

# FINAL THESIS – NATHAN BRASKEY

CONSTRUCTION OPTION  
CRAIG DUBLER

## SUNNYVALE PLAZA



Sunnyvale Plaza  
Mid - Atlantic Region

Project Overview

Nathan Braskey  
Construction Option



**Size:** 752,000 Gross Sq. Ft.

**Stories:** 15 Above Grade, 7 Below Grade

**Location:** Mid-Atlantic

**Prime Cost:** \$500 million

**Contract:** Guaranteed Maximum Price

**Delivery Method:** Design-Build

**Completion:** May 2014

**Architect:** Cooper Carry, TVS

**Gen. Contractor:** Hensel Phelps

**Structural:** GEI Consultants, Inc.

**MEP:** GHT Limited

**Electrical:** Truland Systems

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## Analysis Overview

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**Analysis #1:** Implementation of A Stormwater Harvesting System

**Analysis #2:** Analysis of Excavation Method

**Analysis #3:** Façade Retention Method

**Analysis #4:** Profitability of Early Scheduled Opening

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## Analysis #1:

Implementation of A Stormwater Harvesting System

Breadth 1: Plumbing

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Average Water Usage

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Annual	Beds	Gal / Bed / Year	Gal / Year
Bed - Min	1800	59,967.00	107,940,600
Bed - Max	1800	114,915.00	206,847,000
Average	1800	87,441.00	157,393,800

Monthly	Beds	Gal / Bed / Month	Gal / Month
Bed - Min	1800	4,998.00	8,996,400
Bed - Max	1800	9,577.00	17,238,600
Average	1800	7,287.50	13,117,500

Daily	Beds	Gal / Bed / Day	Gal / Day
Bed - Min	1800	166.60	299,880
Bed - Max	1800	319.23	574,620
Average	1800	242.92	437,250



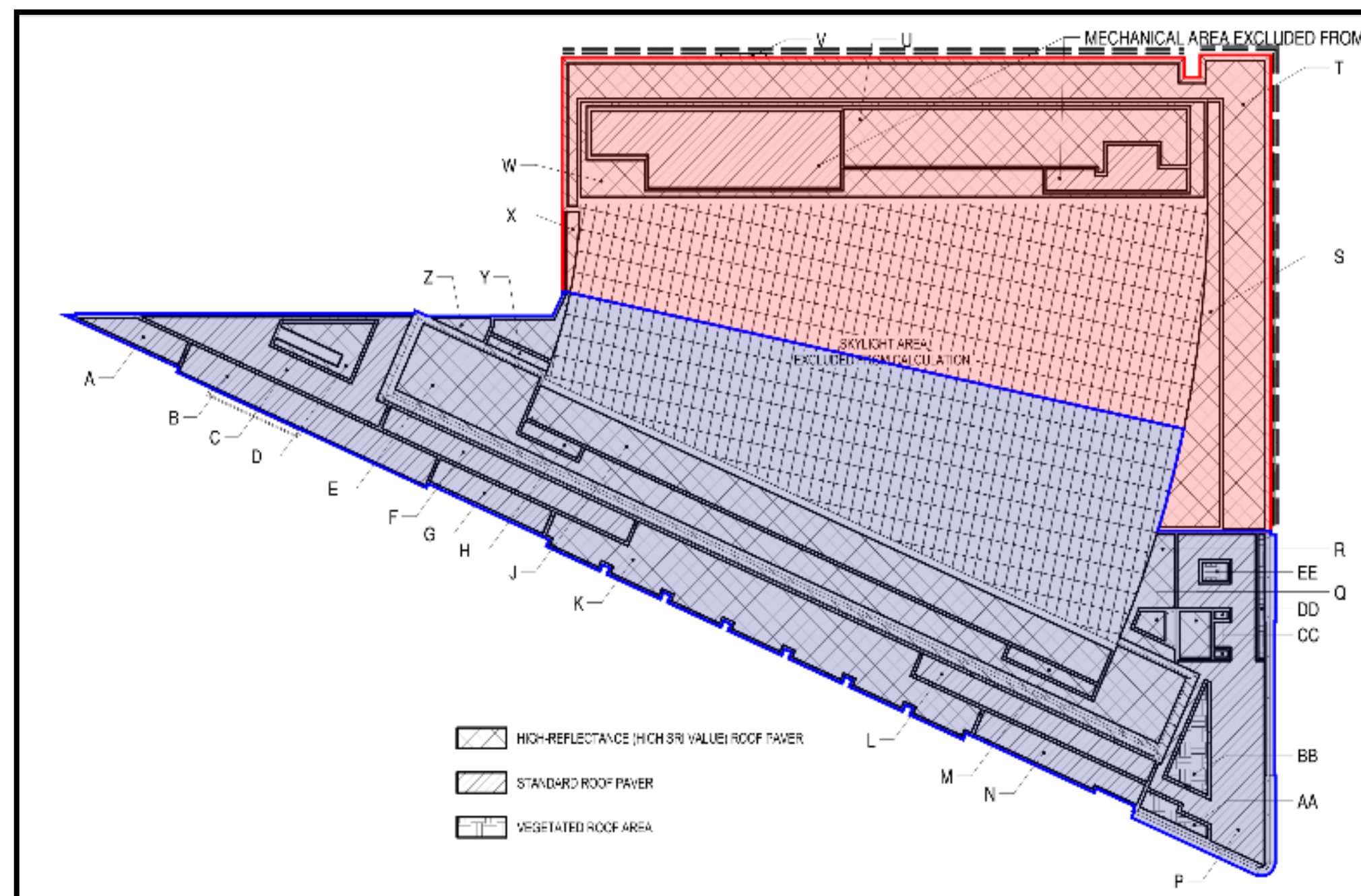
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Annual	Beds	Gal / Bed / Year	Gal / Year
Bed - Min	1800	59,967.00	107,940,600
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## Roof Area Consideration



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Roof Area Consideration

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Daily	Beds	Gal / Bed / Day	Gal / Day
Bed - Min	1800	166.60	299,880
Bed - Max	1800	319.23	574,620
Average	1800	242.92	437,250

Month	Roof Area (sq. ft.)	Accumulation / Day (cubic feet)	Accumulation / Day (gallons)	Gall / Day Used	% Savings
January	84143	635.60	4,754.58	437,250	1.09%
February	84143	656.12	4,908.07	437,250	1.12%
March	84143	787.14	5,888.23	437,250	1.35%
April	84143	715.22	5,350.17	437,250	1.22%
May	84143	902.50	6,751.16	437,250	1.54%
June	84143	883.50	6,609.03	437,250	1.51%
July	84143	843.69	6,311.24	437,250	1.44%
August	84143	662.74	4,957.62	437,250	1.13%
September	84143	869.48	6,504.13	437,250	1.49%
October	84143	769.05	5,752.87	437,250	1.32%
November	84143	740.93	5,542.50	437,250	1.27%
December	84143	689.88	5,160.66	437,250	1.18%
<b>Average</b>		<b>762.99</b>	<b>5,707.52</b>	<b>437,250</b>	<b>1.31%</b>



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## Water Utility Fee Analysis

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Water Rate	Ccf (Hundred Cubic Feet)	1,000 Gallons	Gallons Used	Total Cost
Monthly	\$ 3.61	\$ 4.83	13,117,500	\$ 63,357.53
Annual	\$ 3.61	\$ 4.83	157,393,800	\$ 760,212.05

Stormwater Fee	per ERU (Equivalent Residential Unit)	ERU / Guestroom	Guestrooms	Total Cost
Month	\$ 2.67	0.473	1,175	\$ 1,483.92



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Stormwater Fee	per ERU (Equivalent Residential Unit)	ERU / Guestroom	Guestrooms	Total Cost
Month	\$ 2.67	0.473	1,175	\$ 1,483.92

Water Utility	
Savings / Month	\$ 829.98
Savings / Year	\$ 9,958.78
Stormwater Utility	
Savings / Month	\$ 1,483.92
Savings / Year	\$ 17,807.03
Total Savings	
Savings / Month	\$ 2,313.90
Savings / Year	\$ 27,765.81

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## Results

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Product Code	Item	Quantity	Unit	Cost / Item	Total Cost
221113740160	Pipe, Plastic, Fiberglass - 6" Diameter	100	L. Ft.	\$ 66.84	\$ 6,684.00
221426133920	Roof Drain 6" Pipe	2	Each	\$ 814.63	\$ 1,629.26
221426134920	Roof Terrace Drain 6" Pipe	1	Each	\$ 768.05	\$ 768.05
221429167160	Rainwater Pump, Submersible Sump - 1/2 HP	1	Each	\$ 388.46	\$ 388.46
221453132100	Rainwater Storage Tank, Fiberglass - 25,000 Gallon	1	Each	\$ 48,707.10	\$ 48,707.10
221455103210	Rainwater System Vortex Rainwater Filter - 5,500 SF	2	Each	\$ 1,273.86	\$ 2,547.72
	<b>Total</b>				<b>\$ 60,724.59</b>

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	<b>Total</b>				<b>\$ 60,724.59</b>

3 Year Payback Cycle		
<b>Cost of System: 2014</b>		<b>Annual Savings</b>
\$ 60,724.59		\$ 27,765.81
<b>2 Year Inflation</b>	<b>Dollar Value: 2016</b>	<b>Payback Period (Years)</b>
4.87%	\$ 63,681.01	2.29
<b>3 Year Inflation</b>	<b>Dollar Value: 2017</b>	<b>Payback Period (Years)</b>
7.30%	\$ 65,159.22	2.35
<b>4 Year Inflation</b>	<b>Dollar Value: 2018</b>	<b>Payback Period (Years)</b>
9.74%	\$ 66,637.43	2.40

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## Analysis #2:

Analysis of Excavation Method

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## Background Information / Research

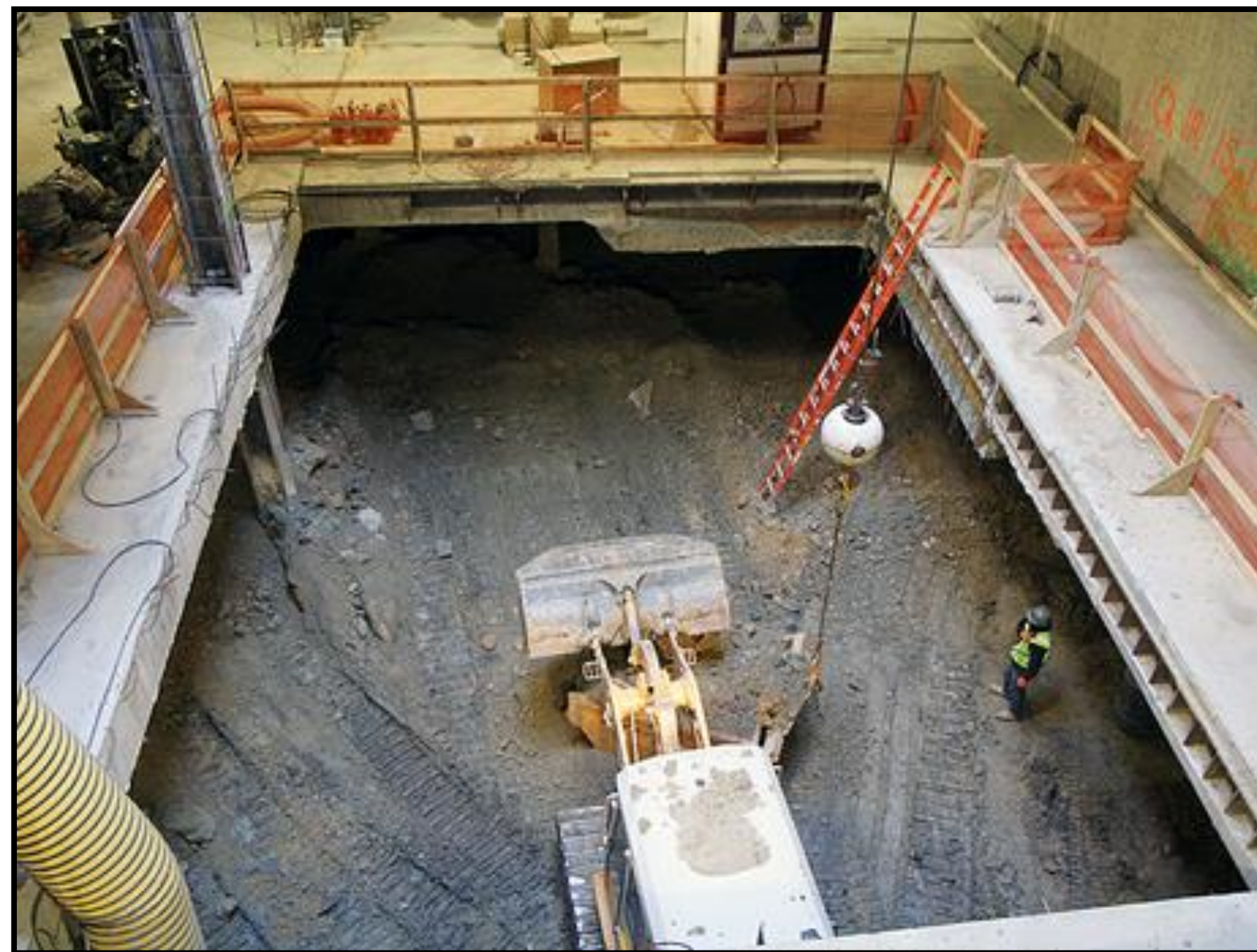
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Construction Option



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## Background Information / Research

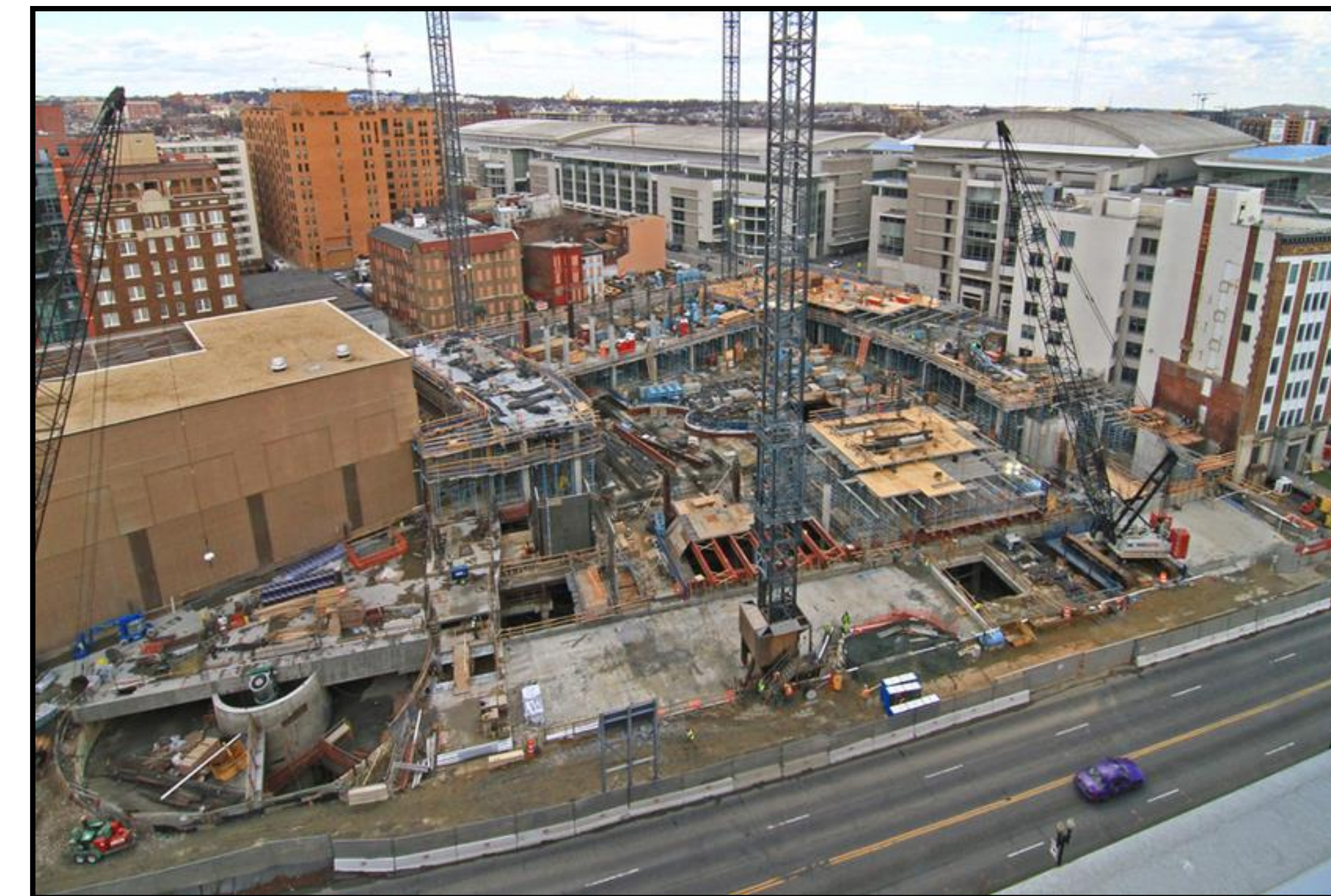
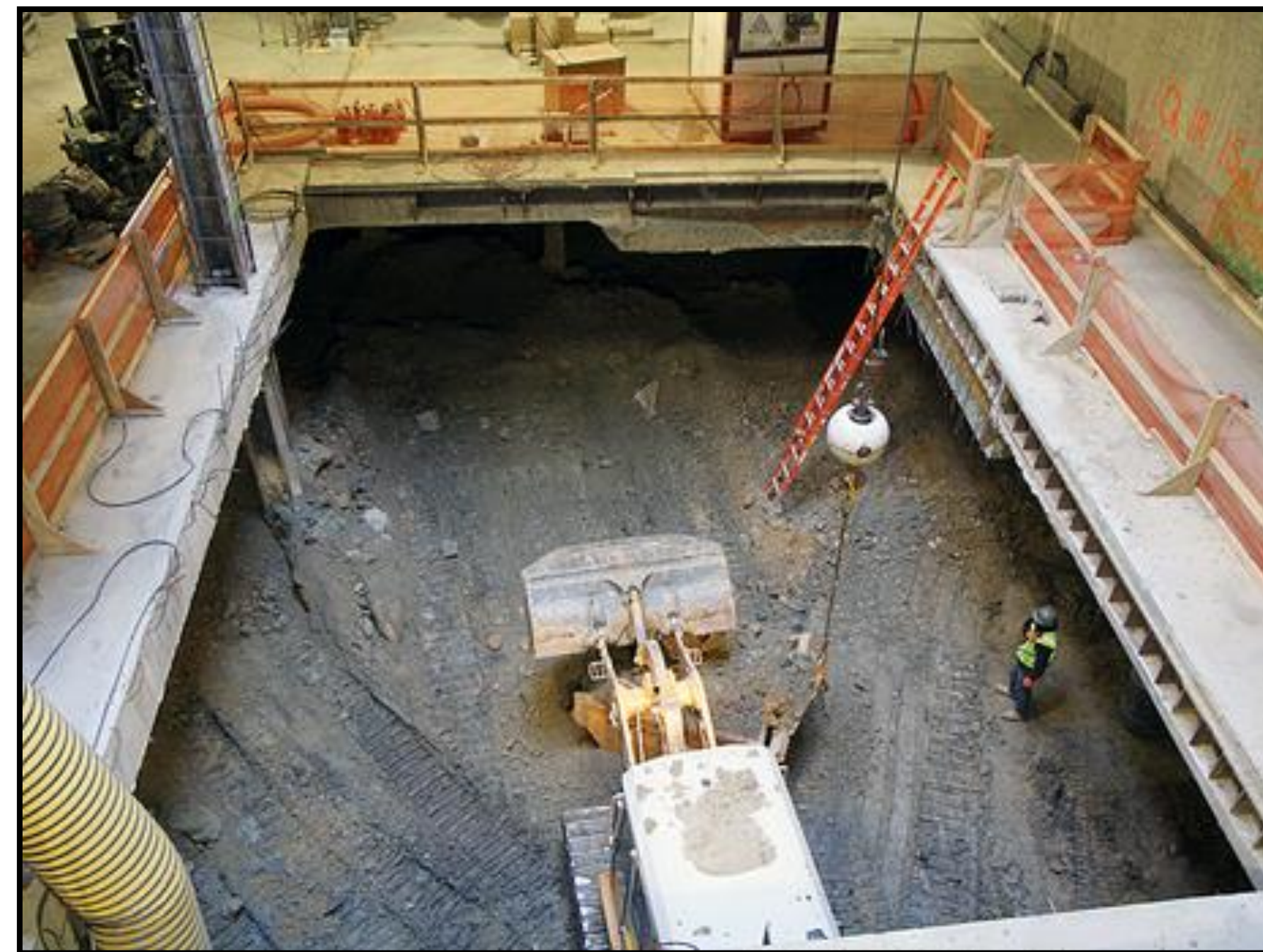
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## Background Information / Research

# Nathan Braskey Construction Option



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### Analysis #3:

Façade Retention Method

Breadth 2: Structural



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Background Information



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## Retaining Structure Analysis

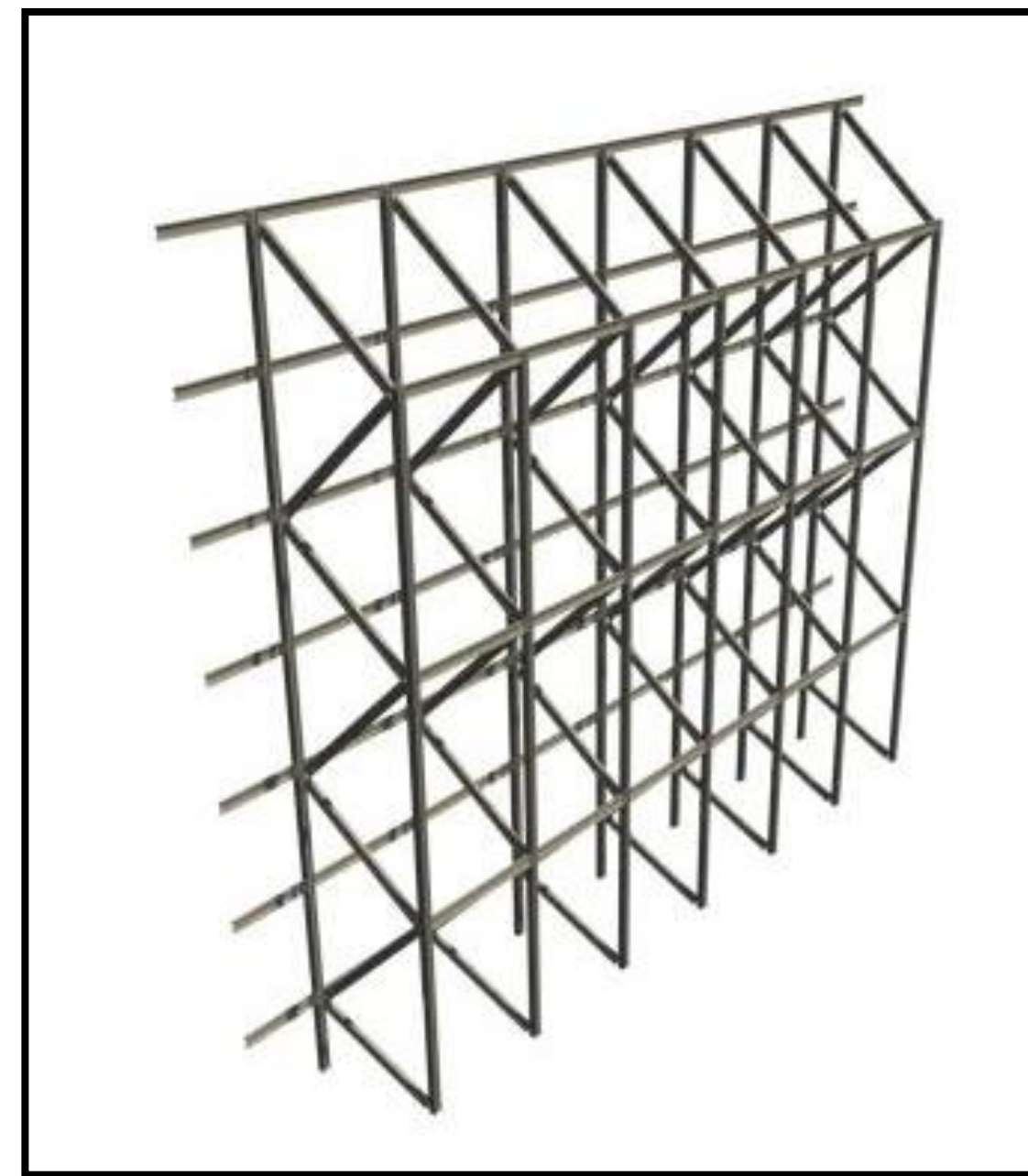
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Retaining Structure Analysis

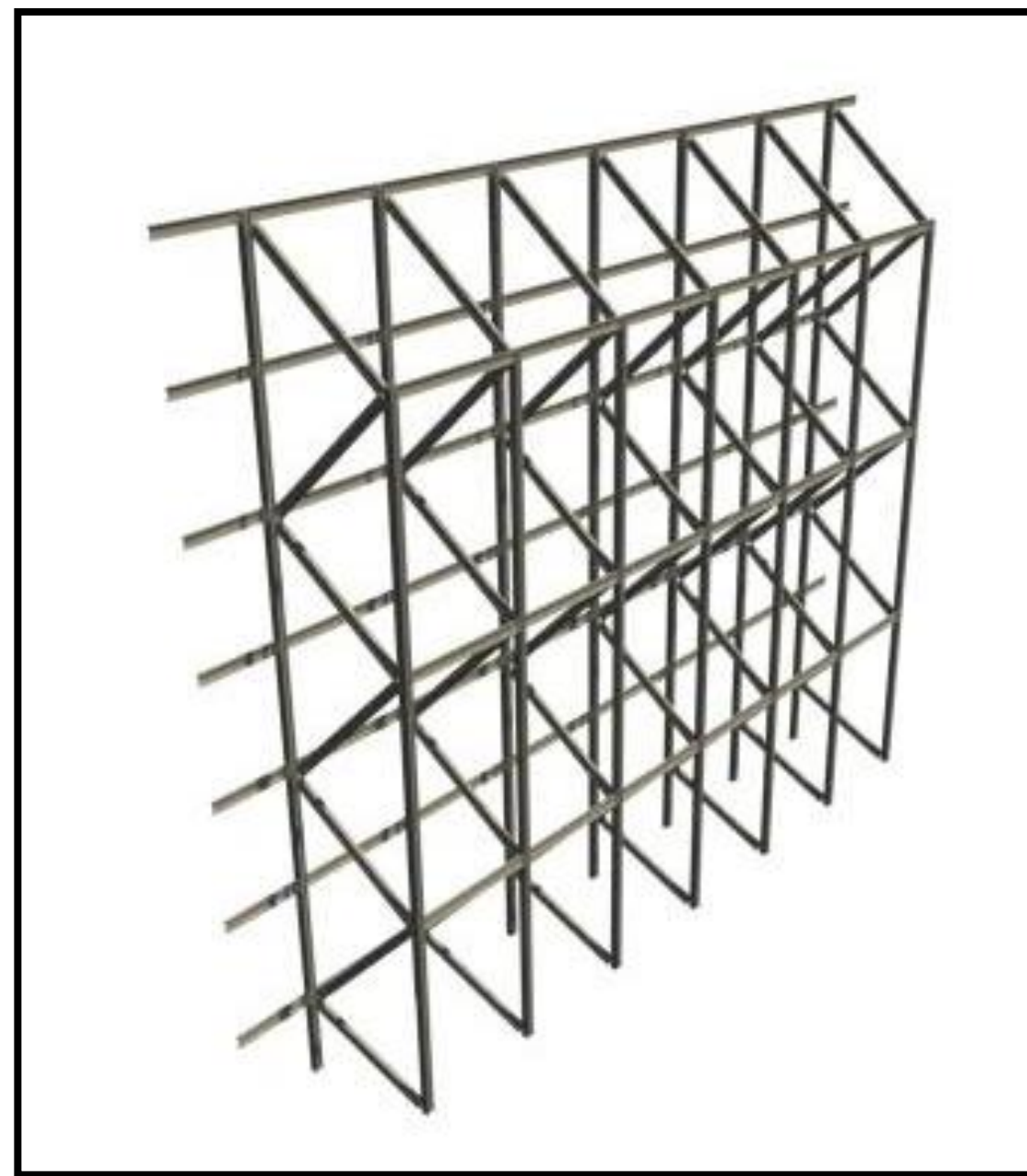


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Retaining Structure Analysis



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Total Façade Retention Cost Estimate	
Demolition	\$ 256,880
Façade Retention Structure	\$ 255,406
Building Structure - New	\$ 2,062,877
<b>Total:</b>	<b>\$ 2,575,163</b>

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Description	Quantity	Unit	Bare Labor	Bare Equipment	Bare Total	Total O&P
Deconstruction / Selective Demolition - Average	41,600	SF Flr	\$ 2,035,280	\$ 49,400	\$ 2,084,680	\$ 3,407,872

Total Façade Retention Cost Estimate	
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Method	Cost
Renovation	\$3,407,872
Façade Retention	\$2,575,163
<b>Difference</b>	<b>\$832,709</b>

Project Overview		Analysis Overview			Analysis 1	Analysis 2	Analysis 3	Analysis 4	Conclusions & Recommendations	
Sunnyvale Plaza Mid - Atlantic Region		Schedule Analysis					Nathan Braskey Construction Option			
Description	Quantity	Unit	Crew	Daily Output	Labor Hours					
Deconstruction / Selective Demolition - Average	41600	SF Flr.	16.5 x	4290	1889					



Description	Quantity	Unit	Crew	Daily Output	Labor Hours
Deconstruction / Selective Demolition - Average	41600	SF Flr.	16.5 x	4290	1889

Total Façade Retention Duration	
Demolition	15.5 Days
Retention Structure	16.5 Days
Building Construction - New	4.5 Days
<b>Total:</b>	<b>36.5 Days</b>

Sunnyvale Plaza Mid - Atlantic Region	Schedule Analysis	Nathan Braskey Construction Option
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Building Construction - New	4.5 Days
<b>Total:</b>	<b>36.5 Days</b>

Fit-Out Start Dates			
Level	PUB	New	Lead-Time (Workdays)
1	May 9, 2013	February 18, 2013	57
2	May 2, 2013	April 11, 2013	15
3	May 9, 2013	March 21, 2013	35
4	May 9, 2013	March 18, 2013	37
5	May 9, 2013	March 11, 2013	42
6	May 9, 2013	April 25, 2013	10
7	April 30, 2013	April 8, 2013	16

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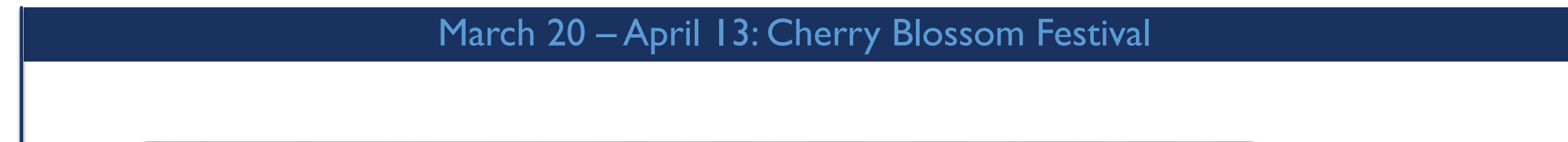
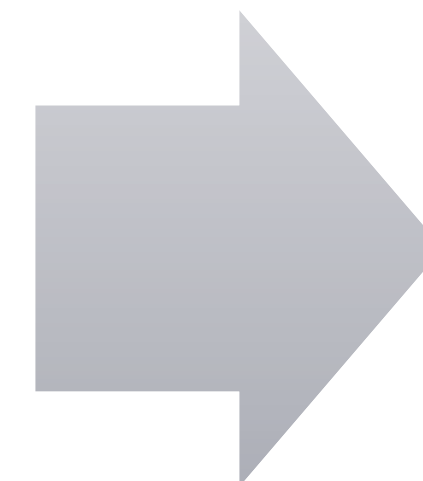
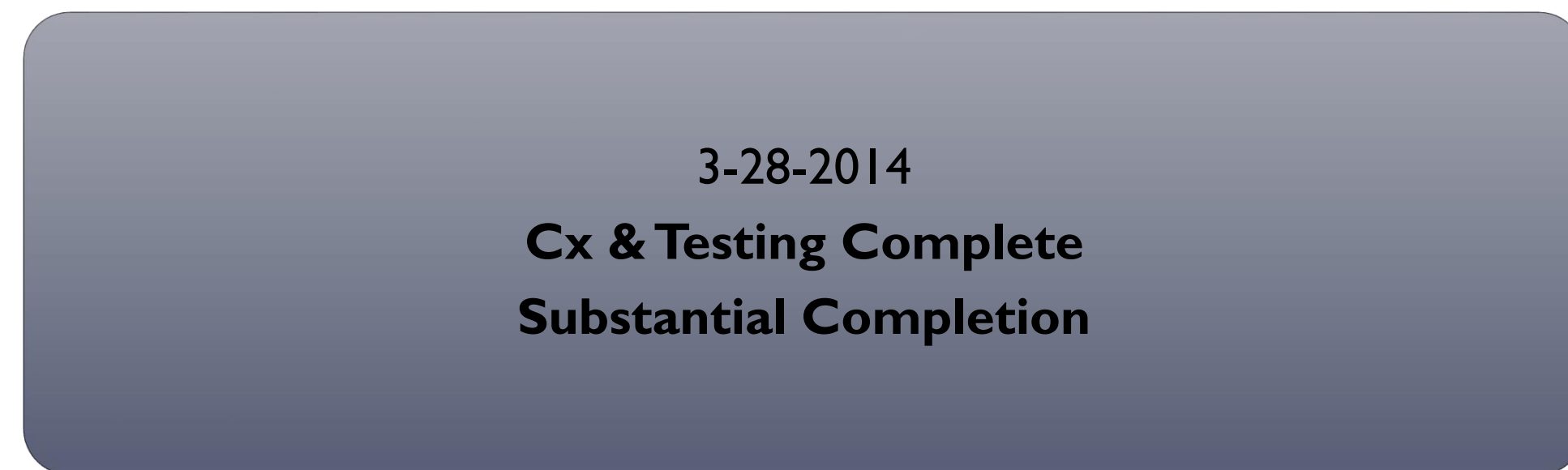
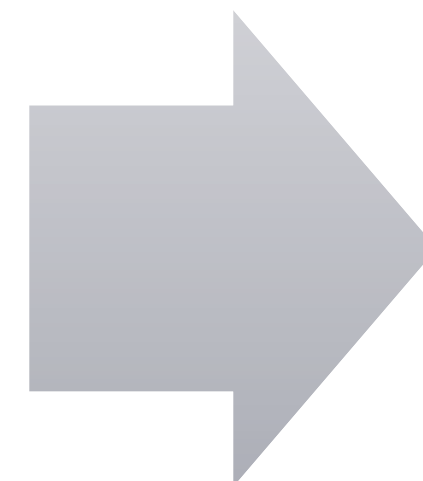
## Analysis #4:

Profitability of Early Scheduled Opening

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Background Information

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Construction Option



Opening	Rates - 100% Occupancy			Average	Rooms	Revenue / Day	100% Revenue / Month
January	\$269.00	\$249.00	\$264.00	\$261.00	1175	\$306,675.00	\$9,506,925.00
February	\$258.00	\$288.00	\$302.00	\$283.00	1175	\$332,525.00	\$9,310,700.00
1/2 March	\$353.00	\$384.00	\$403.00	\$380.00	1175	\$446,500.00	\$8,483,500.00
Festival	\$429.00	\$449.00	\$600.00	\$493.00	1175	\$579,275.00	\$14,481,875.00

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Year	Revenue	Cost of Revenue	Gross Profit	Profit Margin
2010	\$11,691	\$10,216	\$1,475	12.62%
2011	\$12,317	\$11,039	\$1,278	10.38%
2012	\$11,814	\$10,229	\$1,585	13.42%
2013	\$12,784	\$11,070	\$1,714	13.41%
<b>Average</b>	<b>\$12,152</b>	<b>\$10,639</b>	<b>\$1,513</b>	<b>12.45%</b>

Sunnyvale Plaza Mid - Atlantic Region	Financial Analysis	Nathan Braskey Construction Option
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<b>Average</b>	<b>\$12,152</b>	<b>\$10,639</b>	<b>\$1,513</b>	<b>12.45%</b>

Opening	Revenue / Day	Rev / Month	Profit Margin	Occupancy	Profit / Month
January	\$306,675	\$9,506,925	12.45%	66.4%	\$785,918
February	\$332,525	\$9,310,700	12.45%	66.4%	\$769,697
1/2 March	\$446,500	\$8,483,500	12.45%	66.4%	\$701,314
Festival	\$579,275	\$14,481,875	12.45%	88.1%	\$1,588,437

Item	Cost
Temporary Utilities / Week	\$ 111,721.72
Field Personnel / Week	\$ 25,975.00
<b>Total Cost / Week</b>	<b>\$ 137,697.72</b>
<b>Total Cost / Month</b>	<b>\$ 550,790.88</b>



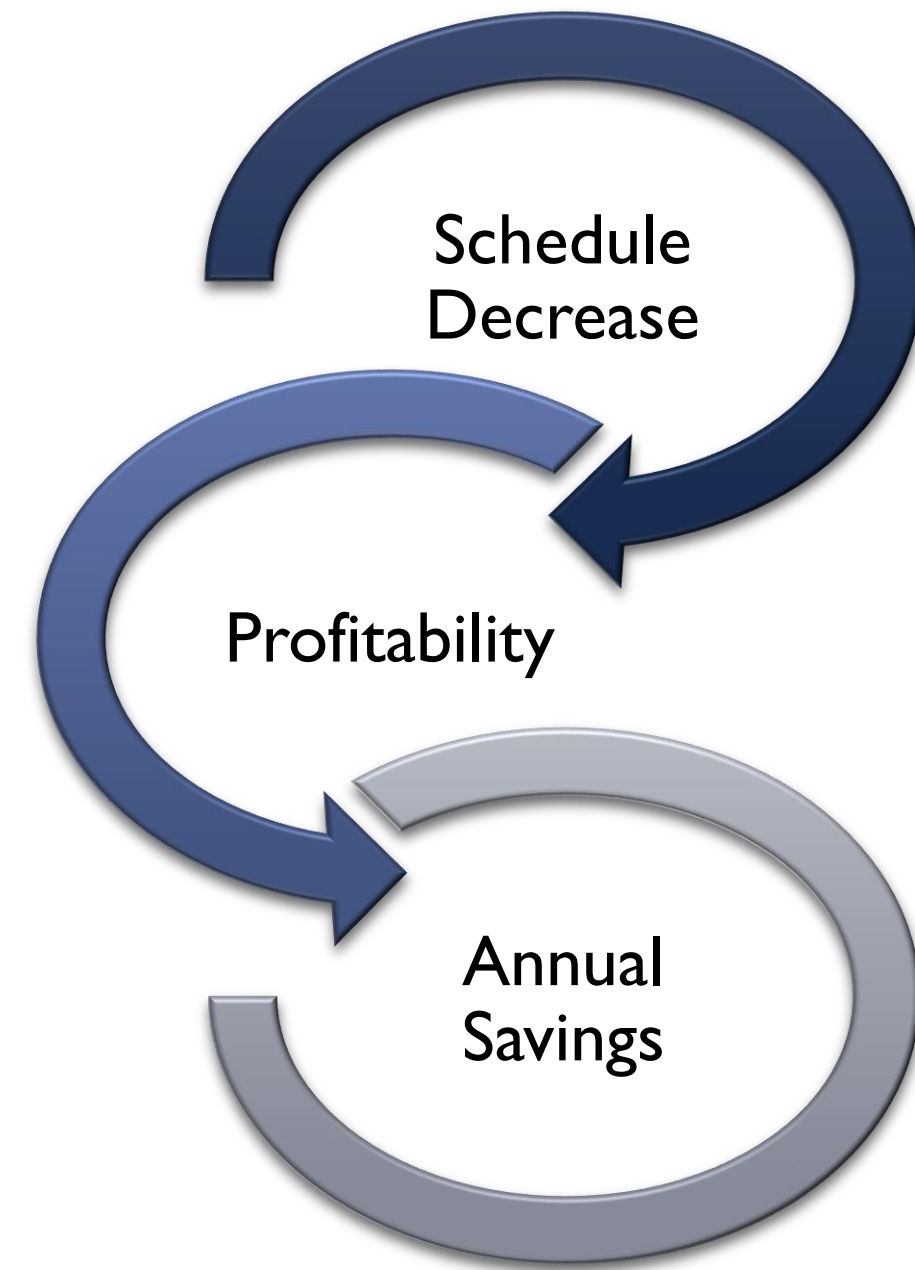
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Field Personnel / Week	\$ 25,975.00
<b>Total Cost / Week</b>	<b>\$ 137,697.72</b>
<b>Total Cost / Month</b>	<b>\$ 550,790.88</b>

Item	Profit
Early Opening	\$1,588,437
General Conditions	\$550,790
<b>Total</b>	<b>\$2,139,227</b>

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## Conclusion

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### Summary:

- Decrease schedule by 30 days
  - Total Profit of \$3 million
  - Annual Savings of \$27,800

### Analysis 1:

- Annual savings of \$27,800
- Payback period of 2.5 years

### Analysis 3:

- Decrease schedule by 30 days
  - Cost savings of \$832,700

### Analysis 4:

- Added revenue of \$14,500,000
  - Profitability of \$2,140,000

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## Acknowledgements

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**HENSEL PHELPS**  
Plan. Build. Manage.



### Academic:

Dr. Craig Dubler - Construction Advisor

Penn State AE Faculty

### Special Thanks:

Chris Mihalick

Keith Bush

David Webb

Jeff Overmiller

PACE Industry Members

Family and Friends

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Analysis #1: Zone Rainwater Collection

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Month	Roof Area (sq. ft.)	Total Accumulation (cubic feet)	Accumulation / Day (cubic feet)	Accumulation / Day (gallons)
January	36791	8,615.23	277.91	2,078.91
February	36791	8,032.70	286.88	2,146.02
March	36791	10,669.39	344.17	2,574.59
April	36791	9,381.71	312.72	2,339.33
May	36791	12,233.01	394.61	2,951.90
June	36791	11,589.17	386.31	2,889.76
July	36791	11,435.87	368.90	2,759.55
August	36791	8,983.14	289.78	2,167.69
September	36791	11,405.21	380.17	2,843.89
October	36791	10,424.12	336.26	2,515.41
November	36791	9,718.96	323.97	2,423.42
December	36791	9,351.05	301.65	2,256.47
<b>Average</b>			<b>333.61</b>	<b>2,495.58</b>

Month	Roof Area (sq. ft.)	Total Accumulation (cubic feet)	Accumulation / Day (cubic feet)	Accumulation / Day (gallons)
January	47352	11,088.26	357.69	2,675.67
February	47352	10,338.52	369.23	2,762.05
March	47352	13,732.08	442.97	3,313.64
April	47352	12,074.76	402.49	3,010.84
May	47352	15,744.54	507.89	3,799.26
June	47352	14,915.88	497.20	3,719.27
July	47352	14,718.58	474.79	3,551.69
August	47352	11,561.78	372.96	2,789.93
September	47352	14,679.12	489.30	3,660.24
October	47352	13,416.40	432.79	3,237.46
November	47352	12,508.82	416.96	3,119.07
December	47352	12,035.30	388.24	2,904.20
<b>Average</b>			<b>429.38</b>	<b>3,211.94</b>



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Analysis #1: Total Rainwater Collection

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Month	Roof Area (sq. ft.)	Total Accumulation (cubic feet)	Accumulation / Day (cubic feet)	Accumulation / Day (gallons)
January	84143	19,703.49	635.60	4,754.58
February	84143	18,371.22	656.12	4,908.07
March	84143	24,401.47	787.14	5,888.23
April	84143	21,456.47	715.22	5,350.17
May	84143	27,977.55	902.50	6,751.16
June	84143	26,505.05	883.50	6,609.03
July	84143	26,154.45	843.69	6,311.24
August	84143	20,544.92	662.74	4,957.62
September	84143	26,084.33	869.48	6,504.13
October	84143	23,840.52	769.05	5,752.87
November	84143	22,227.78	740.93	5,542.50
December	84143	21,386.35	689.88	5,160.66
<b>Average</b>			<b>762.99</b>	<b>5,707.52</b>



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Analysis #3: New Construction Costs

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<b>Structural Cost:</b>	Steel Structural System	\$ 8,400,000.00
	Concrete Structural System	\$ 27,000,000.00
	<b>Total:</b>	<b>\$ 35,400,000.00</b>
<b>Cost / SF:</b>	Steel Structural System	\$ 11.17
	Concrete Structural System	\$ 35.90
	<b>Total:</b>	<b>\$ 47.07</b>
<b>Plumber's Floor Area</b>	Per Floor	\$ 5,172.00
	<b>Total:</b>	<b>\$ 41,376.00</b>
<b>Structural Estimate</b>	Structural Cost / Floor	\$ 243,469.15
	<b>Total Structural Cost</b>	<b>\$ 1,947,753.19</b>

<b>Total Retaining Structure Cost</b>	
Steel (Material)	\$ 338,320
Steel (Assembly)	\$ 110,746
Steel (Disassembly)	\$ 110,746
Concrete	\$ 33,913
<b>Total:</b>	<b>\$ 593,726</b>
<b>True Cost:</b>	<b>\$ 255,406</b>

<b>Total Façade Retention Cost Estimate</b>	
Demolition	\$ 256,880
Façade Retention Structure	\$ 255,406
Building Structure - New	\$ 2,062,877
<b>Total:</b>	<b>\$ 2,575,163</b>

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### Analysis #3: Renovation Costs

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Line Number	Description	Unit	Bare Labor	Bare Equipment	Bare Total	Total O&P
24116190225	Minor Building Deconstruction - Pre 1970, Average	SF Flr.	\$93.75	\$0.00	\$93.75	\$154.50
24119211000	Selective Demolition, Gutting, Building Interior, Average	SF Flr.	\$4.10	\$2.38	\$6.48	\$9.34
Average	Deconstruction / Selective Demolition - Average	SF Flr.	\$48.93	\$1.19	\$50.11	\$81.92

Description	Quantity	Unit	Bare Labor	Bare Equipment	Bare Total	Total O&P
Deconstruction / Selective Demolition - Average	41,600	SF Flr	\$ 2,035,280	\$ 49,400	\$ 2,084,680	\$ 3,407,872

Method	Cost
Renovation	\$3,407,872
Façade Retention	\$2,575,163
<b>Difference</b>	<b>\$832,709</b>



Sunnyvale Plaza  
Mid - Atlantic Region

Analysis #3: New Construction Durations

Nathan Braskey  
Construction Option

Line Number	Description	Quantity	Unit	Crew	Output	Labor Hours	Days
51223790250	W8x31	6268	L.F.	E2 x 5	58.03	130.36	16.30

Line Number	Description	Quantity	Unit	Crew	Output	Labor Hours	Days
33053403850	Structural Concrete	104	C.Y.	C14C x 5	6.93	31.05	3.88

Line Number	Description	Quantity	Unit	Crew	Daily Output	Labor Hours	Days
24116130600	Building Demolition	494000	C.F.	B3 x 16	699.47	123.5	15.44

<b>Structural Duration:</b>	Days	75
	Labor Hours	600
<b>Duration / SF:</b>	Days	0.00010
	Labor Hours	0.00080
<b>Plumber's SF</b>	Per Floor	5,172.00
	Total:	<b>41,376.00</b>
<b>Structural Duration:</b>	Days / Floor:	0.52
	<b>Total Additional Duration:</b>	<b>4.13</b>

Total Façade Retention Duration	
Demolition	15.5 Days
Retention Structure	16.5 Days
Building Construction - New	4.5 Days
<b>Total:</b>	<b>36.5 Days</b>

Sunnyvale Plaza  
Mid - Atlantic Region

Analysis #4: Hotel Rate Data

Nathan Braskey  
Construction Option

Date Checked	Hotel 1					
	1/20/2014		2/20/2014		3/20/2014	
	Duration Until	Rate	Duration Until	Rate	Duration Until	Rate
12/16/2013	35	269.00	66	304.00	94	459.00
12/30/2013	21	269.00	52	239.00	80	369.00
1/13/2014	7	269.00	38	258.00	66	352.00
1/27/2014			24	250.00	52	369.00
2/10/2014			10	239.00	38	329.00
2/24/2014			24	279.00		
3/10/2014			10	309.00		
Average		269.00		258.00		352.29

Date Checked	Hotel 2					
	1/20/2014		2/20/2014		3/20/2014	
	Duration Until	Rate	Duration Until	Rate	Duration Until	Rate
12/16/2013	35	249.00	66	304.00	94	459.00
12/30/2013	21	249.00	52	299.00	80	399.00
1/13/2014	7	249.00	38	288.00	66	384.00
1/27/2014			24	250.00	52	399.00
2/10/2014			10	299.00	38	359.00
2/24/2014			24	359.00		
3/10/2014			10	329.00		
Average		249.00		288.00		384.00

Date Checked	Hotel 3					
	1/20/2014		2/20/2014		3/20/2014	
	Duration Until	Rate	Duration Until	Rate	Duration Until	Rate
12/16/2013	35	264.00	66	304.00	94	459.00
12/30/2013	21	264.00	52	304.00	80	459.00
1/13/2014	7	264.00	38	301.00	66	402.00
1/27/2014			24	250.00	52	349.00
2/10/2014			10	349.00	38	399.00
2/24/2014			24	399.00		
3/10/2014			10	349.00		
Average		264.00		301.60		402.29