flood wall.	
Description of Alternative Concept:	
The alternative concept is to use pre-cast l-wall caps for the flood wall.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)

	First Cost	O&M	Total LCC
Original Concept	$108,071,000	$0	$108,071,000
Alternative Concept	$106,450,000	$0	$106,450,000
Savings	$1,621,000	$0	$1,621,000

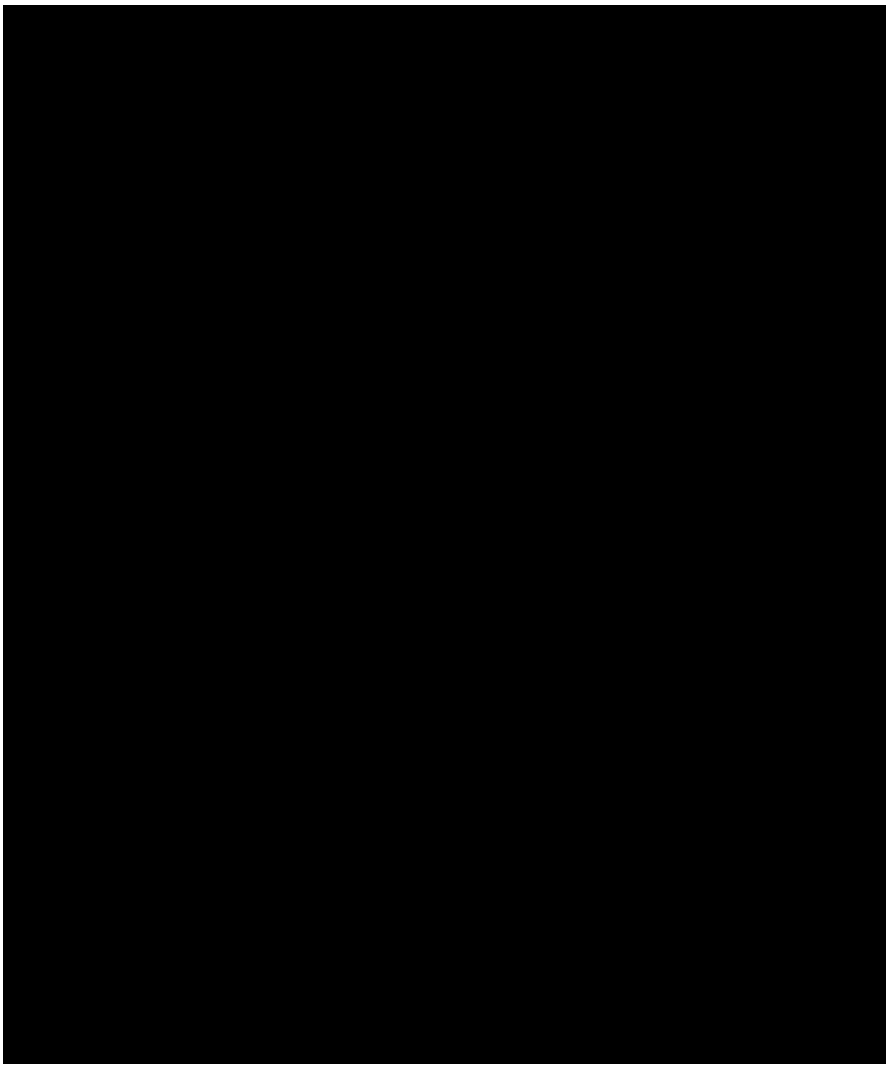
Alternative No.: C-12

[redacted]

Sketch

Alternative No.: C-12

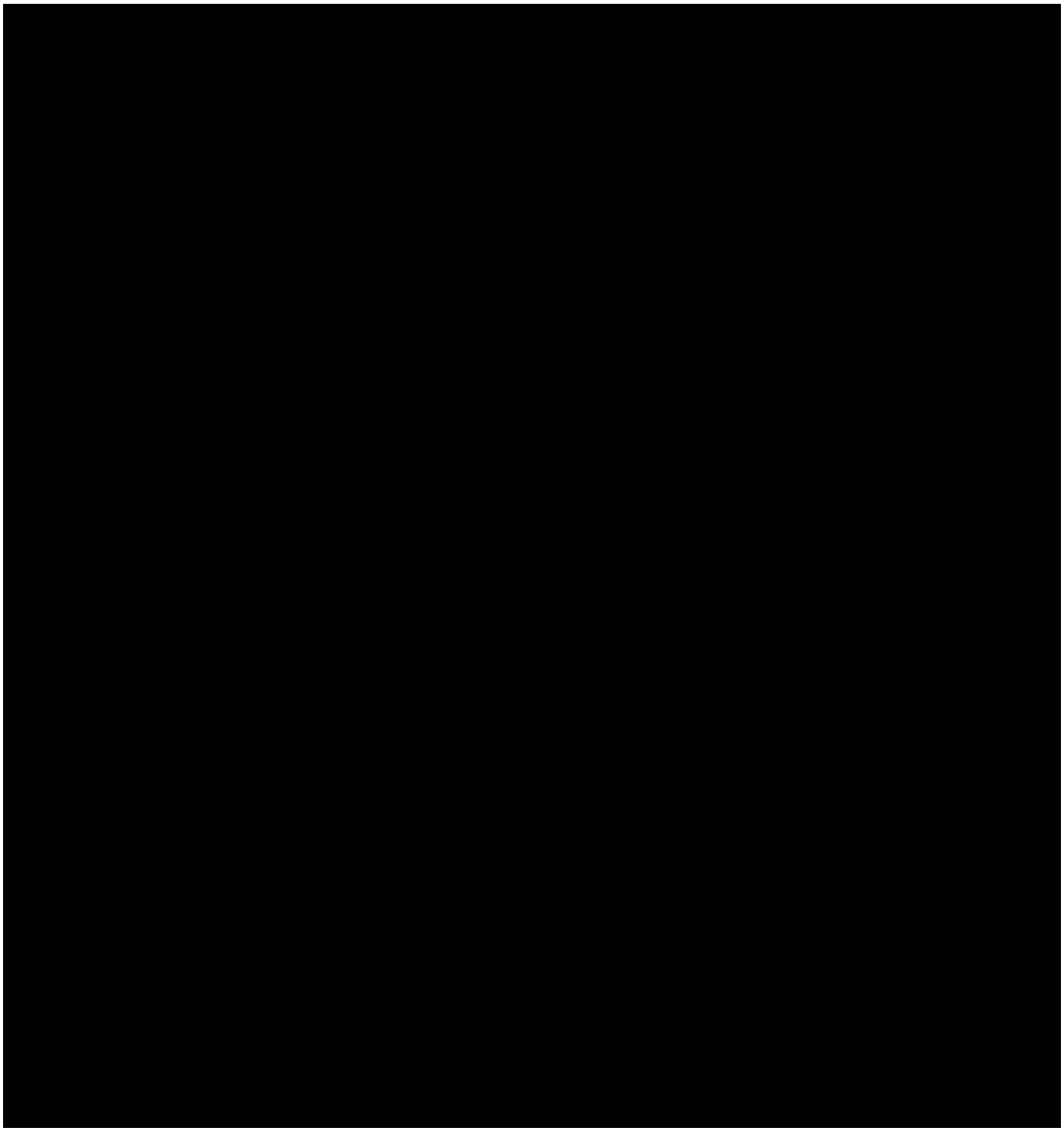
■ Original ■ Alternative



Sketch

Alternative No.: C-12

■ Original ■ Alternative



Sketch

Alternative No.: C-12

■ Original ■ Alternative

Precast concrete wall

Construction Cost Estimate

Alternative No.: C-12

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Precast Wall						
Precast Wall	CY	350.00			1,400	$490,000
Place Wall	LF	62.50			3,865	$241,563
Pin Through Sheeting	EA	500.00			1,289	$644,500
Grout, 2CF / LF	CF	50.00			7,730	$386,500
Existing Cap, as designed	CY	1,255.00	1,299	$1,630,245		
General Conditions						
Duration (Cost / Month)	MO	980,546.00	56	$54,910,576	55	$53,930,030
Total Markup	91.14%			$51,530,507.32		$50,757,444.27
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$108,071,000.00		$106,450,000
NET SAVINGS						$1,621,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-15
Leave area in north end open to allow trucks to access FDR to Exit 7 during construction	
Description of Original Concept:	
The original concept is to only have one access at Montgomery Street to Area 1 (East River Park) section of the project, which would handle both entering and exiting vehicles to the park, including all construction related vehicles.	
Description of Alternative Concept:	
The alternative concept is to provide an exit to Area 1 at the north end of East River Park, so that construction vehicles can enter at Montgomery and exit at the north end.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
• [redacted]	• [redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$0	$0	$0
Alternative Concept	$478,000	$0	$478,000
Savings	($478,000)	$0	($478,000)

Discussion

Alternative No.: C-15

[redacted]

Advantages:

- [redacted]
  - [redacted]
  - [redacted]
  - [redacted]
- [redacted]
- [redacted]
- [redacted]

Disadvantages

- [redacted]
- [redacted]
- [redacted]

Sketch

Alternative No.: C-15

■ Original ■ Alternative

[redacted]

Corlears Hook Bridge and back of Amphitheater – Pinch point only one-way at a time.

Sketch

Alternative No.: C-15

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: C-15

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
MPT For Single Lane Closure	LS	50,000.00			1	$50,000
Roadway Modifications	LS	100,000.00			1	$100,000
Restore Finished Park Sections	LS	100,000.00			1	$100,000
Total Markup	91.14%					$227,846.48
TOTALS	Breakdown of Markup can be found in the Cost Appendix					$478,000
NET SAVINGS						($478,000)

Design Suggestion

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-19
Advance order long-lead items to improve schedule and use HUD money	

Discussion

[redacted]

Advantages:

- [redacted]

Disadvantages:

- [redacted]

[redacted]

Figure #1 Representative Giken Silent Piler System

Figure #2 Representative Auger Attachment for Giken Silent Piler Equipment

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-20
Pre-cast U-shape and place on tunnel slab	
Description of Original Concept:	
Construct each section of the utility tunnel as cast-in-place.	
Description of Alternative Concept:	
Use precast U-shaped reinforced concrete sections and install on cast-in-place tunnel floor slabs, except at CSO crossings and where tunnel is integral with floodwall.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$129,015,000	$0	$129,015,000
Alternative Concept	$109,653,000	$0	$109,653,000
Savings	$19,362,000	$0	$19,362,000

Discussion

Alternative No.: C-20

[redacted]

Sketch

Alternative No.: C-20

■ Original ■ Alternative

Sketch

Alternative No.: C-20

■ Original ■ Alternative

Sketch

Alternative No.: C-20

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: C-20

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Tunnel (Partial Length)	LF					
Elevated Slab	CY	1,255.00	2,176	$2,730,692		
Cast in Place Walls	CY	1,255.00	6,140	$7,705,700		
Slab on Grade	CY	1,255.00	1,714	$2,151,070		
Pre-Cast						
Pre-Cast U - Shaped Section	CY	350.00			8,316	$2,910,600
Place 20' Sections	EA	78.00			2,500	$195,000
Seals at Pre-Cast	LF	25.00			5,708	$142,700
Slab on Grade	CY	1,255.00			1,714	$2,151,070
Duration Savings	MO	980,546.00	56	$54,910,576	53	$51,968,938
Total Markup	91.14%			$61,516,760.45		$52,284,667.30
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$129,015,000.00		$109,653,000
NET SAVINGS						$19,362,000

Design Suggestion

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-35
Complete bulkhead repairs as an early package and part of this project	
Discussion	

[redacted]

Advantages:

- [redacted]

Disadvantages:

- [redacted]

[redacted]

[redacted]

Design Suggestion

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-36
Use A + B bidding	
Discussion	

[redacted]

[redacted]

PRICE + TIME BIDDING
A+B
Guidelines

A. Introduction

The Department first introduced A+B Bidding in 1996. A+B bidding is a method of awarding a project based on both cost and time. Each bid submitted consists of two parts:

- The A portion of the bid is the sum bid for the contract work items.
- The B portion of the bid is the time in calendar days proposed by the bidder to complete the project or a portion of the project, multiplied by a daily road user cost determined by the Department.

The contract is awarded based on the sum of the A portion and the B portion of the bid. The contract amount after award is limited to the A portion of the bid.
A disincentive provision is incorporated into the contract (based on road user costs) should the Contractor fail to complete the work in the length of time bid. An incentive provision is also included to pay for acceleration costs and to reward the Contractor for earlier completion.

Experience has shown that A+B bidding is an effective way to reduce construction induced congestion and delays by allowing the cost of work and time to be balanced through the open competitive bidding process. Benefits of A+B include:

- encourages potential Contractors to develop even more detailed well thought out plans in order to bid on the time to complete a project or project phase. Since the time bid by each Contractor is based on their own capabilities to perform the work, the more efficient Contractors can generally bid shorter times.
- encourages Contractors to schedule their operations to maximize the efficiency of their work crews and equipment in order to meet the time bid.
- encourages Contractors to work overtime, double shifts and at night to reduce construction time.
- encourages Contractors to develop innovative ways to reduce construction duration at the lowest cost during bid preparation and during construction.
- road user costs and inconvenience are minimized.
- reduces the number of congestion related complaints from the road users and local communities.
- congestion related pollution and environmental impacts are reduced.

Guidelines for Developing A+B Provisions

Some of the guidance below is based on guidelines for the development and use of I/D provisions, contained in FHWA Technical Advisory T 5080.10 titled Incentive/Disincentive for Early Completion, dated February 8, 1989.

1. Project Selection

The use of A+B Bidding provisions is primarily intended for critical projects or critical project phases where traffic inconvenience and delays must be held to a minimum. User delay costs or public benefit must be significant enough to warrant construction acceleration. If UDOT staff and the Contractors staff are working double shifts and/or overtime to complete a project or phase and there is no apparent user delay or reason to expedite the work, Contractors, UDOT staff, and the public, may question why they are rushing to finish. This is not cost effective or good for morale. Generally, the use of these provisions should be limited to those projects or project phases that would severely disrupt highway traffic. As a guide, user delay and other documented delay costs should be at least $3,000 per day to warrant the use of incentive provisions.

The following characteristics are associated with projects appropriate for A+B bidding:

- high traffic volume facilities generally found in urban areas,
- projects that will complete a gap in a significant highway system,
- major reconstruction or rehabilitation on an existing facility that will severely disrupt traffic,
- major bridges out of service,
- projects with lengthy detours of high volumes of traffic,

A+B bidding may be used for projects or phases which produce user delay costs less than $3,000/day if extraordinary concerns exist such as interference with public events or significant public interest and benefit.

If the established contract time is longer than necessary for a good contractor to finish using normal effort, unnecessary prolonged delays and impacts are imposed on the public. On the other hand, if established contract time is too short, the contractor is forced to increase the bid to compensate for acceleration costs. A+B bidding provides an opportunity for the contractor to balance the time required to complete the work with the costs associated with doing the work. It is extremely important in all cases that the user costs established in the contract accurately represent the projected user costs.

When selecting projects for A+B bidding, the total B portion of the bid must be an amount large enough to influence the bidding. If a very large project has a very short B portion completion time, the time element may have little impact on the overall results of the bidding. For example, a $30,000 B portion (10 days X $3,000/day) would have minimal effect on a $20 million project (A portion) due to its small percentage of the total A+B bid. On the other hand, a $1,250,000 B portion (250 days X $5,000/day) on a $5 million project (A portion) may provide too much influence on how the bid is structured and how the work proceeds because the relative

value of the B portion is so high. The B(time) portion of the bid shouldn't exceed 10-15% of the total cost of the work to avoid undesirable emphasis on time over the actual cost of the work.

2. Project Development

It is essential that a project's suitability for A+B bidding be identified during the early stages of project development. During the development of A+B projects, extra effort should be made to ensure that the design, specifications, schedule, etc., are compatible and appropriate for the project. A field change to correct mistakes in plans can be very costly in both time and money on an A+B project. The plans and specifications should indicate any unusual conditions or restrictions the Contractor may be required to work under, such as prohibiting jack hammering, pile driving or heavy equipment operation during the night due to noise problems.

During the preconstruction phase of the project, all affected parties (e.g., local officials, police, Regional functional groups, businesses, schools, utility companies, railroads, etc.) should be involved in the project development. It is essential that designers work closely with the Region Construction group regarding schedules, wording of the special provisions, etc.

Pre-design field reviews are essential since "as built" plans or old construction plans may not be reliable, due to maintenance operations or field changes not recorded on the plans. Also, a pre-bid meeting may be necessary to discuss the I/D phase and any unusual features of the project with prospective bidders.

A. Special Note: Description of B Portion Work

The contract must clearly define what constitutes the start and the completion of the B portion work. Both may differ from the start or completion of the project. For example, the B time might not begin until a detour is implemented, a bridge closed or traffic is otherwise impacted. This allows the Contractor time to fabricate and deliver steel, obtain mix design approval, do other pre-construction planning, etc. However, it is necessary to define in detail what is expected of the Contractor. This can be done through the plans and by detailed description in the special provisions. Work to be completed must be clearly stated. Completion of items such as paving up to, and including, base course, signing, lighting, signals, striping, curb, shoulder, etc., should be addressed. Off-road items such as landscaping, sidewalks or other items that could be performed without disrupting traffic should also be addressed. If the intent is to get the roadway open to traffic as soon as possible, off-road items may be excluded from the B portion work.
Counting days for the B portion work can begin with the lane closure or event that results in user delay, or with the award notification, or with a combination thereof.

A.1 Begin B portion work with lane closure or event that results in user delay

Under this condition, B portion work begins with an event such as closing a bridge or the first lane closure(s) and ends with an event, i.e., when the bridge is reopened or all work requiring lane closures is complete.

This is the preferred method of starting the B portion work if the goal is to minimize user delay associated with a certain situation. The Contractor should be allowed the flexibility to prepare for the lane closure period and select a start date that will result in the shortest period of time, within the overall time limits of the contract. Bridge replacement projects with an off-site detour are ideally suited for this situation. The counting of B portion workdays should start when the Contractor closes the bridge to traffic and end when the bridge is reopened to traffic. This encourages the Contractor to take care of all shop drawing submittals, ordering and delivery of materials, and other preparatory work such that the timing of the closure is based on the critical path of the actual construction. If the B portion work starts with the notice to proceed, the Contractor may close the bridge earlier than necessary, resulting in additional user delay. One thing to consider in this situation is the amount of time that can be allowed before starting the B portion work. If the Contractor waits too long before starting the work, the time bid may end after the contract completion date or some other milestone date. If the B portion work must be complete by a certain date, then the Contractor must be informed in the contract what the consequences are for not completing the work by that date. One option is to indicate in the special note that the disincentive period will begin on a certain date regardless of the time bid. In other words, if the Contractor fails to begin the work in time to complete by the milestone or contract completion date, all incentive payments must be forfeited.

A.2 Begin "B" portion work with notification to proceed

In some cases, the goal is to achieve the B portion milestone date as soon as possible, by having the Contractor mobilize and begin working immediately. The starting point could then be tied to the notice to proceed. Standard wording in the special provision for this situation could be:

"The counting of consecutive calendar days for the B portion work shall begin 10 calendar days after the date of the Notice to Proceed."

The10 day period (or whatever number of days is appropriate) is not meant to be a day that any physical work begins; it is an agreed date to begin counting.

A.3 Begin "B" portion work with either an event that results in user delay or tied to notification to proceed.

This option still gives the contractor the flexibility desirable in a.1 while also allowing the Department to demand the B portion work begin within a reasonable time period. Standard wording in the special provision for this situation could be:

"The counting of consecutive calendar days for the B portion work shall start on the earlier of the following dates 1) 60 calendar days after the date shown on the Notice to Proceed, or, 2) when the Contractor first restricts traffic...."

Again the 60 day period (or whatever number of days appropriate) is not meant to be a day that any physical work begins; it is an agreed date to begin counting the B portion of contract.

b. Multiple B Phases

Periodically, projects include multiple phases with varying degrees of user delay. Furthermore, projects may not be completed in one season, but the roadway must be fully open for the winter months.

For example, assume Phase 1 of a project is "pave westbound" and phase 2 is "pave eastbound", and the project is let early enough to allow the Contractor to complete both phases in one season. If the user delay is the same for each direction and we want both phases completed in one season, separate B portions may not be required.

If this same project is let late in the season and both phases are in the same B portion work and can not be done concurrently, some Contractors may bid one season, while others may bid 2 seasons. A Contractor that bids one season would have a significantly lower B portion bid because they are not including the winter months within their bid. The one season bid may require late season paving. If there are any significant increases in the B portion work during construction of Phase 1, the Contractor would most certainly request an extension of time which would result in the performance of Phase 2 in the second season.

The need for multiple B portions must be determined on a project-specific basis in consideration of the problems and objectives of the situation. All options must be considered when developing the description of the B portion work. A general guide is to tie the B portion work to the user delay. If there is no user delay during the winter, this period should not be included in the B portion work. If the user delay for westbound is different than eastbound, they should be separate B portions. If the roadway is closed or restricted during the winter with a measurable user impact, the winter should be included in the B portion time frame.

c. Utilities and Railroads

Utility, Railroad or other third party work within the B portion requires additional effort by designers and construction staff in order to minimize potential for delays. If possible, arrangements should be made to have this third party work done prior to the start of B portion work. If this is not possible, special provisions must be included in the contract describing the time frames allowed for any Utility, Railroad or other third party agreement. It is essential that these time frames be consistent with the description of B portion work and the Designer's schedule. Conflicts between these third party schedules and the time specified for the B portion work must be avoided. Underground utilities within the B portion phase should be located

with the highest possible degree of accuracy if there is contract work that could potentially interfere with these utilities.

e. Special notes regarding time restrictions

If the contract contains work hour restrictions, milestone dates or other time restrictions, consideration must be given to the location of these requirements. Restrictions in various special provisions, on different plan sheets, and in several specifications could lead to confusion. Consider combining time restrictions in a separate special provision and appropriate cross- references.

3. Determination of the Daily Cost

The daily cost must be determined by estimating the user cost associated with the construction or delay in delivering the product. This can be done by using "Delay User Cost" (DUC) developed by BYU for UDOT or by using "Delay E", written by Martin Knopp and made available by him to UDOT. The B component may be adjusted downward from the maximum values obtained from a delay analysis. It is important to remember that the daily cost must be sufficient to encourage the Contractor to develop innovative ideas, work efficiently and complete the project in a timely manner, but not so large as to induce undue risk to the contractor. Extreme risk will lead to undesirable bids and even a lack of interested bidders.

a. Typically the contract has an incentive/disincentive clause in it. The daily I/D amounts must be equal to the daily user costs estimated for the B portion of the work The contract should provide for disincentives to continue until the specified work is complete.
b. A cap on the amount of incentive paid under A+B provisions is required for budgeting and other fiscal reasons. As a general guideline, the maximum number of days of incentive for each incentive period could be limited to 10 % of the number of days estimated by the Engineer rounded to the nearest whole day. In addition, the sum of all incentives for a single contract should also be limited. As general guideline, use 5% of the Engineer's estimated contract amount as a maximum. Although this cap limits the number of days of incentive payment, keep in mind that the Contractor must bid on the time in order to get the project, and it is to their advantage to bid fewer days in order to be the lowest bidder. The daily cost disincentive will also encourage completion on or ahead of schedule. The Engineer's estimate must include the appropriate amount for the maximum incentive for the contract. If a contract contains multiple B phases, the sum of all maximum incentives must be included in the estimate for budgeting purposes.

4. B Portion Work Time Determination

When determining the maximum duration for the B portion time period, the Designer must consider to what extent, and at what cost, construction can be compressed from a normal construction schedule. Normal construction time is generally based on a highly qualified Contractor working five days a week, eight hours a day, while an accelerated time should be based on the performance of the same Contractor working extended or extra shifts with additional workers and crews for six or seven days a week. However, the use of a continuous seven-day workweek is cautioned against, because extended periods of work without days off

may result in reduced efficiency and morale, and high turnover rates for both Contractor and inspection personnel. The maximum duration for the B portion time period should be based on an accelerated but achievable work schedule. If the completion date is impossible to meet, the Contractor will not even try to earn the incentive. In fact, unreasonable completion dates may discourage potential bidders from bidding.

It is important to establish a maximum acceptable duration for the B portion of the contract so that the contractors don't bid a duration that is unacceptable for the project goals.

To accurately determine the B portion time period, Designers should develop a schedule using the critical path method. This will ensure that the maximum duration specified is achievable, and that any other time related contract provisions are incorporated and consistent, i.e., utility schedule, railroad involvement, seasonal limitations, work restrictions, etc.

The season of the year in which the project will be constructed should also be considered in determining the B portion time.

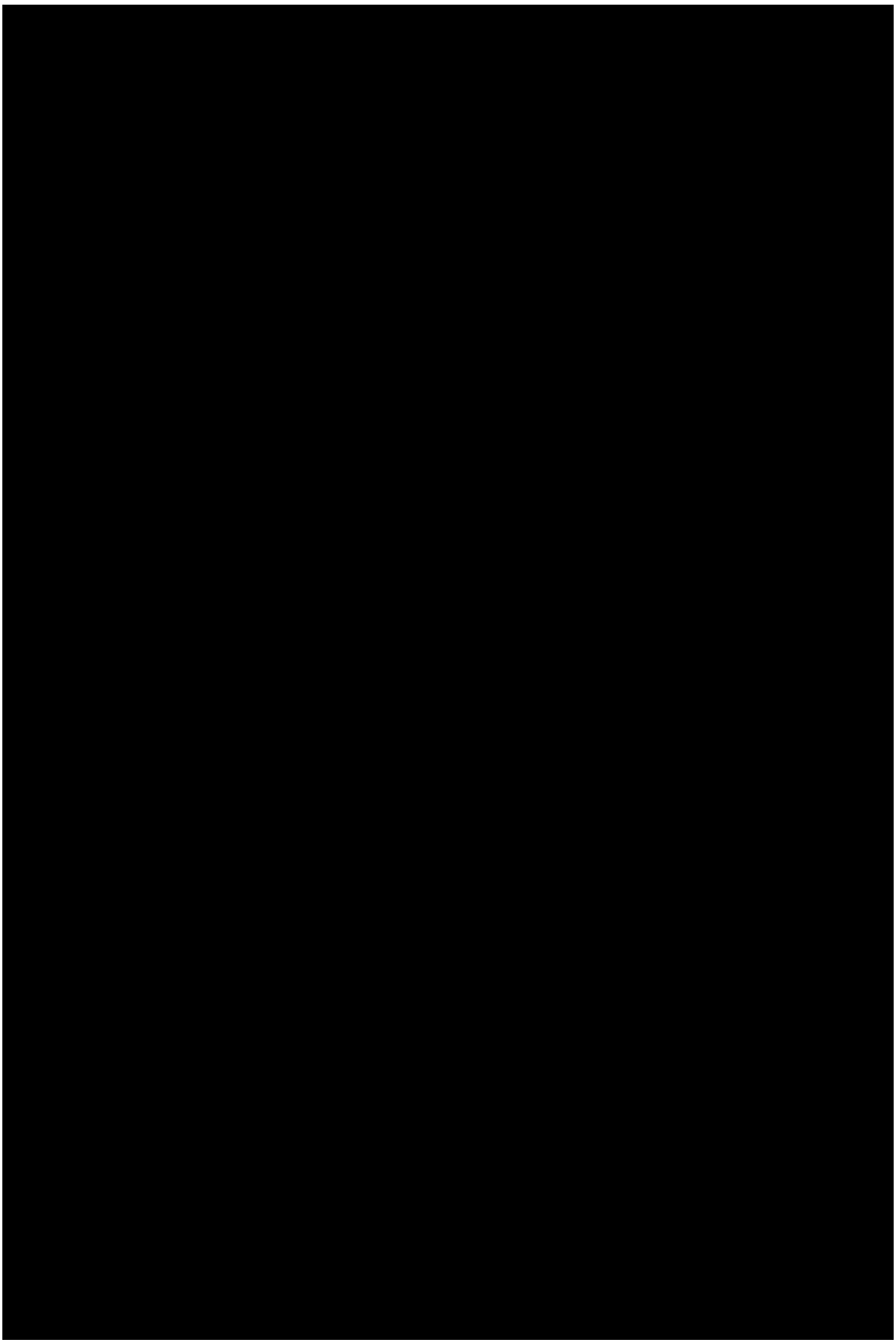
5. Constructability Review

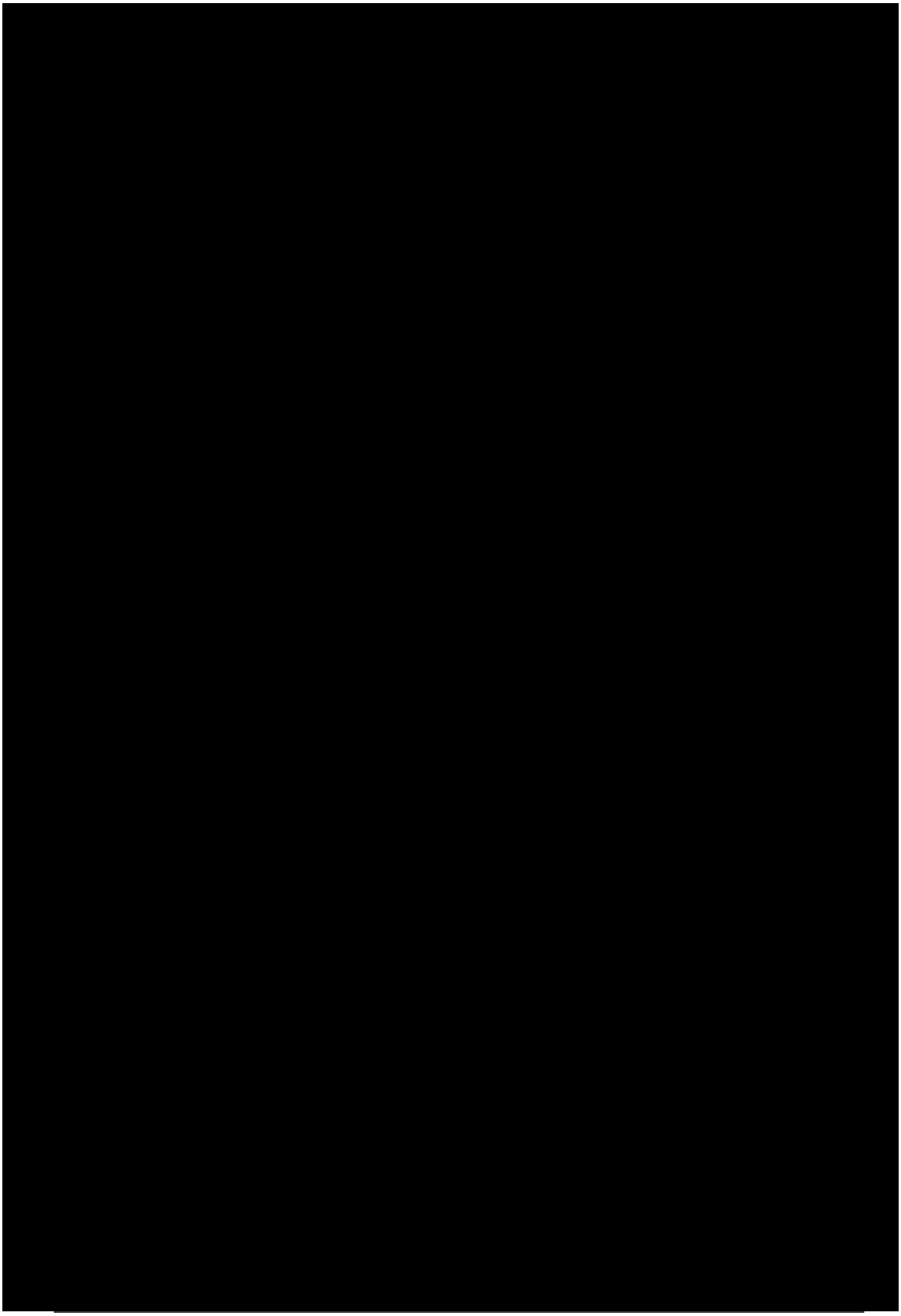
On any project where the Designer intends to use A+B bidding, the Special Provisions, supporting analyses, CPM schedule, and Limitation of Operations should be developed and coordinated with the Region Construction Group.

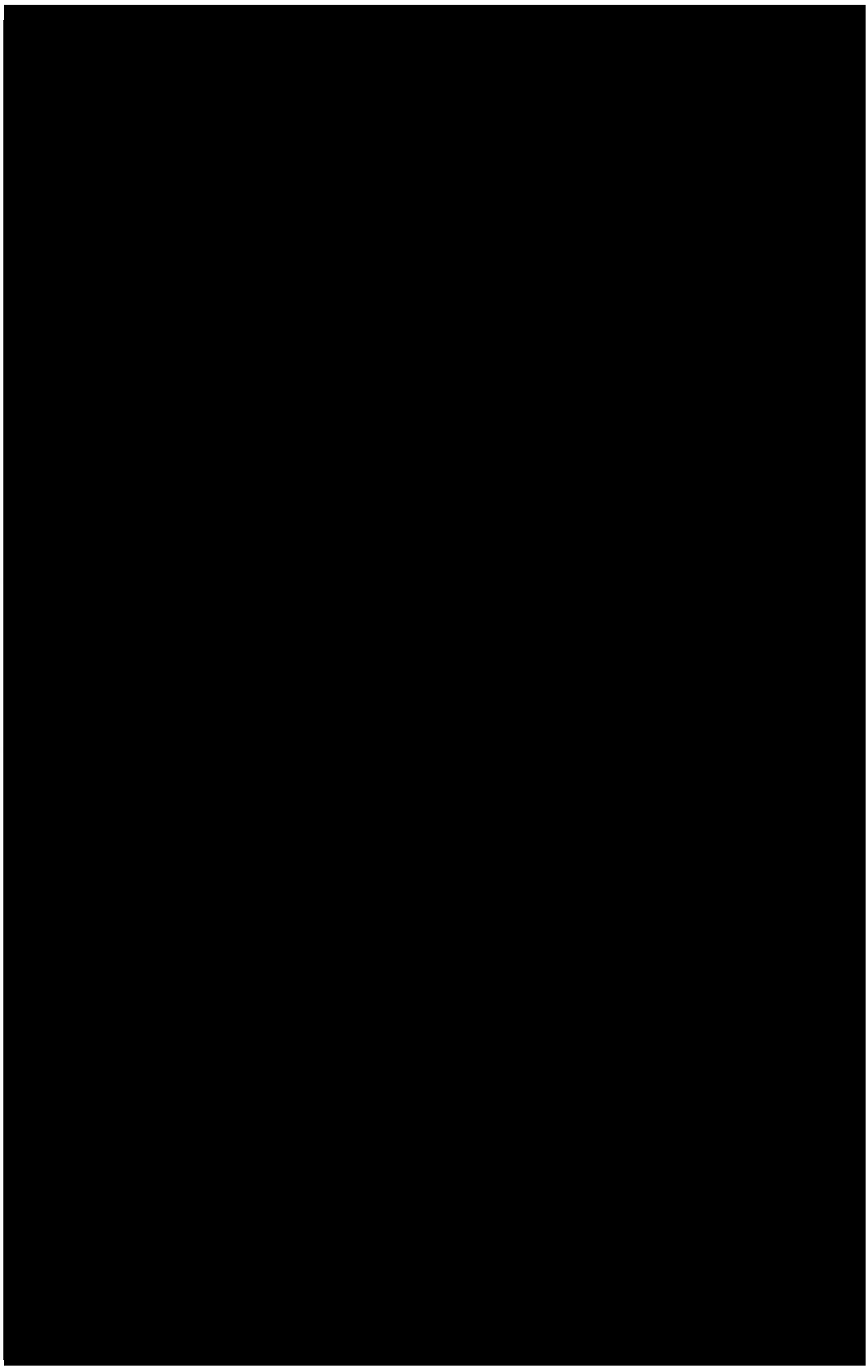
6. Information Required With the PS&E Submission

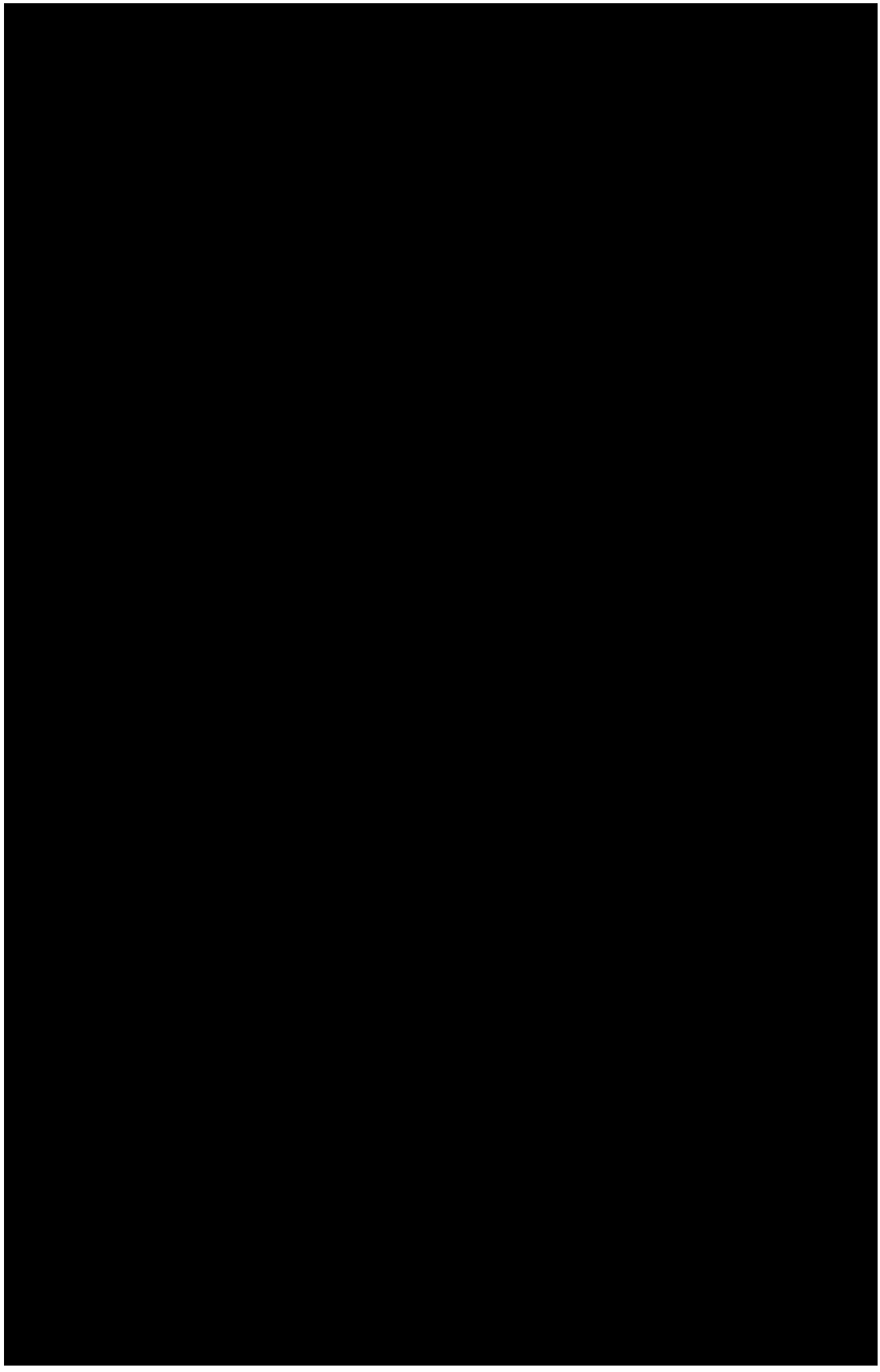
a. Special Provisions for A+B bidding (see Attachments)
   i. Section 02221S (Bidding Contract Time)
   ii. Section 00515M (Award and Execution of Contracts)
   iii. Section 00555M (Prosecution and Progress)
   iv. Section 00570M (Definitions)

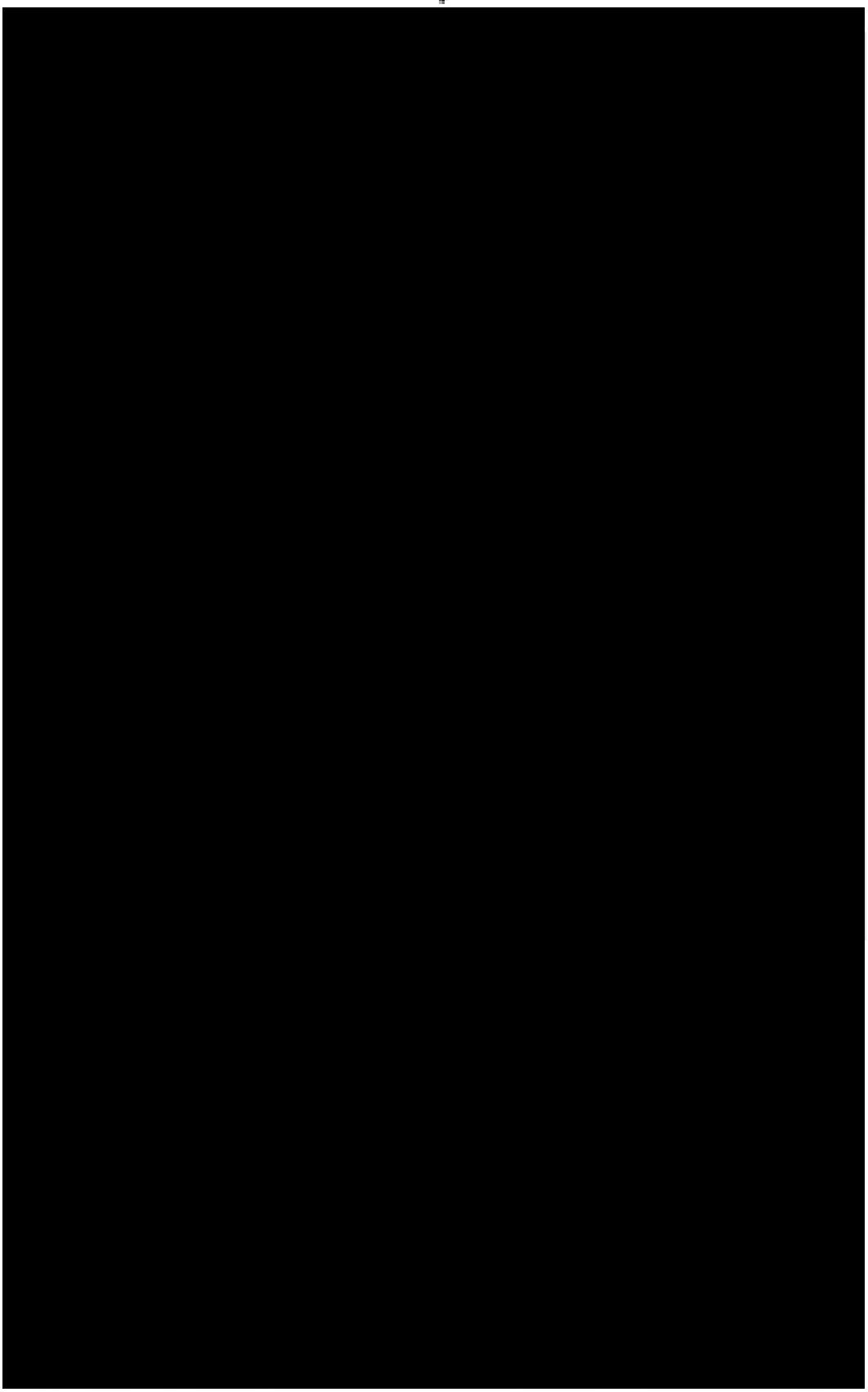
The above provisions are generic special provisions that need to be modified to fit each project circumstances. There are either blanks to be filled in or highlighted narratives that provide suggestions to consider.

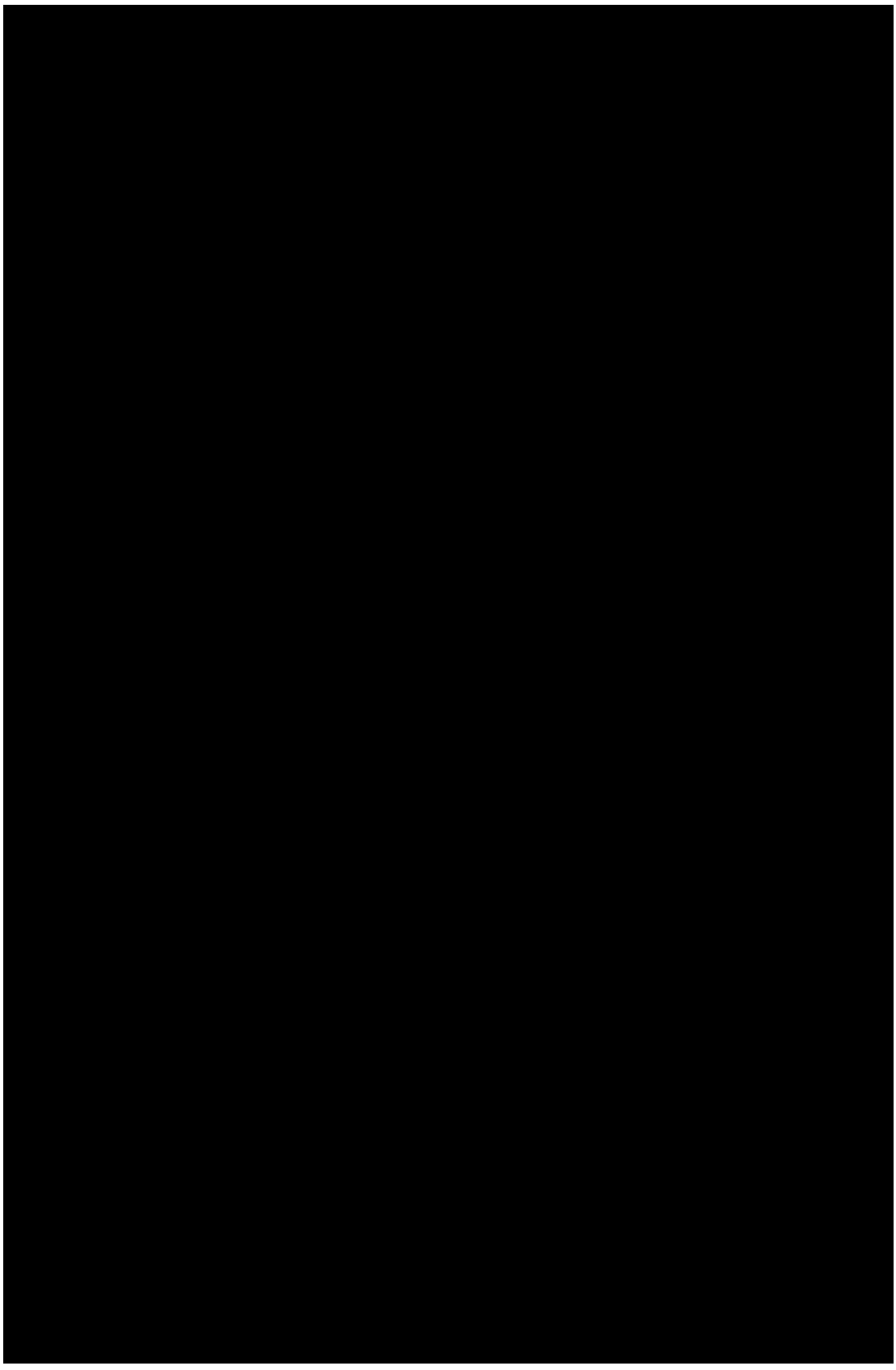


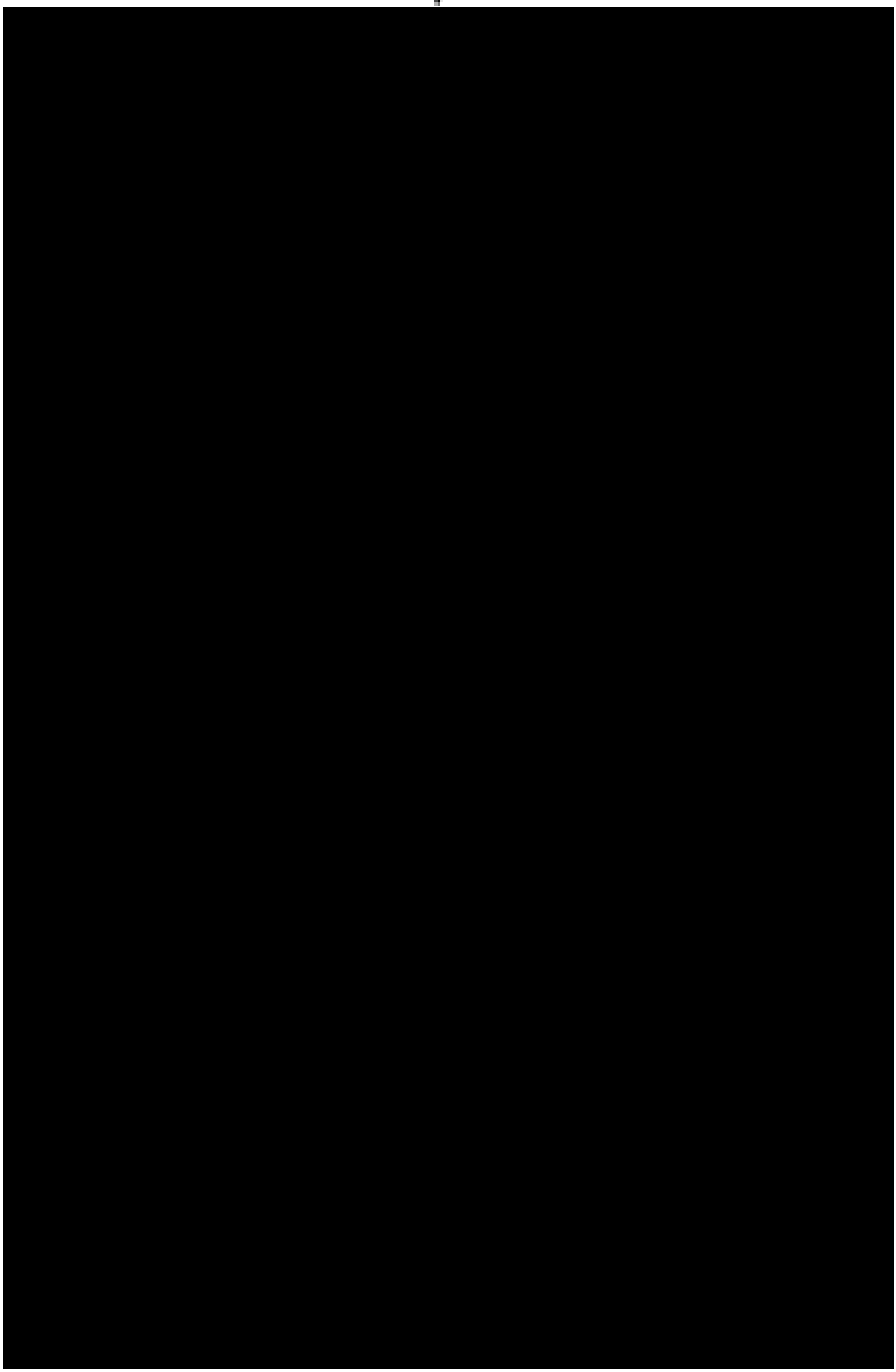


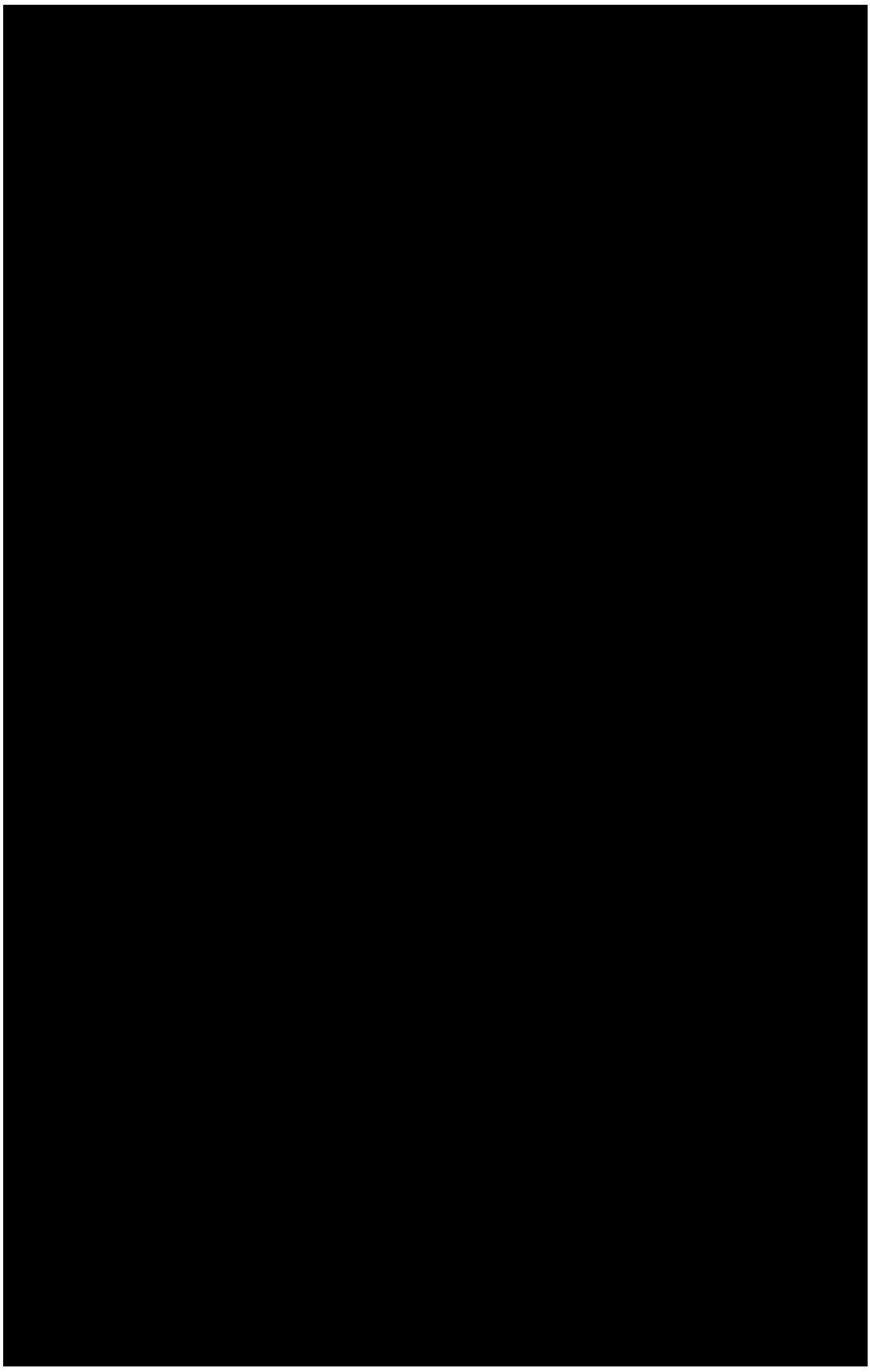


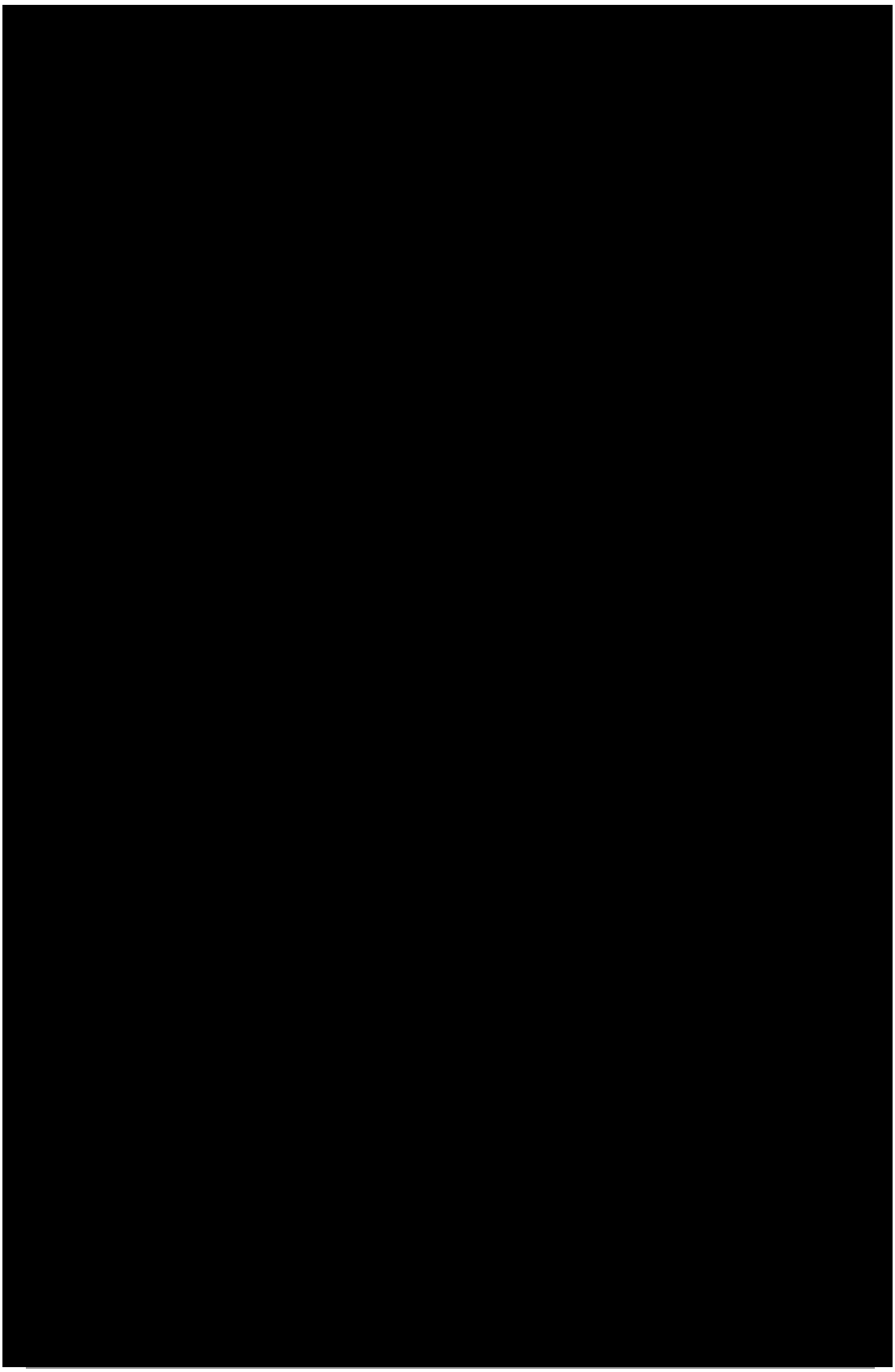












Design Suggestion

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-38
Keep landscape packages small enough to encourage competition	
Discussion	
[redacted]	

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-40
Use southbound service road as part of FDR mainline and shift traffic west	
Description of Original Concept:	
The original concept is to close one lane northbound overnight to allow construction activity associated with the wall, pedestrian bridges and other elements of the design.	
Description of Alternative Concept:	
The alternative concept is to shift all lanes of the FDR 10 feet to the west to allow 24/7 construction activity adjacent to the FDR.	
Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$46,209,000	$0	$46,209,000
Alternative Concept	$16,928,000	$0	$16,928,000
Savings	$29,281,000	$0	$29,281,000

Discussion

Alternative No.: C-40

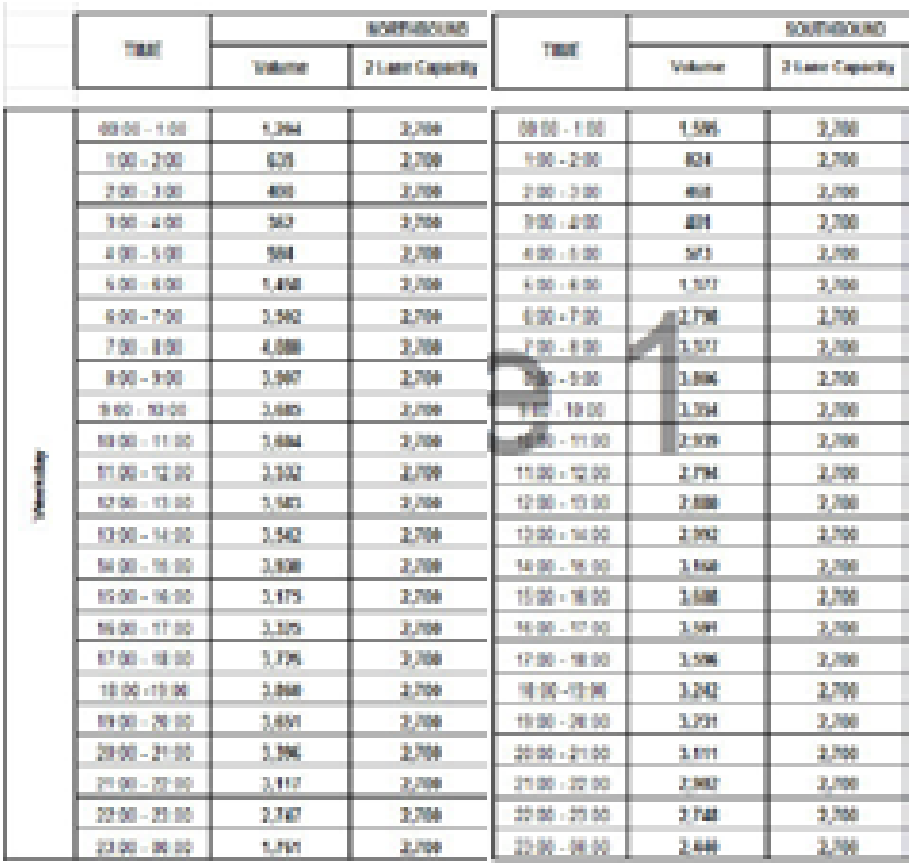
[redacted]

[redacted]

The peak hour traffic volumes are experienced during the weekday morning period on the FDR; shown in the table below.

Time	Northbound	Southbound
8-9am	4,000	3,800

FDR Weekday Traffic Volumes between Houston Street and 10th Street.



[redacted]

- [redacted]
- [redacted]
- [redacted]

Advantages:

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

Disadvantages

- [redacted]
- [redacted]
- [redacted]

Sketch

Alternative No.: C-40

■ Original ■ Alternative

Sketch

Alternative No.: C-40

■ Original ■ Alternative

[redacted]

[redacted]

Street view of service road adjacent to Manhattan Bridge

Street view of service road adjacent to Housing

Construction Cost Estimate

Alternative No.: C-40

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Remove Jersey Barrier Median	LF	60.00			2,572	$154,320
Temporary Paving	SF	123.00			12,860	$1,581,780
Temporary Striping	LF	10.00			2,572	$25,720
Signage	LS	1.00			20,000	$20,000
Relocate						
New Jersey Barrier	LF	125.00			2,572	$321,500
Paving	SF	123.00			12,860	$1,581,780
Striping	LF	10.00			2,572	$25,720
Signage	LS	1.00			20,000	$20,000
MPT	LF	970.00	10,782	$10,458,540		
MPT	LF	700.00			2,572	$1,800,400
General Conditions						
Duration (Reach D, E, F, H, 50% of I)	MO	415,670.00	33	$13,717,110	8	$3,325,360
Total Markup	91.14%			$22,033,346.65		$8,071,762.18
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$46,209,000.00		$16,928,000
NET SAVINGS						$29,281,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-50
Use landing barge or floating dock to allow landing in shallow areas	
Description of Original Concept:	
The original concept would provide only one barge berthing location on the rehabilitated esplanade (see Figure 1) between Construction Segments 2 and 3 (see Figure 2), without any floating dock.	
Description of Alternative Concept:	
The alternative concept is to develop conceptual drawings of multiple (assume three) spudded floating docks such as FlexiFloat Units or an existing landing barge or floating dock) to allow barge access from the esplanade. This will permit concurrent East River construction access to Construction Segments 1, 4 and 5.	

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$104,955,000	$0	$104,955,000
Alternative Concept	$113,727,000	$0	$113,727,000
Savings	($8,772,000)	$0	($8,772,000)

Advantages of Alternative Concept	Disadvantages of Alternative Concept
[redacted]	[redacted]

Discussion

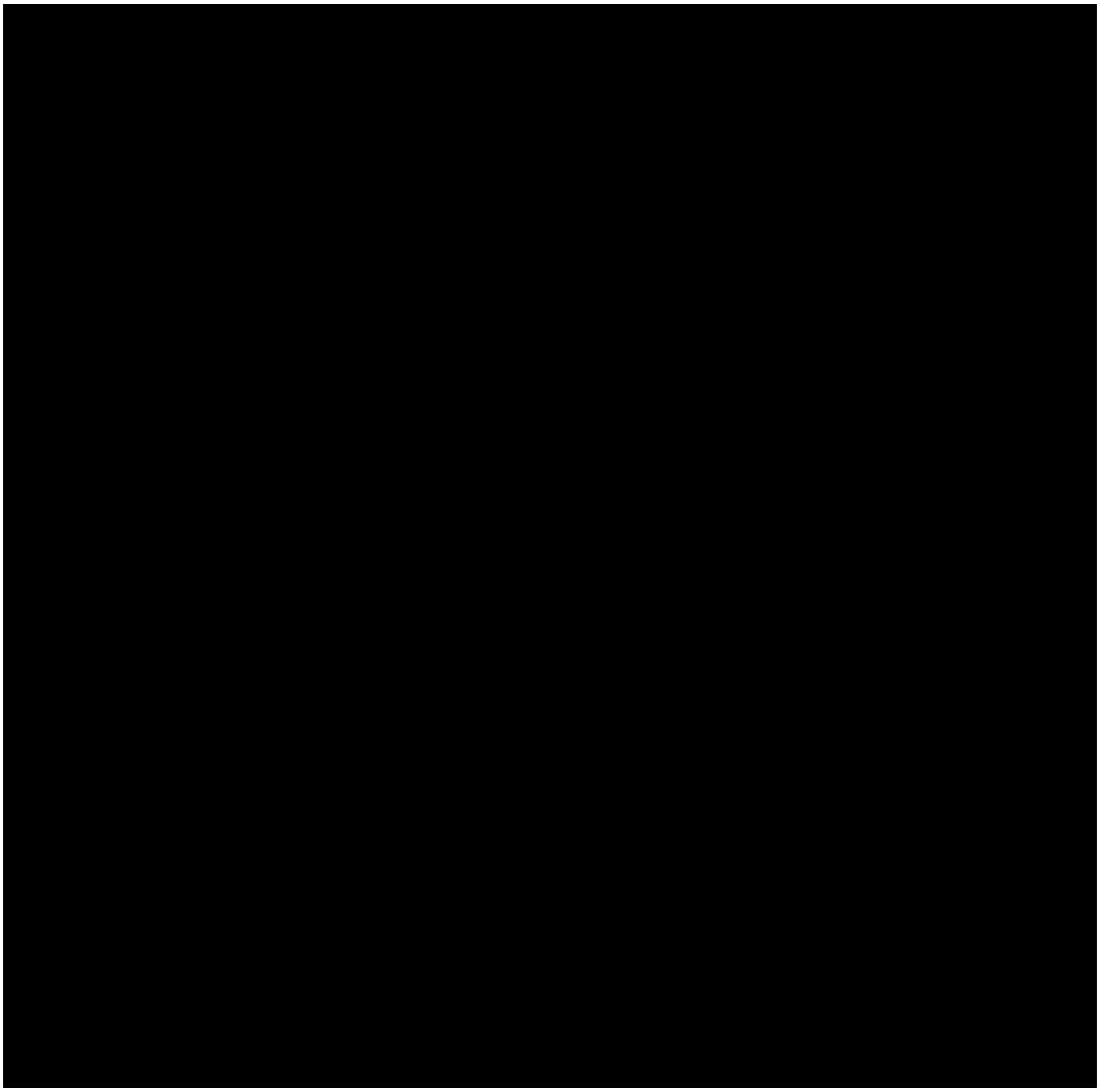
Alternative No.: C-50

[redacted]

Sketch

Alternative No.: C-50

■ Original ■ Alternative



Sketch

Alternative No.: C-50

■ Original ■ Alternative

December 1, 1981 Page IX-B-3

SERIES S-70 FLOATATION UNITS		NUMBER	FLEXIFLOATS			BUOYANT ATTACHMENTS			
SPECIFICATIONS			300 DUO-FLOATS	300 TRI-FLOATS	400 QUADRA-FLOATS	700 SIDE RAKE	702 END RAKE	703 SIDE RAKE	704 LOADING RAMP
DIMENSIONS (Effective)	Length	feet	20.00	30.00	40.00	7.00	10.00	10.00	20.00
		meters	6.10	9.14	12.19	2.13	4.57	4.57	6.10
	Width	feet	10.00	10.00	10.00	10.00	10.00	10.00	10.00
		meters	3.05	3.05	3.05	3.05	3.05	3.05	3.05
	Depth	inches	84.0	84.0	84.0	84.0	84.0	84.0	84.0
		centimeters	213.4	213.4	213.4	213.4	213.4	213.4	213.4
UNIT WEIGHT	Minimum	net tons	9.45	13.39	17.80	2.60	5.25	7.00	7.35
		metric tons	8.57	12.15	16.15	2.36	4.76	6.35	6.67
RATED LOAD CAPACITY (@ 85% Submergence)	Buoyancy	net tons	19.20	29.50	40.00	3.10	4.50	3.24	2.20
		metric tons	17.42	26.76	36.29	2.81	4.08	2.94	2.00
LOCKING UNITS	Number of	male	6	6	10	Option of 2 Male or Female			
	Number of	female	6	6	10				
LOCK SPACING	Horizontal	inches	60.0	60.0	60.0	60.0	60.0	60.0	60.0
		centimeters	152.4	152.4	152.4	152.4	152.4	152.4	152.4
	Vertical	inches	76.0	76.0	76.0	76.0	76.0	76.0	76.0
		centimeters	193.0	193.0	193.0	193.0	193.0	193.0	193.0
LOCK STRENGTH (@ 85% of yield)	Tension or Shear	net tons	70.0	70.0	70.0	70.0	70.0	70.0	70.0
		metric tons	63.5	63.5	63.5	63.5	63.5	63.5	63.5
PLATE THICKNESS (Minimum)	Deck	inches	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		millimeters	6	6	6	6	6	6	6
	Bottom	inches	0.31	0.31	0.31	0.31	0.31	0.31	0.31
		millimeters	8	8	8	8	8	8	8
	Sides	inches	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		millimeters	6	6	6	6	6	6	6
DECK BEAM SPACING (Maximum)	Longitudinal	inches	18.0	18.0	18.0	18.0	18.0	18.0	18.0
		centimeters	45.7	45.7	45.7	45.7	45.7	45.7	45.7
	Transverse	inches	19.1	19.1	19.1	19.1	19.1	19.1	19.1
		centimeters	48.5	48.5	48.5	48.5	48.5	48.5	48.5
DECK BEARING (Rated Capacity)	Pounds	per sq. ft	5000	5000	5000	3000	3000	3000	6000
	Grams	per sq. cm.	2441	2441	2441	1465	1465	1465	2930
ROPE THIMBLES		number of	8	8	8	1	1	1	2
OPTIONAL BULKHEADS		number of	None	2	3	None	None	None	None
	Distance from end	feet		10.00	10.00				
		meters		3.05	3.05				
	Added Weight	net tons		1.00	1.00				
		metric tons		0.91	0.91				

Figure #3 Representative FlexiFloat Components Assumed to be Used for Floating Docks

Sketch

Alternative No.: C-50

■ Original ■ Alternative

Figure #4 Representative FlexiFloat Units Configured as a Floating Construction Dock

Calculations

Alternative No.: C-50

■ Original ■ Alternative

[redacted]

Construction Cost Estimate

Alternative No.: C-50

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Barge Service	LOC	500,000.00			3	$1,500,000
2 Free Deck						
1 Crane Mounted						
Temporary Bridge to Park, from Barge	LOC	250,000.00			3	$750,000
Rental Estimate	MO	70,000.00			36	$2,520,000
Man Power (6 ea x $150 X 176 hrs.)	MO	158,400.00			36	$5,702,400
Duration Savings (Assumption)	MO	980,546.00	56	$54,910,576	50	$49,027,300
Total Markup	91.14%			$50,044,725.00		$54,227,187.93
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$104,955,000.00		$113,727,000
NET SAVINGS						($8,772,000)

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-51
Allow a construction access (road) by building a temporary berm at Houston Street for construction access into the park	
Description of Original Concept:	
The original concept is to have a single construction entrance to East River Park at Montgomery Street to access the work zone for all work within the park.	
Description of Alternative Concept:	
The alternative concept is to obtain approval for a second construction entrance from the Houston Street overpass with a temporary construction ramp down to the Park. To allow for this, this will likely require inclusion in the EIS.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)

	First Cost	**O&M**	**Total LCC**
Original Concept	$0	$0	$0
Alternative Concept	$11,358,000	$0	$11,358,000
Savings	($11,358,000)	$0	($11,358,000)

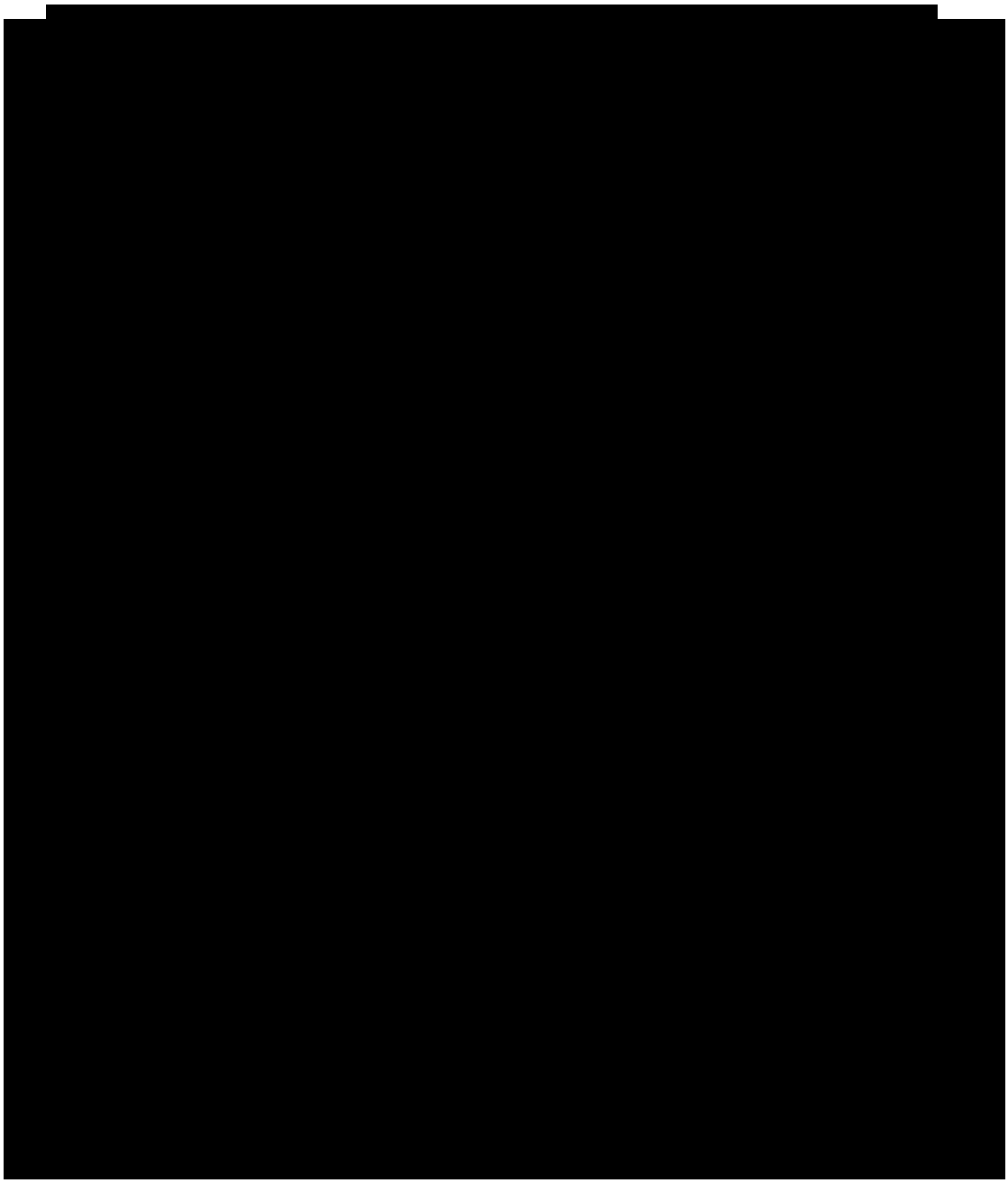
Discussion

Alternative No.: C-51

Sketch

Alternative No.: C-51

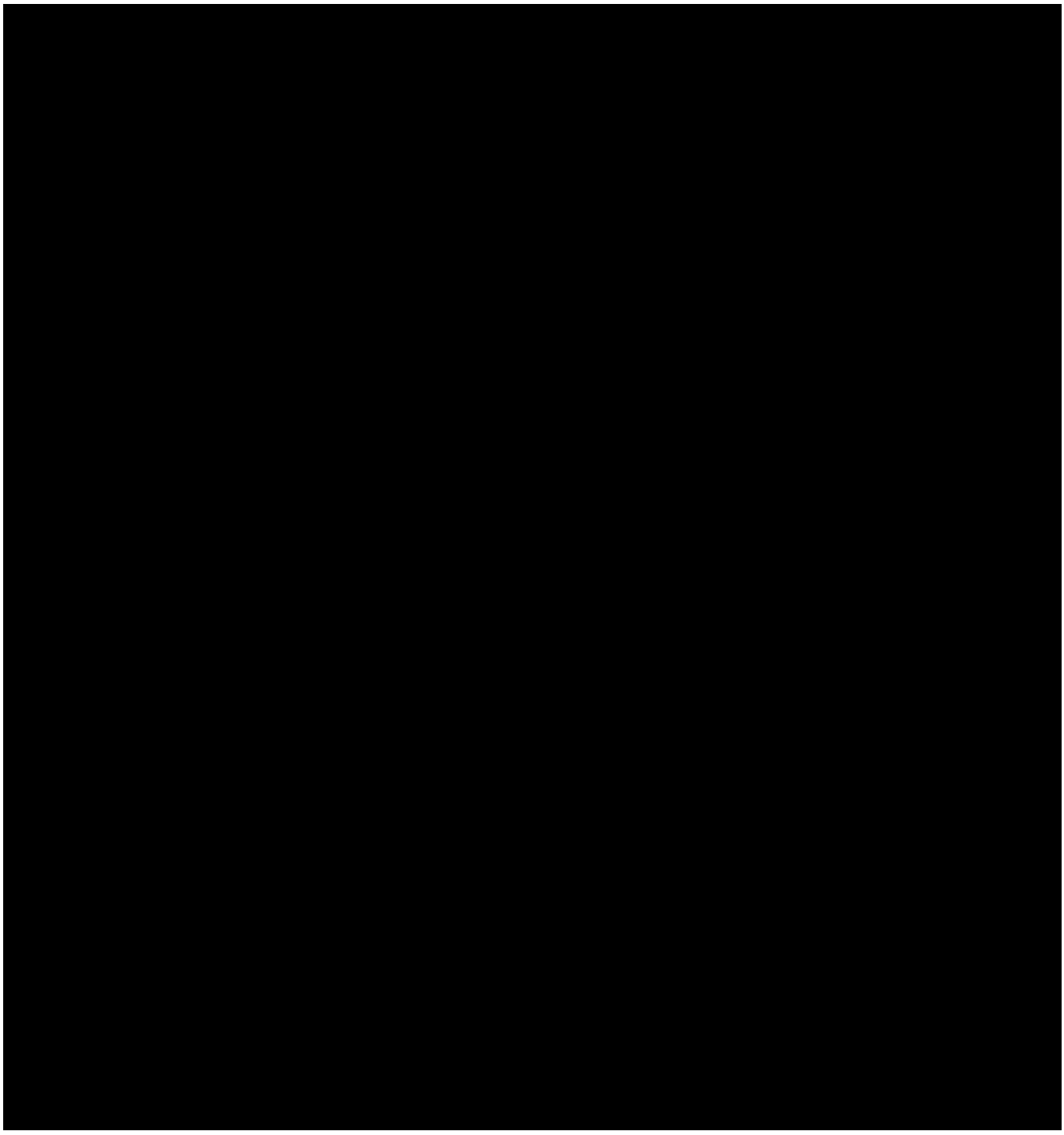
■ Original ■ Alternative



Sketch

Alternative No.: C-51

■ Original ■ Alternative



Sketch

Alternative No.: C-51

■ Original ■ Alternative

Construction Cost Estimate

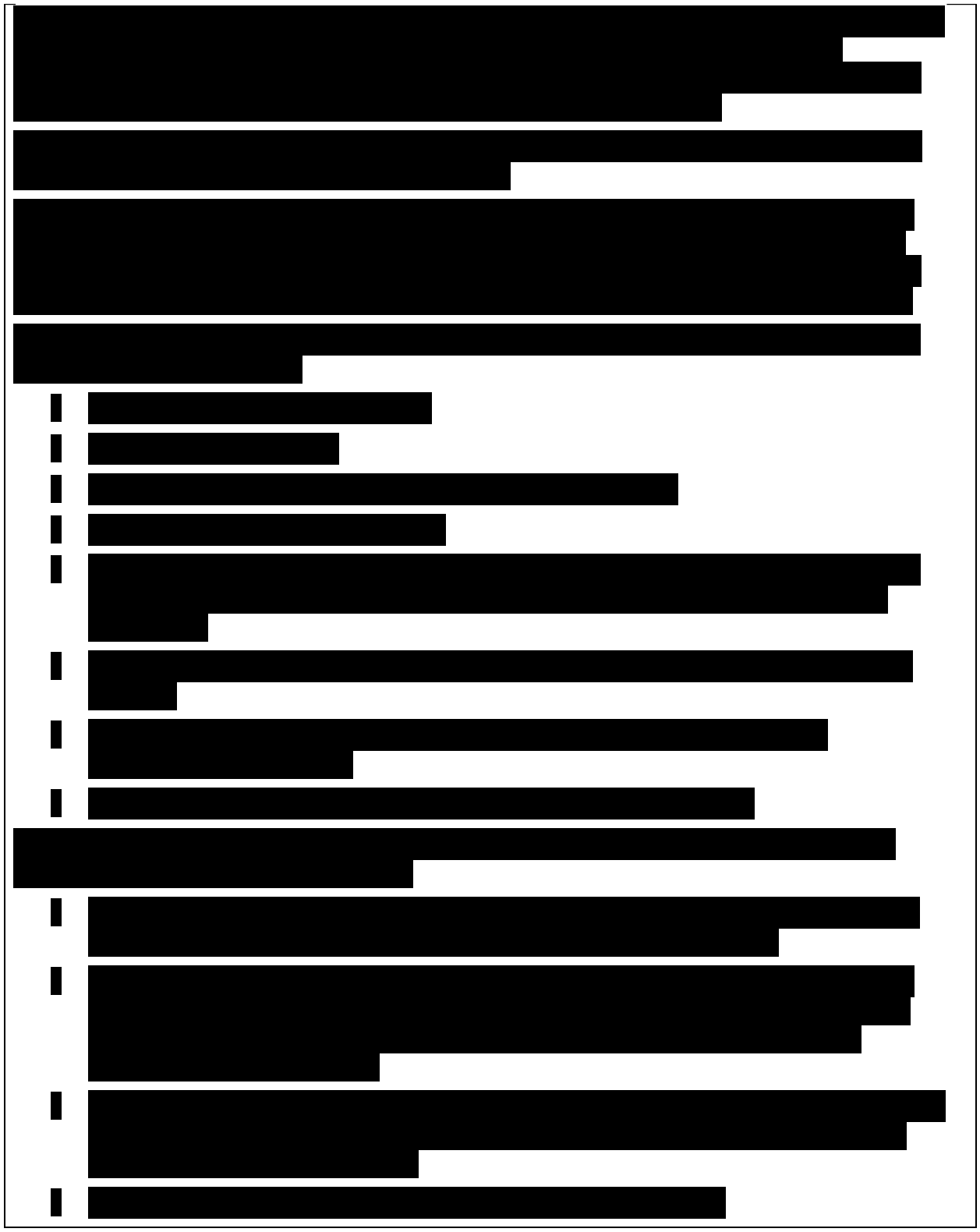
Alternative No.: C-51

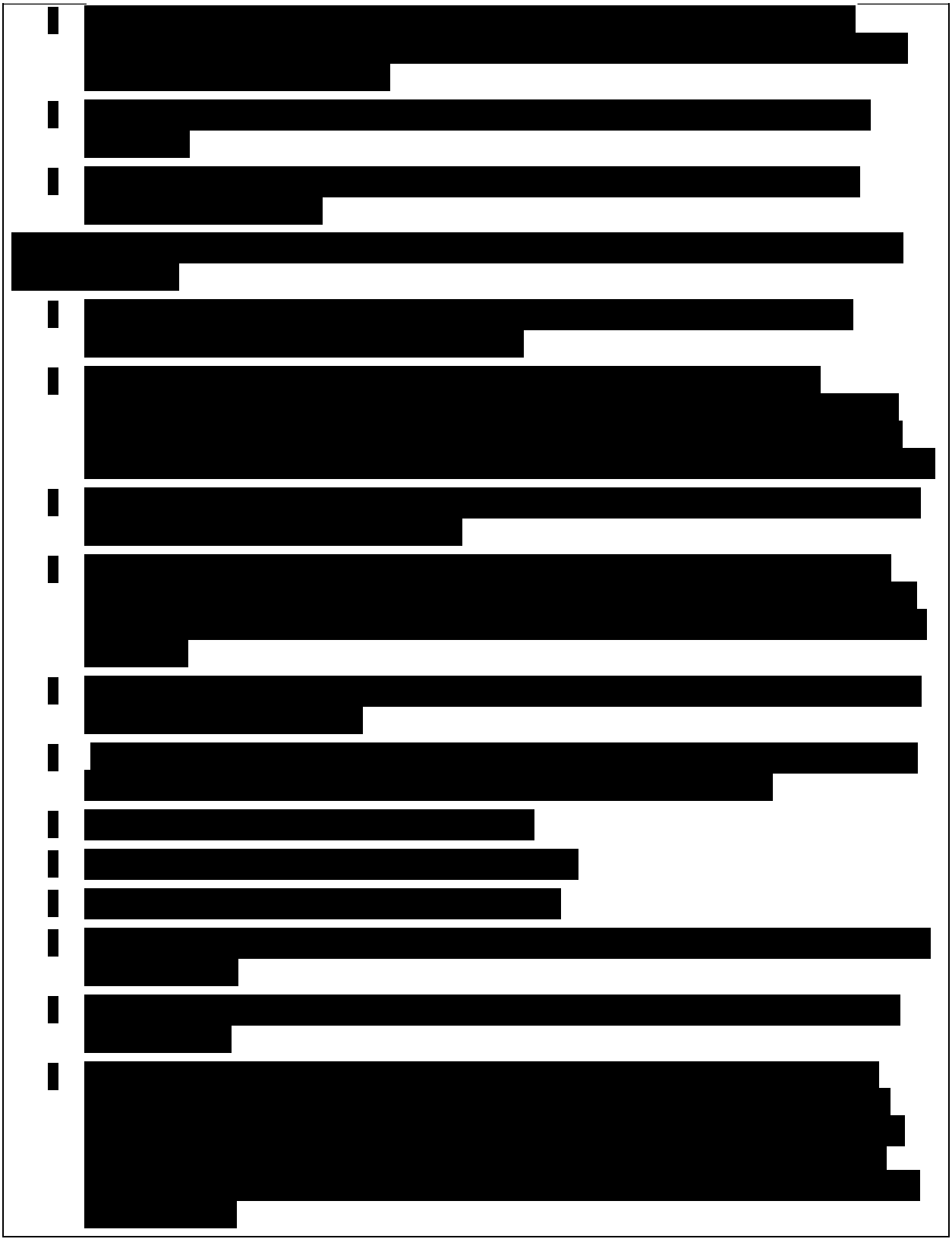
Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Gres Wall	SF	35.00			157,500	$5,512,500
Fill	CY	50.00			3,567	$178,350
Road Modification	LS	50,000.00			1	$50,000
Construct Roadway	SF	10.00			10,148	$101,480
Removal/Restoration	LS	100,000.00			1	$100,000
Total Markup	91.14%					$5,415,755.80
TOTALS	Breakdown of Markup can be found in the Cost Appendix					$11,358,000
NET SAVINGS						($11,358,000)

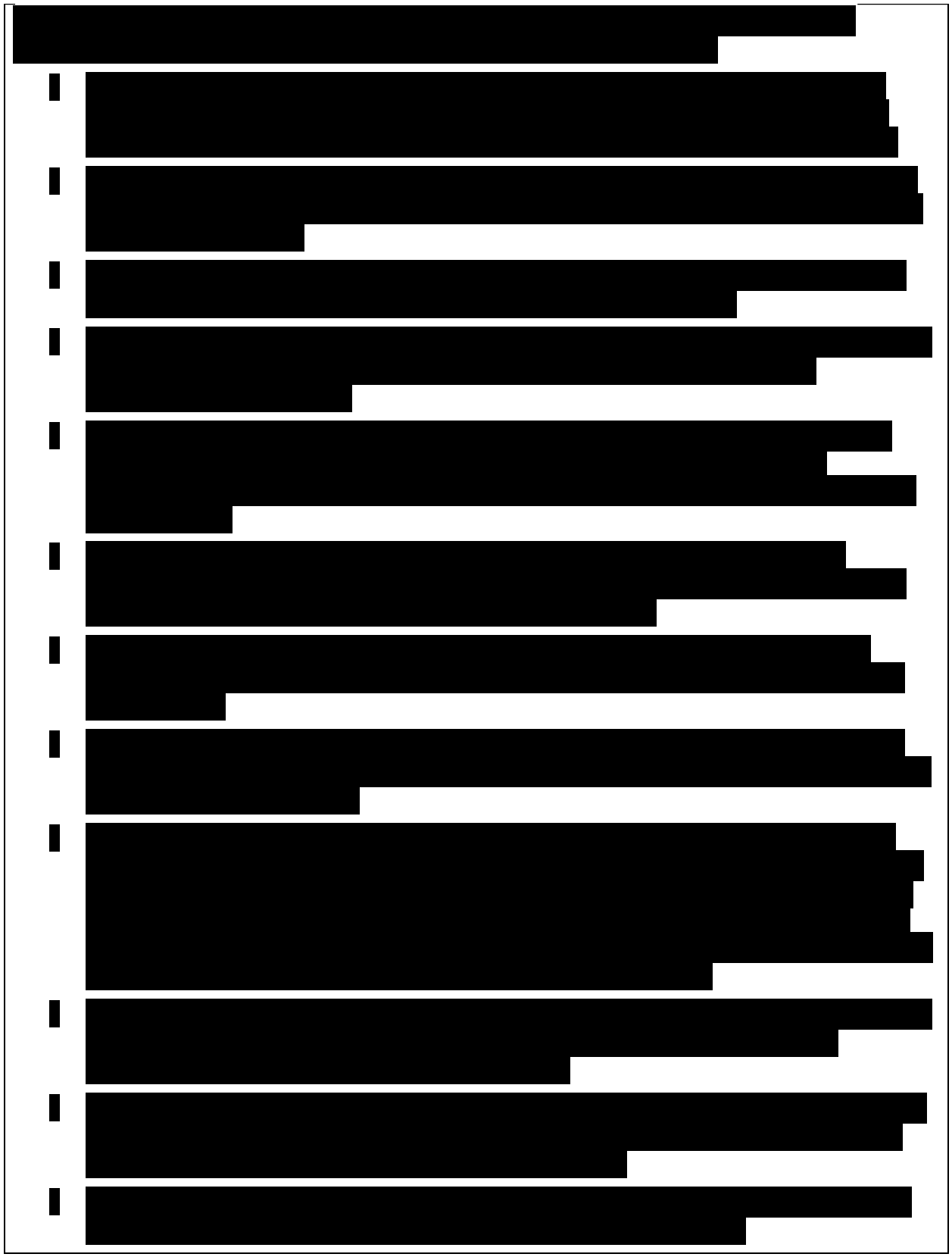
Design Suggestion

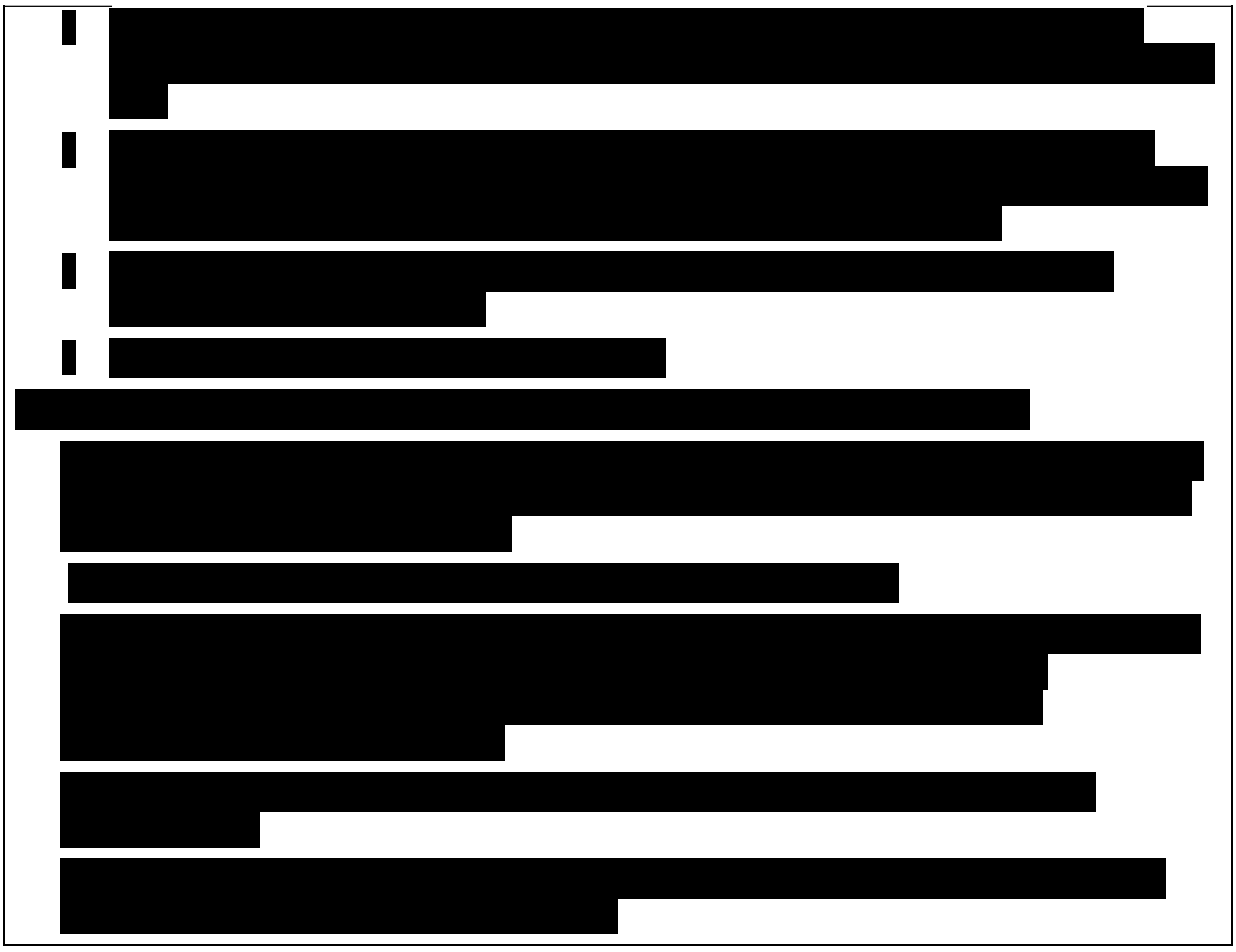
Project: East Side Coastal Resiliency
Location: New York City, NY

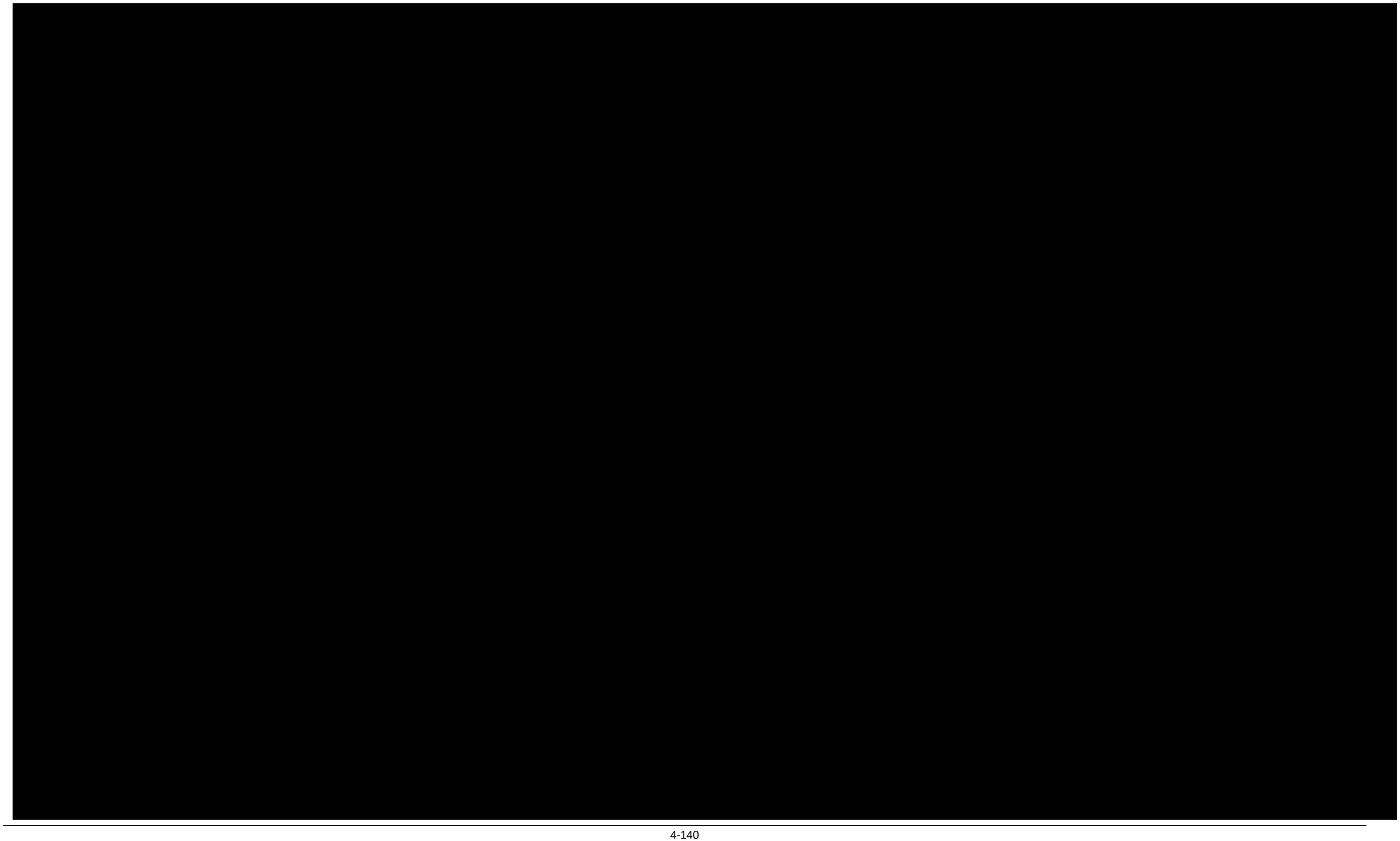
	Alternative No:
Title:	C-58
Evaluate project schedule with regard to risk	
Discussion	

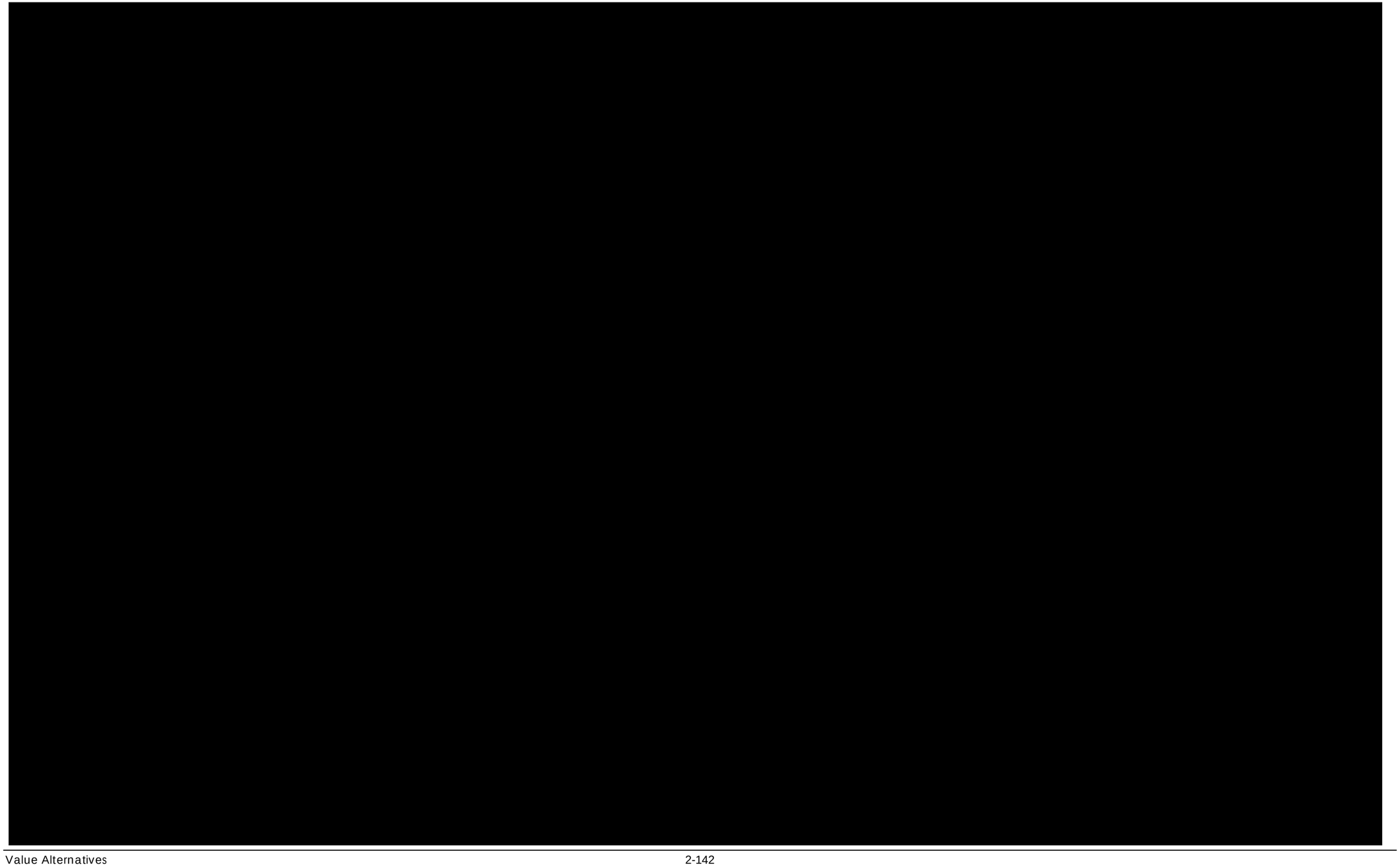












Design Suggestion

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	C-60
Focus the HUD scope of work on CSO construction and park utilities as an early contract	
Discussion	

[redacted]

[redacted]

Advantages:

- [redacted]
- [redacted]
- [redacted]

Disadvantages:

- [redacted]
- [redacted]

IMPROVE ACCESS (IA)

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	IA-03
Rebuild Houston Street pedestrian ramps to handle HS-20 loads	
Description of Original Concept:	
The original concept is to provide two pedestrian paths along the new flood protection berm that would provide pedestrian and bike access to/from the park via the Houston Street overpass.	
Description of Alternative Concept:	
The alternative concept is to provide/allow emergency vehicle access from Houston Street by upgrading the infrastructure to handle HS-20 loads.	

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$0	$0	$0
Alternative Concept	$4,524,000	$0	$4,524,000
Savings	($4,524,000)	$0	($4,524,000)

Advantages of Alternative Concept	Disadvantages of Alternative Concept
[redacted]	[redacted]

Discussion

Alternative No.: IA-03

[redacted]

Advantages:

- [redacted]
- [redacted]
- [redacted]
- [redacted]

- [redacted]

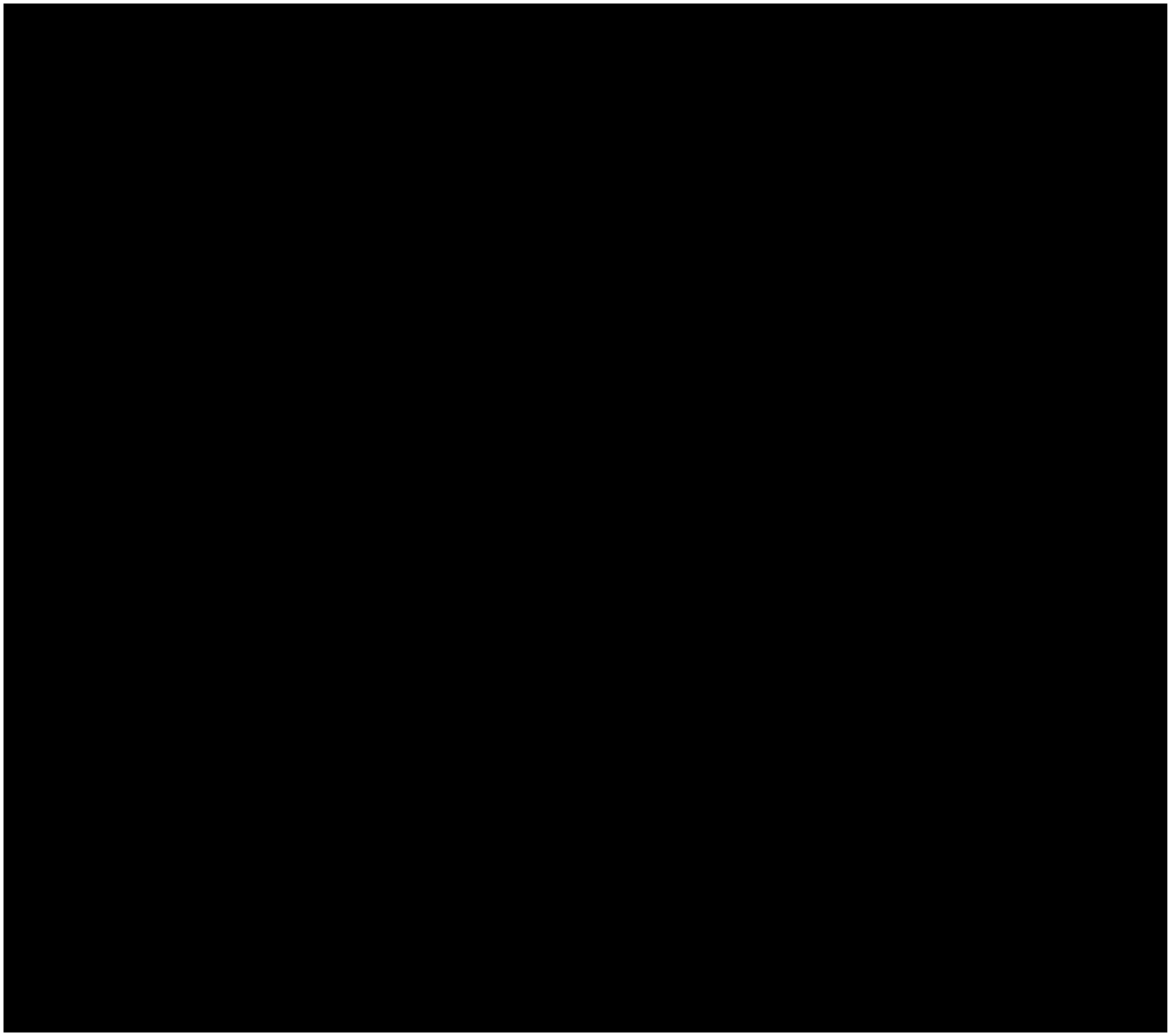
Disadvantages

- [redacted]
- [redacted]

Sketch

Alternative No.: IA-03

■ Original ■ Alternative



Sketch

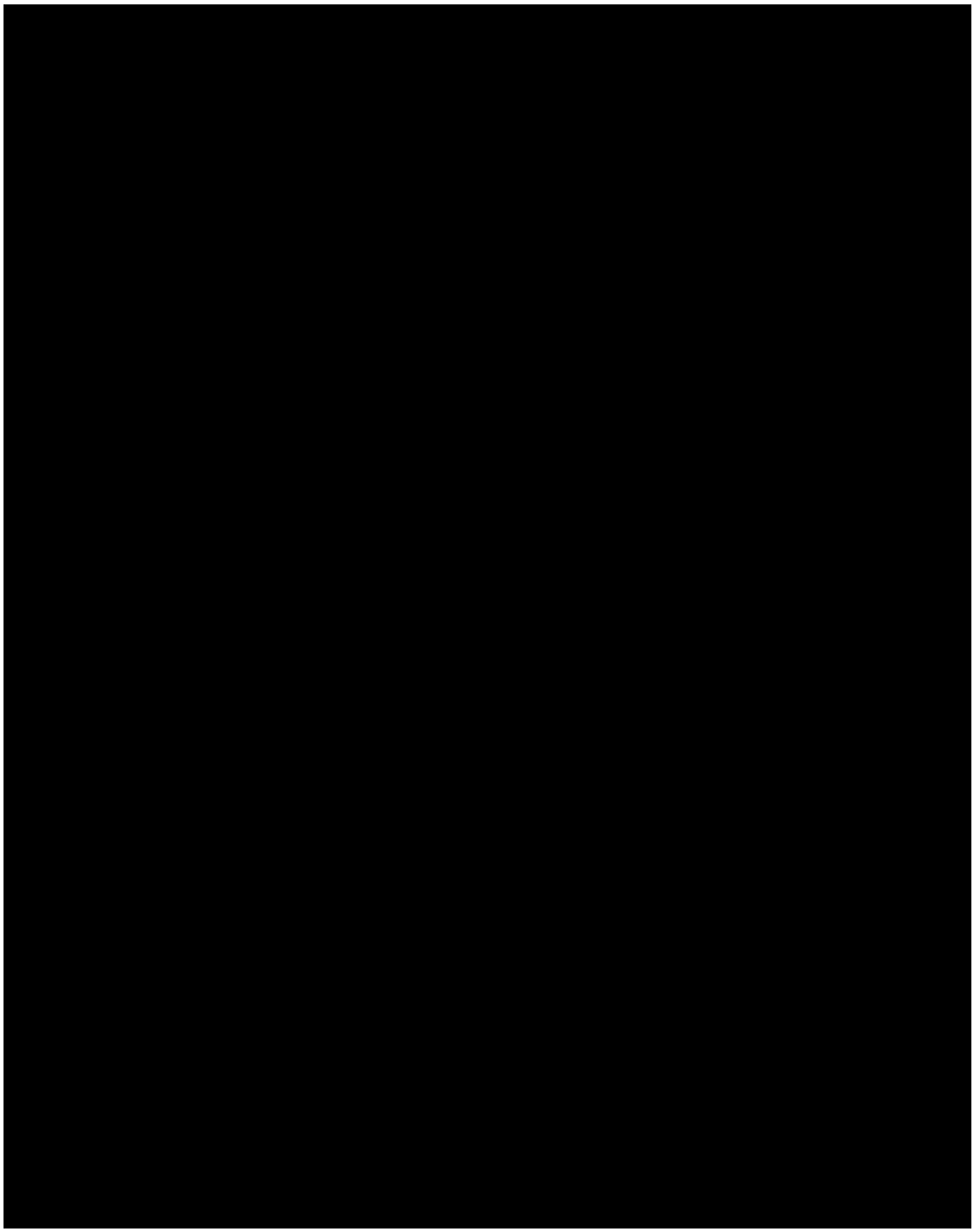
Alternative No.: IA-03

■ Original ■ Alternative

Sketch

Alternative No.: IA-03

■ Original ■ Alternative



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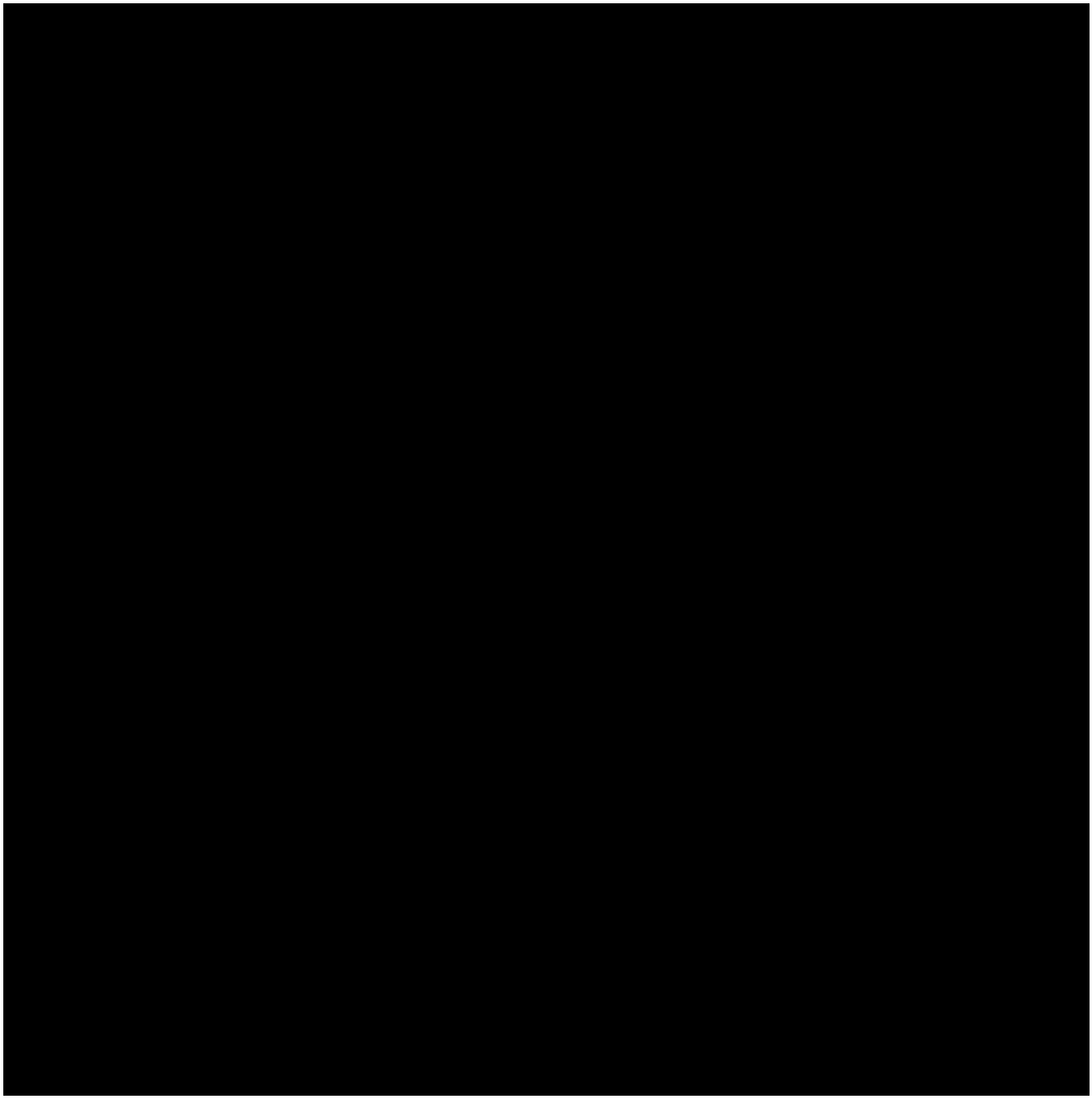
Alternative No.: IA-03

■ Original ■ Alternative



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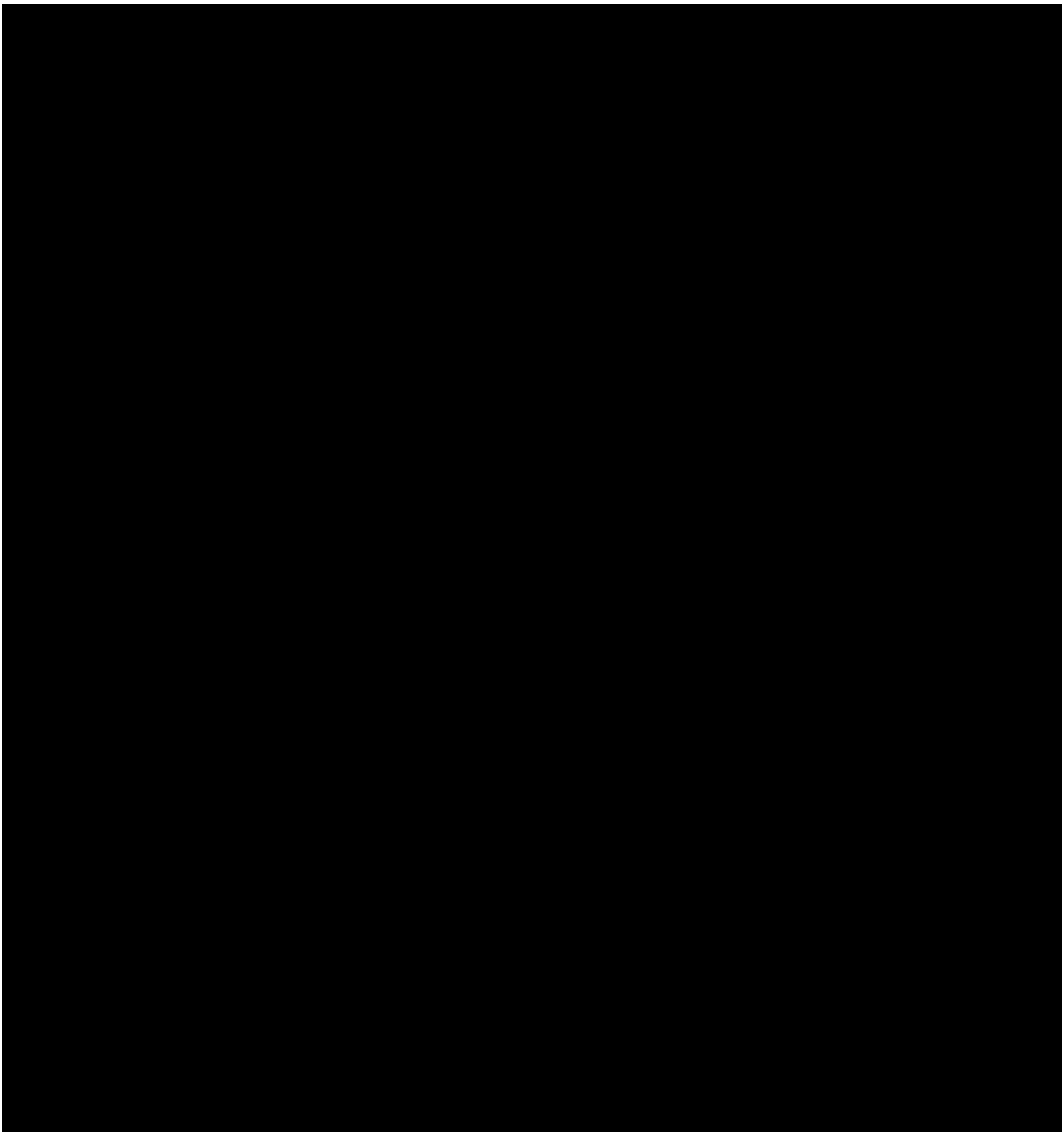
■ Original ■ Alternative



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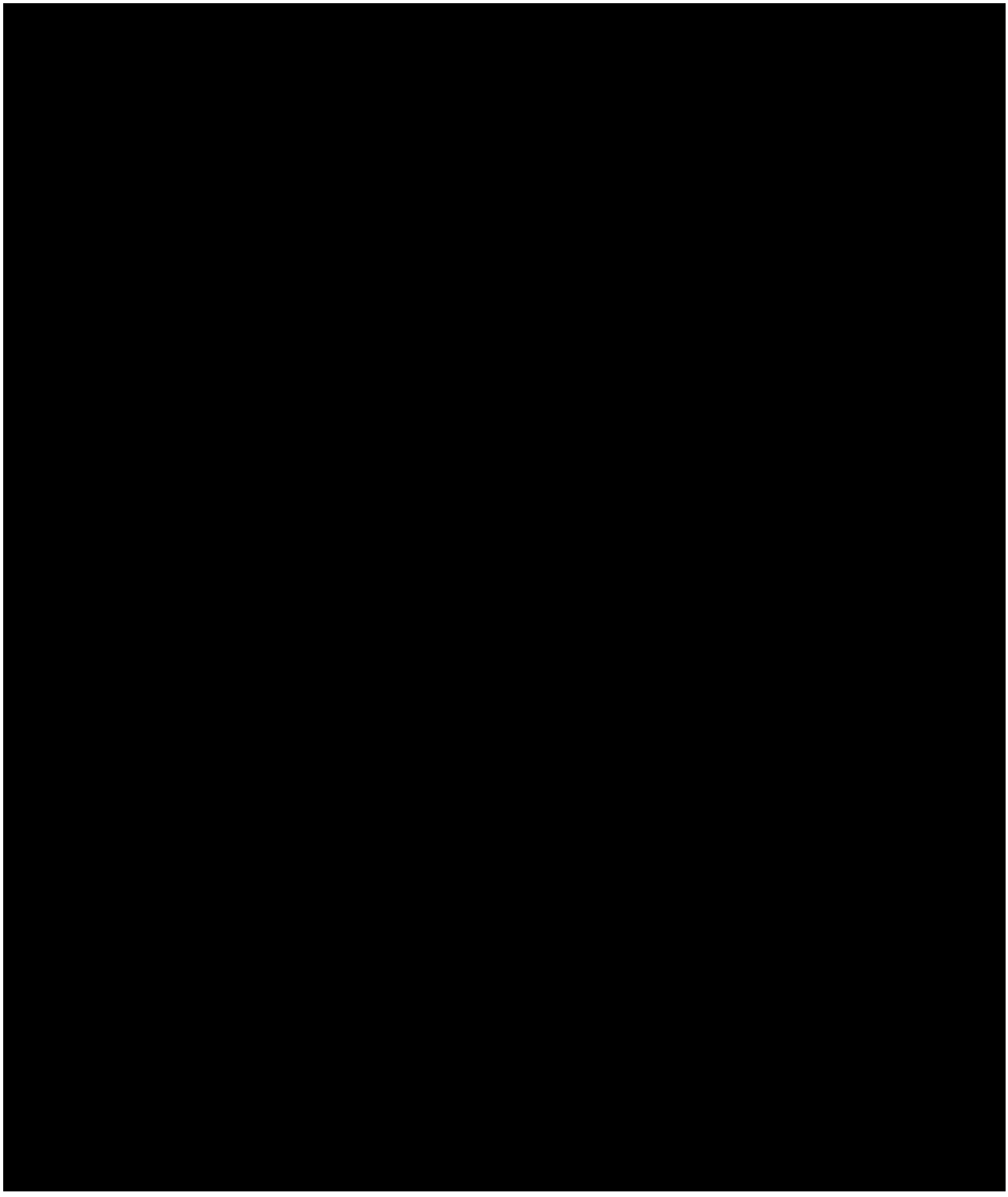
Alternative No.: IA-03

■ Original ■ Alternative



Sketch

Alternative No.: IA-03

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: IA-03

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Reconstruct Road	SF	150.00			11,750	$1,762,500
Cuts & Fills	CY	125.00			435	$54,375
Reconstruct Ramps	LS	250,000.00			1	$250,000
Parapet	LF	1,000.00			250	$250,000
Seating	LF	400.00			125	$50,000
Total Markup	91.14%					$2,157,136.51
TOTALS	Breakdown of Markup can be found in the Cost Appendix					$4,524,000
NET SAVINGS						($4,524,000)

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	IA-04
During construction, remove FDR jersey barrier in several places to facilitate night time construction vehicle access	
Description of Original Concept:	
The original concept is to only have one access at Montgomery Street to Area 1 (East River Park) section of the project, which would handle both entering and exiting vehicles to the park, including all construction related vehicles.	
Description of Alternative Concept:	
The alternative concept is to provide several "breaks" in the existing jersey barrier that separates the park from the FDR, so that construction vehicles can enter/exit at different locations along the park.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$0	$0	$0
Alternative Concept	$956,000	$0	$956,000
Savings	($956,000)	$0	($956,000)

Alternative No.: IA-04

[redacted]

Advantages:

[redacted]

- [redacted]
- [redacted]

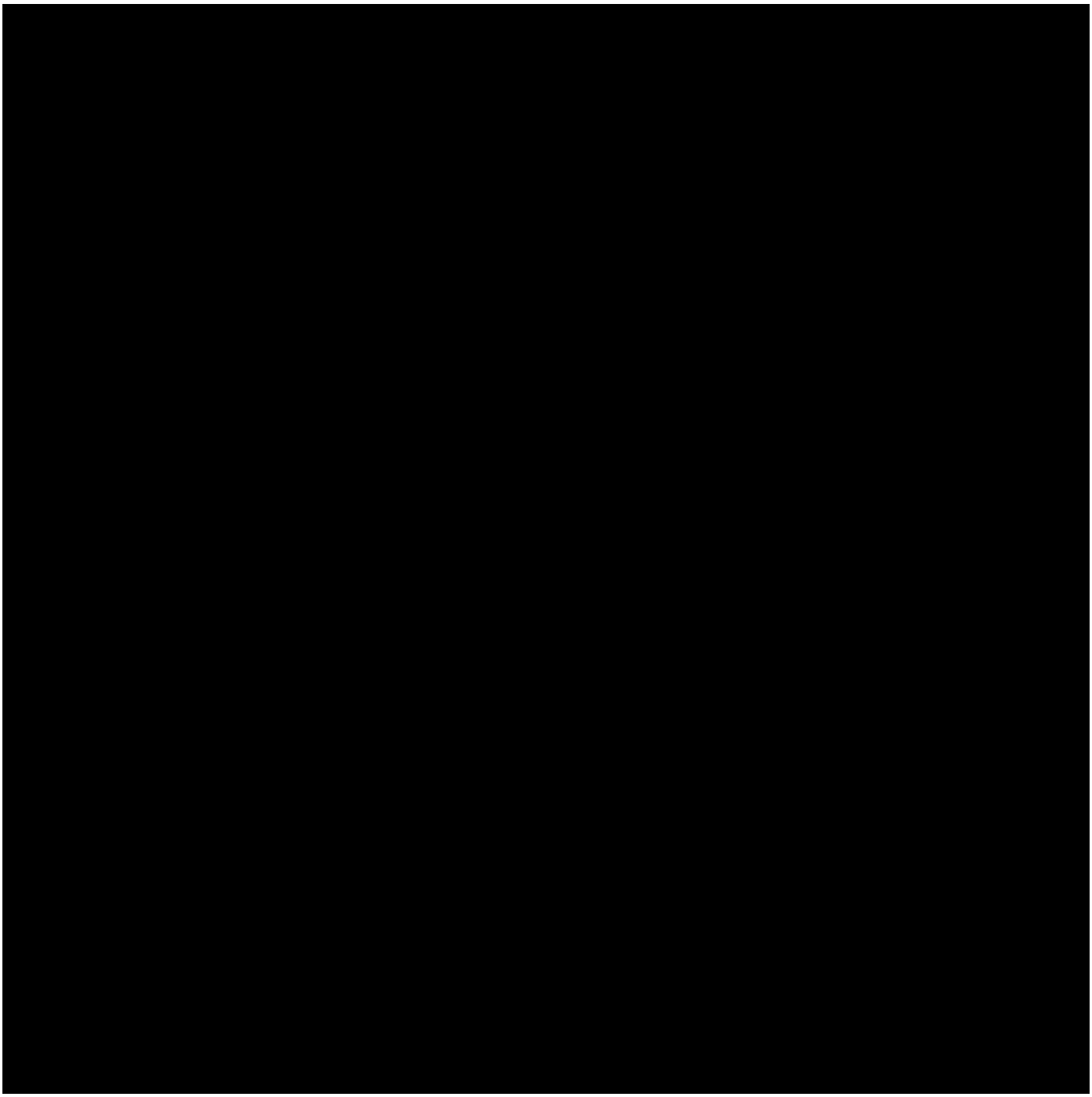
Disadvantages

- [redacted]
- [redacted]

Sketch

Alternative No.: IA-04

■ Original ■ Alternative



Sketch

Alternative No.: IA-04

■ Original ■ Alternative

Sketch

Alternative No.: IA-04

■ Original ■ Alternative

[redacted]

[redacted]

Construction Cost Estimate

Alternative No.: IA-04

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
MPT For Single Lane Closure	LS	50,000.00			2	$100,000
Roadway Modifications	LS	100,000.00			2	$200,000
Restore Finished Park Sections	LS	100,000.00			2	$200,000
Total Markup	91.14%					$455,692.95
TOTALS	Breakdown of Markup can be found in the Cost Appendix					$956,000
NET SAVINGS						($956,000)

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	IA-16
Use a pre-fab bridge design at pedestrian bridge crossings	
Description of Original Concept:	
The original concept is using multiple prestressed concrete box beams for each pedestrian bridge to be replaced (Delancey Street and East 10th Street)	
Description of Alternative Concept:	
The alternative concept is using a completely prefabricated bridge for each span of each bridge (Delancey Street – 2 spans, East 10th Street – 3 spans).	
Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$32,776,000	$0	$32,776,000
Alternative Concept	$16,388,000	$0	$16,388,000
Savings	$16,388,000	$0	$16,388,000

Discussion

Alternative No.: IA-16

[redacted]

Sketch

Alternative No.: IA-16

■ Original ■ Alternative

Sketch

Alternative No.: IA-16

■ Original ■ Alternative

Sketch

Alternative No.: IA-16

■ Original ■ Alternative

Sketch

Alternative No.: IA-16

■ Original ■ Alternative

Typical prefabricated pedestrian bridge (124 ft long, 14 ft wide)

Calculations

Alternative No.: IA-16

■ Original ■ Alternative

[redacted]

[redacted]

[redacted]

Construction Cost Estimate

Alternative No.: IA-16

			Original Concept (Deletions)		Alternative Concept (Additions)	
Item	**Unit of Meas**	**Unit Cost**	**Qty**	**Total**	**Qty**	**Total**
Estimate Correction						
Delancey Street						
Site Built Spans	LF	43,522.00	165	$7,181,130		
Pre-Fabricated Pedestrian Spans	LF	21,761.00			165	$3,590,565
10th Street						
Site Built Spans	LF	43,522.00	229	$9,966,538		
Pre-Fabricated Pedestrian Spans	LF	21,761.00			229	$4,983,269
Total Markup	91.14%			$15,628,142.92		$7,814,071.46
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$32,776,000.00		$16,388,000
NET SAVINGS						$16,388,000

LIMIT INUNDATION (LI)

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	LI-06
Lower the park elevation by 1 foot and reduce the cross section of horticultural soil	
Description of Original Concept:	
The original concept is reflected in the current grading plans and has a 3'-0" horticultural soil profile.	
Description of Alternative Concept:	
The alternative concept looks at lowering the park elevation by 1 foot but still meeting the 16.5-foot flood protection elevation, and reviews reducing the 36" horticultural soil profile to 32".	
Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$20,083,000		$20,083,000
Alternative Concept	$16,128,000		$16,128,000
Savings	$3,955,000		$3,955,000

Discussion

Alternative No.: LI-06

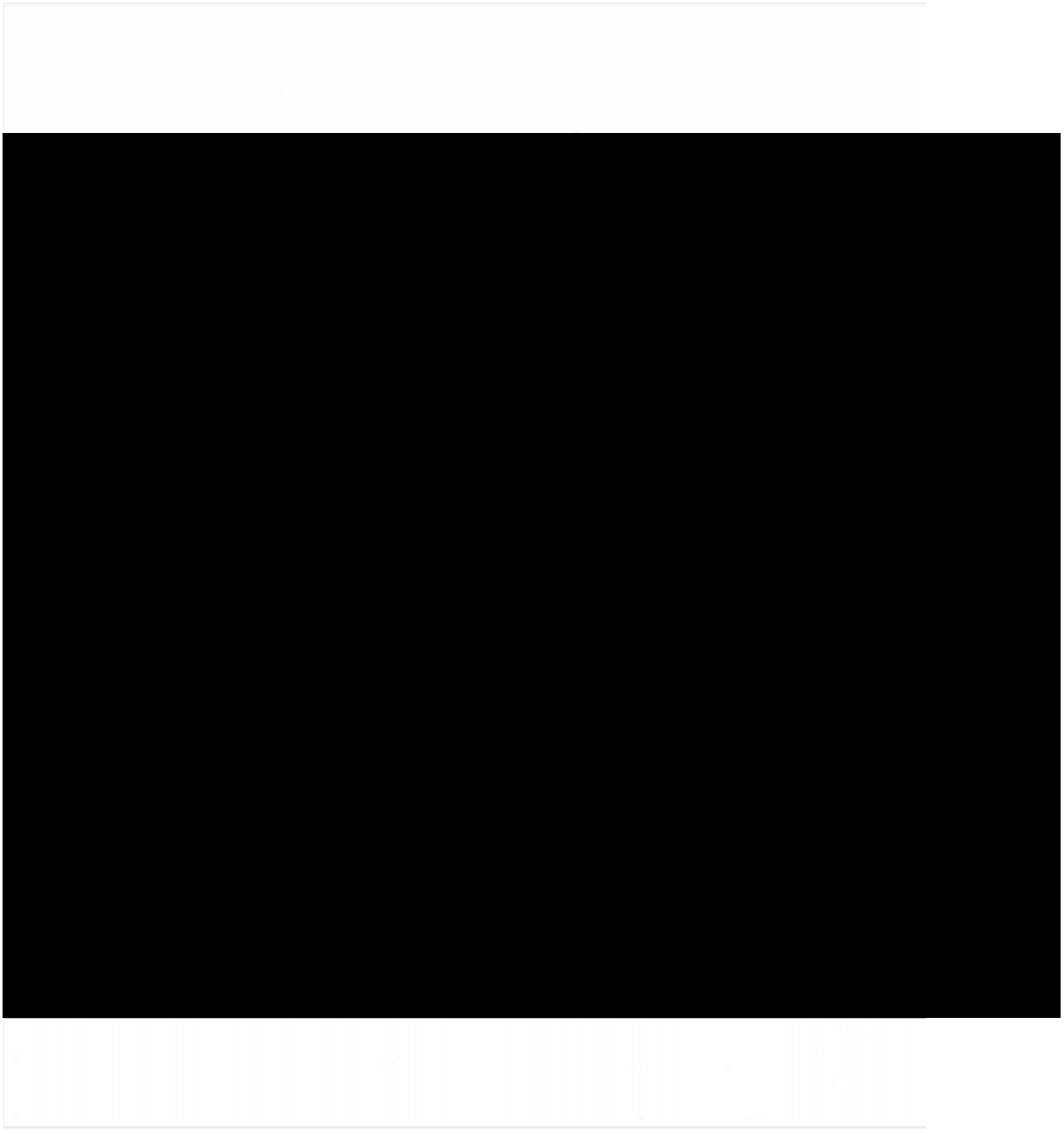
[redacted]

[redacted]

Sketch

Alternative No.: LI-06

■ Original ■ Alternative



Sketch

Alternative No.: LI-06

■ Original ■ Alternative

Discussion

Alternative No.: LI-06

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Reduce Park Elevation by 1' overall, General Fill	CY	50.00	60,000	$3,000,000	40,000	$2,000,000
Reduce 36" Planting soil profile by 4" Overall	CY	94.38	58,491	$5,520,381	51,991	$4,906,911
Lower Fence on Top of Wall	LF	973.31	2,041	$1,986,526		
Lower Fence on Top of Wall, Less 1'	LF	750.00			2,041	$1,530,750
Total Markup	91.14%			$9,575,995		$7,690,084
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$20,083,000		$16,128,000
NET SAVINGS						$3,955,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	LI-14
Simplify levee and use a high-performance erosion control mat in lieu of clay	
Description of Original Concept:	
The original concept is to construct an impervious clay cap for the levee sections.	
Description of Alternative Concept:	
The alternative concept is to use high-performance erosion control mat for scour protection and homogenous general backfill for the levee cap.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)

	First Cost	**O&M**	**Total LCC**
Original Concept	$1,846,000		$1,846,000
Alternative Concept	$1,338,000		$1,338,000
Savings	$508,000		$508,000

Discussion

Alternative No.: LI-14

The project must be certified by FEMA to receive the HUD funding. FEMA requires engineering analyses that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability.

FEMA also requires engineering analyses that evaluate levee embankment stability. The analyses provided must evaluate expected seepage during loading conditions associated with the base flood and must demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (USACE) Engineer Manual 1110–2–1913, Design and Construction of Levees, (Chapter 6, Section II), may be used.

Sketch

Alternative No.: LI-14

■ Original ■ Alternative

Sketch

Alternative No.: LI-14

■ Original ■ Alternative

Sketch

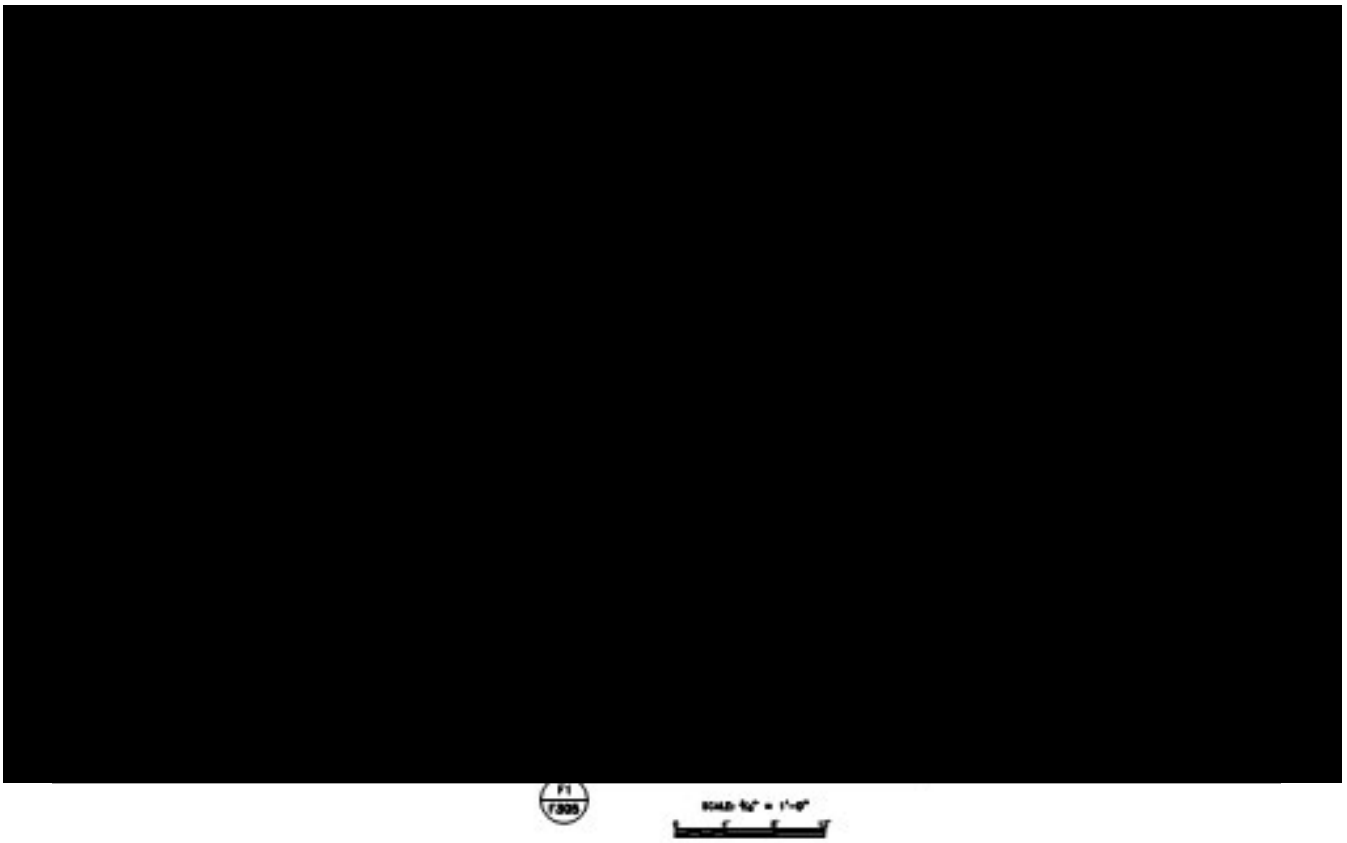
Alternative No.: LI-14

■ Original ■ Alternative

Sketch

Alternative No.: LI-14

■ Original ■ Alternative



Sketch

Alternative No.: LI-14

■ Original ■ Alternative

Sketch

Alternative No.: LI-14

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: LI-14

Item	Unit of Means	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Remove all impervious fill	CY	69.00	14,000	$966,000		
Backfill with general fill, compact	CY	50.00			14,000	$700,000
Total Markup	91.14%			$880,412		$637,980
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$1,846,000		$1,338,000
NET SAVINGS						$508,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	LI-29
Elevate park high enough to eliminate wall	
Description of Original Concept:	
Flood protection through Section 1 and 2 of the East River Park is a series of levees and different wall constructions.	
Description of Alternative Concept:	
Raise the park high enough to work as the flood protection barrier and reduce the need for the Con Edison tunnel and minimize the concrete flood walls.	

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$412,526,000	$0	$412,526,000
Alternative Concept	$93,414,000	$0	$93,414,000
Savings	$319,112,000	$0	$319,112,000

Advantages of Alternative Concept	Disadvantages of Alternative Concept
[redacted]	[redacted]

Discussion

Alternative No.: LI-29

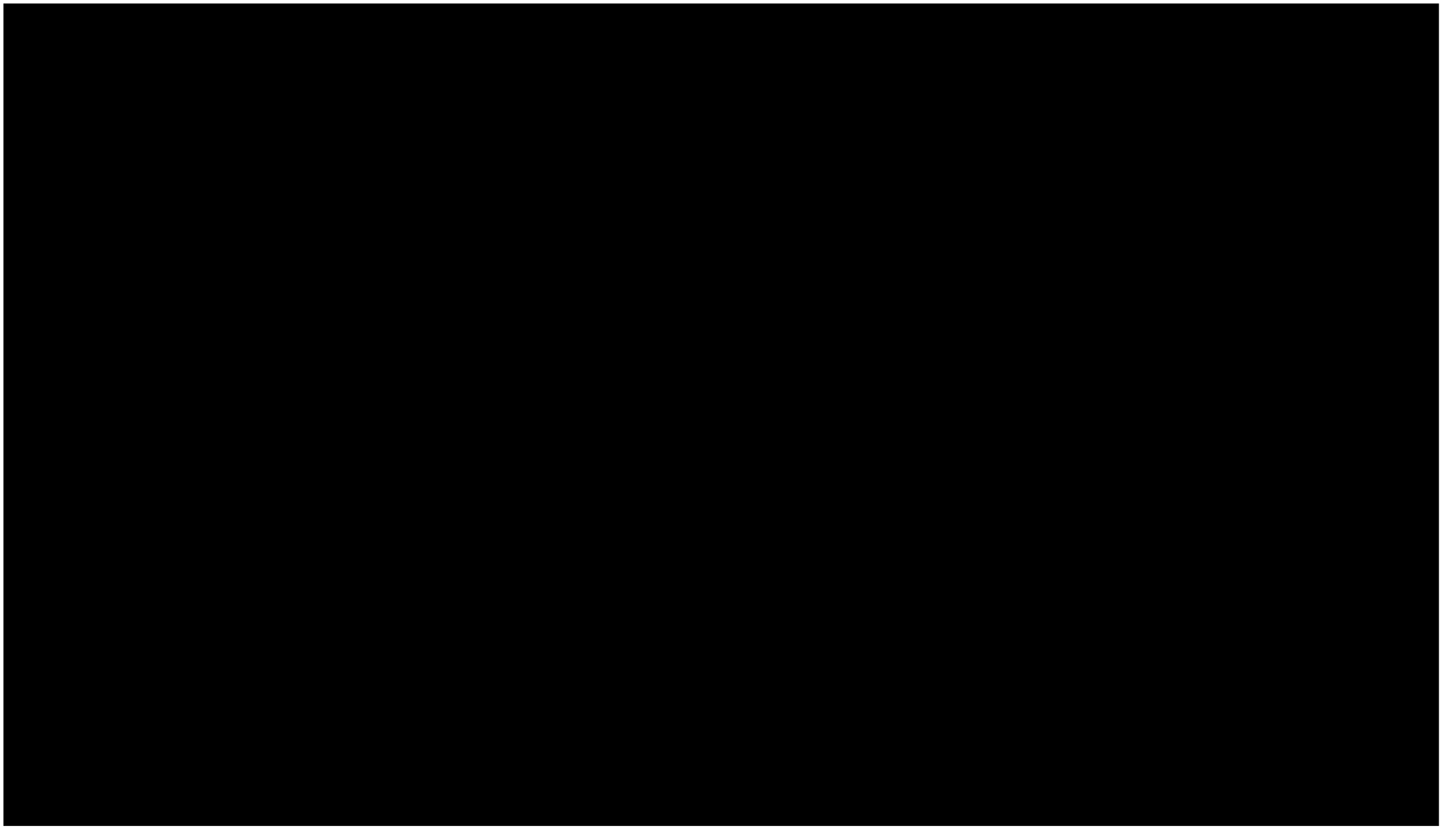
[redacted]

Sketch

Alternative No.: LI-29

■ Original

■ Alternative



Sketch

Alternative No.: LI-29

■ Original

■ Alternative

Sketch

Alternative No.: LI-29

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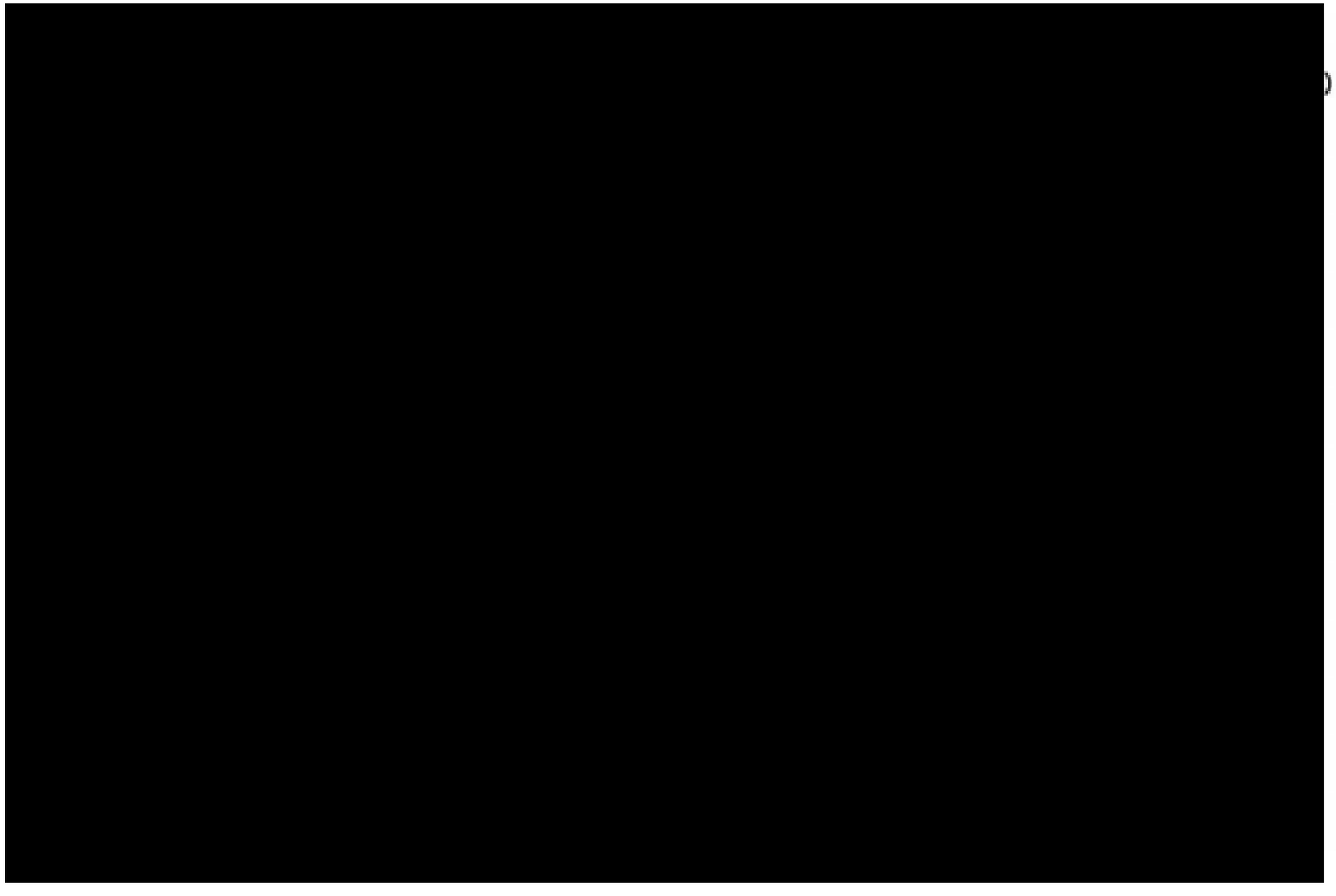
Sketch

Alternative No.: LI-29

■ Original

■ Alternative



Alternative No.: LI-29

■ Original

■ Alternative

Sketch

Alternative No.: LI-29

■ Original

■ Alternative


[redacted]

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VE TEAM STUDY

Reach D
Sections - Preliminary
40

Sketch

Alternative No.: LI-29

■ Original

■ Alternative

Sketch

Alternative No.: LI-29

■ Original

■ Alternative

VE TEAM STUDY

Reaches D-E
Sections - Preliminary
41

Sketch

Alternative No.: LI-29

■ Original

■ Alternative

Sketch

Alternative No.: LI-29

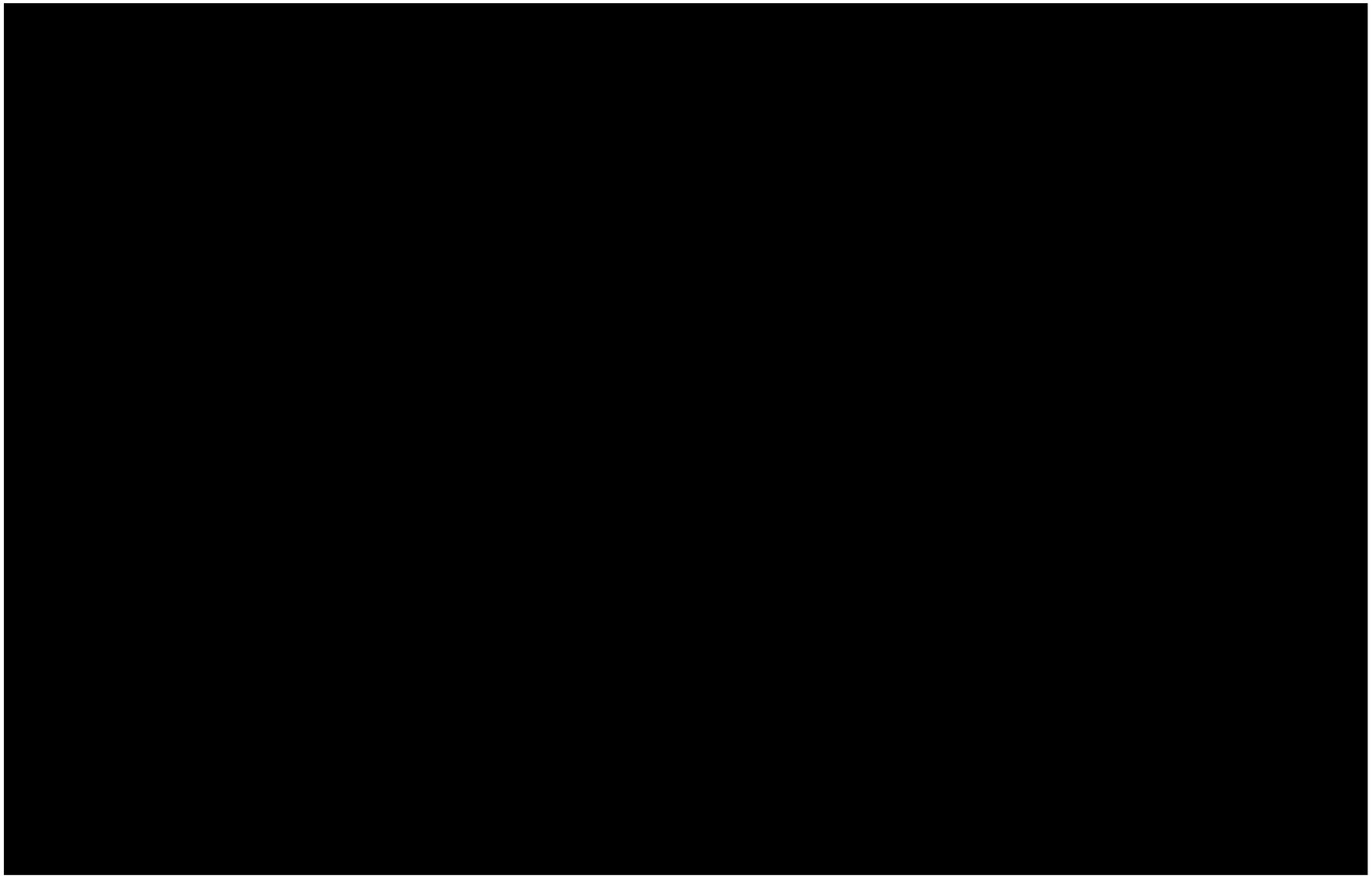
■ Original

■ Alternative

Alternative No.: LI-29

■ Original

■ Alternative

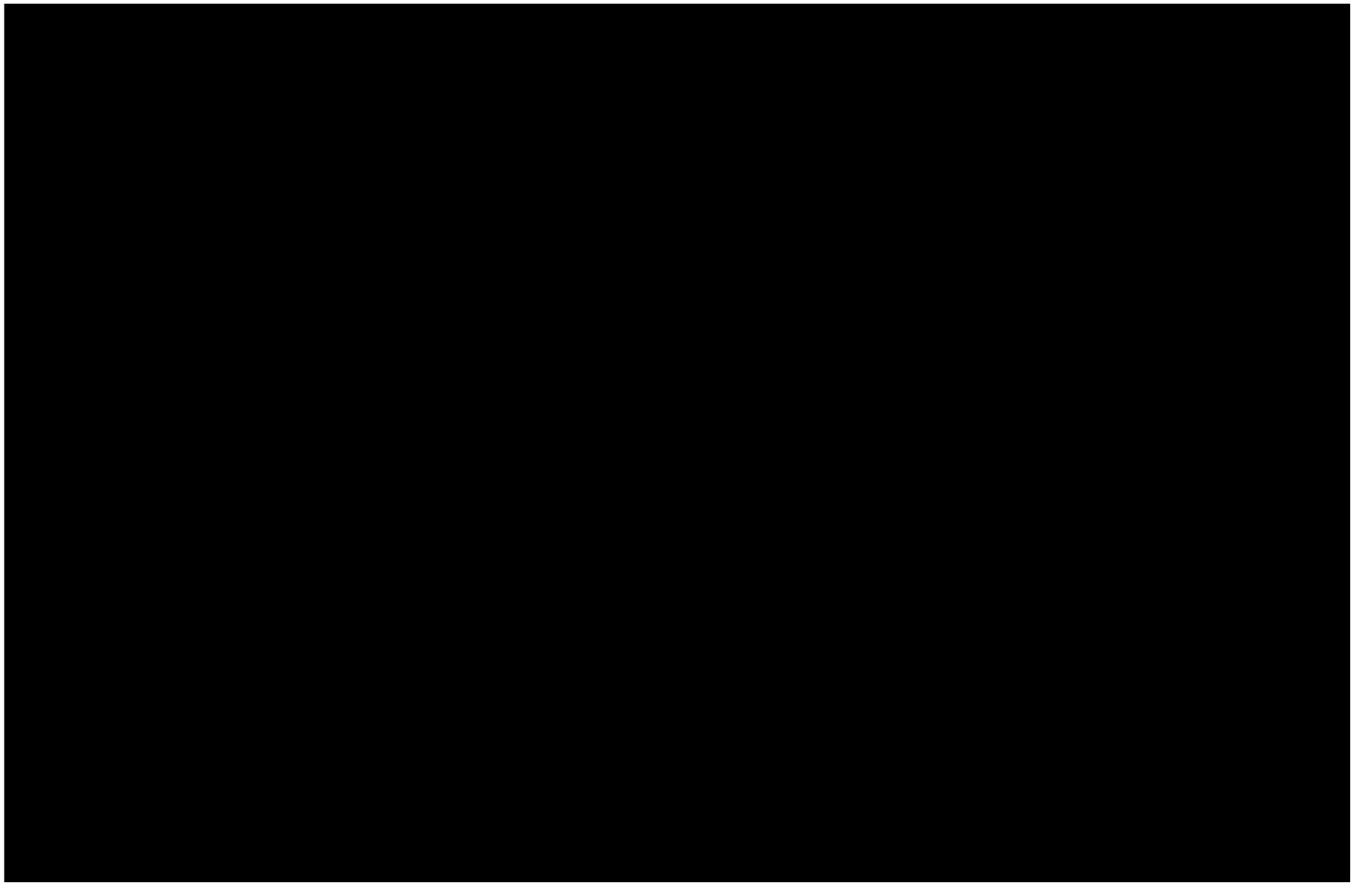


Sketch

Alternative No.: LI-29

■ Original

■ Alternative



Alternative No.: LI-29

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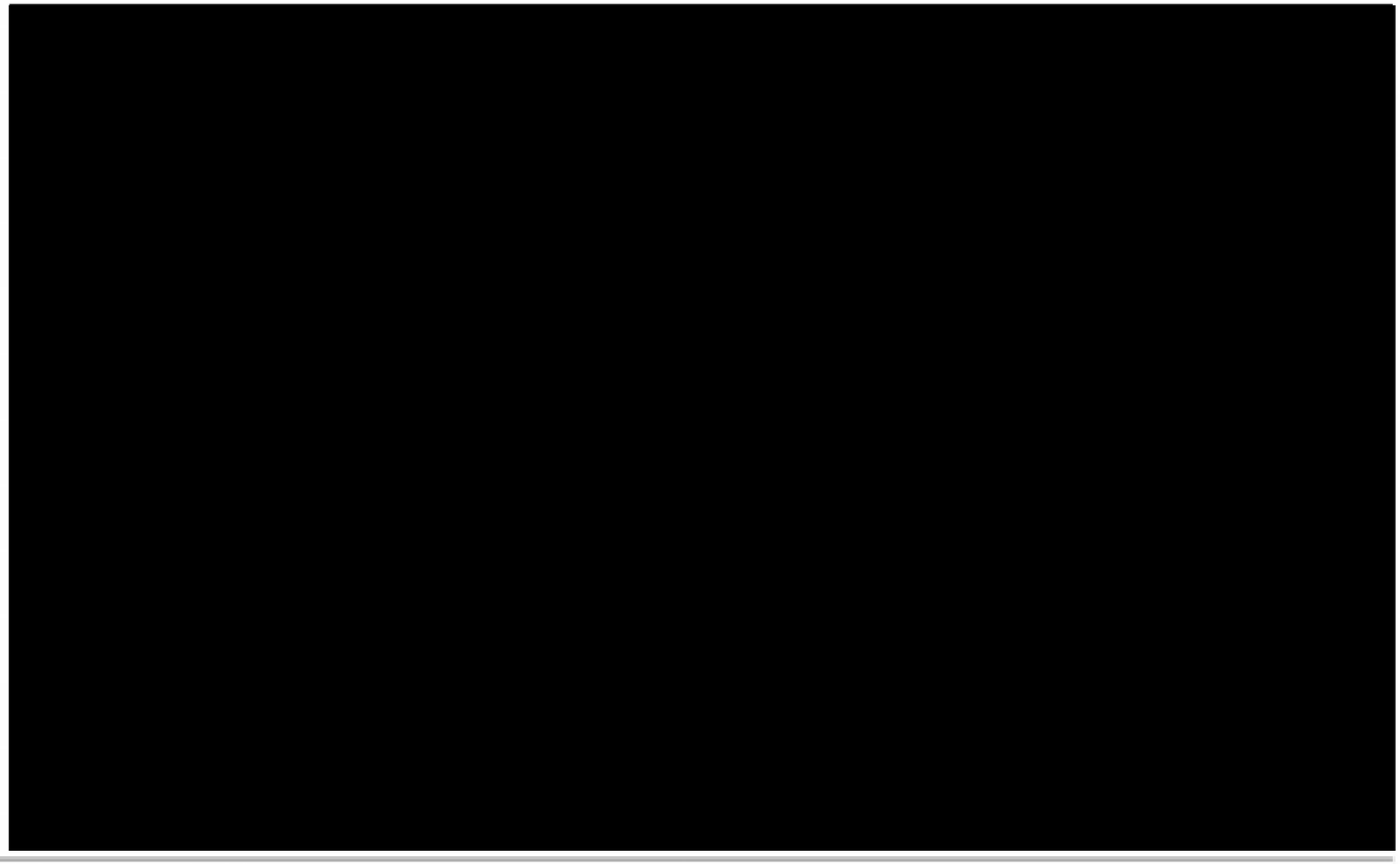
■ Alternative



DESIGN TEAM PROPOSAL

Reach G
Sections: Preliminary
51

Sketch

Alternative No.: LI-29

■ Original

■ Alternative

Sketch

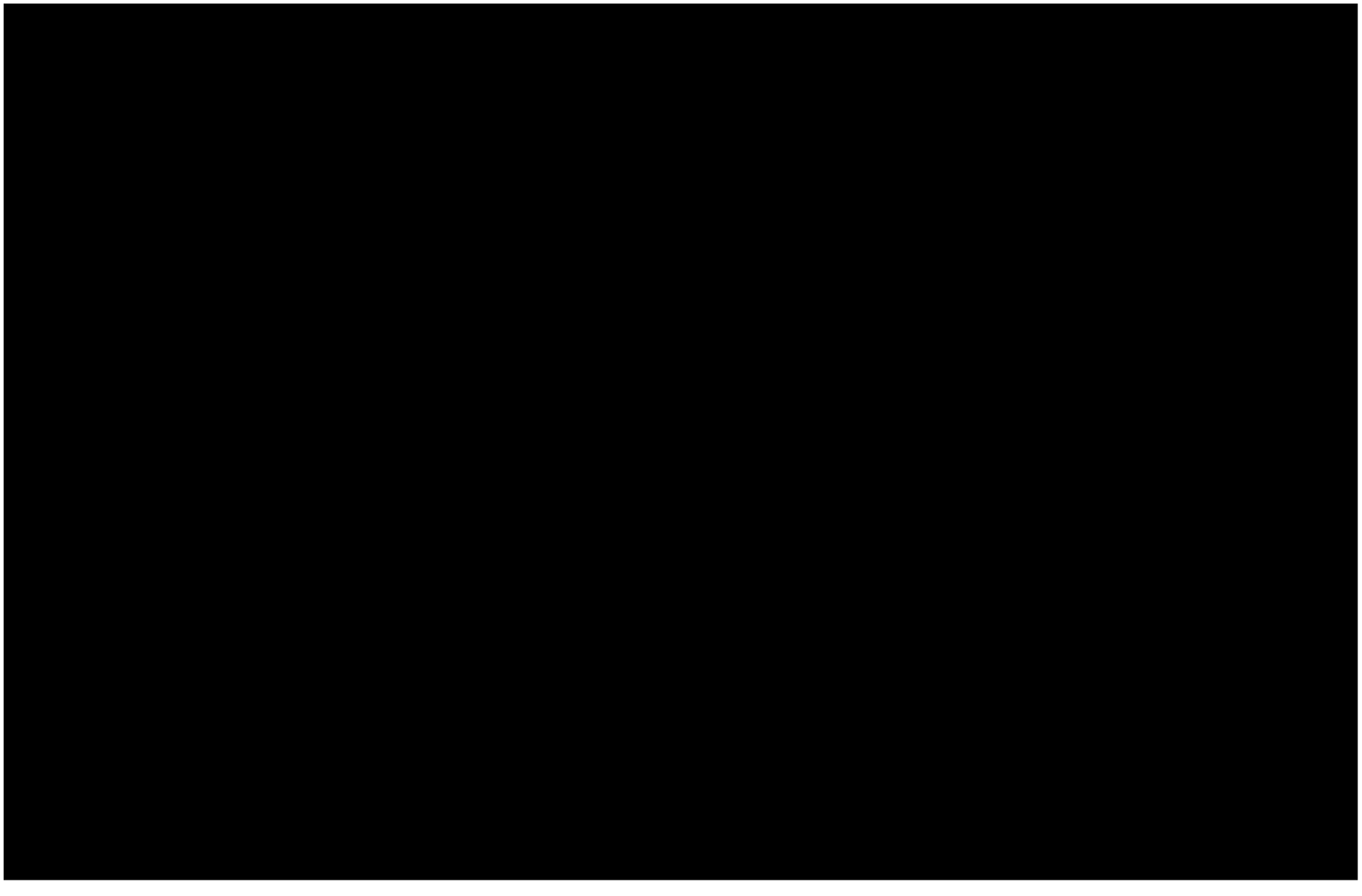
Alternative No.: LI-29

■ Original

■ Alternative

Alternative No.: LI-29

■ Original



■ Alternative

Sketch

Alternative No.: LI-29

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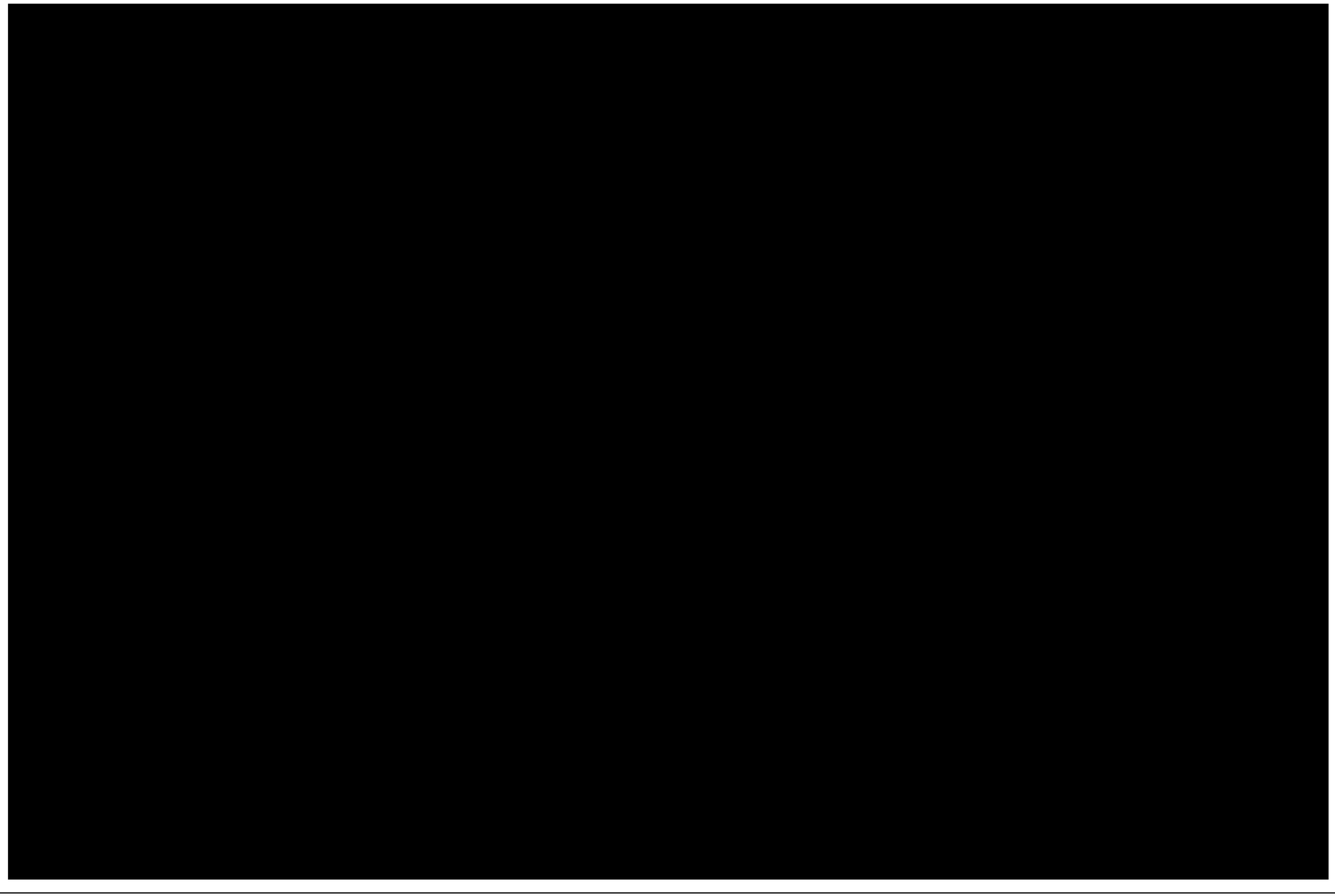
■ Alternative



Sketch

Alternative No.: LI-29

■ Original

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Sketch

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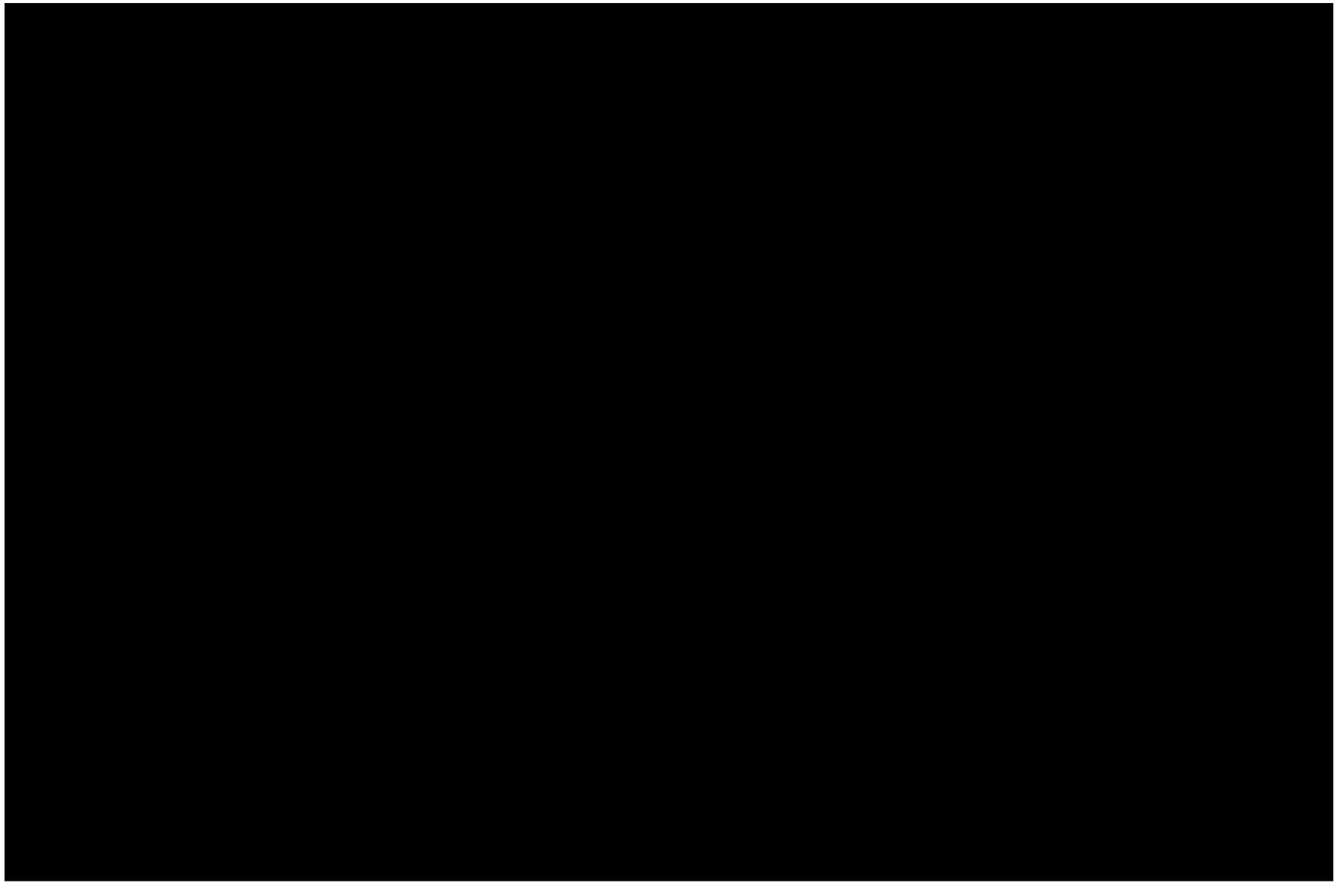
■ Original

■ Alternative



Construction Cost Estimate

Alternative No.: LI-29

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Gravel Fill, Raise Park to Desired Elevation	CY	50.00			215,000	$10,750,000
I Wall, includes MPT	LF	10,667.00	3,865	$41,227,955	1,000	$10,667,000
L Wall, includes MPT	LF	12,642.00	3,062	$38,709,804		
T Wall, includes MPT	LF	64,665.00	123	$7,953,795		
Tunnel Sections	LF	18,810.00	3,739	$70,330,590		
Carbon Wrap on Conduit	LF	63.80	10,328	$658,926		
Excavate, Backfill with Structural Fill, Compact	CY	90.25	22,538	$2,034,055		
Duration Savings	MO	980,546.00	56	$54,910,576	28	$27,455,288
Total Markup	91.14%			$196,700,501.83		$44,541,514.43
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$412,526,000.00		$93,414,000
NET SAVINGS						$319,112,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	LI-30
Realign flood wall to east edge of East River Park in combination with levees	
Description of Original Concept:	
The original concept is to align the flood protection on the west side of the park.	
Description of Alternative Concept:	
The alternative concept is to place the flood protection aligned along the backside (landside) of the promenade. The flood protection could include a combination of floodwalls, levees and gates.	

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$286,788,000	$0	$286,788,000
Alternative Concept	$181,084,000	$0	$181,084,000
Savings	$105,704,000	$0	$105,704,000

Advantages of Alternative Concept	Disadvantages of Alternative Concept
[redacted]	[redacted]

Discussion

Alternative No.: LI-30

This [redacted]

[redacted]

Sketch

Alternative No.: LI-30

■ Original

■ Alternative

Sketch

Alternative No.: LI-30

■ Original ■ Alternative

Sketch

Alternative No.: LI-30

■ Original ■ Alternative

Sketch

Alternative No.: LI-30

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Calculations

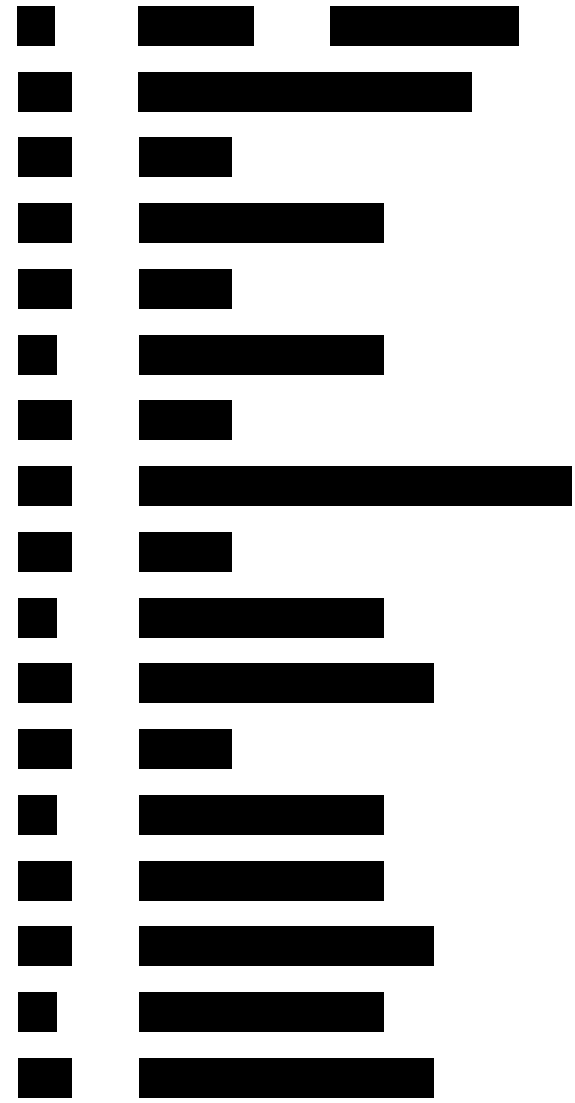
Alternative No.: LI-30

■ Original ■ Alternative

Calculations

Alternative No.: LI-30

■ Original ■ Alternative



Calculations

Alternative No.: LI-30

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: LI-30

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 20	LF	22,400.00			2,640	$673,954
Foundation at Actuated Gate, I Wall Equivalent	LF	8,500.00			2,640	$22,440,000
I Wall, includes MPT	LF	10,667.00			1,600	$17,067,200
Reduce General Fill Required at Park	CY	50.00	60,000	$3,000,000	24,000	$1,200,000
Berm						
Sheet piling at Berm	SF	100.00			205,000	$20,500,000
Topsoil at Berm	CY	94.38			6,150	$580,437
General Fill at Berm	CY	50.00			53,300	$2,665,000
Seeding at Berm	SY	6.00			32,800	$196,800
I Wall, includes MPT, Station 22 to 85	LF	10,667.00	1,482	$15,808,494		
Tunnel Sections, Station 22 to 85	LF	18,810.00	3,739	$70,330,590		
L Wall, includes MPT, Station 22 to 85	LF	12,642.00	367	$4,639,614		
Carbon Wrap on Conduit, Station 22 to 85	LF	63.80	5,289	$337,438		
Excavate, Backfill with Structural Fill, Compact	CY	90.25	11,250	$1,015,313		
Duration Savings (Assumption)	MO	980,546.00	56	$54,910,576	30.0	$29,416,380
Total Markup	91.14%			$136,746,186.74		$86,344,491.93
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$286,788,000.00		$181,084,000
NET SAVINGS						$105,704,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	LI-35
Shift all construction to the east to avoid closures on FDR	
Description of Original Concept:	
The original concept is to reconstruct the FDR Drive east side traffic barrier and fence along East River Park.	
Description of Alternative Concept:	
The alternative concept is to shift all floodwall and related work within East River Park, directly along the FDR Drive, to the east, to eliminate the need for barrier replacement and ancillary work.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$30,036,000	$ 0	$30,036,000
Alternative Concept	$ 0	$ 0	$ 0
Savings	$30,036,000	$ 0	$30,036,000

Discussion

Alternative No.: LI-35

Sketch

Alternative No.: LI-35

■ Original ■ Alternative

Sketch

Alternative No.: LI-35

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: LI-35

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
FDR Scope to Be Removed						
I Wall Structures						
Saw Cut Pavement	LS	8,102.00	1	$8,102		
Demolish Jersey Barrier	LS	42,880.00	1	$42,880		
New Jersey Barrier	LS	274,253.00	1	$274,253		
Maintenance Protection of Traffic	LS	2,959,450.00	1	$2,959,450		
Roadway Patching	LS	664,804.00	1	$664,804		
L Wall Structures						
Saw Cut Pavement	LS	4,120.00	1	$4,120		
Demolish Jersey Barrier	LS	20,323.00	1	$20,323		
New Jersey Barrier	LS	129,982.00	1	$129,982		
Maintenance Protection of Traffic	LS	1,712,565.00	1	$1,712,565		
Roadway Patching	LS	255,710.00	1	$255,710		
T Wall Structures						
Saw Cut Pavement	LS	488.00	1	$488		
Demolish Jersey Barrier	LS	2,408.00	1	$2,408		
New Jersey Barrier	LS	15,403.00	1	$15,403		
Maintenance Protection of Traffic	LS	178,350.00	1	$178,350		
Roadway Patching	LS	75,756.00	1	$75,756		
Tunnel Structures						
Saw Cut Pavement	LS	11,492.00	1	$11,492		
Demolish Jersey Barrier	LS	109,696.00	1	$109,696		
New Jersey Barrier	LS	3,107,395.00	1	$3,107,395		
Maintenance Protection of Traffic	LS	5,033,443.00	1	$5,033,443		
Roadway Patching	LS	1,107,586.00	1	$1,107,586		
Total Markup	91.14%			$14,321,705.86		
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$30,036,000.00		
NET SAVINGS						$30,036,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	LI-38
Use only I-wall the entire length	
Description of Original Concept:	
The original concept is the construction of a levee as the principal flood protection feature for a length of about 4000 ft between the FDR Drive and East River Park.	
Description of Alternative Concept:	
The alternative concept is to use I-wall construction as the floodwall for the entire length of East River Park. This eliminates the overburden on the Con Ed transmission lines and the need for the utility tunnel as protection for those lines.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$412,526,000		$412,526,000
Alternative Concept	$309,936,000		$309,936,000
Savings	$102,590,000		$102,590,000

Discussion

Alternative No.: LI-38

[redacted]

Con Ed maintains several underground high voltage transmission lines within the park along the FDR Drive. [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Sketch

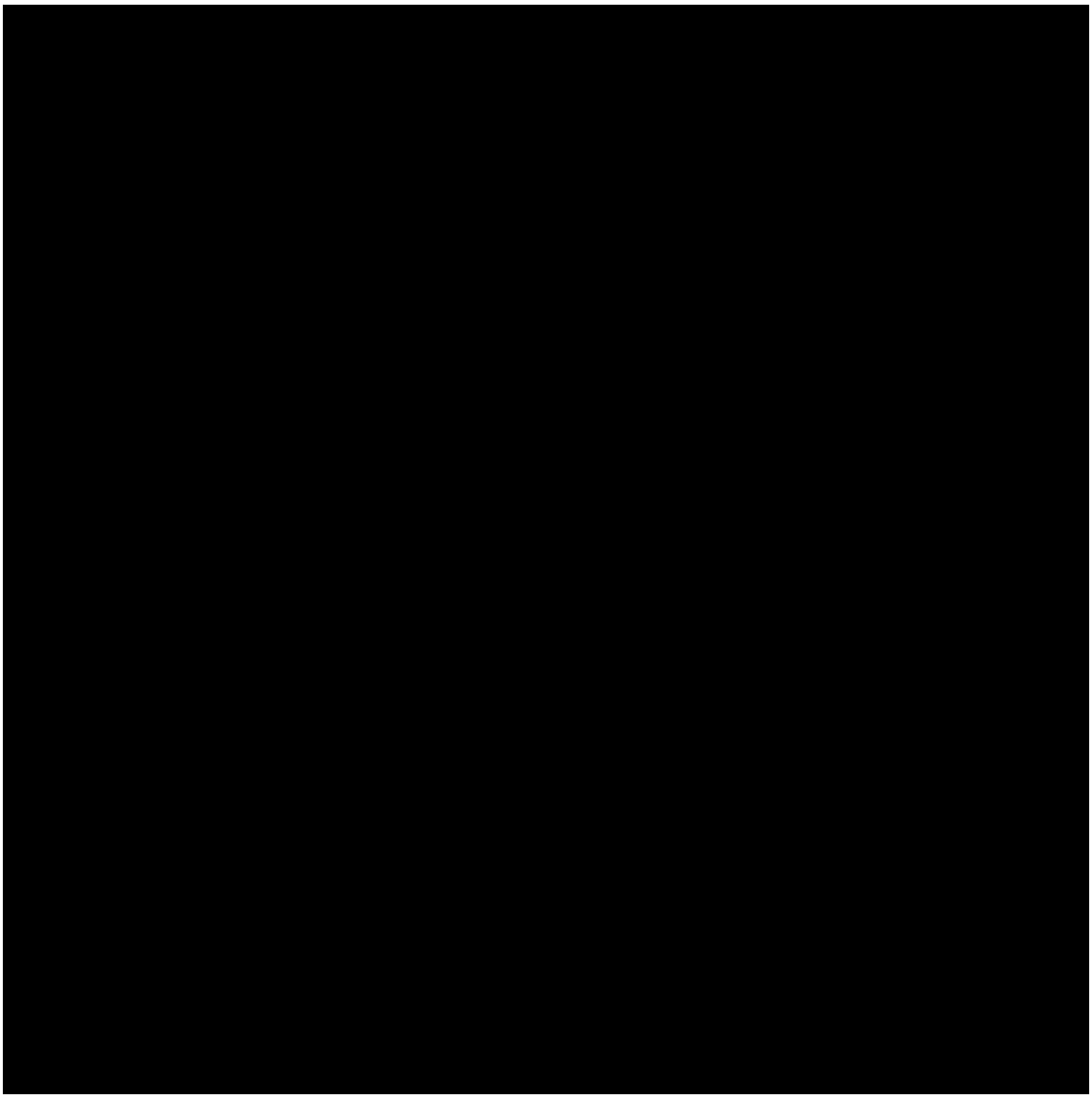
Alternative No.: LI-38

■ Original ■ Alternative

Sketch

Alternative No.: LI-38

■ Original ■ Alternative



Sketch

Alternative No.: LI-38

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: LI-38

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
I Wall	LF	10,667.00	3,865	$41,227,955	10,789	$115,086,263
L Wall	LF	12,642.00	3,062	$38,709,804		
T Wall	LF	64,665.00	123	$7,953,795		
Tunnel Sections	LF	18,810.00	3,739	$70,330,590		
Carbon Wrap on Conduit	LF	63.80	10,328	$658,926		
Excavate, Backfill with Structural Fill, Compact	CY	90.25	22,538	$2,034,055		
Duration Savings	MO	980,546.00	56	$54,910,576	48	$47,066,208
Total Markup	91.14%			$196,700,501.83		$147,783,476.53
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$412,526,000.00		$309,936,000
NET SAVINGS						$102,590,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	LI-41
Use bottom-hinged gates at road closures	
Description of Original Concept:	
The original concept is to construct either roller or swing gates for road closures.	
Description of Alternative Concept:	
The alternative concept is to provide a bottom-hinged gate instead of a roller or swing gate at road crossings.	

Cost Savings Summary (Present Worth)

	First Cost	O&M	Total LCC
Original Concept	$35,813,000	$0	$35,813,000
Alternative Concept	$29,559,000	$0	$29,559,000
Savings	$6,254,000	$0	$6,254,000

Advantages of Alternative Concept	Disadvantages of Alternative Concept
[redacted]	[redacted]

Discussion

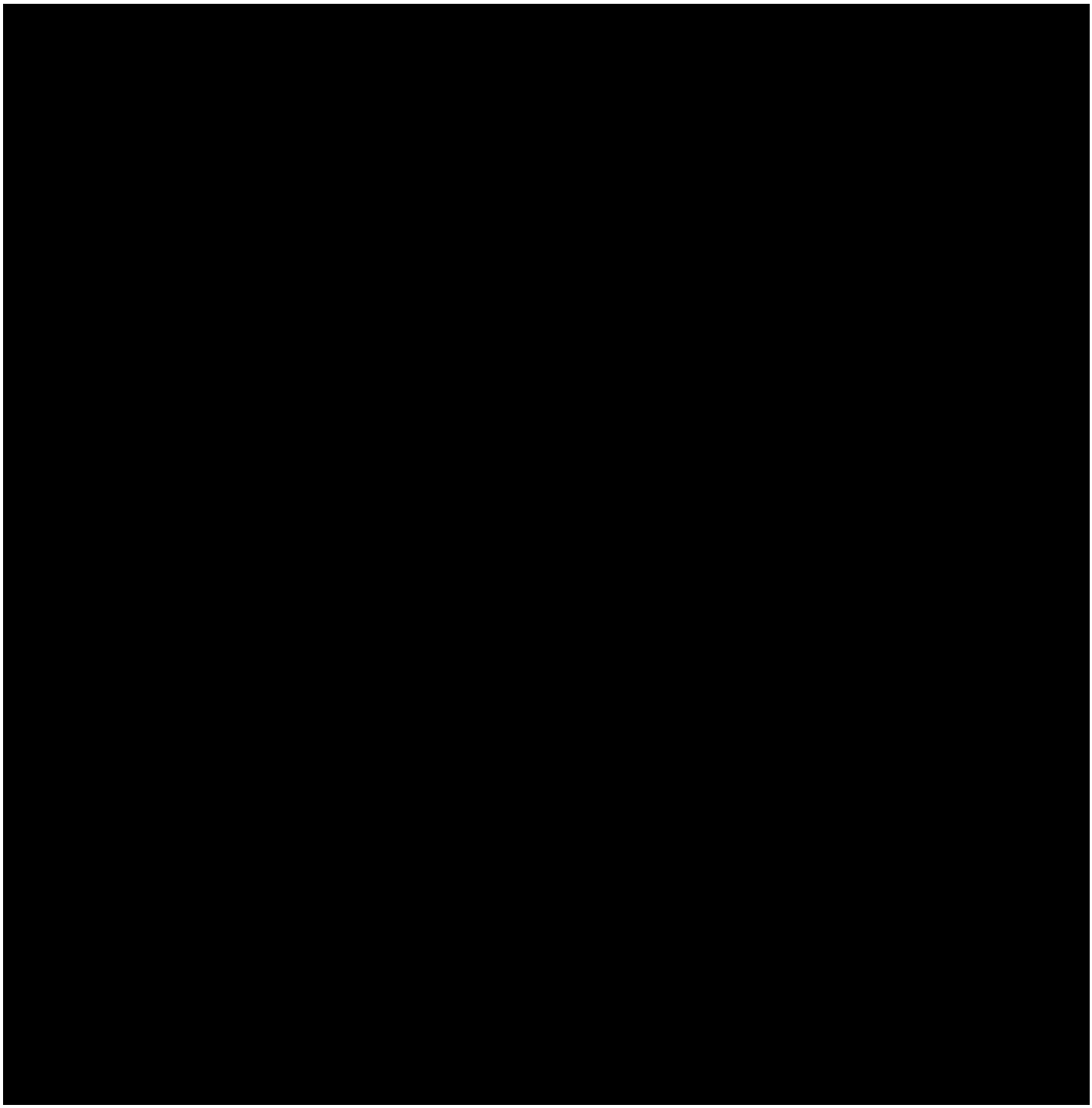
Alternative No.: LI-41

[redacted]

Sketch

Alternative No.: LI-41

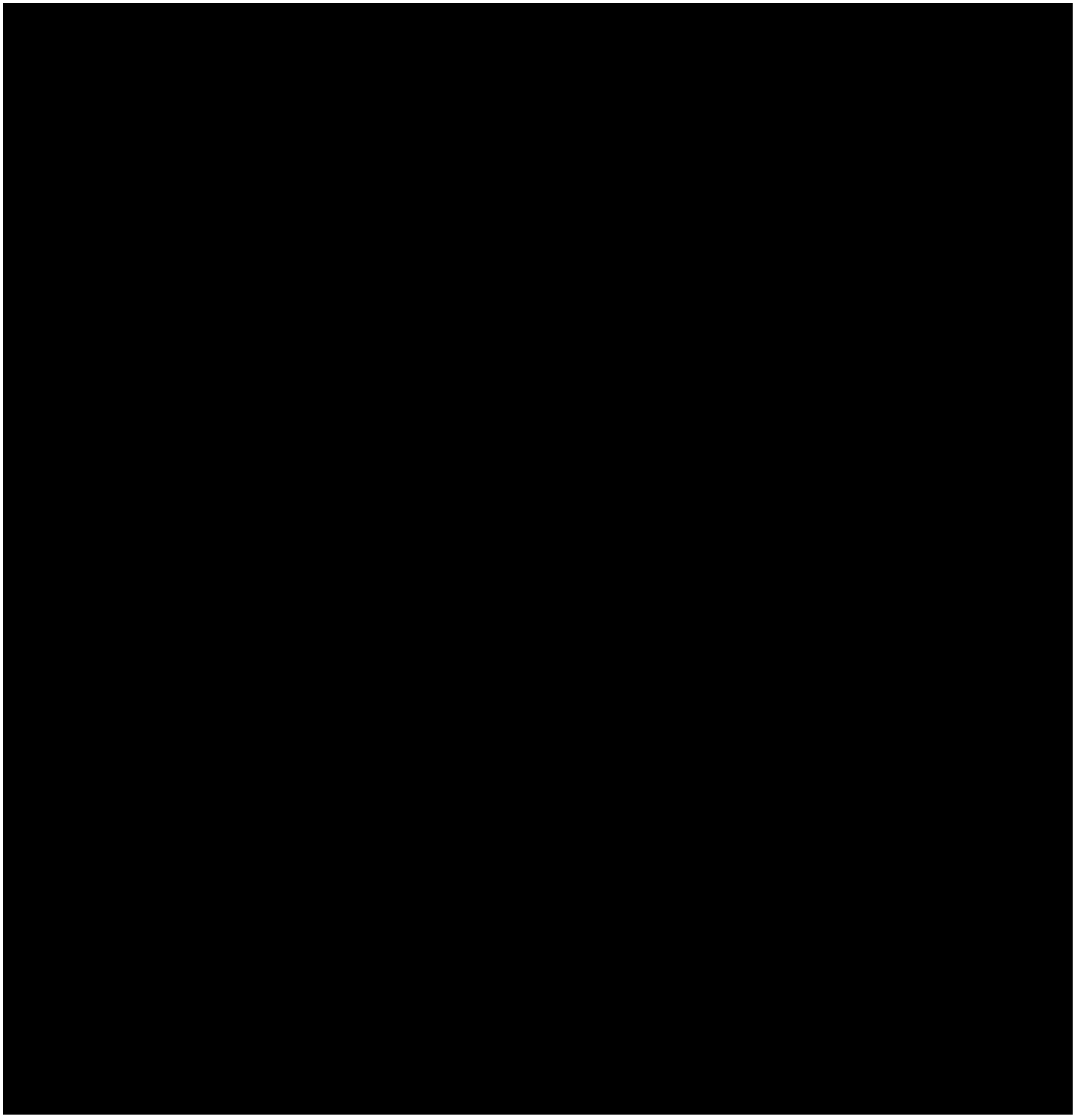
■ Original ■ Alternative



Sketch

Alternative No.: LI-41

■ Original ■ Alternative



Sketch

Alternative No.: LI-41

■ Original ■ Alternative

Sketch

Alternative No.: LI-41

■ Original ■ Alternative

Calculations

Alternative No.: LI-41

■ Original ■ Alternative

OBERMEYER EXAMPLE COST

Escalation	Cost of Example	Height Example (ft)	Length of Example (ft)	Intallation Multiplier
1.092727	$ 1,400,000	6.5	350	1.2

PROPOSED GATE SCHEDULE

Gate No.	Sill Elevation (Approx)	Gate Height (Calculated El. 18 minus Sill El.)	Gate Length	Extrapolated Obermeyer Cost	Comment
1	9.00	9	44.66	$ 324,340	
2	7.00	11	25.25	$ 324,340	
3	6.00	12	36	$ 348,597	
4	6.00	12	35.17	$ 324,341	
5	6.00	12	5	$ 48,416	Maybe Low?
6	6.00	12	3.75	$ 324,342	Maybe Low?
7	7.00	11	35.17	$ 312,180	
8	7.00	11	3.75	$ 324,343	Maybe Low?
9	6.00	12	5	$ 48,416	Maybe Low?
10	6.00	12	28.25	$ 324,344	
11	5.75	12.25	40	$ 395,399	
12	5.75	12.25	28	$ 324,345	
13	7.20	10.8	48	$ 418,316	
14	7.20	10.8	54	$ 324,346	
15	7.65	10.35	72	$ 601,329	
16	7.80	10.2	36	$ 324,347	
17	7.00	11	72	$ 639,094	
18	6.10	11.9	24	$ 324,348	
19	9.10	8.9	36	$ 258,543	
20	6.40	11.6	72	$ 324,349	

Assumes same opening width and height as the original gates.

Construction Cost Estimate

Alternative No.: LI-41

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Roller Gate Assemblies, Foundations, Piles, 72'	EA	3,383,268.00	3	$10,149,804		
Roller Gate Assemblies, Foundations, Piles, 44.5'	EA	1,154,108.00	1	$1,154,108		
Roller Gate Assemblies, Foundations, Piles, 35'2"	EA	1,650,375.00	1	$1,650,375		
Roller Gate Assemblies, Foundations, Piles, 48'	EA	1,650,375.00	1	$1,650,375		
Roller Gate Assemblies, Foundations, Piles, 54'	EA	1,864,924.00	1	$1,864,924		
Swing Gate Assemblies, Foundations, Piles, 24'	EA	321,926.00	1	$321,926		
Swing Gate Assemblies, Foundations, Piles, 25'3"	EA	290,786.00	1	$290,786		
Swing Gate Assemblies, Foundations, Piles, 28'	EA	373,435.00	1	$373,435		
Swing Gate Assemblies, Foundations, Piles, 28'3"	EA	319,865.00	1	$319,865		
Swing Gate Assemblies, Foundations, Piles, 36'	EA	480,486.00	2	$960,972		
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 1	LF	44.66			22,400	$1,000,384
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 2	LF	25.25			22,400	$224,127
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 7	LF	35.17			22,400	$787,808
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 10	LF	28.25			22,400	$273,552
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 11	LF	40.00			22,400	$896,000
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 12	LF	28.00			22,400	$276,779
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 13	LF	48.00			22,400	$1,075,200
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 14	LF	54.00			22,400	$470,606
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 15	LF	72.00			22,400	$1,612,800
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 16	LF	36.00			22,400	$296,307
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 17	LF	72.00			22,400	$1,612,800
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 18	LF	24.00			22,400	$230,461
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 19	LF	36.00			22,400	$806,400
Auto/Hydro Actuated Gate Assemblies (Road Load), Installed, Gate 20	LF	72.00			22,400	$673,954
Foundation at Actuated Gate, I Wall Equivalent	LF	8,500.00			615	$5,227,500
Swing/Roller Gate Assembly at Pedestrian Gates and FDR Drive Remain						
Total Markup	91.14%			$17,076,245		$14,094,289
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$35,813,000		$29,559,000
NET SAVINGS						$6,254,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	LI-43
Use lightweight fill and eliminate deep foundations for the tunnel	
Description of Original Concept:	
The original concept is to use steel pipe piles to resist the unbalanced load between the weight of excavated soil, and the weight of the concrete tunnel and backfill over the tunnel	
Description of Alternative Concept:	
The alternative concept is use lightweight backfill over the tunnel to decrease the load and thereby reduce the pilings required.	

Advantages of Alternative Concept	**Disadvantages of Alternative Concept**
[redacted]	[redacted]

Cost Savings Summary (Present Worth)

	First Cost	**O&M**	**Total LCC**
Original Concept	$7,838,000		$7,838,000
Alternative Concept	$7,529,000		$7,529,000
Savings	$309,000		$309,000

Discussion

Alternative No.: LI-43

Sketch

Alternative No.: LI-43

■ Original ■ Alternative

Sketch

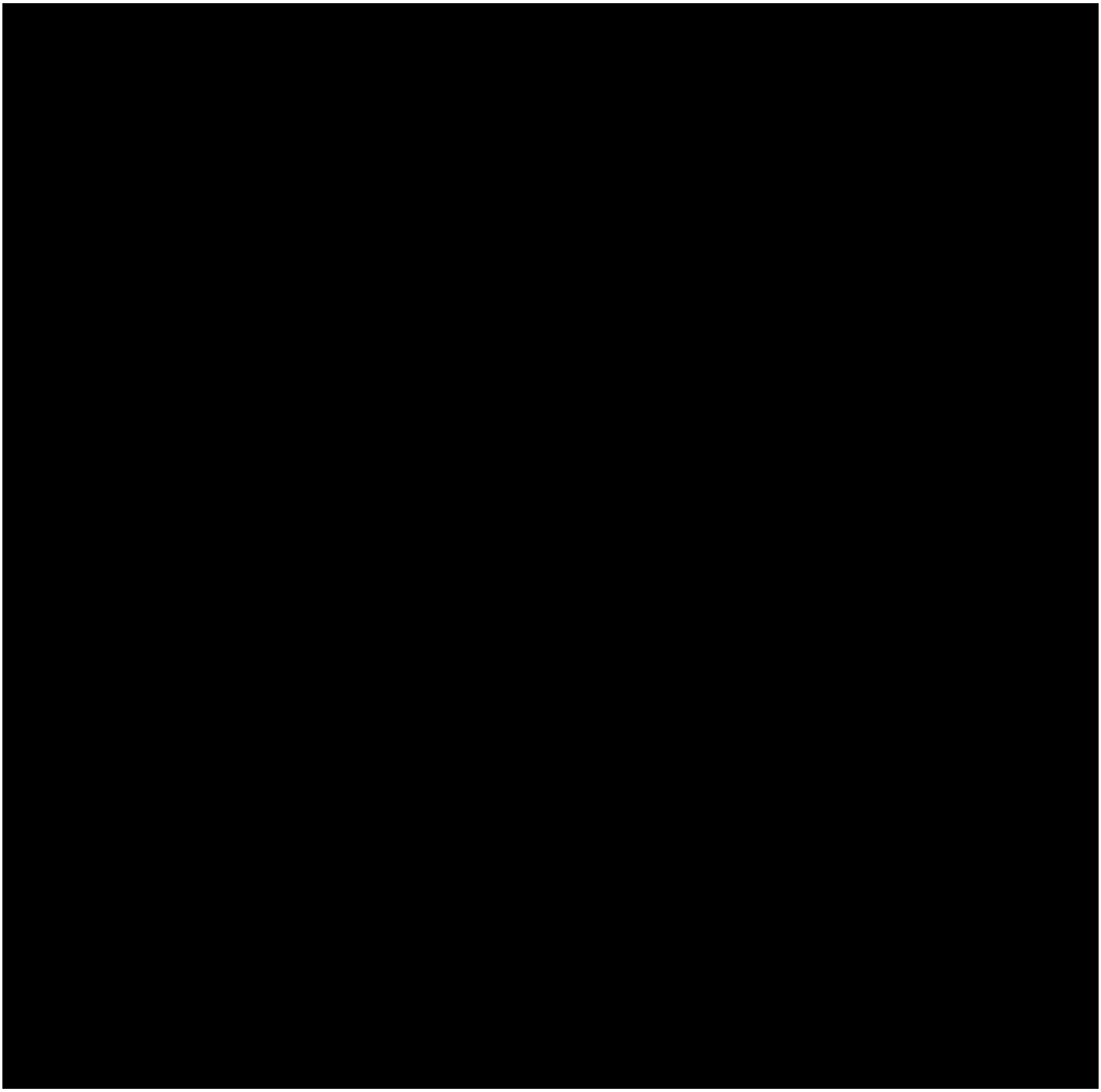
Alternative No.: LI-43

■ Original ■ Alternative

Calculations

Alternative No.: LI-43

■ Original ■ Alternative



Calculations

Alternative No.: LI-43

■ Original ■ Alternative

Calculations

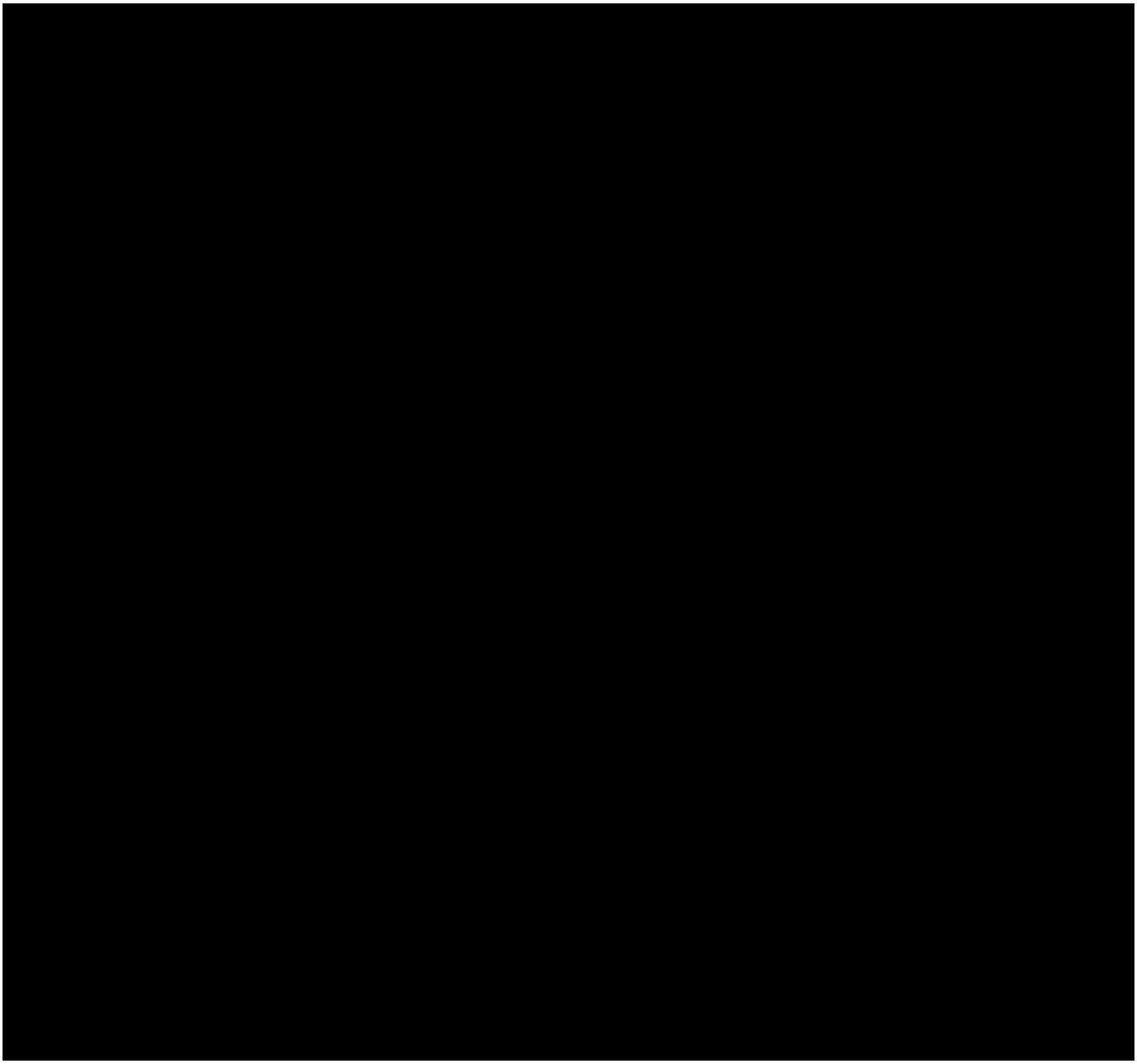
Alternative No.: LI-43

■ Original ■ Alternative

Calculations

Alternative No.: LI-43

■ Original ■ Alternative



Construction Cost Estimate

Alternative No.: LI-43

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Core Filled Steel Pipe Piles, 24"	LF	228.00	14,611	$3,331,308	7,744	$1,765,632
Replace overburden soil over pile supported sections with Flowable Backfill	CY	28.50	27,000	$769,500		
Flowable Backfill	CY	80.50			27,000	$2,173,500
Total Markup	91.14%			$3,737,418.61		$3,590,069.38
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$7,838,000.00		$7,529,000
NET SAVINGS						$309,000

Value Alternative

Project: East Side Coastal Resiliency
Location: New York City, NY

	Alternative No:
Title:	LI-61
Tie floodwall into either side of the Con Ed intake structure and keep the floodwall on the east side of the FDR	
Description of Original Concept:	
The original concept is for the floodwall alignment north of East River Park to cross the FDR Drive using swing gates, tie into the Con Ed Building and proceed along the west side of the sidewalk to the Avenue C intersection and cross below the viaduct to tie in at Stuyvesant Cove Park.	
Description of Alternative Concept:	
The alternative concept is to maintain the floodwall alignment on the east side of the FDR Drive, tie into the Con Ed gate structure at the bike path "pinch point" and proceed along the west side of the bike path to Stuyvesant Cove Park.	

Cost Savings Summary (Present Worth)			
	First Cost	**O&M**	**Total LCC**
Original Concept	$120,647,000	$0	$120,647,000
Alternative Concept	$100,865,000	$0	$100,865,000
Savings	$19,782,000	$0	$19,782,000

Advantages of Alternative Concept	Disadvantages of Alternative Concept
[redacted]	[redacted]

Discussion

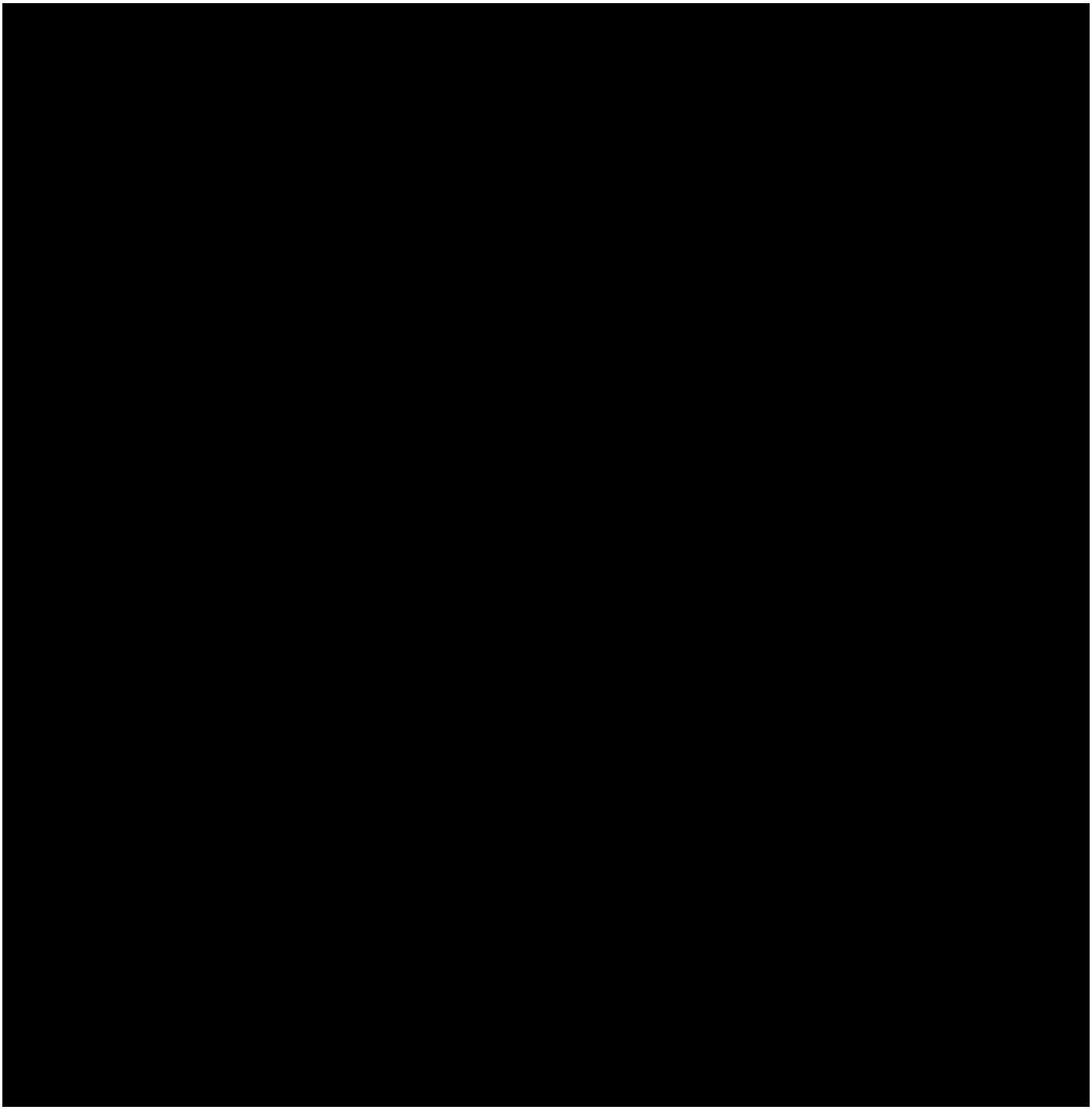
Alternative No.: LI-61

[redacted]

Sketch

Alternative No.: LI-61

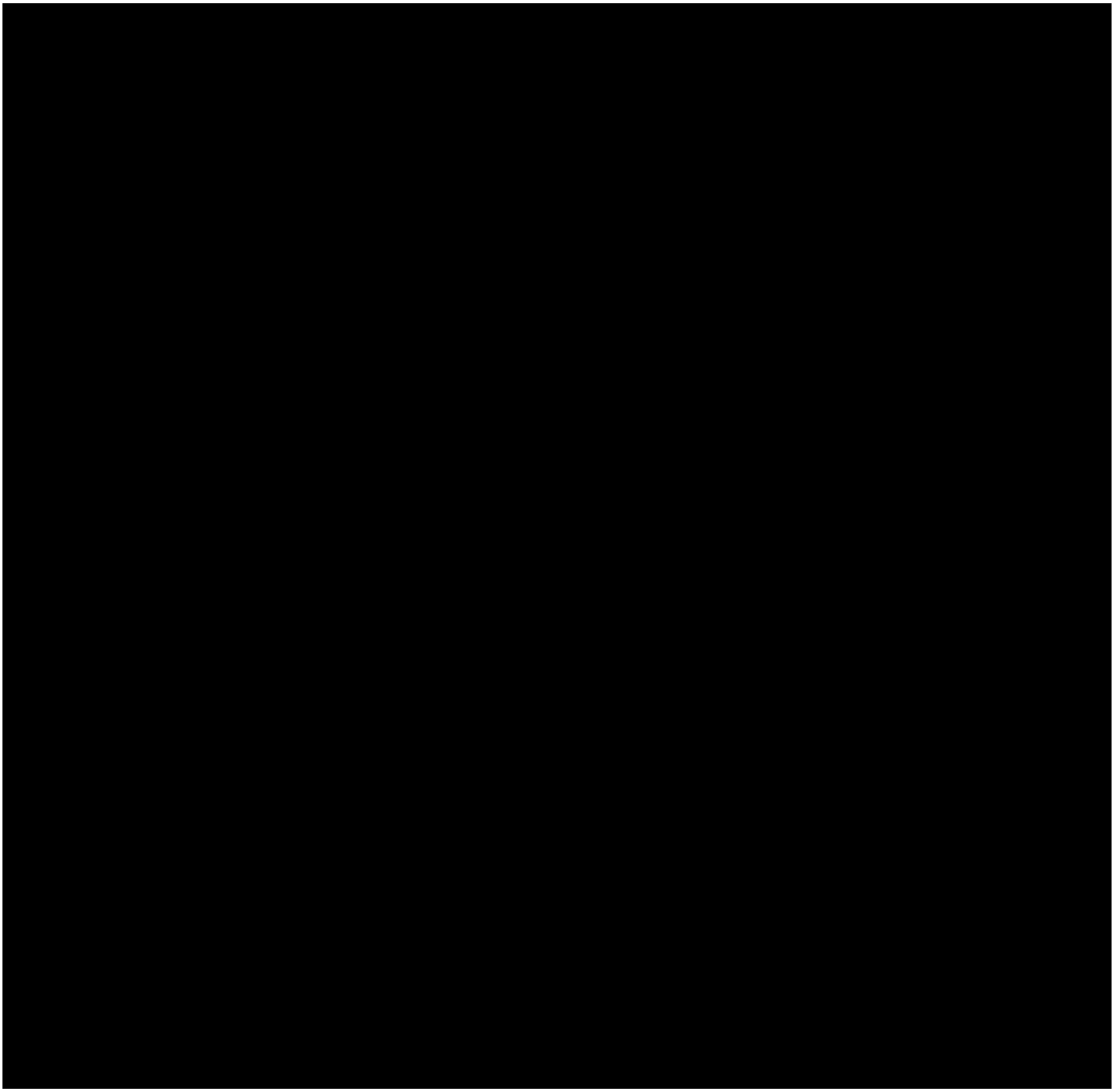
■ Original ■ Alternative



Sketch

Alternative No.: LI-61

■ Original ■ Alternative



Sketch

Alternative No.: LI-61

■ Original ■ Alternative

Construction Cost Estimate

Alternative No.: LI-61

Item	Unit of Meas	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Gate 3	EA	871,448.00	1	$871,448		
Gate 4	EA	871,416.00	1	$871,416		
Gate 5	EA	36,348.00	1	$36,348		
Gate 6	EA	27,262.00	1	$27,262		
Gate 7	EA	1,650,375.00	1	$1,650,375		
Gate 8	EA	27,262.00	1	$27,262		
Gate 9	EA	36,348.00	1	$36,348		
Gate 10	EA	319,865.00	1	$319,865		
Gate 11	EA	480,486.00	1	$480,486		
Gate 12	EA	373,436.00	1	$373,436		
Gate 13	EA	1,650,375.00	1	$1,650,375		
Gate 14	EA	1,864,924.00	1	$1,864,924		
10' Foot Gate	EA	43,618.00			2	$87,236
12' Foot Gate	EA	87,235.00			2	$174,470
Con Ed Wall Tie-In	EA	20,000.00			2	$40,000
Con Ed Building Floodproofing	LS	500,000.00			1	$500,000
Duration Savings (Assumption)	MO	980,546.00	56	$54,910,576	53	$51,968,938
Total Markup	91.14%			$57,526,788.60		$48,094,421.14
TOTALS	Breakdown of Markup can be found in the Cost Appendix			$120,647,000.00		$100,865,000
NET SAVINGS						$19,782,000

APPENDICES

A – RECONCILED COST ESTIMATE

Summary of Reconciled Cost Estimate

East Side Coastal Resiliency

Date: 03/11/2018

EAST SIDE COASTAL RESILIENCY

Basis of VE Cost Estimate

The attached cost estimate was developed based on digital quantity takeoff of the 40% design documents, dated November 11, 2017. The labor wage rate table utilized is a NYC Union Labor 2017. Material pricing was sourced from previous bid experience from projects with similar scope, DOT WAIP reports for region 11, market costs received from trade professionals in the NYC metro area.

Assumptions.

[redacted]

The total Estimated Cost of Construction is $988,463,322, and includes indirect costs calculated by compounding the following percentages:

Direct Cost	**$421,010,012**	
Contingency	**$126,303,003**	**30.000%**
Subtotal	**$547,313,015**	
Escalation 3.34 year x 4%	**$76,350,165**	**13.950%**
Subtotal	**$623,663,180**	
GC General Conditions	**$62,366,318**	**10.000%**
Subtotal	**$686,029,498**	
Overhead & Profit (10%&5%)	**$102,904,425**	**15.000%**
Subtotal	**$788,933,923**	
Contractor Bond & Insurance	**15,778,678**	**2.000 %**
Subtotal	**$804,712,601**	
Tree Mitigation	**$21,783,580**	
DEP Interior Drainage	**$161,967,141**	
Total	**$988,463,322**	

Pkg	Area	Tag	Phase	Description	Takeoff Quantity	Total Amount	Grand Total
01				FLOOD PROTECTION		227,392,227	434,634,298
02				PARK LANDSCAPING		52,115,531	99,612,892
03				PARK UTILITIES		24,462,201	46,756,706
04				PEDESTRIAN BRIDGES	1,183.00 lf	41,221,906	78,790,970
05				COMBINED SEWER SYSTEM		53,306,716	101,889,706
06				COMFORT STATION	702.00 sf	2,799,225	5,350,400
07				INTERCEPTOR GATES	2.00 ea	11,600,000	22,172,077
08				WATER MAIN RELOCATION (24")	1,596.00 lf	2,612,204	4,992,929
09				AMENDMENTS	1.00 ls	5,500,000	10,512,622

Estimate Totals

Description	Amount	Totals	Rate	Cost Basi	Cost per Unit	cent of Total	
Labor	484,978,350					49.06%	
Material	205,175,107					20.76%	
Subcontract							
Equipment	66,964,860					6.77%	
Other	47,594,283					4.81%	
	804,712,600	**804,712,600**				**81.41**	**81.41%**
Tree Mitigation	21,783,580			L		2.20%	
DEP Interior Drainage	161,967,141			L		16.39%	
	183,750,721	**988,463,321**				**18.59**	**100.00%**
Total		***988,463,321***					

Pkg	Area	Tag	Phase	Description	Takeoff Quantity	Total Amount	Grand Total
01				FLOOD PROTECTION		227,392,227	434,634,298
02				PARK LANDSCAPING		52,115,531	99,612,892
03				PARK UTILITIES		24,462,201	46,756,706
04				PEDESTRIAN BRIDGES	1,183.00 lf	41,221,906	78,790,970
05				COMBINED SEWER SYSTEM		53,306,716	101,889,706
06				COMFORT STATION	702.00 sf	2,799,225	5,350,400
07				INTERCEPTOR GATES	2.00 ea	11,600,000	22,172,077
08				WATER MAIN RELOCATION (24")	1,596.00 lf	2,612,204	4,992,929
09				AMENDMENTS	1.00 ls	5,500,000	10,512,622

Estimate Totals

Description	Amount	Totals	Rate	Cost Basi	Cost per Unit	cent of Total	
Labor	253,731,259					25.67%	
Material	107,343,633					10.86%	
Subcontract							
Equipment	35,034,715					3.54%	
Other	24,900,405					2.52%	
	421,010,012	**421,010,012**				**42.59**	**42.59%**
Contingency	126,303,003		30.000 %	T		12.78%	
	126,303,003	**547,313,015**				**12.78**	**55.37%**
Escalation 3.34 year x 4%	76,350,165		13.950 %	T		7.72%	
	76,350,165	**623,663,180**				**7.72**	**63.09%**
GC Gnl Conditions	62,366,318		10.000 %	T		6.31%	
	62,366,318	**686,029,498**				**6.31**	**69.40%**
Overhead & Profit (10%&5%)	102,904,425		15.000 %	T		10.41%	
	102,904,425	**788,933,923**				**10.41**	**79.81%**
Contractor Bond & Insurance	15,778,678		2.000 %	T		1.60%	
	15,778,678	**804,712,601**				**1.60**	**81.41%**
Tree Mitigation	21,783,580			L		2.20%	
DEP Interior Drainage	161,967,141			L		16.39%	
	183,750,721	**988,463,322**				**18.59**	**100.00%**
Total		***988,463,322***					

Area	Pkg	Tag	Phase	Description	Takeoff Quantity	Total Amount	Grand Total
1				Segment 1 (Reaches A, B ,C, D & E)			
	01			FLOOD PROTECTION		97,790,229	186,914,866
	02			PARK LANDSCAPING		18,790,820	35,916,509
	03			PARK UTILITIES		22,234,300	42,498,327
	05			COMBINED SEWER SYSTEM		29,916,945	57,182,827
	07			INTERCEPTOR GATES		11,600,000	22,172,077
				1 Segment 1 (Reaches A, B ,C, D & E)		180,332,294	344,684,605
2				Segment 2 (Reaches F, G & H)			
	01			FLOOD PROTECTION		35,770,767	68,371,739
	02			PARK LANDSCAPING		15,047,746	28,762,049
	03			PARK UTILITIES		213,505	408,090
	04			PEDESTRIAN BRIDGES		21,632,493	41,348,042
	05			COMBINED SEWER SYSTEM		16,673,084	31,868,697
				2 Segment 2 (Reaches F, G & H)		89,337,593	170,758,617
3				Segment 3 (Reaches I & J)			
	01			FLOOD PROTECTION		26,380,061	50,422,477
	02			PARK LANDSCAPING		4,772,467	9,122,027
	03			PARK UTILITIES		35,525	67,902
	04			PEDESTRIAN BRIDGES		19,589,413	37,442,928
	05			COMBINED SEWER SYSTEM		5,927,786	11,330,287
	06			COMFORT STATION		2,799,225	5,350,400
				3 Segment 3 (Reaches I & J)		59,504,478	113,736,021
4				Segment 4 Reaches (K, L & M)			
	01			FLOOD PROTECTION		30,945,689	59,149,154
	02			PARK LANDSCAPING		1,920,778	3,671,347
	03			PARK UTILITIES		21,025	40,187
	05			COMBINED SEWER SYSTEM		618,550	1,182,287
	08			WATER MAIN RELOCATION (24")		18,081	34,560
				4 Segment 4 Reaches (K, L & M)		33,524,122	64,077,535
5				Segment 5 (Reaches (N & O)			
	01			FLOOD PROTECTION		29,950,109	57,246,217
	02			PARK LANDSCAPING		3,052,068	5,833,680
	05			COMBINED SEWER SYSTEM		42,588	81,402
	08			WATER MAIN RELOCATION (24")		2,594,122	4,958,369
				5 Segment 5 (Reaches (N & O)		35,638,888	68,119,668
6				Segment 6 (Reach Q)			
	01			FLOOD PROTECTION		6,555,371	12,529,844

Area	Pkg	Tag	Phase	Description	Takeoff Quantity	Total Amount	Grand Total
	02			PARK LANDSCAPING		963,181	1,841,011
	03			PARK UTILITIES		725	1,385
	05			COMBINED SEWER SYSTEM		127,764	244,206
				6 Segment 6 (Reach Q)		**7,647,041**	**14,616,447**
7				**All Segments & Reaches**			
	03			PARK UTILITIES		1,957,122	3,740,815
				7 All Segments & Reaches		**1,957,122**	**3,740,815**
02							
	02			PARK LANDSCAPING		7,568,471	14,466,270
				02		**7,568,471**	**14,466,270**
*** unassigned ***							
	09			AMENDMENTS		5,500,000	10,512,622
				*** unassigned ***		**5,500,000**	**10,512,622**

Estimate Totals

Description	Amount	Totals	Rate	Cost Basi	Cost per Unit	cent of Total	
Labor	253,731,259					25.67%	
Material	107,343,633					10.86%	
Subcontract							
Equipment	35,034,715					3.54%	
Other	24,900,405					2.52%	
	421,010,012	**421,010,012**				**42.59**	**42.59%**
Contingency	126,303,003		30.000 %	T		12.78%	
	126,303,003	**547,313,015**				**12.78**	**55.37%**
Escalation 3.34 year x 4%	76,350,165		13.950 %	T		7.72%	
	76,350,165	**623,663,180**				**7.72**	**63.09%**
GC Gnl Conditions	62,366,318		10.000 %	T		6.31%	
	62,366,318	**686,029,498**				**6.31**	**69.40%**
Overhead & Profit (10%&5%)	102,904,425		15.000 %	T		10.41%	
	102,904,425	**788,933,923**				**10.41**	**79.81%**
Contractor Bond & Insurance	15,778,678		2.000 %	T		1.60%	
	15,778,678	**804,712,601**				**1.60**	**81.41%**
Tree Mitigation	21,783,580			L		2.20%	
DEP Interior Drainage	161,967,141			L		16.39%	

Estimate Totals

	183,750,721	988,463,322		18.59	100.00%
Total		***988,463,322***			

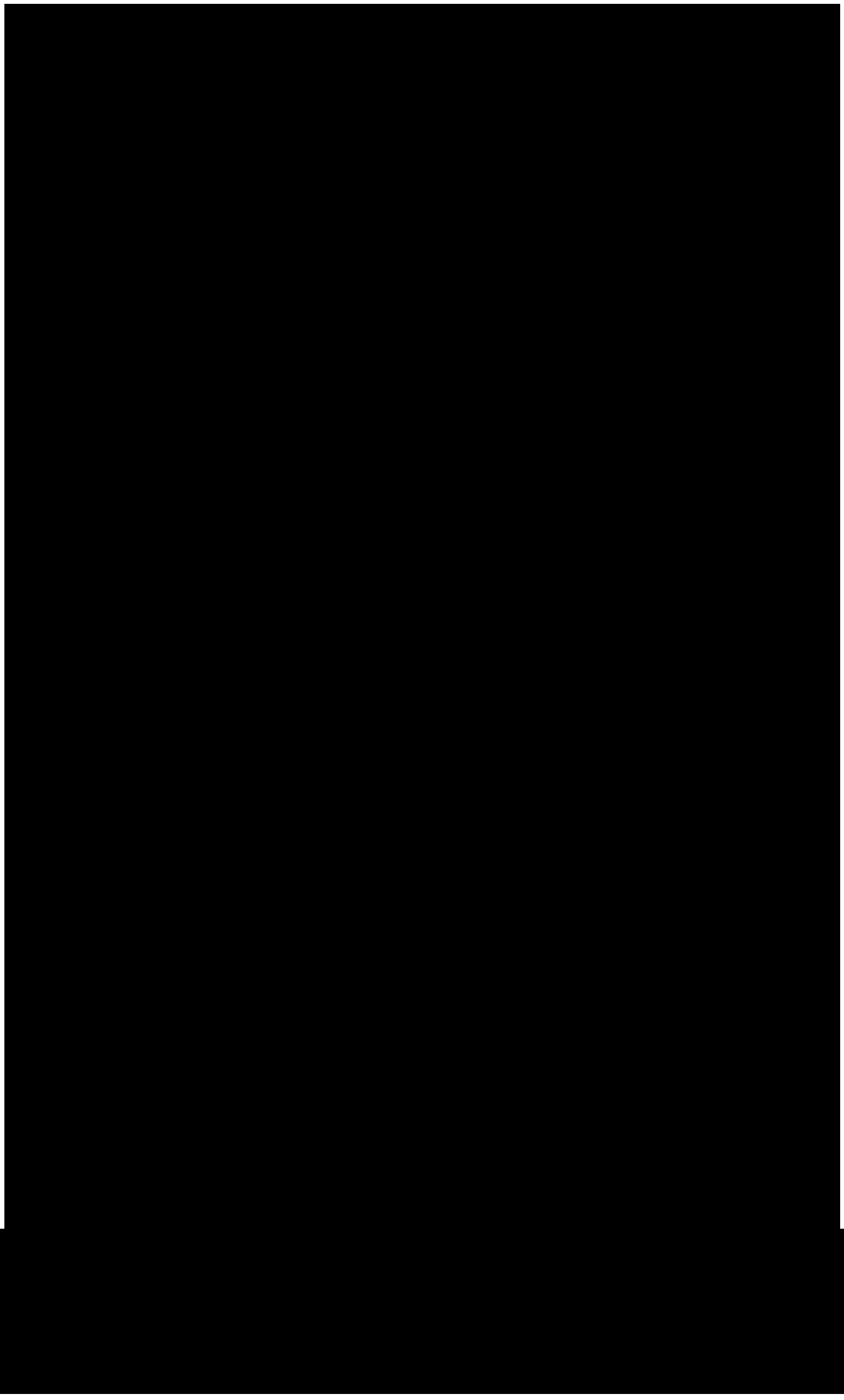
B – FUNCTION ANALYSIS

HOW?

FAST Diagram

WHY?

WHEN?



C – CREATIVE IDEA LISTING

Idea No.	Description	Votes
AD - Assure Dependability		
AD-01	Design a decision model for different flooding criteria	3
AD-02	Add instrumentation and controls to actively manage system storage (sewer system)	0
AD-03	Connect isolation gates to city-wide SCADA	0
AD-04	Remove control structure and hydraulic operator and use portable operator	3
AD-05	Monitor gate position by SCADA system	2
AD-06	Replace interceptor isolation gates with adjustable orifice gates or weirs to maximize storage capacity	8
AD-07	Build pump station to handle excess flow from interceptor	2
AD-08	Exercise gates monthly	1
AD-09	Install cameras to minimize vandalism and monitor conditions	0
AD-10	Move manholes off FDR	11
AD-11	Directional drill manholes on FDR	0
AD-12	Slip line existing manholes	0
AD-13	Make manhole (gate well) integral to floodwall	0
AD-14	Construct header on park side to intercept to CSOs and eliminate individual outfalls	1
AD-15	Harden electrical equipment to temporary submergence level	7
AD-16	Jack up remaining buildings to reduce inundation	2
AD-17	Berm around existing remaining buildings	1
AD-18	Replace park buildings at a higher elevation	1
AD-19	Standardize gate sizes and hardware to facilitate maintenance	DS
AD-20	Use directional drilling to reduce ponding water	0
AD-21	Use directional drilling for parallel conveyance	1
AD-22	Make two gates at Con Ed as small as operationally possible	7
AD-23	Eliminate isolation chambers and direct flow to interceptors	8
AD-24	Elevate FDR at 14th street and eliminate gates	1
AD-25	Eliminate fire alarm system in tunnel and use temperature sensors	2

Idea No.	Description	Votes
AD-26	Use repeat cycle timer for ventilation in tunnel	2
AD-27	Cross train staff for gate operation (O&M, first responders) twice/year	7
AD-28	Train under adverse conditions	2
AD-29	Have an alert system away from gates	7
AD-30	Use green wall to eliminate graffiti on wall	1
AD-31	Locate maintenance/spare parts facility	1
AD-32	Locate shed for spare parts under FDR in parking area	7
AD-33	Use sand tubes rather than sand bags for final closure	0
AD-34	Provide emergency lighting in tunnel	2
AD-35	Provide non-electrical exit signs in tunnel	2
AD-36	Leave 14th and 15th street gates normally closed	0
AD-37	Move floodwall to river side of FDR and eliminate gates	2
AD-38	Past the Con Ed intake building, extend a floodwall along the esplanade and east of the FDR ramp to 18th street	6
AD-39	Place gates across the 18th street ramp, and align the floodwall east of Stuyvesant park	0
AD-40	Reduce the number of gates by changing the traffic pattern and realigning the flood wall	3
AD-41	Do not expose and wrap the Con Ed lines	8
AD-42	Plant salt tolerant species now to replace landscaping and trees that we are trying to save	2
AD-43	Use stainless steel for road gates to increase life and expedite delivery	0
AD-44	Revisit transformer sizes throughout project	5
AD-45	Eliminate mechanical rooms at the tunnel, install equipment in tunnel	2
AD-46	Use NEMA 6P equipment enclosure rating in the lower part of the tunnel	2
AD-47	Replace metal halide lights at sports fields 5 and 6 with LED lights	7
AD-48	Eliminate low height poles (Flushing Meadow type); use masts for illumination	1
AD-49	Use 277V for lower pole lighting (up to 22 ft)	2

Idea No.	Description	Votes
AD-50	Use PVC 80 conduits for installation below grade (outdoor lighting)	1
AD-51	Use aluminum conduit for lighting, comm, fire alarm, et., within tunnel	2
AD-52	Maintain safe passage in the tunnel	6
AD-53	In the tunnel, use only 120/280 system: 280V lighting, 120V receptacles and eliminate step up transformers	4
AD-54	Reduce the luminaires in the tunnel to achieve the target illumination	5
AD-55	Do not install VFDs for fan control in tunnel, use 2-speed fans	2
AD-56	Reuse sports fields existing underground raceways where possible	1
AD-57	Protect NEMA 3R rated SCADA panels against flood	1
AD-58	Use 480V for lights installed above 22 feet	1
AD-59	Optimize tunnel electrical	8
AD-60	Optimize park electrical	8
C - Construction		
C-01	Consider a Construction Manager at Risk (CM@Risk) contract	7
C-02	Put a concrete plant onsite in a staging area	4
C-03	Close off park to pedestrians and bikes south of the amphitheater; use Cherry Street bridge for access	7
C-04	Close park entirely during construction	8
C-05	Include barging as an option for materials management	7
C-06	Use a floating batch plant	5
C-07	Prequalify/identify offsite storage location	2
C-08	Modify construction sequencing to facilitate use of HUD money	8
C-09	Use FDR parking area for staging and stockpiling materials	2
C-10	Delay Pier 42 Phase 1B Park opening until ESCR is complete in that area	DS
C-11	Establish staging areas on southbound service road for concrete pumping across FDR	7
C-12	Use pre-cast concrete wall panels	8

Idea No.	Description	Votes
C-13	Pre-bid all gates as a package	7
C-14	Pre-bid Con Ed work to work under GC	2
C-15	Leave area in north end open to allow trucks to access FDR during construction	8
C-16	Complete work along FDR first, then complete remainder of work in segment	2
C-17	Use segmented tunnel plant techniques to build Con Ed tunnel	5
C-18	Use sheet pile/shoring as permanent wall for tunnel	3
C-19	Advance order long-lead items to improve schedule and use HUD money	DS
C-20	Pre-cast U-shape and place on tunnel slab	8
C-21	Make Con Ed tunnel construction Con Ed's responsibility	2
C-22	Have a consistent wall section to allow pre-fab	3
C-23	Purchase silent piler equipment and lease back to contractor	5
C-24	Consider separate early utilities contract	7
C-25	Contract grow plants	0
C-26	Identify soil source that will meet specifications	7
C-27	Conduct public community meetings	0
C-28	Allow old/new pedestrian bridge for transporting materials	1
C-29	Use pedestrian bridge for staging area	0
C-30	Encourage use of VECPs	1
C-31	Identify disposal sites for clean and contaminated soils	0
C-32	Prepare alternate bid options for precast wall and tunnel sections	4
C-33	Build Asser Levy and Murphy's Brothers playgrounds as early package	7
C-34	Make pedestrian bridges an early package	6
C-35	Complete bulkhead repairs as an early package and part of this project	DS
C-36	Use A + B bidding	DS
C-37	Use 2-stage bidding process; pre-qualify bidders	1
C-38	Keep landscape packages small enough to encourage competition	DS

Idea No.	Description	Votes
C-39	Use owner's rep in lieu of CM for landscaping packages	2
C-40	Use southbound service road as part of FDR mainline and shift traffic west	8
C-41	Closure at entrance ramp at Avenue C to allow lane shift on FDR	0
C-42	Redesign work to eliminate long-term closures on FDR	7
C-43	Hire program manager now	1
C-44	Look for experienced contractor to assist with constructability review	7
C-45	Hire USACE person to review plans	0
C-46	Consider weekend work for lane closures	7
C-47	Use lightweight fill and eliminate stone columns at MSE walls	6
C-48	Identify poor condition area of bulkhead section and rebuild to allow use of barging	3
C-49	Rebuild esplanade area out to allow barging and recapture space for park land	4
C-50	Use landing barge or floating dock to allow landing in shallow areas	13
C-51	Allow a construction access (road) by building a temporary berm at Houston Street for construction access into the park	8
C-52	Eliminate backslope on levee where it adjoins jersey wall	2
C-53	Match tunnel design to locally available pre-cast segments	6
C-54	Eliminate on-ramp at Montgomery completely	0
C-55	Reroute pedestrian/bike traffic to minimize interference with construction	7
C-56	Move shared use path to the water side	2
C-57	Design fence to minimize debris catching	1
C-58	Evaluate project schedule with regard to risk	DS
C-59	Include flood engineering expertise in negotiations for environmental permitting in water	4
C-60	Focus the HUD scope of work on CSO construction and park utilities as an early contract	DS
IA - Improve Access		
IA-01	Build a heliport for emergency access	1

Idea No.	Description	Votes
IA-02	Reinforce area of sports fields for heliport	0
IA-03	Rebuild Houston Street pedestrian ramps to handle HS-20 loads	12
IA-04	During construction, remove FDR jersey barrier in several places to facilitate night time construction vehicle access	9
IA-05	Add a new ingress/egress for vehicle access at north end of park	7
IA-06	Use straight stairs and elevator in lieu of ramp	0
IA-07	With elevating park, add connections back to city	2
IA-08	Resignalized at Houston street to allow bicycle and small vehicle access into park	1
IA-09	Increase Delancey Street bridge rating to HS20	3
IA-10	Change allowable grades to ADA (1 on 12) to Universal ADA	2
IA-11	Increase capacity of Corlears Hook bridge	7
IA-12	Make Delancey Street bridge perpendicular to FDR	0
IA-13	Replace several adjacent bridges with a deck	0
IA-14	Put a catwalk on top of roller gate for emergency access	0
IA-15	Put a tramway to transport people from Thompkins Park across FDR	0
IA-16	Use a pre-fab bridge design at pedestrian bridge crossings	17
LI - Limit Inundation		
LI-01	Install popup wall	0
LI-02	Construct levee out of roller compact concrete	3
LI-03	Install remote operation of service gates	4
LI-04	Install transparent barrier in critical locations and berm	4
LI-05	Eliminate berm and Con Ed tunnel except at bridge crossovers	7
LI-06	Lower the final park elevation by 1 foot and reduce the cross section of the horticultural soil	12
LI-07	Reduce horticultural soil	7
LI-08	Construct rectangular CSO conduit under the tunnel	4
LI-09	Offset wall to the east of Con Ed lines; add roller gates to maintain viewshed and access	2

Idea No.	Description	Votes
LI-10	Lower top of wall to 13.5' then raise in future as needed	2
LI-11	Separate transmission line project and make Con Ed responsible	4
LI-12	Build wall on west side of the highway	5
LI-13	Contract grow the plants	4
LI-14	Simplify levee and use a high-performance erosion control mat in lieu of clay	9
LI-15	Use a thin veneer of clay	6
LI-16	Use landscape planting erosion control to reinforce levee	3
LI-17	Install intermittent wave deflection for overtopping	0
LI-18	Replace clay with a stem wall extending from Con Ed tunnel	2
LI-19	Move flood protection to water side of esplanade	7
LI-20	Standardize all deep foundations for the wall and use auger cast piles	7
LI-21	Relocate Con Ed lines as close to esplanade/water side to simplify flood wall	2
LI-22	Use raising (lift) gates across FDR and where applicable	1
LI-23	Use inflatable dams in lieu of flood gates	0
LI-24	Raise height of levee to force overtopping to concrete wall areas and eliminate clay and erosion control mat	2
LI-25	Use flex gates in lieu of roller gates	4
LI-26	Use portable electrical gate operators for roller gates	2
LI-27	Plant trees on top of levee to reduce wave impact and alienation cost	1
LI-28	Use landscaping features to break up waves	0
LI-29	Elevate park high enough to eliminate wall	9
LI-30	Rebuild promenade as a flood wall and provide gate access where needed	8
LI-31	Relocate Con Ed lines to southbound sidewalk across FDR Drive	1
LI-32	Reuse excavated material from Con Ed lines for levee construction	3
LI-33	Identify levee as berm in the plans	3

Idea No.	Description	Votes
LI-34	Flatten landside of levee to reduce overtopping and landscaping	1
LI-35	Shift all construction to the east to avoid closures on FDR	8
LI-36	Form a safety shape into the floodwall and eliminate the jersey barrier	3
LI-37	Move wall far enough east to avoid Con Ed lines	6
LI-38	Use only I-wall the entire length	10
LI-39	Harden the wall for scour from wave overtopping	0
LI-40	Disconnect the sheet pile from tunnel where there are no deep foundations	0
LI-41	Use bottom-hinged gates at road closures	11
LI-42	Use bottom-hinged gates as a floodwall	7
LI-43	Use lightweight fill and eliminate deep foundations for the tunnel	10
LI-44	Use flowable backfill around the conduit including thermal dissipation system	1
LI-45	Decrease the size of the tunnel	1
LI-46	Make the tunnel the minimum required size	2
LI-47	Eliminate tying into Con Ed facility by using a barrier wall in the river around the intake structure	0
LI-48	Use TBM in lieu of rectangular culvert and replace conduit	0
LI-49	Use soil modification to eliminate piles under tunnel and other sections	7
LI-50	Relocate Con Ed lines along new alignment	7
LI-51	Use chamber in lieu of tunnel for Con Ed lines	3
LI-52	Put a walkway on top of levee for overtopping	5
LI-53	Expose the landside/west side face for scour protection on that side of the levee	0
LI-54	Build an elevated section above FDR, route traffic over it, build a barrier underneath it	4
LI-55	At t0th street overpass shift the SUP to the east to allow grading down to FDR and flood wall	2
LI-56	Eliminate all temporary sheet pile; make it permanent	4

Idea No.	Description	Votes
LI-57	Either move wall or Con Ed cable to eliminate overlap (See sta. 70+21)	1
LI-58	Use floodwall to support sources of renewable energy	0
LI-59	Raise service road and ramp at Montgomery Street to eliminate two gates	1
LI-60	Build a double sheet pile wall in the water around the Con Ed intake structure	1
LI-61	Tie floodwall into either side of the Con Ed intake structure and keep the floodwall on the east side of the FDR	13
LI-62	Extend an I-wall from intake structure to a point north of Stuyvesant park	5
LI-63	Extend I-wall from north of the intake structure tying into a crossing at FDR	4
LI-64	Cross FDR as planned and tie back into east side of FDR as quickly as possible	2
LI-65	Move wall inland at Avenue C; follow along west side of FDR to reduce number of gates	3
LI-66	Configure Gate 11 to be perpendicular to roadway to shorten the gate width	1
LI-67	Reduce side of Gate 15 to match crosswalk width	4
LI-68	Move wall to river side of BP Station to eliminate gates	2
LI-69	Install flood barriers in river north and south of project limits to provide protection all along Manhattan coast	1

DS – Indicates the Idea was selected to be written as a Design Suggestion and is included in the Design Suggestion Section of this report

RR – Indicates the Idea received enough votes by the Value Team to be developed. However, during the Development Phase the team found that the Idea was not feasible. Therefore, it has been designated RR indicating that it was Reviewed and Rejected by the Value Team.

D – PARTICIPANTS

OMB TECHNICAL SERVICES UNIT
VE ORIENTATION ATTENDANCE SHEET

VE TC: John Robinson, SVS, Inc. *DATE:* February 22nd, 2018

LOCATION: 255 Park Place, 8th Floor, Conference Room 8-S1/S2

STUDY: East Side Coastal Resiliency

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OMB TECHNICAL SERVICES UNIT

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OMB TECHNICAL SERVICES UNIT
VE ORIENTATION ATTENDANCE SHEET

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OMB TECHNICAL SERVICES UNIT
VE ORIENTATION ATTENDANCE SHEET

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OMB TECHNICAL SERVICES UNIT
WORKSHOP MEETING ATTENDANCE SHEET

VETC **John Robinson, SVS, Inc.**

LOCATION **OMB, 255 Greenwich Street, 8th Floor, Conference Room S1-S2**

STUDY **East Side Coastal Resiliency** *DATE:* **Monday, March 5, 2018**

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OMB TECHNICAL SERVICES UNIT
WORKSHOP MEETING ATTENDANCE SHEET

VETC **John Robinson, SVS, Inc.**

LOCATION **OMB, 255 Greenwich Street, 8th Floor, Conference Room S1-S2**

STUDY **East Side Coastal Resiliency** *DATE:* **Monday, March 5, 2018**

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OMB TECHNICAL SERVICES UNIT
WORKSHOP MEETING ATTENDANCE SHEET

VETC **John Robinson, SVS, Inc.**

LOCATION **OMB, 255 Greenwich Street, 8th Floor, Conference Room S1-S2**

STUDY **East Side Coastal Resiliency** *DATE:* **Monday, March 5, 2018**

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OMB TECHNICAL SERVICES UNIT
WORKSHOP MEETING ATTENDANCE SHEET

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STUDY **East Side Coastal Resiliency** *DATE:* **Monday, March 5, 2018**

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VETC **John Robinson, SVS, Inc.**

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STUDY **East Side Coastal Resiliency** *DATE:* **Monday, March 5, 2018**

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STUDY **East Side Coastal Resiliency** *DATE:* **Tuesday, March 6, 2018**

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E – MATERIALS PROVIDED

Materials Provided

Document	Prepared by	Date
ESCR Traffic Study, Project Area 1	AKRF/KSE	October 2015
ESCR Traffic Study, Project Area	AKRF/KSE	October 2015
ESCR Preliminary Design	AKRF/KSE	November 10, 2017
Scope of Work- Parallel Conveyance & Isolation Gates	AKRF/KSE	Dec 2017, Rev Jan 2018
ESCR Traffic Studies for East 10th and East 23rd Streets	AKRF/KSE	January 2018
ESCR Interior Drainage Management Conceptual Design Workshop	ORR/DDC/DOT/DEP/DPR	Jan 24, 2018
FDR Lane Closures, DDC Alternate VI	Unknown	Jan 30, 2018
FDR Lane Closures DOT Option A	Unknown	Jan 30, 2018
Field Usage Summary	DPR	Feb 2018
ESCR Contracting Meeting Minutes		Jan 9, 2018
ESCR Construction Phasing & Schedule Meeting	ORR/DDC/DOT/DEP/DPR	Feb 9, 2018
FDR Lane Closures for ESCR	AKRF/KSF	Undated
FDR Drive Closure Recommendation & Impacts	NYCDOT	Feb 22, 2018
ESCR Preliminary Geotechnical Report	AKRF/KSF	Nov 30, 2018
Traffic Counts for FDR NB, FDR SB,	NYCDOT	

F – PROJECT DESCRIPTION

EAST SIDE COASTAL RESILIENCY

PROJECT DESCRIPTION

The Office of Management and Budget, in conjunction with the New York City Office of Recovery and Resiliency (ORR) and the Department of Design and Construction (DDC) conducted a Value Engineering (VE) study of the preliminary design for the East Side Coastal Resiliency Project (ESCR). The designer for this project is a joint venture led by AKRF-KSE.

BACKGROUND

The damage done in 2012 when storm surge from Hurricane Sandy made landfall in New York City revealed a vulnerability that threatened residential and commercial property, open space, and critical infrastructure. To protect the east side of Manhattan from a repeat of the flooding it experienced, the City is now proposing to construct an integrated coastal flood protection system along a stretch of the East River coastline, and to make related improvements to City infrastructure.

The ESCR project originated from the Rebuild by Design competition, in which New York City was awarded $335 million in US Department of Housing and Urban Development (HUD) Community Development Block Grant – Disaster Recovery (CDBG-DR) funding to implement the first phase of the winning concept. Development is planned for a 2.4-mile span of eastern Manhattan, from Montgomery Street in the south to East 25th Street in the north. It will tie in to an existing flood protection system at the VA Medical Center at East 25th Street. The project area is divided into two sub-areas labeled Project Area

One and Project Area Two, and consists primarily of City property, including parkland and rights-of-way.

PROJECT GOALS

- To reduce future risk caused by coastal flooding and climate change to the East River Park and the Lower East Side of Manhattan
- To provide a reliable, integrated flood protection system that minimizes the use of closure structures
- To achieve implementation milestones and project funding allocations as established by HUD
- To provide resilient park landscapes
- To improve community connection to and enjoyment of the waterfront through integrated landscape and urban design
- To retain and provide enhanced recreational opportunities to residents and visitors
- To achieve a practical and implementable design

SCOPE OF WORK

The designers describe the scope of work as including: "a reliable, adaptable, and integrated flood protection system, composed of a system of levees, floodwalls, and closure structures (flood gates) to reduce the risks of flooding associated with coastal storm tides within the Project Area. The design condition for the flood protection system was selected to be the 100-year Federal Emergency Management Agency (FEMA) Stillwater elevation plus wave action plus the New York Panel for Climate Change (NPCC) 90th percentile probability sea level rise for 2050. The design criteria for the flood protection system, as developed by the Design Team and presented to the City, additionally considers future adaptability of the flood protection system and the resiliency of the system in the event of storm conditions which exceed the design condition. In consideration of these elements, the Preliminary Design includes a flood protection system with a Minimum Design Elevation of +16.5 ft NAVD88 with foundations designed to provide future adaptability to a design elevation of +18.5 ft NAVD88."

The majority of the southern section, known as Project Area One, is comprised of East River Park. To reduce the impact of the flood protection system to the community, the grade of the existing parklands will be raised in some locations to crest above the design flood elevation to function as a berm or levee. Pedestrian bridges will be required for connectivity between the park and its surrounding communities.

At the north end of the site, known as Project Area Two, closure areas will be required in several locations. There are swing gates and roller gates proposed. The FDR Drive elevated roadway will have to bridge over the proposed floodwall at multiple points along this northern section. Located midway through this section is the Consolidated Edison complex, which has utility infrastructure the design must accommodate. Similarly, two playgrounds must be integrated into the protection plan.

In the interest of enhancing drainage capacity in the project area, a parallel sewer conveyance system will be activated during large storm events. The conceptual design called for tank storage, but this was removed due to complexity and cost concerns. This design will require aboveground enclosures for interceptor gates.

PROJECT BUDGET

HUD funding through a City Development Block Grant in the amount of $338 million is expected to be spent and reimbursed by September of 2022, with an allocation of $250 million of this towards ESCR construction. City capital funding is expected to make up a portion of further costs.

PROJECT SCHEDULE

The Final Design phase will finish before 2019, with a land use proposal (ULURP) and Environmental Impact Statement (EIS) to follow shortly thereafter. Construction is to begin in spring of 2019, with a planned five-year duration. Because HUD funding requires reimbursement by 2022, a significant portion of the construction will have to be completed prior to that date.

G – VALUE STUDY PROCESS

VALUE STUDY PROCESS

This section describes the process used to conduct this Value Study and the significant findings of the Value Team. This Value Study used the international standard Value Methodology established by SAVE International, the Value Society. The standard establishes the specific 6-Phase, sequential process, and the objectives of each of those phases, but does not standardize the specific activities in each phase.

Value Methodology (VM) is the general term that describes the structure and process for executing the Value Workshop. This systematic process was used with a multidisciplinary team to improve the value of the project through the analysis of functions and the identification of targets of opportunity for value improvement.

The **Job Plan** provides the structure for the activities associated with the Value Study. These activities are further organized into three major stages:

1. Pre-Workshop preparation
2. Workshop
3. Post-Workshop documentation and implementation

Figure G-2 at the end of this section shows a diagram of the Job Plan used for this Value Study.

Defining Value

Within the context of VM, Value is commonly represented by the following relationship:

$$\text{Value} \approx \frac{\text{Function}}{\text{Resources}}$$

In this expression, functions are measured by the performance requirements of the customer, such as mission objectives, risk reduction and quality improvements. Resources are measured in materials, labor, price, time, etc. required to accomplish the specific function. VM focuses on improving Value by identifying the most resource efficient way to reliably accomplish a function that meets the performance expectations of the customer.

It can be seen from this relationship that Value is improved or increased by:

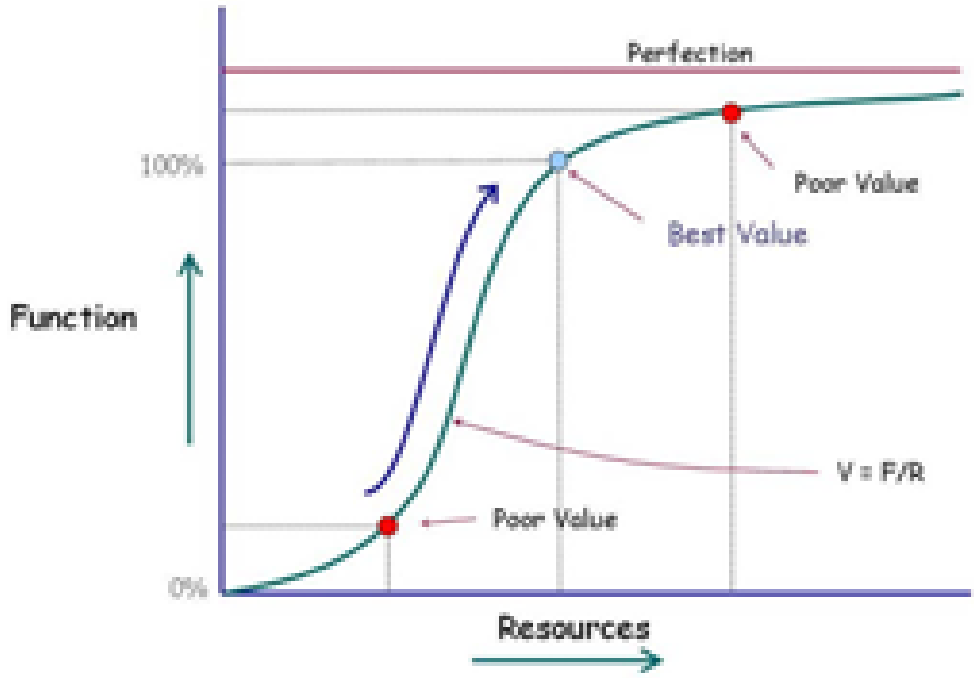
1. Increasing function without increasing resource consumption. Some increase in resources is acceptable as long as there is a greater increase in function performance.

2. Decreasing resources without decreasing function. Again, some decrease in function may be acceptable if the corresponding decrease in resources is significant enough.

Ideally, the Value Team looks for opportunities to increase function and concurrently decrease resource requirements. This will achieve the best value solution.

This Value concept is illustrated in the Figure G-1, The Value Curve. This figure shows a hypothetical curve from plotting the value expression above. This curve will asymptotically approach perfection. The best value solution for a given project or project element will be found at the knee of the curve. At this point the required function or functions have been achieved to 100% of the required level with a corresponding minimum resource commitment. To attempt to increase the function performance beyond this level will result in a resource consumption that has a higher worth than the marginal increase in function. This results in a poor value solution. Conversely, a poor value solution can also be the result of not achieving the function to 100% of the requirement. In this case, an incremental increase in resources delivers significant increase in function performance. The Value Methodology is used to identify the poor value decisions in a project and then develop alternative solutions to better align the project along this curve to achieve a best value solution.

Figure G-1
The Value Curve™



This understanding how Value is affected by changes in function or resources provides the foundation for all SVS Value Studies. The following paragraphs describe the process we used to understand the functional requirements and how we identified value improvement alternatives.

Pre-Workshop

Prior to the start of the workshop, the team was tasked with reviewing the most current documentation on the project development. This was done to familiarize them with the project documents and to prepare them for asking questions of the project stakeholders during the project presentations at the beginning of the workshop other activities included:

- Coordinating workshop logistics and communicating those to the various participants
- Determining necessary presentation content for the project introduction
- Scheduling workshop participants and assigning tasks to ensure the team is prepared for the workshop
- Gathering necessary background information on the project and making sure project documentation is distributed to the team members

Materials furnished to the team are listed in the Appendix.

Site Visit

A site visit was conducted prior to the workshop. This site visit was attended by representatives from the Value Team, Owner Agency, Designer, and OMB. The purpose of the site visit was to give the team members a first-hand opportunity to see the physical features that influenced the project development.

Workshop

The workshop was an intensive session during which the project was analyzed to optimize the balance between functional requirements and resource commitments (primarily capital and O&M costs).

The Job Plan used by SVS includes the execution of the following phases during the workshop:

1. Information Phase
2. Function Analysis Phase
3. Creative Phase
4. Evaluation Phase

5. Development Phase

6. Presentation Phase

Information Phase

At the beginning of the workshop, it was important to understand the background of the project at the level developed. This background was provided in an oral overview by the Owner Agency and the Designer. The overview and subsequent project analysis provided information on the following topics:

- Rationale why this project is necessary
- Project objectives that have governed the proposed project documents
- Rationale for the proposed configuration
- Explanation of features, criteria, and assumptions
- Value Study constraints
- Project cost

The Owner Agency and the Designer presentations provided the team with a presentation of the goals, issues, and expectations for the project. Further, this gave the designer an opportunity to share their issues and concerns about the project from their perspective. This included an explanation of the rationale behind key project decisions. The Owner Agency, the Designer, OMB, and the Value Team also finalized the Value Study constraints.

Function Analysis Phase

Function Analysis is the heart of the VM process and is the key activity that differentiates the VM process from other problem solving or improvement practices. During the Function Analysis Phase of the VM Job Plan, functions are identified that describe the expected outcomes of the project under study. Function Analysis also defines how those outcomes are expected to be accomplished. These functions are described using a two-word, active verb and measurable noun pairing.

This identification and naming convention of project functions enables a more precise understanding by limiting the description of a function to an *active verb* that operates on a *measurable noun* to communicate what work an item or activity performs. This naming convention also helps multidisciplinary teams to build a shared understanding of the functional requirements of the project.

Function Determination

Defining functional requirements for the project allowed the Owner Agency, the Designer, and OMB to be sure that the facility would fulfill the needed purposes. The entire project was analyzed to determine what functions are being accomplished.

Required functions were retained. Some functions were not necessary to accomplish the mission of the project and thus became candidates for deletion.

During the Function Analysis Phase, the Value Team used various function analysis techniques to analyze the project. This analysis helped the team confirm its understanding of the overall project objectives and analyzed the functions of key project elements. The Value Team Leader led the team through an in-depth discussion of the possible functions of each key project element to clearly and precisely identify the purposes of each.

FAST Diagram

Function analysis was enhanced by using a graphical mapping tool known as the *Function Analysis System Technique* (FAST), which allows team members to understand how the functions of a project relate to each other. The resulting FAST Diagram allowed quick visualization of the logical relationship between project functions and the project as a whole. The FAST diagram is in the Function Analysis section of the Appendix.

The FAST Diagram is structured such that moving to the right of any function answers the question, "How are we accomplishing this function?" Moving to the left of any function answers the question, "Why are we accomplishing this function?" Elements that are vertically connected occur "When" or as a consequence of the function it is connected to on the horizontal path.

Creative Phase

This step in the VM process involved generating ideas using creativity techniques. The team recorded all ideas regardless of their feasibility. In order to maximize the Value Team's creativity, evaluation of the ideas was not allowed during the creative phase. The team's effort was directed toward a large quantity of ideas. These ideas were later screened in the Evaluation Phase of the workshop.

The creative ideas generated by the team are included in the Appendix. The list also includes ratings for each idea based on the Evaluation Phase of the workshop. These lists should be carefully reviewed, as there may be other good ideas not developed by the team because of time constraints. These should be further evaluated or modified to gain the maximum benefit for the project.

Evaluation Phase

In this phase of the workshop, the team selected the ideas with the most merit for further development.

After an initial vote, the Value Team Leader assessed how many ideas could be developed into Value Alternatives within the remaining duration of the workshop. From this assessment, all ideas with a certain number of votes were selected for development. However, prior to the final selection, the results were revisited collectively by the Value Team to ensure that those selected by the voting process truly represented the best ideas for development. This gave the team the opportunity to

down-rate some ideas and to up-rate other ideas based upon team discussion of the ideas.

The criteria used for selection were:

1. The inherent value, benefit and technical appropriateness of the idea

2. The expected magnitude of the potential cost savings, both capital and life cycle

3. The potential for acceptance of the idea

Ideas were selected for development as Value Alternatives based on all three criteria.

Not all ideas were developed. This evaluation process is designed to identify those ideas with the greatest potential for value improvement that can be developed into Value Alternatives within the time constraints of the workshop and the production capacity of the team. The remaining ideas were eliminated from further consideration by the team; however, the ideas not developed should also be reviewed, as there may still be other good ideas not developed by the team because of time constraints or other factors. These could be further evaluated or modified to gain the maximum benefit for the project.

To further ensure the Value Team is focused on developing the best ideas, a mid-point review meeting is conducted with the Value Team Leader, Owner Agency, Designer, and OMB. This mid-point review allowed the Owner Agency, Designer, and OMB to identify any fatal flaws in the ideas that were not apparent to the Value Team but were apparent to the Owner Agency, Designer, and OMB project teams because of their greater institutional knowledge of the project. These fatal flaws may be technical, operational, political, etc.

Development Phase

During the Development Phase of the workshop, each idea was expanded into a workable alternative to the original project concept. Development consisted of preparing a description of the value alternative, evaluating advantages and disadvantages, and making cost comparisons.

Each alternative is presented with a brief narrative to compare the original concept and the alternative concept. Sketches and brief calculations were also developed, if needed, to clarify and support the alternative. The value alternatives developed during the workshop are presented in Section 2 – Value Alternatives.

The Value Team Leader and, to the extent possible, other team members reviewed each alternative to improve completeness and accuracy.

Redesign costs are not included in the cost comparison of alternatives. The Owner Agency will be responsible for determining these costs.

Presentation Phase

The last phase of this workshop was the presentation of the Value Alternatives. The presentation was made by the Value Team to representatives of the Owner Agency's project team, the Designer, OMB, as well as other agencies involved. The Value Team described each Value Alternative and the rationale that went into the development. This was followed by answering the audience's questions. The acceptability of the Value Alternatives was deferred pending the project team's review of our Preliminary Report.

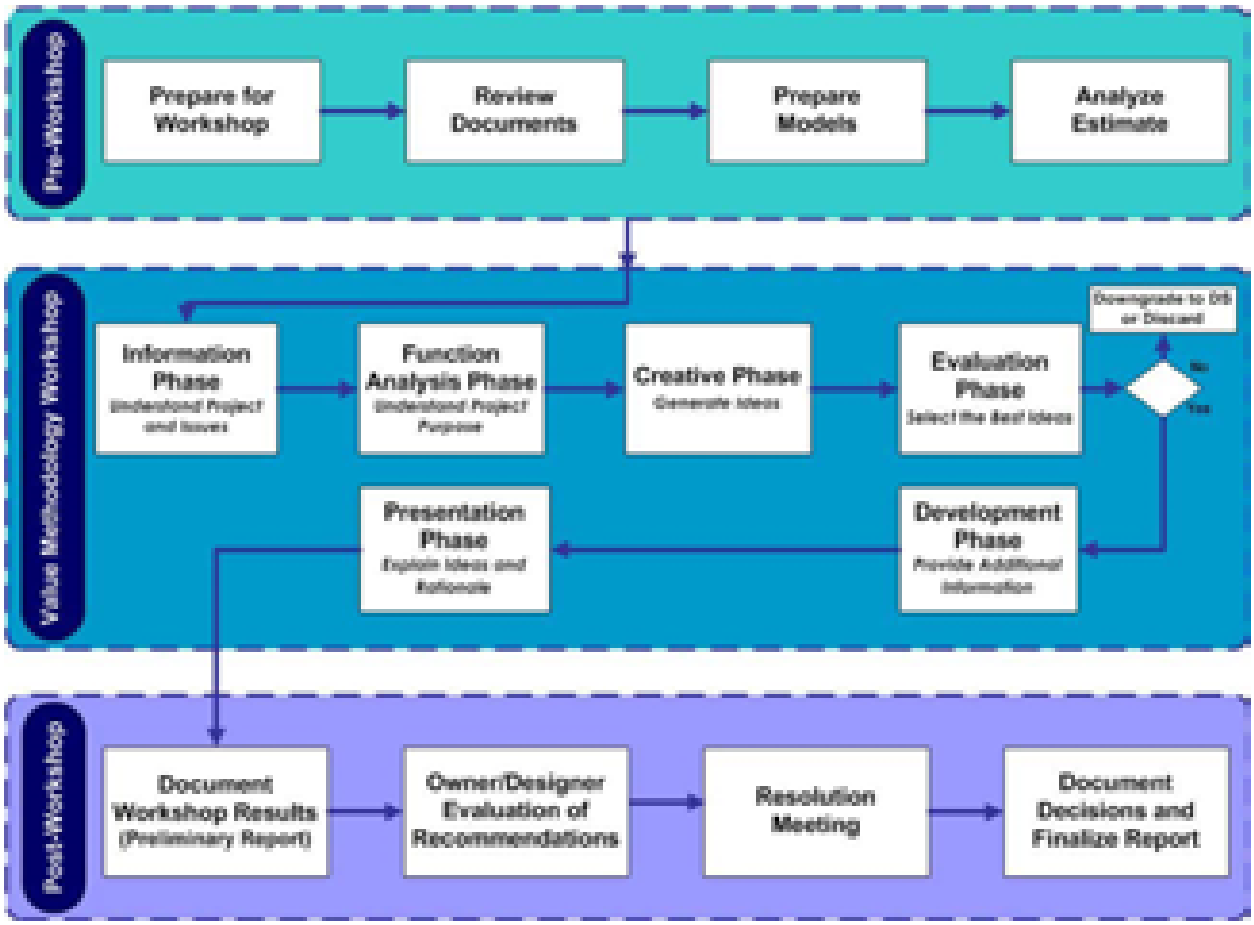
Post-Workshop

The Post-Workshop activities of this Value Study consisted of preparing the Value Study Reports. This Final Preliminary Value Study Report includes documentation of the Value process, as well as, the Value Alternatives developed during the workshop.

Implementation Results

The final phase of the VE process will consist of implementation decisions and actions by Owner Agency, Designer, and OMB. At a mutually agreed upon date, an implementation meeting will be conducted at OMB's offices to discuss each Value Alternative and design suggestion, answer questions, and decide what changes to make to the project.

Figure G-2
Value Engineering Process Diagram



H – AGENDAS

VALUE ENGINEERING ORIENTATION AGENDA

East Side Coastal Resiliency
New York City, NY

Date: **February 22, 2018**

Location: **OMB, 8th Floor Conference Room 8-S1/S2, Tel # (212) 788-6201/6202**

9:00 – 9:30	Welcome & Introductions	[redacted], SVS & Jill Woller, OMB
	Explanation of the Value Study Process • Review Agendas for both Orientation Meeting and VE Workshop, including City and Designer participation in the process	[redacted], SVS
9:30 – 9:45	Agency Opening Comments • Agency Goals and Objectives for the Project • Key Project Issues & Constraints	ORR, DDC, DPR, DEP & DOT
9:45 – 10:30	Project Design Presentation • Key Design Objectives • Overview of the project design • Project Challenges and Risks • Project Schedule	AKRF/KSE
10:30 – 10:45	Break	
10:45 – 11:30	Project Design Presentation (continued)	
11:30 – 12:00	Orientation Wrap-Up • Questions & Answers • Requests for Additional Information	[redacted], SVS
12:00 – 1:00	Lunch Break	
1:00 – 1:30	Travel to the project site	
1:30 – 3:30	Site Visit	NYCDDC, AKRF/KSE, VE Team & OMB
3:30	Adjourn the Meeting at the Project Site	
3:30 – 4:00	Travel back to OMB's office	

VALUE ENGINEERING WORKSHOP AGENDA

East Side Coastal Resiliency
New York City, NY

Date: **March 5-9, 2018**

Location: **OMB, 8th Floor Conference Room 8-S1/S2, Tel # (212) 788-6201/6202**

Monday

8:30 – 8:45	Kick-Off and Introductions	[redacted],SVS & Jill Woller, OMB
8:45 – 9:00	Agency Opening Comments Review of Agency Concerns and Goals Objectives and Constraints on the Value Study	NYCORR, DDC, DPR, OMB, DOT & DEP
9:45 –12:00	Designer In-Depth Presentation ***Detailed Presentation of the Project Design including:*** • ***Key Design Considerations and Challenges*** • ***Description of the Project Elements and Features*** • ***Constructability Challenges*** • ***Design and Construction Schedule***	AKRF/KSE JV
12:00 – 1:00	Lunch Break	
1:00 – 5:30	Estimate Reconciliation ***Conference Room E4*** ***(Concurrent Activity)***	Design Team Estimator / VE Team Estimator / Design Team Rep
1:00 – 3:00	Team Review and Project Analysis	NYC Agency Reps / VE Team / OMB
3:00 – 5:30	Function Analysis	NYC Agency Reps / VE Team / OMB

Tuesday

8:30 – 11:00	Function Analysis (Cont.)	NYC Agency Reps / VE Team / OMB
11:00 – 12:00	Creative Idea Generation	NYC Agency Reps / VE Team / OMB
12:00 – 1:00	Lunch Break	
1:00 – 5:30	Creative Idea Generation (Cont.)	NYC Agency Reps / VE Team / OMB

VALUE ENGINEERING WORKSHOP AGENDA CONTINUED

East Side Coastal Resiliency

New York City, NY

Wednesday

8:30 – 9:00	Creative Idea Generation (Cont.)	**NYC Agency Reps / VE Team / OMB**
9:00 – 12:00	Evaluation of Ideas	**NYC Agency Reps / VE Team / OMB**
12:00 – 1:00	Lunch Break	
1:00 – 5:30	Value Alternative Development	**VE Team / OMB**
3:00 – 4:30	Mid-Point Review of Ideas Selected for Development ***Conference Room # 8-E4*** ***(Concurrent Activity)*** ***A review of the list of ideas selected for development with the objective of providing an opportunity to brief the designers and key Agency decision makers.***	**Limited NYC Agency & Design Team Reps / SVS / OMB**

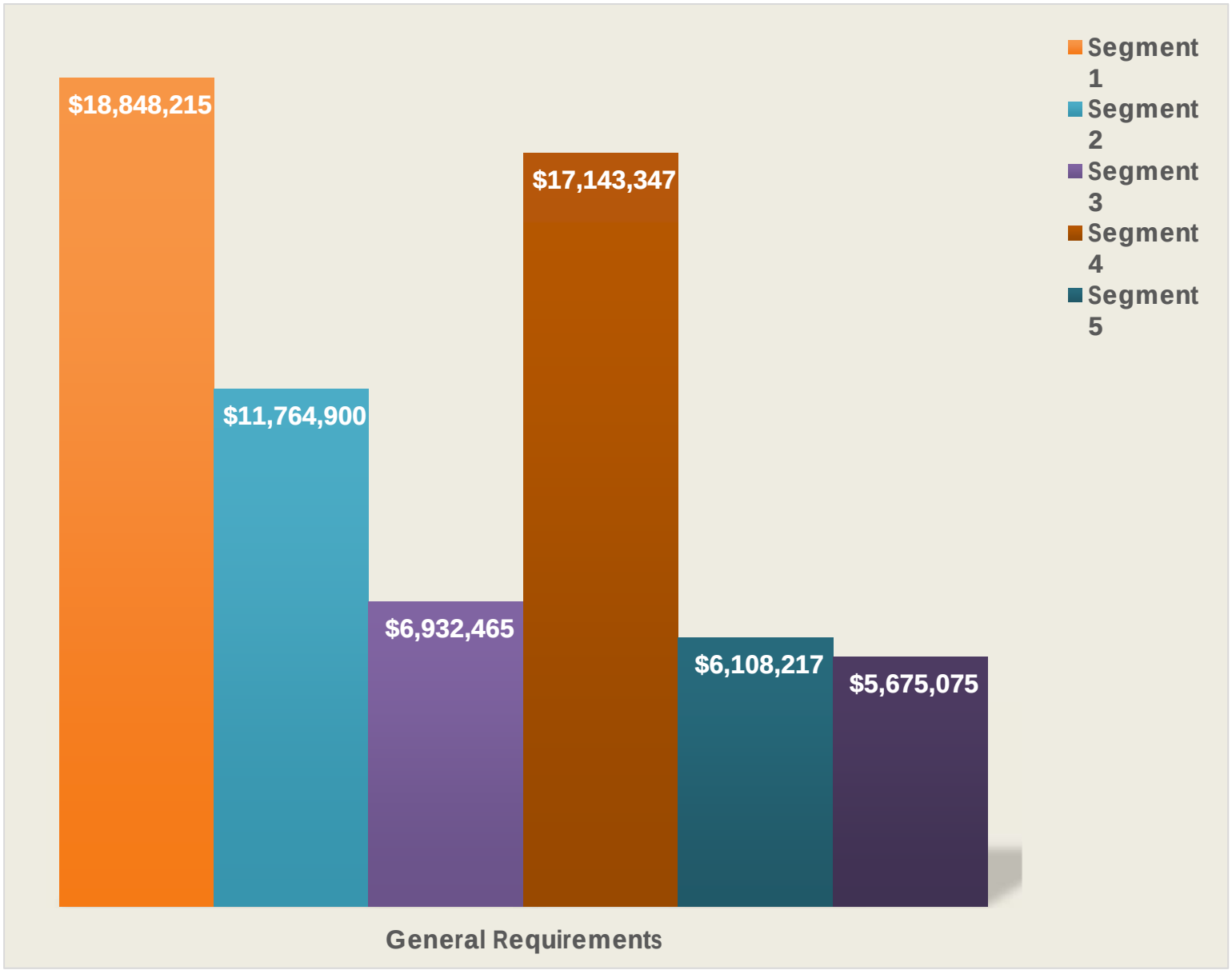
Thursday

8:30 – 12:00	Value Alternative Development (Cont.)	**VE Team / OMB**
12:00 – 1:00	Lunch Break	
1:00 – 6:30	Value Alternative Development (Cont.)	**VE Team / OMB**

Friday

8:30 – 11:00	Value Alternative Development (Cont.)	**VE Team / OMB**
11:00 – 12:00	Wrap Up Value Alternative Development	**VE Team / OMB**
12:00 – 1:00	Lunch Break	
1:00 – 2:00	Prepare for Value Team Presentation	**VE Team / OMB**
2:00 – 4:00	Value Team Presentation of Value Alternatives ***The VE Team will present findings and recommendations with the objective of having an exchange of information.***	**ALL**

I – COST MODELS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Segment 5
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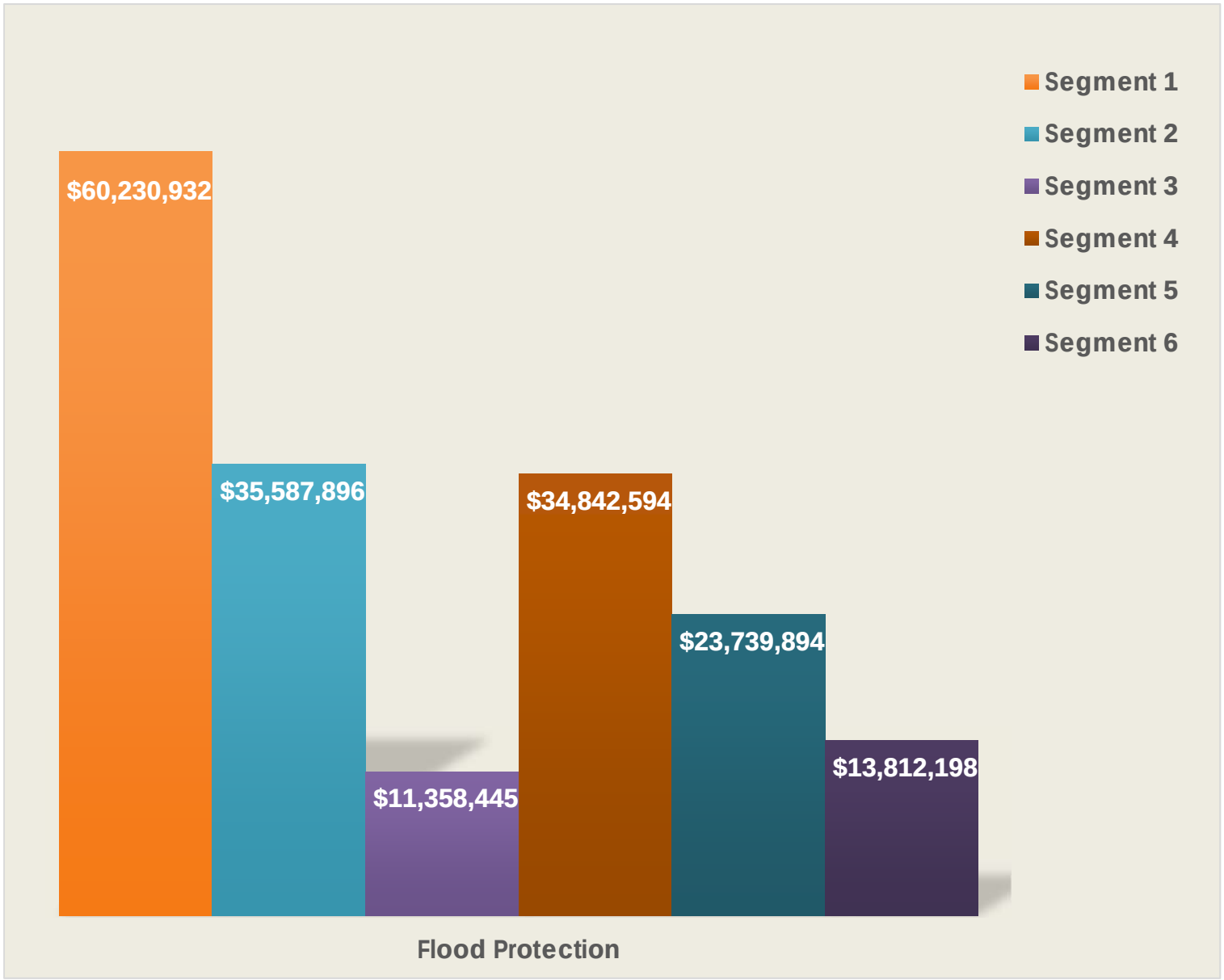
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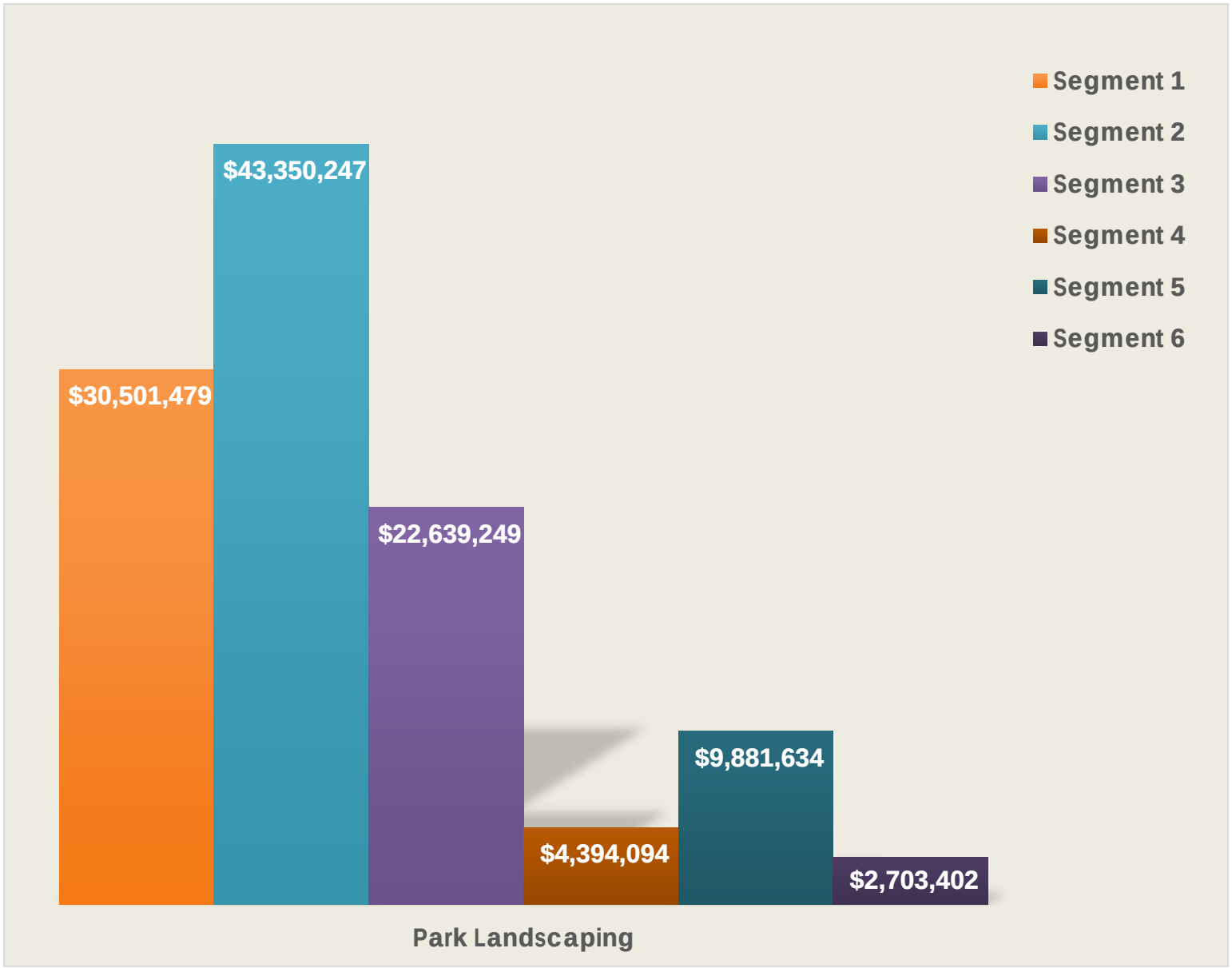
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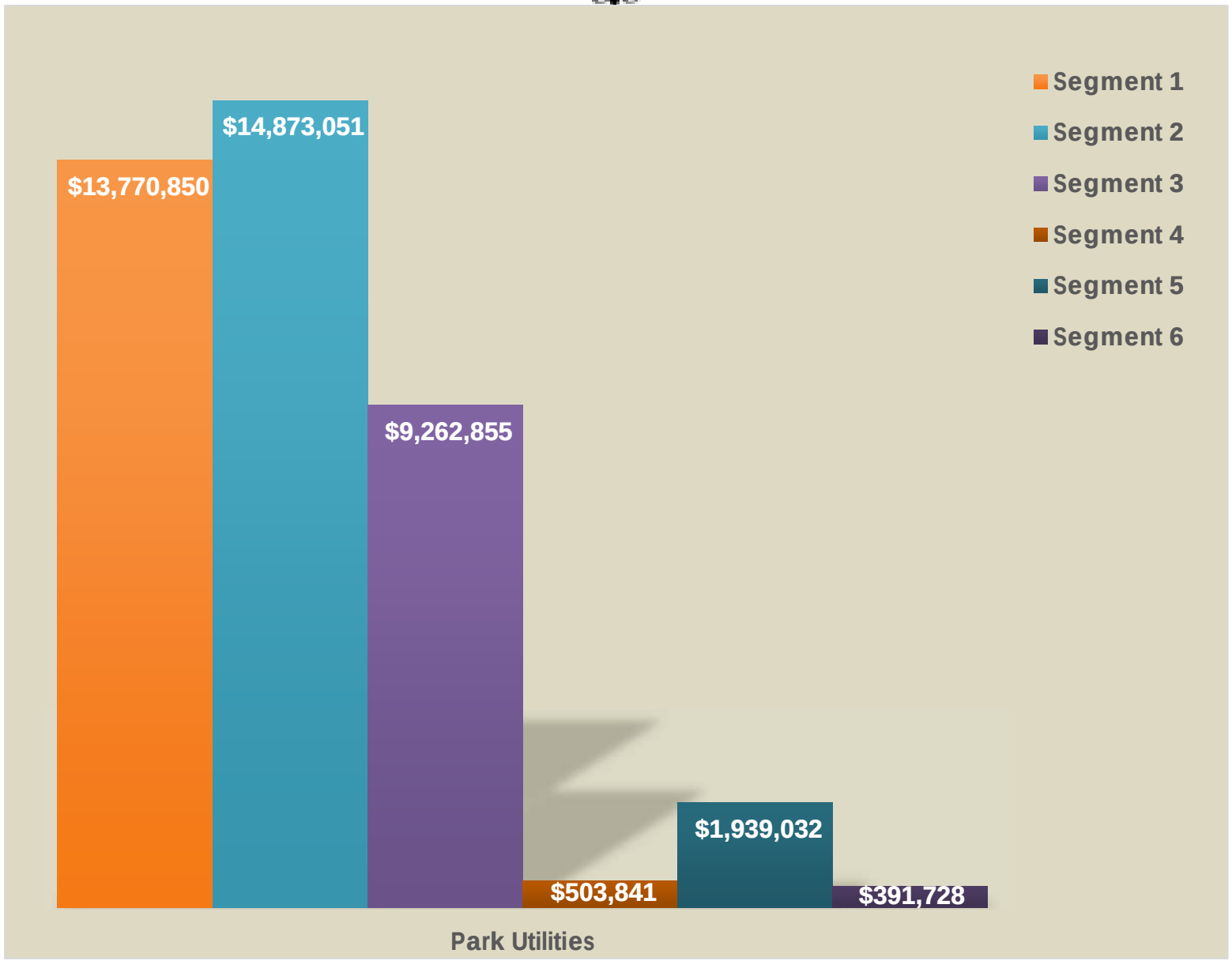
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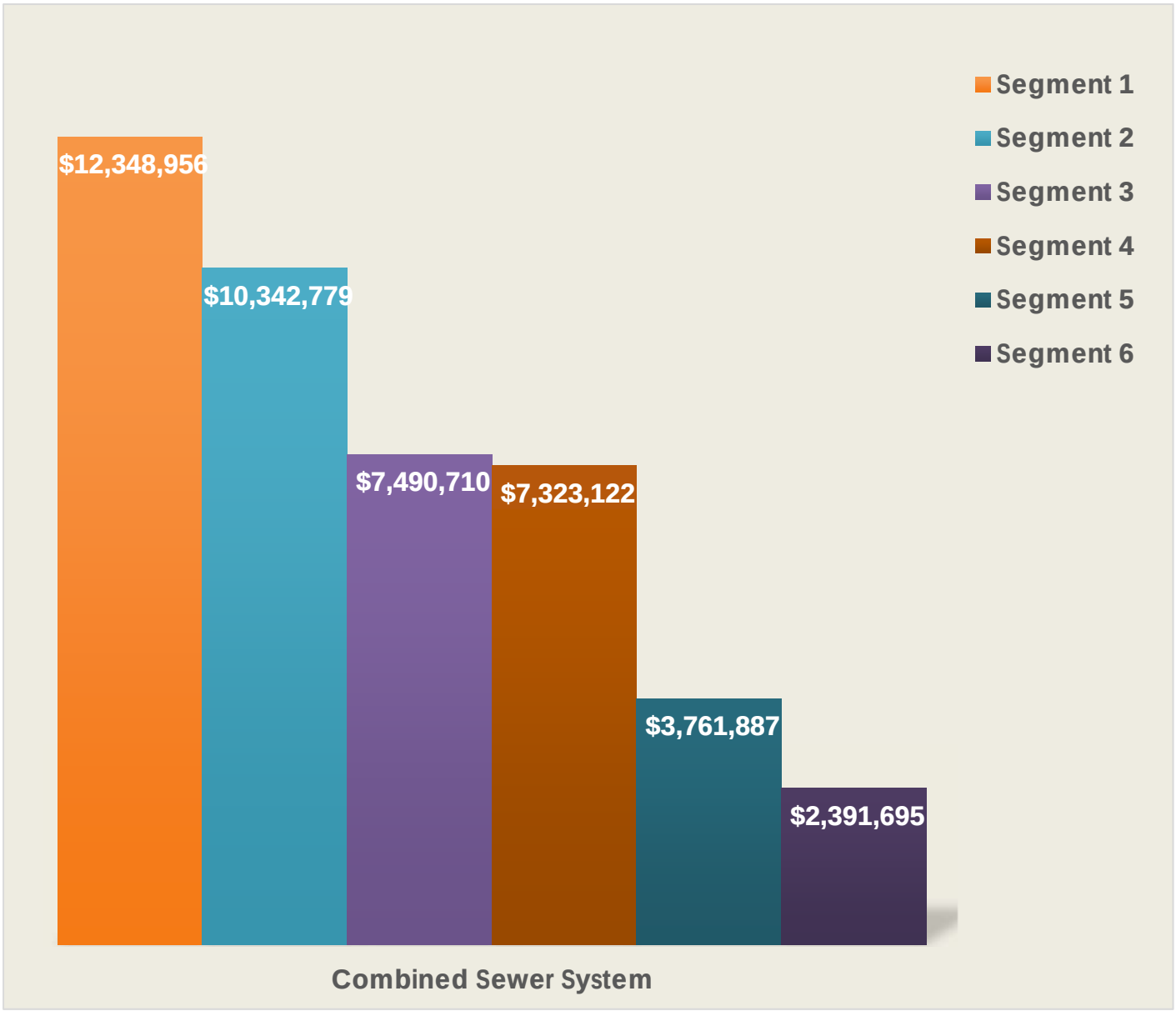
Park Utilities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Combined Sewer System