

RESIDENCE INN

BY MARRIOTT
2345 MILL RD, ALEXANDRIA, VA

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CONSTRUCTION MANAGEMENT

TECHINICAL ASSIGNMENT #2
DR. HORMAN



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Executive Summary

This report is intended to analyze key features of the project that affect the project outcome. This report contains a detailed schedule analysis, a site planning analysis of the superstructure phase, an assemblies estimate of the mechanical system, a detailed structural systems estimate, and a general conditions estimate.

The detailed schedule highlights the concrete phase and interior phase of construction because they are the most critical for completing the project on time. The site plan analyzes six different views to properly show the complexity of the site caused by the constriction by the three metro tracks bordering the site.

The assemblies estimate includes the HVAC, sheet metal, and plumbing systems with appropriate fixtures associated with each system. The assemblies estimate totals \$995,542.16 which is a great deal of the \$6.2 million mechanical contract.

The detailed structural systems estimates the concrete and steel reinforcing for the mat foundation, one floor of the cast in place concrete and one floor of the post tensioned concrete. One of each floor type was chosen to estimate because the interior bay sizes were very different; the only congruity was vertically through the types of floor systems. The structural estimate totaled \$3,540,139.47 which is relatively accurate without including the façade pre-cast concrete.

The general conditions estimate includes engineering fees, main office and overhead fees, staffing, insurance, bonds, and contingency, utilities, barricades and fencing, permits, and miscellaneous site requirements. Which totals \$4,610,482.03 and is accurate based on the difference between the construction cost and total project cost.

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Detailed Project Schedule

Please see Appendix A for the Detailed Project Schedule.

The construction is currently at the seventh floor concrete. The schedule has been accelerated more than previously to try to make up for lost time from delays while pouring the lower level parking areas. Fortunately due to a repetitive floor plan the other trades will be able to keep up with the reworked durations during the interior construction. The Residence Inn is being constructed like many other high rise repetitive buildings have been done. The excavation was first, to install the mat slab foundation and water proofing. Then the below grade concrete levels and columns were constructed followed by accelerating the upper floors easily because of a repetitive floor layout and penetrations. The tower crane is placed in an area that can be finished quickly at the end of the project (crane placement can be seen in the Site Layout Appendix B).

The interior floor construction is easiest understood by floor, however each floor is also organized logically by trade. Once interior construction starts it progresses through each floor in approximately 150 days while leaving time at the end of the schedule to close up the room that had the tower crane. The progress through each floor consists of the following sequence:

Interior Construction Sequence: 3rd Floor			
Task	Duration	Start	Finish
Layout Floor	5 days	11/2/2007	11/8/2007
3rd Floor Interior Construction	153 days	11/2/2007	6/10/2008
HVAC Risers and Wall/Clg.Rough In	7 days	11/9/2007	11/19/2007
Fire Protection Rough In	3 days	11/20/2007	11/26/2007
Frame Walls, Core, Set Door Frames	5 days	11/27/2007	12/3/2007
Set Tubs, Strap Waste and Risers	4 days	12/4/2007	12/7/2007
Exterior Studs - East Side	4 days	12/7/2007	12/12/2007
CMU Exterior South	2 days	12/14/2007	12/17/2007
CMU West	2 days	1/8/2008	1/9/2008
Frame Exterior Walls	4 days	1/8/2008	1/11/2008
CMU North	2 days	1/10/2008	1/11/2008
Electrical Wall/Clg Rough In	4 days	1/10/2008	1/15/2008
Inspections, MEP, Elec, Wall Close In	5 days	1/16/2008	1/22/2008
Install Windows 3rd Floor	5 days	1/16/2008	1/22/2008
Hang Shafts (str., elev, 3 side MEP) Purple	3 days	1/23/2008	1/25/2008
Temp Dry in up to 6th Flr.	5 days	2/13/2008	2/19/2008

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Hang Dry Wall & Tape except at FCU's	8 days	2/20/2008	2/29/2008
Set and Hook Up FCU / Inspect for Close In	5 days	3/3/2008	3/7/2008
Hang Drywall and Tape at FCU's	4 days	3/10/2008	3/13/2008
Temporary Conditioning	1 day	3/28/2008	3/28/2008
Install Wood Trim	4 days	3/31/2008	4/3/2008
Prime Paint and Texture Clgs	3 days	4/4/2008	4/8/2008
Point up, Reprime	3 days	4/9/2008	4/11/2008
Wall Covering and Paint, Tile	5 days	4/14/2008	4/18/2008
Install Kitchen and Bath Casework	7 days	4/21/2008	4/29/2008
Install Kitchen Sinks, and Electrical Trim	4 days	4/28/2008	5/1/2008
Final Coat Paint	3 days	5/2/2008	5/6/2008
Install Carpet	5 days	5/7/2008	5/13/2008
Start up FCU, Test MEP	5 days	5/14/2008	5/20/2008
Punch Floor	5 days	5/21/2008	5/27/2008
Complete Punch	5 days	5/28/2008	6/3/2008
Owner FFE Items	5 days	6/4/2008	6/10/2008
5 Day Stagger	5 days	6/11/2008	6/17/2008
Complete Walls and Finishes at Hoist Room	10 days	8/8/2008	8/21/2008
Owner FFE at Hoist Room	2 days	8/22/2008	8/25/2008

The HVAC rough-in occurs very early in the process followed by the Fire Protection, and shortly after that the Electrical rough-in. After the rough-ins occur the systems are inspected and the rest of the interior construction can flow smoothly. As the rough-ins are taking place the masonry is being installed to help close in the building as quickly as possible. The close in of each floor occurs about half way through the interior construction of that floor. This helps the finish trades progress quickly since the environment inside the building will be more controlled for dry wall, painting, and wood trim activities. Each floor is punched when construction is completed with the exception of the hoist room, this will help when closing out the project. There will be a minimum amount of punchlist items left once the interior construction is complete and help finish on time. This also allows for the time needed at the end of the schedule to remove the tower crane and close up the room on each floor that had not been completed. Since the hoist room has its own punch and turnover process it can go very quickly because there will need to be only one room per floor punched rather than the entire floor. This enables other punchlist problems to be addressed before the hoist room is completed and possibly causing the project completion to be delayed.

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Site Layout Planning

Please see Appendix B for the Site Layout Sheets.

The site layout sheets were drawn in Google SketchUp to be able to rotate and crop specific areas to highlight the complexities of the site.

Sheet S-100 of the Site Layout is a plan view of the superstructure phase of the project. It varies slightly from the excavation phase detailed in Technical Assignment 1. There is no longer any on site staging areas directly south of the footprint. Also, the north end of the site is covered by the construction traffic access road through the site. The excavation boundaries extend beyond the above grade visible building footprint. Sheet S-100 also highlights the tower crane and swing. The tower crane swing cannot come within 25 feet of the WMATA Metro track closest to the building footprint; this is mandated by the city of Alexandria in attempt to prevent a major accident should anything fall from the crane, or the crane topple over. The superstructure phase also adds access points to the site for deliveries. These are located on the east side of the site, each have a gated entrance and can be seen on Sheet S-100. In the superstructure phase there is no parking for employees on the site in exchange for more delivery areas in comparison there were a few limited spots during excavation.

Sheet S-200 focuses on the main gated entrance to the site. In the fore-front the site boundary fence can be seen with the blocked off delivery lane and covered pedestrian walkway in front of it. Inside the entrance are three protected metro foundation columns; this is also mandated by the city of Alexandria to ensure protection from the ground level down to the bottom the of the column extending out at a 45° angel underground. There is also a small on site staging area that can be seen under the metro track next to the on site trailers. The dumpsters are located near the entrance at the south of the site next to the electrical transformers and utilities.

Sheet S-300 is an aerial view above the metro track looking down onto the west side of the site. The third protected metro column can be seen as well as highlighting the complexity of the items located under the metro. This shows how close the trailers are to the underside of the metro and to the staging area; the trailers are within a few feet of each. The transformers and dumpsters can also be seen at the front of the site on the south end.

Sheet S-400 highlights the complexity that is added by the metro tracks and foundation column protection. The detailed rear view shows the staging area in every available space between the construction road, metro columns, and the site boundary fence.

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Sheet S-500 is an aerial view from the back of the site on the north side. In this view the protected city fire hydrant can be seen within the site boundary and protected from the construction traffic and staging areas directly near it. This view also shows very clearly the location of the additional site access points on the east side. The road on the east side of the site, Andrews Lane, is completely blocked during the superstructure phase of construction. Flagmen must be watching this lane at all times since it is an egress point from the private parking behind Carlyle Towers.

Sheet S-600 also is an aerial view, but from the southeast corner of the site. This view shows the complexity that exists on the opposite side of the metros. In the most extreme southeast corner can be seen where Andrews Lane is completely blocked by the site boundary fence. It also shows the traffic flow through and on and off the site; with the slow lane on the south side of the site blocked for construction deliveries.

Beyond the key points described where flagmen are needed the traffic light operates as normal. Unless there is a flagmen on the road the public traffic follows the direction of the traffic lights, the lane markings as shown on all sheets.

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Assemblies Estimate

Please see Appendix C for the detailed Assemblies Estimate calculation and take off sheets.

The mechanical and plumbing systems were estimated by assembly. This was done by combing the detailed cost breakdown of those systems and selecting the key equipment, fixtures, and specialties. The costs do not include labor since it is difficult to estimate the number or workers needed, usually that is based on schedule. However, compared to the equipment cost, the labor is a minimal addition. R.S. Means was not used in this section due to the fact that it does not contain the majority of the equipment specified, and cannot accurately estimate the hours to install (cannot easily compare different equipment). The Mechanical Systems summary sheet can be seen below.

Mechanical Systems Summary		
Division	Description	Cost
15700		
05580		
15400		
Grand Total		\$1,016,534.21
Adjusted Grand Total		\$955,542.16

As shown the equipment cost is very high, reaching approximately \$1 million in comparison to the mechanical contract of \$6.2 million. The equipment used for this project is specialized for an all water system to save on floor to floor height and maximize the number of floors. In the mechanical system sheet metal is included in the assembly for the duct work. Plumbing fixtures are included in the plumbing assembly for the lavatories and sinks.

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Detailed Structural Systems Estimate

Please see Appendix D for the Detailed Structural Systems Estimate calculations and take off.

The estimate was performed by manually taking off the concrete and steel reinforcing for the mat foundation, one floor of the cast in place concrete and one floor of the post tensioned concrete. This was done due to the largely differing bay sizes and different floor systems throughout the building. The top 14 floors including the roof slab are post tensioned concrete while the bottom 4 floors are cast in place reinforced concrete and the mat foundation. The data taken for each floor type was then multiplied by the number of floors of that type. Column quantities were estimated by using the columns schedule averaged at the 6th floor for the post tensioned concrete floors and the P-1 Parking level for the cast in place floors. The column data was also multiplied by the number of floors of each floor type. Once the data was taken R.S. Means 2007 was used to calculate the material, labor, and total cost.

Assumptions:

- The cast in place floor area was averaged to 14,700 SF per floor with an 8" slab.
- The post tensioned floor area was averaged to 8,300 SF per floor with a 7.5" slab.
- The rebar in the beams was estimated by the specifications in the drawings by using 2/3 the length of the beam for the top rebar and the full length for the bottom rebar.
- Concrete drop panels were estimated as elevated slabs.
- Reinforcing Steel is put in place on site, A615 Grade 60 steel. Cost includes access labor.
- Concrete costs include 4 time reuse formwork, concrete, placement, and finishes.
- All concrete is pumped.
- Post tensioning tendons are grouted strands at 50 ft lengths stressed to 100kips and 300 kips.

The structural systems summary sheet can be found on the following page. The estimated total after being adjusted for the location is \$3,540,139.47. The calculated value is lower than the structural total detailed in Technical Assignment 1. This is due to the fact that the total in Technical Assignment 1 includes the pre-cast concrete while this estimate is only the pumped structural concrete. Overall this estimate is accurate based on the previous cost analysis and this detailed estimate.

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Structural Systems Total Cost Summary

Division	Description	Quantity	Unit	Unit Price	Labor	Equipment	Total Cost
	Mat Foundation						
03 30 53.40							
03 21 10.60							
	Total Per Foundation						\$603,681.92
	Cast In Place Floor						
03 30 53.40							
03 30 53.40	Concrete						
03 30 53.40							
03 30 53.40							
03 30 53.40							
	Concrete Subtotal						
03 21 10.60		706	CY				\$306,701.80
03 21 10.60	Steel Reinforcing						
03 21 10.60							
03 21 10.60							
03 21 10.60							
	Steel Reinforcing Subtotal						
	Total Per One Floor						\$47,985.37
	Total Per Underground of 4 Floors	32.11	TON				\$1,418,748.68
							\$354,687.17
	Post Tensioned Floor						
03 30 53.40							
03 30 53.40	Concrete						
03 30 53.40							
03 30 53.40							
	Concrete Subtotal						
03 21 10.60		244.45	CY				\$111,158.23
03 21 10.60	Steel Reinforcing						
03 21 10.60							
03 21 10.60							
	Steel Reinforcing Subtotal						
03 23 05.50		8.73	TON				\$13,240.88
	Total Per One Floor						\$124,540.23
	Total Per Superstructure of 14 Floors						\$1,743,675.22
							\$124,540.23
Grand Total							\$3,766,105.82
Adjusted Grand Total							\$3,540,139.47

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General Conditions Estimate

Please see Appendix E for the detailed General Conditions Estimate calculation sheet.

The general conditions estimate was performed using R.S. Means 2007 and the list of general conditions items. The quantities and items were taken from the list of general conditions items then the unit cost and total cost were calculated using R.S. Means 2007. The general conditions estimate includes engineering fees, main office and overhead fees, staffing, insurance, bonds, and contingency, utilities, barricades and fencing, permits, and miscellaneous site requirements. Once the data was totaled, 2% had to be subtracted from the total since Balfour Beatty has a great deal of experience in managing construction projects. Then the location factor also adjusted the total cost. Below is a summary table of the general conditions estimate.

General Conditions Summary	
Description	Total Cost
Engineering Fees Subtotal	\$590,000.00
CM Expense Subtotal	\$2,170,000.00
Insurance / Bonds / Contingency Subtotal	\$1,289,750.00
Barricades / Fencing Subtotal	\$37,785.10
Total without Adjustment	\$5,004,865.42
Grand Total	\$4,610,482.03

As shown above approximately 50% of the general conditions cost is due to the main office overhead expense, the construction management fee, and insurance, bonds, and contingency. The staffing expense is one of the lowest costs. This could be in part because there may not be enough people on site or the salaries estimated in Means are inaccurate for Balfour Beatty. However, the total general conditions estimate correlates with the difference between the total cost of the project and the cost of construction. As outlined in Technical Assignment 1 the total cost is approximately \$33.5 million and the construction cost is \$28.6 million. This is a difference of \$4.9 million which is very similar to the estimated cost of general conditions; the number makes sense that it should equal the difference between the construction cost and total project cost.

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Appendix A: Detailed Project Schedule

The Microsoft Project, Detailed Project Schedule can be found on the following 4 pages.

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Appendix B: Site Layouts

The Google SktechUp site layouts can be found on the following 6 pages.

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Appendix C: Assemblies Estimate

The Assemblies Estimate can be found on the following 3 pages.

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HVAC Equipment		
Description	QTY	Cost
Air Cooled Chiller	1	\$85,880.00
Indoor Central Station Air Handling Unit	1	\$16,200.00
Make Up Air Units	2	\$99,700.00
Air Handling Unit VFD's	12	\$19,500.00
AC Split System	1	\$13,000.00
Vertical Fan Coil Units	189	\$202,840.00
Fan Powered Boxes	21	\$19,910.00
Through Wall AC Units	3	\$2,750.00
Electric Unit Heaters	7	\$4,000.00
Copper Finn Water Tube Boilers, Gas Fired	2	\$26,840.00
Condenser Water Pumps	1	\$5,992.00
Inline Pumps	3	\$4,214.00
Shell & Tube Heat Exchanger	2	\$16,525.00
Expansion Tank	2	\$1,193.00
Wall Mount Electric Unit Heater	49	\$3,000.00
Exhaust Fans	22	\$46,420.00
Moderized Dampers	17	\$4,000.00
Louvers	10	\$3,600.00
Boiler Vents	2	\$1,200.00
Fire & Smoke Dampers	67	\$38,160.00
Sound Attenuator	1	\$600.00
Lined Plenum Slots	94	\$3,000.00
Guestroom GRD's	272	\$6,800.00
Public GRD's	112	\$2,800.00
HVAC Equipment Total		\$628,124.00

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Sheet Metal Equipment

Description	QTY	Unit	Cost
Rectangular Duct	35908	Lbs.	\$30,222.74
Round Duct	7729	Lbs.	\$26,577.86
Flex Duct	710	Lbs.	\$673.31
Rectangular Duct Hangers	1025	Lbs.	\$2,363.67
Round Duct Hangers	160	Lbs.	\$157.49
Flex Duct Hangers	39	Lbs.	\$39.14
Access Panels	22 (22)	EA	\$484.00
ID Tags	46 (5)	EA	\$230.00
Roof Curbs	3	Lbs.	\$625.00
Slab Inserts	160 (5)	EA	\$800.00
Sheet Metal Equipment Total			\$62,173.21

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Plumbing Equipment & Fixtures

Description	QTY	Cost
Duplex Sump Pump	1	\$8,000.00
Sewer Ejector	1	\$3,500.00
Elevated Sump Pump	1	\$3,000.00
Duplex Booster Pump	1	\$32,500.00
Grease Interceptor	1	\$1,800.00
Oil Interceptor	1	\$6,500.00
Water Heaters	4	\$40,000.00
Expansion Tank	1	\$1,500.00
Recirculation Pumps	3	\$1,800.00
Mixing Valves	2	\$4,000.00
Water Closets	183	\$29,913.00
Water Closets ADA	12	\$2,978.00
Lavatories	188	\$28,960.00
Lavatories ADA	7	\$1,288.00
Bath Tubs	181	\$46,517.00
Bath Tubs ADA	7	\$1,855.00
Sinks	181	\$45,974.00
Heat Trace	1534	\$11,505.00
ID Tags	300	\$2,400.00
Valve Tags	375	\$1,875.00
Aerators	137	\$11,645.00
Fire Stopping Sleeves	1747	\$24,021.00
Closet Flanges	182	\$3,649.00
Tub Boxes	182	\$4,323.00
Aerator Boxes	182	\$6,734.00
Plumbing Equipment & Fixtures Total		\$326,237.00

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Appendix D: Detailed Structural Systems Estimate

The Detailed Structural Estimate can be found on the following 5 pages.

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Mat Slab Concrete Volume						
Depth (IN)	Area (SF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost
4	14300	176.54	174	70	0.38	\$43,143.63
30	1414	130.93	174	70	0.38	\$31,995.68
36	4696	521.78	174	70	0.38	\$127,512.05
48	8190	1213.33	174	70	0.38	\$296,514.40
Total		2042.58				\$499,165.76

Mat Slab Concrete Reinforcing						
Bar No.	Length (LF)	Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost
#7	2376	4856.54	2.43	850	630	\$3,593.84
#8	16984	45347.28	22.67	805	365	\$26,528.16
#9	29670	100878.00	50.44	805	365	\$59,013.63
#10	3285	14135.36	7.07	805	365	\$8,269.18
#11	2288	12156.14	6.08	805	365	\$7,111.34
Total		177373.32	88.69			\$104,516.16

Cast In Place Slab & Drop Panel Concrete Volume							
Panel No.	Depth (IN)	Area (SF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost
	8	14292	352.89	274	150	14.3	\$154,671.20
	14	408	17.63	274	150	14.3	\$7,727.07
D 1 (7)	5.5	80	9.51	274	150	14.3	\$4,166.56
D 2 (3)	5.5	80	4.07	274	150	14.3	\$1,785.67
D 3 (1)	5.5	64	1.09	274	150	14.3	\$476.18
D 4 (1)	5.5	88	1.49	274	150	14.3	\$654.74
D 5 (3)	5.5	100	5.09	274	150	14.3	\$2,232.08
D 6 (1)	5.5	110	1.87	274	150	14.3	\$818.43
Total			393.64				\$172,531.93

Cast In Place Slab Concrete Reinforcing						
Bar No.	Length (LF)	Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost
#4	36842	24610.46	12.31	950	455	\$17,288.85
#5	11842.2	12351.41	6.18	950	455	\$8,676.87
#6	2281	3426.06	1.71	950	455	\$2,406.81
#7	185	378.14	0.19	950	455	\$265.64
#9	165	561.00	0.28	950	455	\$394.10
Total		41327.07	20.66			\$29,032.27

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Post Tensioned Slab Concrete Volume						
Depth (IN)	Area (SF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost
7.5	8300	192.13	248	155	14.7	\$80,252.55

Post Tensioned Slab Concrete Reinforcing						
Bar No.	Length (LF)	Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost
#4	8447	5642.60	2.82	950	455	\$3,963.92
#5	4748	4952.16	2.48	950	455	\$3,478.90
Total	13195	10594.76	5.30			\$7,442.82

Post Tensioning Tendons							
Direction	Length (LF)	Quantity	Stress (Kips)	Unit Cost (\$/Lb.)	Labor Cost (\$/Lb.)	Equipment Cost (\$/Lb.)	Total Cost
East - West	52	33	100	1.98	2.02	0.08	\$134.64
North - South	60	8	270	0.87	0.9	0.04	\$14.48
							\$149.12

Cast In Place Walls - Cast In Place Floor						
Length (LF)	Height (LF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost
559	10	207.04	166	127	13.63	\$63,483.77
Reinforcing	Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost	
210#6	3157.36	1.58	850	440	\$2,036.50	
420#4	233.88	0.12	850	440	\$150.85	
		1.70			\$2,187.35	

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Cast In Place Shear Wall - Cast In Place Floor						
Length (LF)	Height (LF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost
58	10	21.48	166	127	13.63	\$6,586.87
Reinforcing	Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost	
70#7	1432.51	0.72	850	440	\$923.97	
44#4	24.50	0.01	850	440	\$15.80	
		0.73			\$939.77	

Cast In Place Shear Wall - Post Tensioned Floor						
Length (LF)	Height (LF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost
58	9.25	19.87	166	127	13.63	\$6,092.85
Reinforcing	Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost	
70#6	1052.45	0.53	850	440	\$678.83	
44#4	24.50	0.01	850	440	\$15.80	
		0.54			\$694.64	

RESIDENCE INN

BY MARRIOTT

2345 MILL RD, ALEXANDRIA, VA

JULIA E. PHILLIPS

CONSTRUCTION MANAGEMENT



Appendix E: General Conditions Estimate

The General Conditions Estimate can be found on the following 2 pages.

RESIDENCE INN

BY MARRIOTT
 2345 MILL RD, ALEXANDRIA, VA
 JULIA E. PHILLIPS
 CONSTRUCTION MANAGEMENT



General Conditions

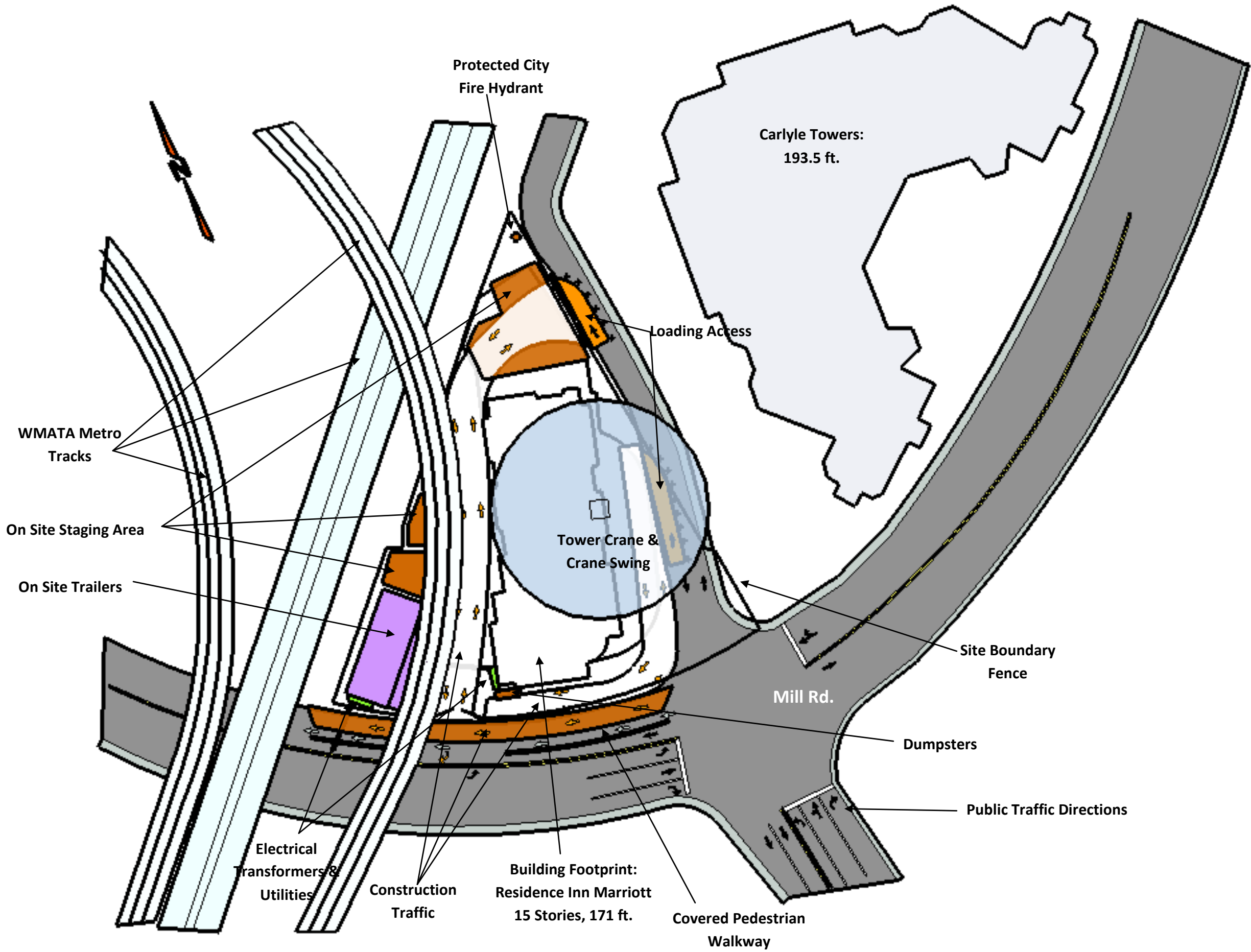
Division	Description	QTY	Unit	Cost / Unit	Total Cost
	Engineering Fees				
01 11 31.10	Architectural Fee	1			\$464,000.00
01 11 31.30	Structural Fee	1			\$126,000.00
	Fee Subtotal				\$590,000.00
01 31 13.40	Main Office Expense	3.00%	% Volume		\$1,500,000.00
01 11 31.20	Construction Management Fee	2.00%	Project Size		\$670,000.00
	CM Expense Subtotal				\$2,170,000.00
	Field Office Support				
01 52 13.20	On Site Trailer	16	Month	375	\$6,000.00
01 52 13.40	Office Equipment	16	Month	150	\$2,400.00
01 52 13.40	Office Supplies	16	Month	95	\$1,520.00
01 52 13.40	Telephone	16	Month	210	\$3,360.00
01 52 13.40	Lights & HVAC	16	Month	110	\$1,760.00
	Field Office Personnel				
01 31 13.20	1 Clerk	65	Wks	239	\$15,535.00
01 31 13.20	3 Field Engineer	65	Wks	740	\$144,300.00
01 31 13.20	2 Project Manager	65	Wks	1200	\$156,000.00
01 31 13.20	1 Superintendent	65	Wks	1125	\$73,125.00
	Field / Staffing Subtotal				\$404,000.00
	Insurance / Bonds				
01 31 13.30	Builders Risk	0.25%	Project Size		\$83,750.00
01 31 13.30	Performance Bond	0.60%	Project Size		\$201,000.00
01 21 16.50	Construction Contingency	3.00%	Project Size		\$1,005,000.00
	Insurance / Bonds / Contingency Subtotal				\$1,289,750.00
	Temporary Utilities				
01 51 13.80	Heat	1245	CSF Flr.	12.12	\$15,089.40
01 51 13.80	Lighting	1245	CSF Flr.	10.88	\$13,545.60
01 51 13.80	Power for Lighting	1245	CSF Flr.	0.75	\$933.75
01 51 13.80	Power for Construction	1245	CSF Flr.	80	\$99,600.00
01 51 13.80	Toilets	16	Month	150	\$2,400.00
	Utilities Subtotal				\$131,568.75

RESIDENCE INN

BY MARRIOTT
 2345 MILL RD, ALEXANDRIA, VA
 JULIA E. PHILLIPS
 CONSTRUCTION MANAGEMENT



	Temporary Barricades				
01 56 13.60	Fire Resistant Tarpaulins	61500	SF	0.4	\$24,600.00
01 56 23.10	Precast Jersey Barriers	100	LF	32.43	\$3,243.00
01 56 29.50	Plywood Walkway Protection	400	SF	0.57	\$228.00
	Temporary Fencing				
01 56 26.50	Chain Link, 6' high	455	LF	7.68	\$3,494.40
01 56 26.50	Plywood, 8' high	410	LF	15.17	\$6,219.70
	Barricades / Fencing Subtotal				\$37,785.10
	Miscellaneous				
01 41 26.50	Permits	0.50%	Project Size		\$167,500.00
01 32 13.50	Scheduling	0.04%	Project Size		\$13,400.00
01 32 33.50	Site Documentation	5	Day	1375	\$6,875.00
02 22 08.00	4 Dumpsters	65	Wks	610	\$158,600.00
01 56 32.50	Watchman, WMATA Track	1600	Hrs.	18.18	\$29,088.00
01 58 13.50	Signs	64	SF	16.55	\$1,059.20
01 74 13.20	Clean Up by Floor	8.3	MSF	19.77	\$164.09
01 74 13.20	Final Cleaning	126	MSF	40.28	\$5,075.28
	Miscellaneous Subtotal				\$381,761.57
	Grand Total				\$5,004,865.42
01 22 55.50	Subtract 2% Due to Experience				\$4,904,768.11
	Location Factor Adjustment			0.94	
	Adjusted Grand Total				\$4,610,482.03



Protected City Fire Hydrant

Carlyle Towers: 193.5 ft.

WMATA Metro Tracks

On Site Staging Area

On Site Trailers

Electrical Transformers & Utilities

Construction Traffic

Loading Access

Tower Crane & Crane Swing

Building Footprint: Residence Inn Marriott 15 Stories, 171 ft.

Mill Rd.

Site Boundary Fence

Dumpsters

Public Traffic Directions

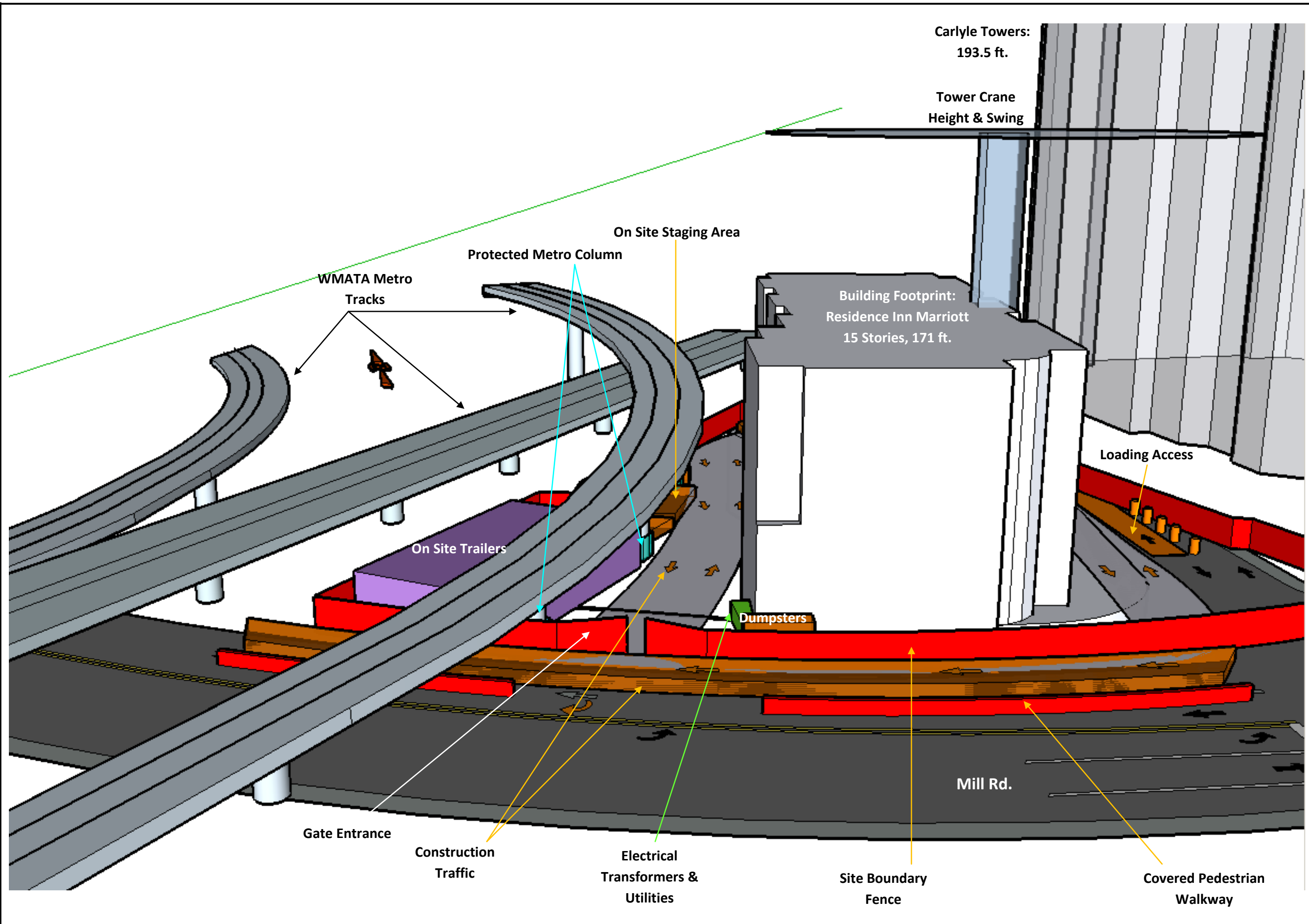
Covered Pedestrian Walkway



Residence Inn by Marriott
 2345 Mill Rd., Alexandria, VA.

Drawn by:
 Julia E. Phillips
 Construction Management
 Penn State University

Superstructure
 Phase Plan
 S - 100



Carlyle Towers:
193.5 ft.
Tower Crane
Height & Swing

Building Footprint:
Residence Inn Marriott
15 Stories, 171 ft.

WMATA Metro
Tracks

Protected Metro Column

On Site Staging Area

On Site Trailers

Dumpsters

Loading Access

Mill Rd.

Gate Entrance

Construction
Traffic

Electrical
Transformers &
Utilities

Site Boundary
Fence

Covered Pedestrian
Walkway

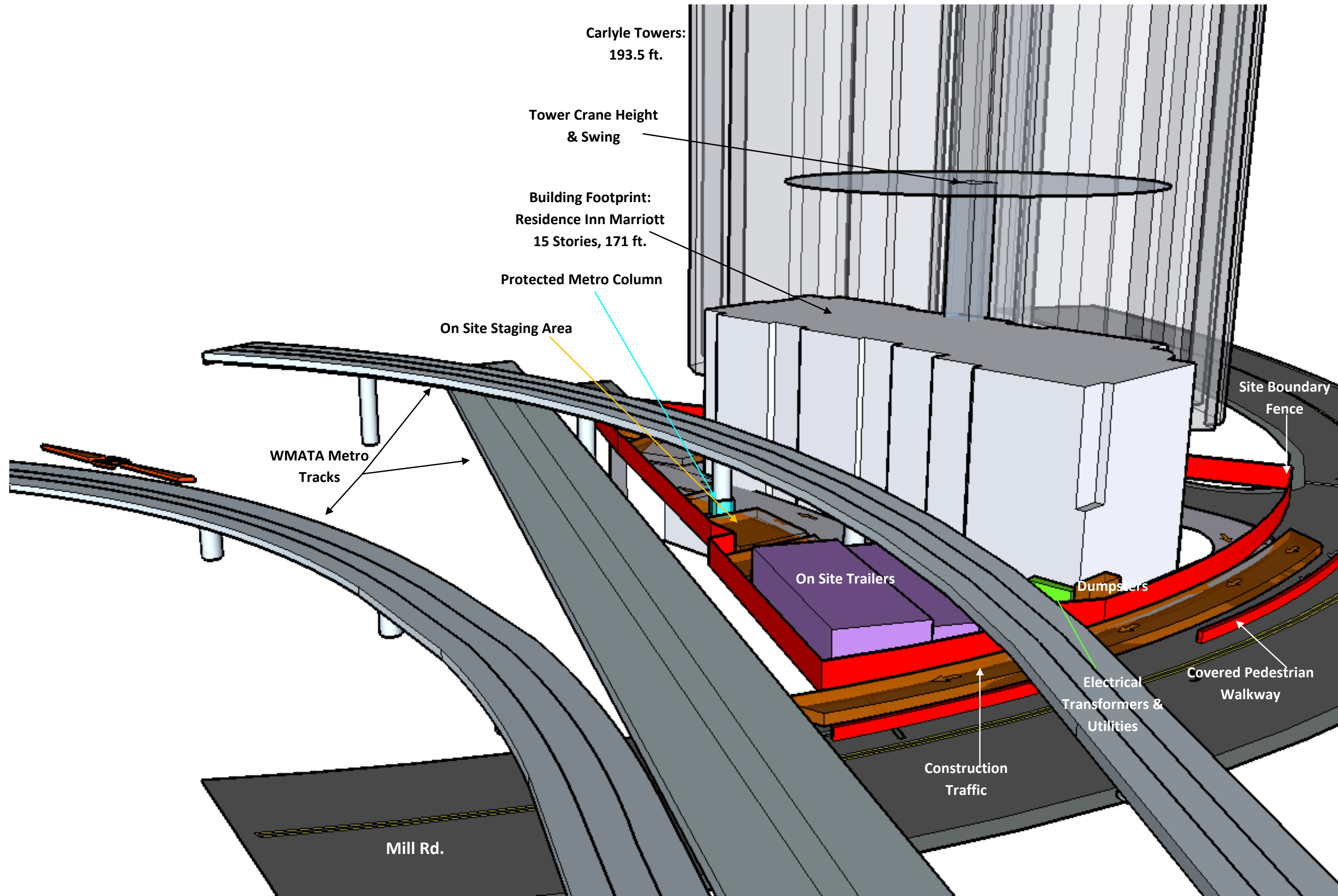


Residence Inn by Marriott
2345 Mill Rd., Alexandria, VA.

Drawn by:
Julia E. Phillips
Construction Management

Penn State University

Construction
Entrance
S - 200

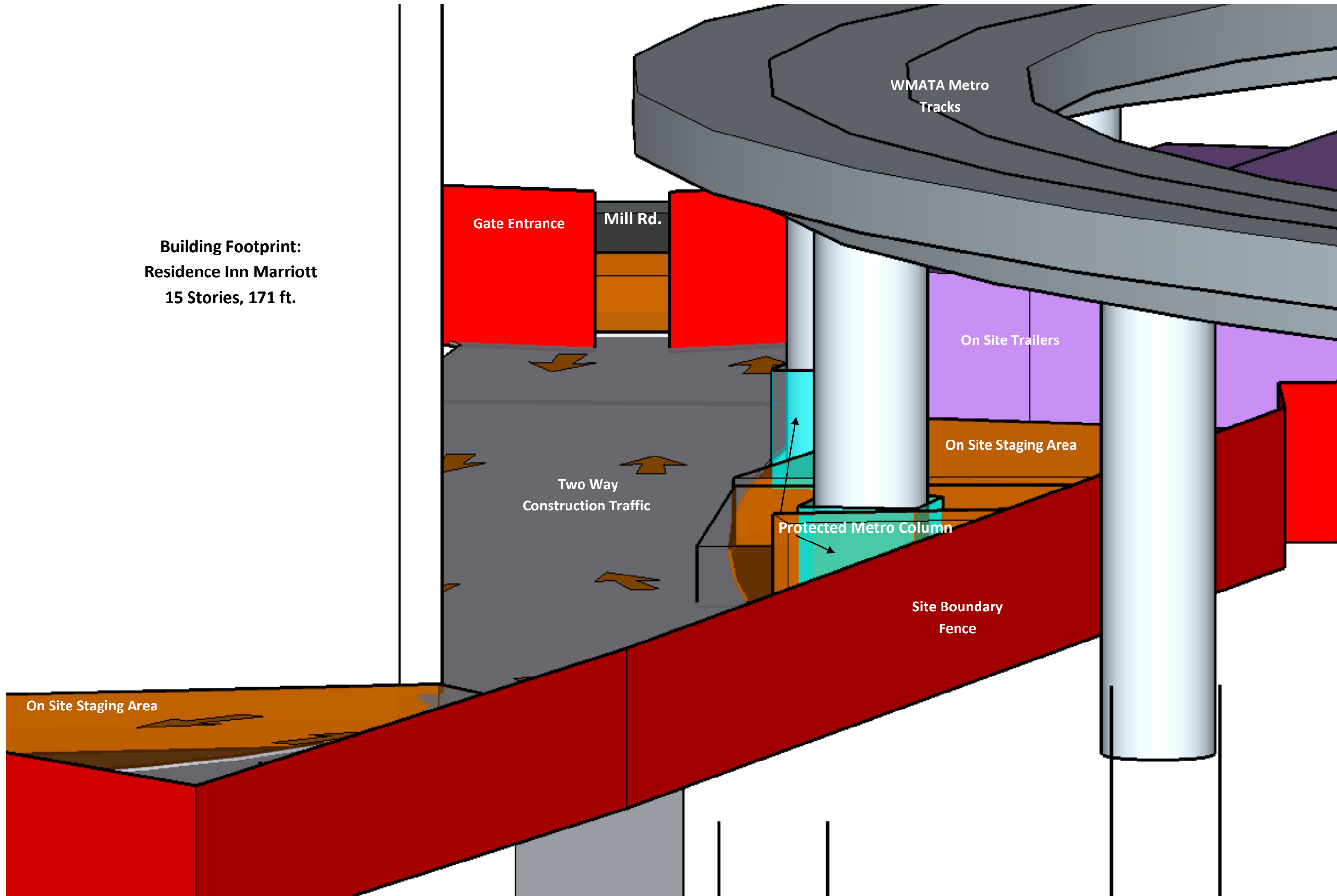


Residence Inn by Marriott
2345 Mill Rd., Alexandria, VA.

Drawn by:
Julia E. Phillips
Construction Management
Penn State University

Metro Aerial
View
S - 300

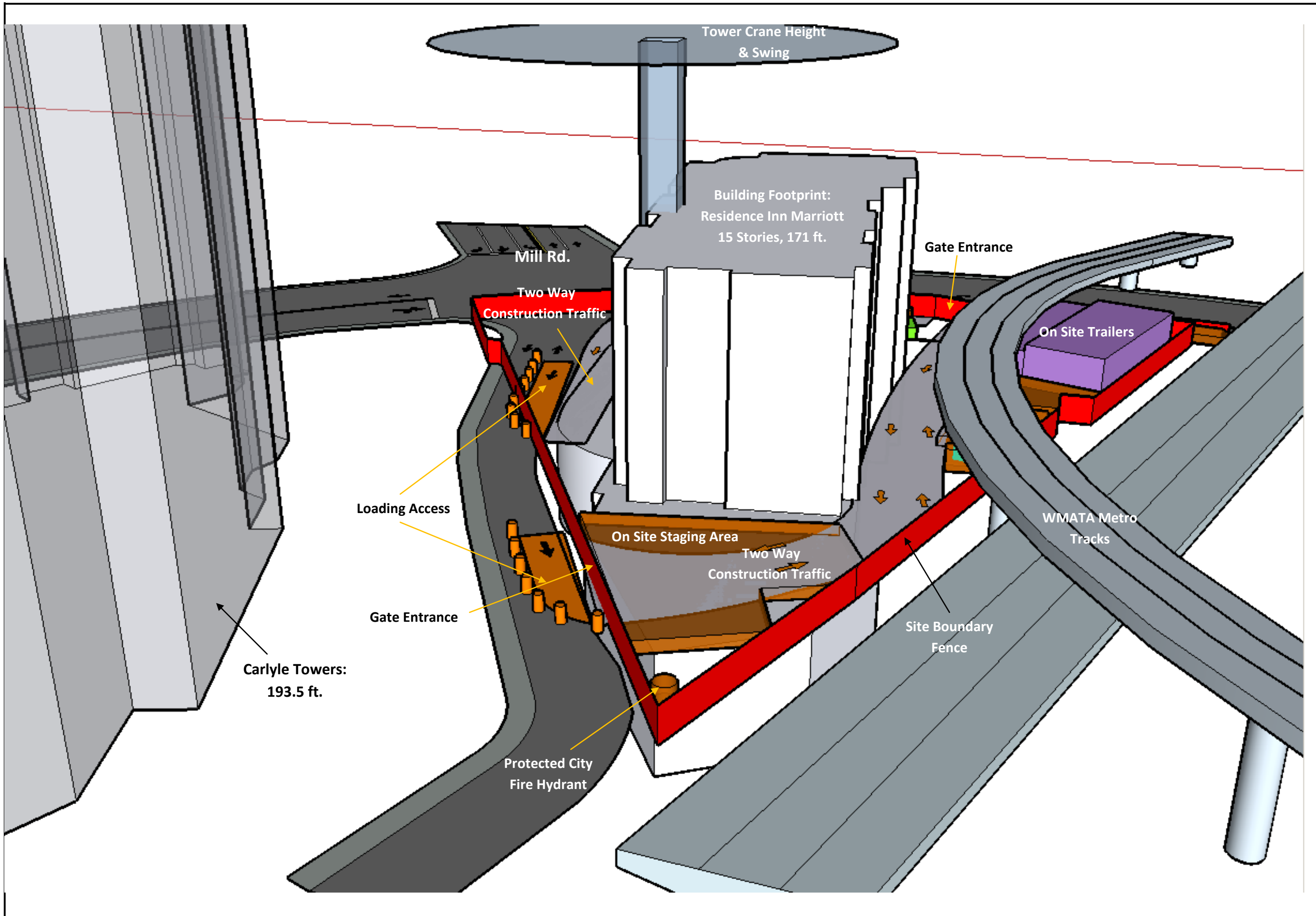
**Building Footprint:
Residence Inn Marriott
15 Stories, 171 ft.**



**Residence Inn by Marriott
2345 Mill Rd., Alexandria, VA.**

**Drawn by:
Julia E. Phillips
Construction Management
Penn State University**

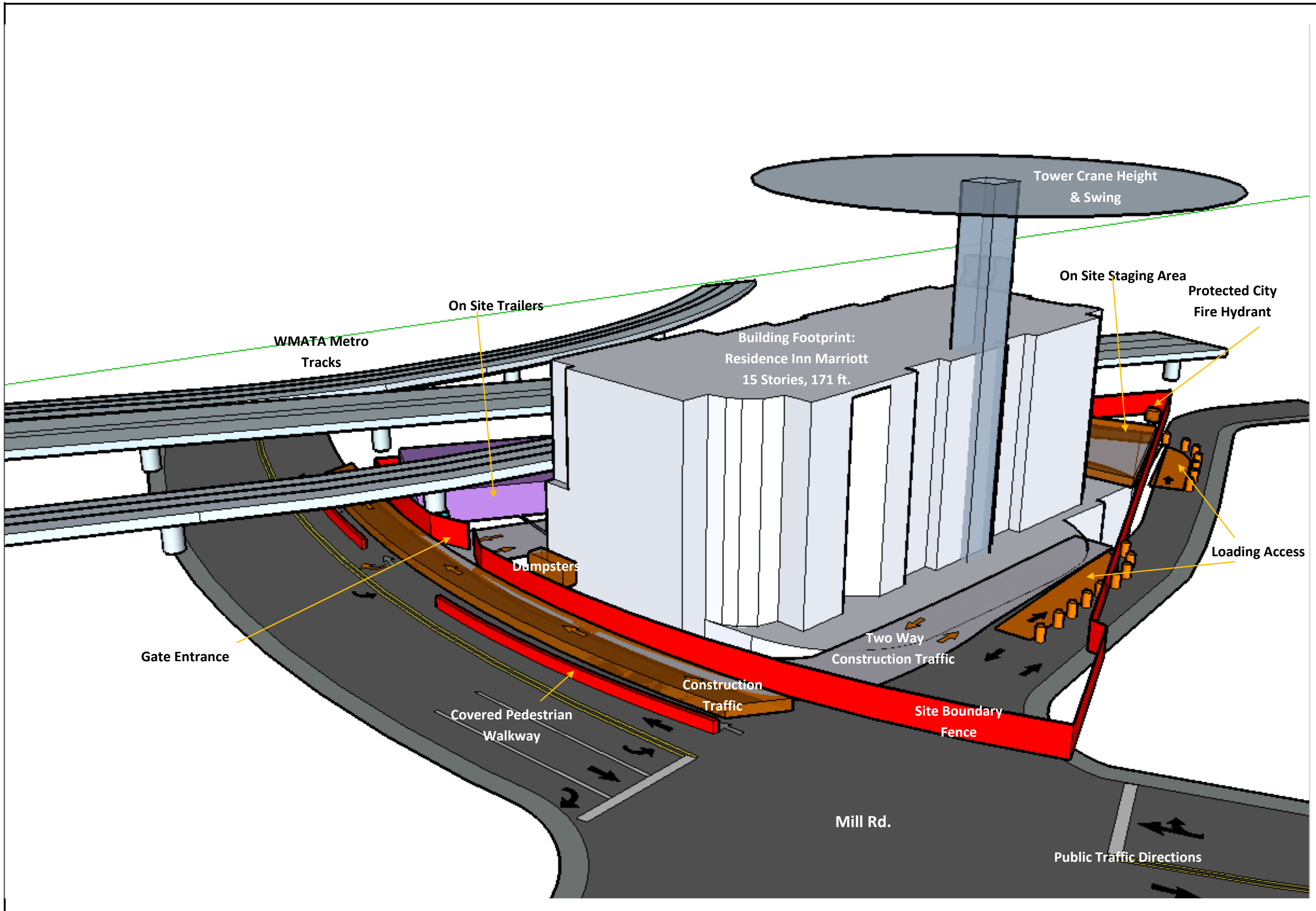
**Detailed Rear
View
S - 400**



Residence Inn by Marriott
 2345 Mill Rd., Alexandria, VA.

Drawn by:
 Julia E. Phillips
 Construction Management
 Penn State University

Expanded Rear View
 S - 500



Residence Inn by Marriott
2345 Mill Rd., Alexandria, VA.

Drawn by:
Julia E. Phillips
Construction Management
Penn State University

Arial Side View
S - 600

RESIDENCE INN
 BY MARRIOTT
 2345 MILL RD, ALEXANDRIA, VA
 JULIA E. PHILLIPS
 CONSTRUCTION MANAGEMENT

DETAILED STRUCTURAL SYSTEMS ESTIMATE
 APPENDIX D



Mat Slab Concrete Reinforcing						
Bar No.	Length (LF)	Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost
#7	2376	4856.54	2.43	850	630	\$3,593.84
#8	16984	45347.28	22.67	805	365	\$26,528.16
#9	29670	100878.00	50.44	805	365	\$59,013.63
#10	3285	14135.36	7.07	805	365	\$8,269.18
#11	2288	12156.14	6.08	805	365	\$7,111.34
Total		177373.32	88.69			\$104,516.16

Cast In Place Slab Concrete Reinforcing						
Bar No.	Length (LF)	Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost
#4	36842	24610.46	12.31	950	455	\$17,288.85
#5	11842.2	12351.41	6.18	950	455	\$8,676.87
#6	2281	3426.06	1.71	950	455	\$2,406.81
#7	185	378.14	0.19	950	455	\$265.64
#9	165	561.00	0.28	950	455	\$394.10
Total		41327.07	20.66			\$29,032.27

RESIDENCE INN
 BY MARRIOTT
 2345 MILL RD, ALEXANDRIA, VA
 JULIA E. PHILLIPS
 CONSTRUCTION MANAGEMENT

DETAILED STRUCTURAL SYSTEMS ESTIMATE
 APPENDIX D



Post Tensioned Slab Concrete Reinforcing						
Bar No.	Length (LF)	Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost
#4	8447	5642.60	2.82	950	455	\$3,963.92
#5	4748	4952.16	2.48	950	455	\$3,478.90
Total	13195	10594.76	5.30			\$7,442.82

Mat Slab Concrete Volume						
Depth (IN)	Area (SF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost
4	14300	176.54	174	70	0.38	\$43,143.63
30	1414	130.93	174	70	0.38	\$31,995.68
36	4696	521.78	174	70	0.38	\$127,512.05
48	8190	1213.33	174	70	0.38	\$296,514.40
Total		2042.58				\$499,165.76

RESIDENCE INN
 BY MARRIOTT
 2345 MILL RD, ALEXANDRIA, VA
 JULIA E. PHILLIPS
 CONSTRUCTION MANAGEMENT

DETAILED STRUCTURAL SYSTEMS ESTIMATE
 APPENDIX D



Cast In Place Slab & Drop Panel Concrete Volume							
Panel No.	Depth (IN)	Area (SF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost
	8	14292	352.89	274	150	14.3	\$154,671.20
	14	408	17.63	274	150	14.3	\$7,727.07
D 1 (7)	5.5	80	9.51	274	150	14.3	\$4,166.56
D 2 (3)	5.5	80	4.07	274	150	14.3	\$1,785.67
D 3 (1)	5.5	64	1.09	274	150	14.3	\$476.18
D 4 (1)	5.5	88	1.49	274	150	14.3	\$654.74
D 5 (3)	5.5	100	5.09	274	150	14.3	\$2,232.08
D 6 (1)	5.5	110	1.87	274	150	14.3	\$818.43
Total			393.64				\$172,531.93

Post Tensioned Slab Concrete Volume						
Depth (IN)	Area (SF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost
7.5	8300	192.13	248	155	14.7	\$80,252.55

RESIDENCE INN
 BY MARRIOTT
 2345 MILL RD, ALEXANDRIA, VA
 JULIA E. PHILLIPS
 CONSTRUCTION MANAGEMENT

DETAILED STRUCTURAL SYSTEMS ESTIMATE
 APPENDIX D



Cast In Place Shear Wall - Cast In Place Floor

Length (LF)	Height (LF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost	
58	10	21.48	166	127	13.63	\$6,586.87	
Reinforcing							
		Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost	
		70#7	1432.51	0.72	850	440	\$923.97
		44#4	24.50	0.01	850	440	\$15.80
			0.73				\$939.77

Cast In Place Walls - Cast In Place Floor

Length (LF)	Height (LF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost	
559	10	207.04	166	127	13.63	\$63,483.77	
Reinforcing							
		Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/TON)	Total Cost	
		210#6	3157.36	1.58	850	440	\$2,036.50
		420#4	233.88	0.12	850	440	\$150.85
			1.70				\$2,187.35



Post Tensioned Slab Concrete Beams																
Beam No.	Width (IN)	Depth (IN)	Length (LF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost	Reinforcing			Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/CY)	Total Cost
									Top	Bottom	Stirrups					
B - 1	8	18	8	0.30	325	400	39.5	\$226.52	2#6	2#6	#3	56.41	0.03	895	825	\$48.51
B - 2	12	24	10	0.74	325	400	39.5	\$566.30	3#7	3#9	#3	166.40	0.08	895	825	\$143.10
B - 3	8	18	8	0.30	325	400	39.5	\$226.52	2#6	2#6	#3	56.41	0.03	895	825	\$48.51
B - 4	8	18	10	0.37	325	400	39.5	\$283.15	2#6	2#6	#3	77.93	0.04	895	825	\$67.02
B - 5	8	24	16	0.79	325	400	39.5	\$604.05	2#7	2#7	#3	138.98	0.07	895	825	\$119.52
B - 6	12	18	8	0.44	325	400	39.5	\$339.78	3#5	3#5	#3	61.27	0.03	895	825	\$52.69
B - 7	12	18	8	0.44	325	400	39.5	\$339.78	3#5	3#5	#3	61.27	0.03	895	825	\$52.69
B - 8	12	18	12	0.67	325	400	39.5	\$509.67	3#8	3#6	#3	144.44	0.07	895	825	\$124.22
B - 9	12	18	12	0.67	325	400	39.5	\$509.67	3#8	3#6	#3	144.44	0.07	895	825	\$124.22
B - 16	10	32	20	1.65	325	400	39.5	\$1,258.44	2#8	2#8	#4	281.10	0.14	895	825	\$241.75
Total				6.36				\$4,863.86				1188.64	0.59			\$1,022.23

Cast In Place Slab Concrete Beams																
Beam No.	Width (IN)	Depth (IN)	Length (LF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost	Reinforcing			Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/CY)	Total Cost
									Top	Bottom	Stirrups					
GB - 1	8	18	8	0.30	325	400	39.5	\$226.52	2#6	2#6	#3	57.78	0.03	895	825	\$49.69
GB - 3	8	18	12	0.44	325	400	39.5	\$339.78	3#7	3#8	#3	172.50	0.09	895	825	\$148.35
GB - 4	8	18	8	0.30	325	400	39.5	\$226.52	2#6	2#6	#3	57.78	0.03	895	825	\$49.69
GB - 5	8	24	16	0.79	325	400	39.5	\$604.05	2#6	2#6	#3	113.82	0.06	895	825	\$97.88
GB - 6	18	30	14	1.94	325	400	39.5	\$1,486.53	3#7	3#7	#4	215.93	0.11	895	825	\$185.70
GB - 7	18	24	20	2.22	325	400	39.5	\$1,698.89	3#7	3#7	#4	258.35	0.13	895	825	\$222.18
GB - 8	8	18	7	0.26	325	400	39.5	\$198.20	2#6	2#6	#3	50.22	0.03	895	825	\$43.19
GB - 9	8	18	7	0.26	325	400	39.5	\$198.20	2#6	2#6	#3	50.22	0.03	895	825	\$43.19
GB - 10	12	24	20	1.48	325	400	39.5	\$1,132.59	3#6	3#7	#3	229.03	0.11	895	825	\$196.97
GB - 11	12	18	18	1.00	325	400	39.5	\$764.50	3#5	3#5	#3	137.45	0.07	895	825	\$118.20
GB - 13	12	24	14	1.04	325	400	39.5	\$792.81	3#7	3#7	#3	160.34	0.08	895	825	\$137.89
GB - 14	12	24	15	1.11	325	400	39.5	\$849.44	3#6	3#6	#3	148.35	0.07	895	825	\$127.58
GB - 15	24	24	29	4.30	325	400	39.5	\$3,284.52	2#7, 4#7	5#8	#3	703.21	0.35	895	825	\$604.76
GB - 16	24	24	29	4.30	325	400	39.5	\$3,284.52	2#7, 4#7	5#8	#3	703.21	0.35	895	825	\$604.76
GB - 17	36	36	32	10.67	325	400	39.5	\$8,154.67	4#9, 4#9, 4#9	6#11	#4	2249.51	1.12	895	825	\$1,934.58
GB - 18	26	69	22	10.15	325	400	39.5	\$7,760.62	2#9, 2#9, 2#9	5#10	#4	1062.44	0.53	895	825	\$913.70
Total				40.55				\$31,002.36				6370.13	3.19			\$5,478.32



Post Tensioned Slab Concrete Columns															
Column No.	Width (IN)	Depth (IN)	Height (LF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost	Reinforcing		Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/CY)	Total Cost
									Bars	Ties					
A - 1	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
C - 2.5	12	30	9.25	0.86	325	400	39.5	\$654.78	6#8	10#3	171.40	0.09	895	880	\$152.12
C - 4	14	24	9.25	0.80	325	400	39.5	\$611.13	6#7	8#3	133.62	0.07	895	880	\$118.59
C - 4.6	14	24	9.25	0.80	325	400	39.5	\$611.13	6#7	8#3	133.62	0.07	895	880	\$118.59
C - 5.3	14	24	9.25	0.80	325	400	39.5	\$611.13	6#7	8#3	133.62	0.07	895	880	\$118.59
C - 6	14	24	9.25	0.80	325	400	39.5	\$611.13	6#7	8#3	133.62	0.07	895	880	\$118.59
C - 7	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
D - 1	30	14	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
E - 2	24	28	9.25	1.60	325	400	39.5	\$1,222.26	8#8	7#3	229.37	0.11	895	880	\$203.56
E - 4	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
E - 4.6	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
E - 5.3	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
E - 6	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
E - 7	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
E.5 - 1	30	14	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
F - 1	28	18	9.25	1.20	325	400	39.5	\$916.69	8#8	7#3	226.74	0.11	895	880	\$201.23
G - 5.6	12	24	9.25	0.69	325	400	39.5	\$523.82	6#7	10#3	155.69	0.08	895	880	\$138.17
G - 6	12	24	9.25	0.69	325	400	39.5	\$523.82	6#7	10#3	155.69	0.08	895	880	\$138.17
H - 1.5	18	28	9.25	1.20	325	400	39.5	\$916.69	8#8	7#3	226.74	0.11	895	880	\$201.23
H - 2	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
H - 3	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
H - 3.7	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
H - 4.3	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
H - 5	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
H - 5.6	12	24	9.25	0.69	325	400	39.5	\$523.82	6#7	10#3	155.69	0.08	895	880	\$138.17
H - 6	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
H - 7	14	30	9.25	1.00	325	400	39.5	\$763.91	6#8	8#3	171.40	0.09	895	880	\$152.12
Total				26.09				\$19,948.97			4598	2.30			\$4,080.89



Cast In Place Slab Concrete Columns															
Column No.	Width (IN)	Depth (IN)	Height (LF)	Concrete (CY)	Unit Cost (\$/CY)	Labor Cost (\$/CY)	Equipment Cost (\$/CY)	Total Cost	Reinforcing		Steel (LBS)	Steel (TONS)	Unit Cost (\$/TON)	Labor Cost (\$/CY)	Total Cost
									Bars	Ties					
A - 1	14	30	10	1.08	325	400	39.5	\$825.85	6#8	10#3	194.20	0.10	895	880	\$172.35
C - 2.5	12	30	10	0.93	325	400	39.5	\$707.87	6#8	10#3	194.20	0.10	895	880	\$172.35
C - 4	14	24	10	0.86	325	400	39.5	\$660.68	6#7	9#3	145.34	0.07	895	880	\$128.99
C - 4.6	14	24	10	0.86	325	400	39.5	\$660.68	6#7	9#3	145.34	0.07	895	880	\$128.99
C - 5.3	14	24	10	0.86	325	400	39.5	\$660.68	6#7	9#3	145.34	0.07	895	880	\$128.99
C - 6	14	24	10	0.86	325	400	39.5	\$660.68	6#7	9#3	145.34	0.07	895	880	\$128.99
C - 7	14	30	10	1.08	325	400	39.5	\$825.85	6#8	9#3	190.82	0.10	895	880	\$169.35
D - 1	30	18	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
E - 2	24	28	10	1.73	325	400	39.5	\$1,321.36	8#11	6#4	452.39	0.23	895	880	\$401.49
E - 4	18	30	10	1.39	325	400	39.5	\$1,061.81	8#11	7#4	449.49	0.22	895	880	\$398.92
E - 4.6	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
E - 5.3	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
E - 6	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
E - 7	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
E.5 - 1	30	18	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
F - 1	28	18	10	1.30	325	400	39.5	\$991.02	8#8	8#3	245.41	0.12	895	880	\$217.80
G - 5	12	24	10	0.74	325	400	39.5	\$566.30	8#8	10#3	243.90	0.12	895	880	\$216.46
G - 6	22	32	10	1.81	325	400	39.5	\$1,384.28	20#11	6#4	1117.61	0.56	895	880	\$991.88
G - 6.5	12	24	10	0.74	325	400	39.5	\$566.30	6#7	10#3	152.86	0.08	895	880	\$135.66
G - 6.9	12	24	10	0.74	325	400	39.5	\$566.30	6#7	10#3	152.86	0.08	895	880	\$135.66
H - 1	18	28	10	1.30	325	400	39.5	\$991.02	8#10	7#3	360.86	0.18	895	880	\$320.27
H - 2	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
H - 3	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
H - 3.7	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
H - 4.3	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
H - 5	18	36	10	1.67	325	400	39.5	\$1,274.17	14#11	7#4	805.71	0.40	895	880	\$715.07
H - 6	18	36	10	1.67	325	400	39.5	\$1,274.17	20#11	7#4	1141.66	0.57	895	880	\$1,013.23
H - 7	14	30	10	1.08	325	400	39.5	\$825.85	6#8	9#3	190.82	0.10	895	880	\$169.35
E.1 - 9	18	24	10	1.11	325	400	39.5	\$849.44	8#11	7#4	448.71	0.22	895	880	\$398.23
F.1 - 10	18	24	10	1.11	325	400	39.5	\$849.44	8#11	7#4	448.71	0.22	895	880	\$398.23
G.1 - 8	18	24	10	1.11	325	400	39.5	\$849.44	8#11	7#4	448.71	0.22	895	880	\$398.23
G.1 - 10	18	24	10	1.11	325	400	39.5	\$849.44	8#11	7#4	448.71	0.22	895	880	\$398.23
H.5 - 6	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
K - 3	24	24	10	1.48	325	400	39.5	\$1,132.59	12#11	6#4	649.44	0.32	895	880	\$576.38
K - 6	18	30	10	1.39	325	400	39.5	\$1,061.81	6#9	7#3	228.41	0.11	895	880	\$202.71
Total				43.29				\$33,096.87			11659.33	5.83			\$10,347.66

RESIDENCE INN
 BY MARRIOTT
 2345 MILL RD, ALEXANDRIA, VA
 JULIA E. PHILLIPS
 CONSTRUCTION MANAGEMENT

DETAILED STRUCTURAL SYSTEMS ESTIMATE
 APPENDIX D



HVAC Equipment		
Description	QTY	Cost
Air Cooled Chiller	1	\$85,880.00
Indoor Central Station Air Handling Unit	1	\$16,200.00
Make Up Air Units	2	\$99,700.00
Air Handling Unit VFD's	12	\$19,500.00
AC Split System	1	\$13,000.00
Vertical Fan Coil Units	189	\$202,840.00
Fan Powered Boxes	21	\$19,910.00
Through Wall AC Units	3	\$2,750.00
Electric Unit Heaters	7	\$4,000.00
Copper Finn Water Tube Boilers, Gas Fired	2	\$26,840.00
Condenser Water Pumps	1	\$5,992.00
Inline Pumps	3	\$4,214.00
Shell & Tube Heat Exchanger	2	\$16,525.00
Expansion Tank	2	\$1,193.00
Wall Mount Electric Unit Heater	49	\$3,000.00
Exhaust Fans	22	\$46,420.00
Moderized Dampers	17	\$4,000.00
Louvers	10	\$3,600.00
Boiler Vents	2	\$1,200.00
Fire & Smoke Dampers	67	\$38,160.00
Sound Attenuator	1	\$600.00
Lined Plenum Slots	94	\$3,000.00
Guestroom GRD's	272	\$6,800.00
Public GRD's	112	\$2,800.00
HVAC Equipment Total		\$628,124.00

RESIDENCE INN
BY MARRIOTT
2345 MILL RD, ALEXANDRIA, VA
JULIA E. PHILLIPS
CONSTRUCTION MANAGEMENT

DETAILED STRUCTURAL SYSTEMS ESTIMATE
APPENDIX D



Sheet Metal Equipment			
Description	QTY	Unit	Cost
Rectangular Duct	35908	Lbs.	\$30,222.74
Round Duct	7729	Lbs.	\$26,577.86
Flex Duct	710	Lbs.	\$673.31
Rectangular Duct Hangers	1025	Lbs.	\$2,363.67
Round Duct Hangers	160	Lbs.	\$157.49
Flex Duct Hangers	39	Lbs.	\$39.14
Access Panels	22 (22)	EA	\$484.00
ID Tags	46 (5)	EA	\$230.00
Roof Curbs	3	Lbs.	\$625.00
Slab Inserts	160 (5)	EA	\$800.00
Sheet Metal Equipment Total			\$62,173.21

RESIDENCE INN
 BY MARRIOTT
 2345 MILL RD, ALEXANDRIA, VA
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 CONSTRUCTION MANAGEMENT

DETAILED STRUCTURAL SYSTEMS ESTIMATE
 APPENDIX D



Plumbing Equipment & Fixtures		
Description	QTY	Cost
Duplex Sump Pump	1	\$8,000.00
Sewer Ejector	1	\$3,500.00
Elevated Sump Pump	1	\$3,000.00
Duplex Booster Pump	1	\$32,500.00
Grease Interceptor	1	\$1,800.00
Oil Interceptor	1	\$6,500.00
Water Heaters	4	\$40,000.00
Expansion Tank	1	\$1,500.00
Recirculation Pumps	3	\$1,800.00
Mixing Valves	2	\$4,000.00
Water Closets	183	\$29,913.00
Water Closets ADA	12	\$2,978.00
Lavatories	188	\$28,960.00
Lavatories ADA	7	\$1,288.00
Bath Tubs	181	\$46,517.00
Bath Tubs ADA	7	\$1,855.00
Sinks	181	\$45,974.00
Heat Trace	1534	\$11,505.00
ID Tags	300	\$2,400.00
Valve Tags	375	\$1,875.00
Aerators	137	\$11,645.00
Fire Stopping Sleeves	1747	\$24,021.00
Closet Flanges	182	\$3,649.00
Tub Boxes	182	\$4,323.00
Aerator Boxes	182	\$6,734.00
Plumbing Equipment & Fixtures Total		\$326,237.00



General Conditions					
Division	Description	QTY	Unit	Cost / Unit	Total Cost
	Engineering Fees				
01 11 31.10	Architectural Fee	1			\$464,000.00
01 11 31.30	Structural Fee	1			\$126,000.00
	Fee Subtotal				\$590,000.00
01 31 13.40	Main Office Expense	3.00%	% Volume		\$1,500,000.00
01 11 31.20	Construction Management Fee	2.00%	Project Size		\$670,000.00
	CM Expense Subtotal				\$2,170,000.00
	Field Office Support				
01 52 13.20	On Site Trailer	16	Month	375	\$6,000.00
01 52 13.40	Office Equipment	16	Month	150	\$2,400.00
01 52 13.40	Office Supplies	16	Month	95	\$1,520.00
01 52 13.40	Telephone	16	Month	210	\$3,360.00
01 52 13.40	Lights & HVAC	16	Month	110	\$1,760.00
	Field Office Personnel				
01 31 13.20	1 Clerk	65	Wks	239	\$15,535.00
01 31 13.20	3 Field Engineer	65	Wks	740	\$144,300.00
01 31 13.20	2 Project Manager	65	Wks	1200	\$156,000.00
01 31 13.20	1 Superintendent	65	Wks	1125	\$73,125.00
	Field / Staffing Subtotal				\$404,000.00
	Insurance / Bonds				
01 31 13.30	Builders Risk	0.25%	Project Size		\$83,750.00
01 31 13.30	Performance Bond	0.60%	Project Size		\$201,000.00
01 21 16.50	Construction Contingency	3.00%	Project Size		\$1,005,000.00
	Insurance / Bonds / Contingency Subtotal				\$1,289,750.00
	Temporary Utilities				
01 51 13.80	Heat	1245	CSF Flr.	12.12	\$15,089.40
01 51 13.80	Lighting	1245	CSF Flr.	10.88	\$13,545.60
01 51 13.80	Power for Lighting	1245	CSF Flr.	0.75	\$933.75
01 51 13.80	Power for Construction	1245	CSF Flr.	80	\$99,600.00
01 51 13.80	Toilets	16	Month	150	\$2,400.00
	Utilities Subtotal				\$131,568.75
	Temporary Barricades				
01 56 13.60	Fire Resistant Tarpaulins	61500	SF	0.4	\$24,600.00
01 56 23.10	Precast Jersey Barriers	100	LF	32.43	\$3,243.00
01 56 29.50	Plywood Walkway Protection	400	SF	0.57	\$228.00
	Temporary Fencing				
01 56 26.50	Chain Link, 6' high	455	LF	7.68	\$3,494.40
01 56 26.50	Plywood, 8' high	410	LF	15.17	\$6,219.70
	Barricades / Fencing Subtotal				\$37,785.10
	Miscellaneous				
01 41 26.50	Permits	0.50%	Project Size		\$167,500.00
01 32 13.50	Scheduling	0.04%	Project Size		\$13,400.00
01 32 33.50	Site Documentation	5	Day	1375	\$6,875.00
02 22 08.00	4 Dumpsters	65	Wks	610	\$158,600.00
01 56 32.50	Watchman, WMATA Track	1600	Hrs.	18.18	\$29,088.00
01 58 13.50	Signs	64	SF	16.55	\$1,059.20
01 74 13.20	Clean Up by Floor	8.3	MSF	19.77	\$164.09
01 74 13.20	Final Cleaning	126	MSF	40.28	\$5,075.28
	Miscellaneous Subtotal				\$381,761.57
	Grand Total				\$5,004,865.42
01 22 55.50	Subtract 2% Due to Experience				\$4,904,768.11
	Location Factor Adjustment				0.94
	Adjusted Grand Total				\$4,610,482.03