



TECHNICAL ASSIGNMENT #1: CONSTRUCTION PROJECT MANAGEMENT

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Aloft & Element Hotels at Arundel Mills
Hanover, Maryland

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1.1 Executive Summary

The Aloft and Element hotels are a new brand of hotels specific to Starwood Hotels and Resorts Worldwide. The Aloft & Element Hotel project will be located across from the Arundel Mills Mall in Anne Arundel County, which is in close proximity to the Baltimore-Washington International Airport. The project entails the construction of two seven story hotels, as well as, a two story parking structure. The Aloft hotel is a vision of W Hotels and includes 142 guestrooms. The Element hotel is an extended stay hotel and consists of 147 guestrooms. The hotels' designers have taken a stab at sustainability by incorporating a few building components typical to green design. The project team, however, will not attempt to obtain a LEED rating.

The Aloft and Element project has been challenged early on with incomplete construction documents and escalated construction costs. Regardless of the challenges faced, the project team continues to press forward as they attempt to successfully complete their mission. Among others topics, the following technical report will describe several aspects of the Aloft and Element Hotel project at Arundel Mills including the project's schedule, costs, and teams.

1.2 Project Summary Schedule

Please refer to Appendix A of this report to reference the bar chart schedule that compliments this section.

Due to the tight 16 month schedule required by the owner of the Aloft & Element Hotel Project, the construction activities of the buildings have been developed so construction trades are able to complete all work for both the hotels and the parking structure at one time. Most building components, starting with the concrete foundations, will be constructed simultaneously for all three buildings. The steel and hollow core planks of the hotels will then be erected floor by floor upon completion of the foundation work. As the steel and precast planks are being erected for both hotels, the cast-in-place superstructure for the two-level parking garage will be constructed. Upon completion, the parking structure will serve as the primary site of construction parking, as well as, the location for the construction trailer.

While the crane swings the steel and hollow core planks in place, trade workers will follow closely behind their progress, constructing the slabs-on grade and the building enclosure. As the hotels top out, the EPDM roof membrane will be put into place in order to weatherproof the buildings. The MEP and finish trade workers will attempt to stay one step behind the building enclosure as they rough-in and finish the hotels floor by floor.

1.3 Building Systems Summary

The information included within this section describes key aspects of the design and construction that pertain to this project.

Demolition

Prior to the commencement of on-site construction, a residential home, a barn, a shed, and a two-car garage require demolition. The home was demolished in December of 2006. Air-Conditioning units used to cool the pre-existing home required the abatement of Freon at the time of demolition.

Structural Steel Frame

The Aloft & Element Hotels will reach their 7-story pinnacle by the implementation of a structural steel frame with pre-cast concrete planks used for decking. The structural steel frame consists of mainly W-shapes of ASTM A992 steel. The columns and beams of the hotels are braced diagonally by structural steel tubing.

Cast in Place Concrete

The cast in place concrete for this project is mainly reserved for spread footings and SOG's and the parking structure. The concrete spread footings of the Aloft and Element are relatively shallow and vary in size. The SOG's of the hotels are typically 5" in thickness and reinforced with 6" x 6" WWF. The parking structure is primarily a steel reinforced cast in place concrete structure consisting of concrete spread footings, columns, beams, and slabs.

Precast Concrete

Following recent structural trends, the floors of the Aloft & Element hotels implemented the use of 8" precast hollow core planks, rather than the traditional cast in place concrete slabs on steel decking. The precast planks span the beams and girders of floors 2-7 of each hotel.

Mechanical System

Although the norm of a hotel is a Package Terminal Air Conditioner (PTAC) unit located in each guestroom, the mechanical systems of the Aloft and Element defy industry trends by utilizing a forced air system. Each guestroom of the hotels is fitted with a fan coil unit (FCU) which gives each guest the ability to control the temperature of their room separately. The air is forced through the spaces of the buildings by three air handling units (AHU's) located on the roof of each hotel. The AHU's of the Aloft range from 3300 to 10500 cfm in size, while the AHU's in the Element range from 3770 to 11775 cfm. A 3800 cfm ventilation unit located on the first floor of the Aloft hotel forces temperature controlled air through the swimming pool room. Both the hotels and the parking structure have standpipes designed into their fire suppression systems. The fire suppressions systems of the Aloft and Element buildings also contain a water-based sprinkler system throughout.

Electrical System

The electric for the buildings are supplied by underground raceways stemming from a transformer. The Aloft and the Element each contain their own step down transformer supplying a 3-phase, 4-wire, 208/120V secondary service. One 480 kW generator located on the eastern corner of the site provides back up power for both the Aloft and Element buildings.

Curtain Wall

While both hotels contain a considerable amount of storefront, the Aloft hotel will uniquely display a curtain wall on the outside corner of its L-shaped floor plan spanning floors 2-7. This curtain wall supports itself with its 2 ¼" aluminum frame system and contains both spandrel panels and ¼" frosted glass.

1.4 Project Cost Evaluation

Actual costs reported are mere approximations and have been generalized per the request of the owner and general contractor. These values may not be an accurate representation of costs incurred throughout the project.

The actual building construction cost for the Aloft & Element Hotel Project at Arundel Mills is approximately \$32.7 million and \$156.12 per square foot, while the total project costs are approximately \$36 million and \$171.87 per square foot. Table I below provides a breakdown of the site work and approximate costs of each building.

Table I. Approximate Actual Project Costs

CSI DIVISION	ALOFT		ELEMENT		PARKING STRUCTURE		SITE
	Amount	Cost/SF	Amount	Cost/SF	Amount	Cost/SF	Amount
00 Bidding Requirements	NA	NA	NA	NA	NA	NA	NA
01 General Requirements	\$ 900,000	\$ 11.71	\$ 1,000,000	\$ 10.21	\$ 50,000	\$ 1.44	\$ 200,000
02 Site Work	NA	NA	NA	NA	NA	NA	\$ 2,400,000
03 Concrete	\$ 1,100,000	\$ 14.31	\$ 1,300,000	\$ 13.28	\$ 800,000	\$ 23.05	NA
04 Masonry	NA	NA	NA	NA	NA	NA	\$ 20,000
05 Metals	\$ 600,000	\$ 7.80	\$ 600,000	\$ 6.13	\$ 30,000	\$ 0.86	\$ 30,000
06 Wood & Plastics	\$ 400,000	\$ 5.20	\$ 1,200,000	\$ 12.25	NA	NA	NA
07 Thermal & Moisture Protection	\$ 1,000,000	\$ 13.01	\$ 1,200,000	\$ 12.25	\$ 20,000	\$ 0.58	NA
08 Doors & Windows	\$ 1,300,000	\$ 16.91	\$ 1,100,000	\$ 11.23	NA	NA	NA
09 Finishes	\$ 2,800,000	\$ 36.42	\$ 3,800,000	\$ 38.81	\$ 10,000	\$ 0.29	NA
10 Specialties	\$ 100,000	\$ 1.30	\$ 100,000	\$ 1.02	\$ 1,000	\$ 0.03	\$ 10,000
11 Equipment	NA	NA	NA	NA	NA	NA	NA
12 Furnishings	NA	NA	NA	NA	NA	NA	NA
13 Special Construction	\$ 100,000	\$ 1.30	NA	NA	NA	NA	NA
14 Conveying Systems	\$ 20,000	\$ 0.26	\$ 20,000	\$ 0.20	NA	NA	NA
15 Mechanical/Plumbing	\$ 4,000,000	\$ 52.03	\$ 3,700,000	\$ 37.78	\$ 50,000	\$ 1.44	NA
16 Electrical	\$ 2,200,000	\$ 28.61	\$ 1,800,000	\$ 18.38	NA	NA	\$ 300,000
TOTAL	\$14,520,000	\$ 188.86	\$ 15,820,000	\$ 161.56	\$ 961,000	\$ 27.69	\$ 2,960,000

A parametric estimate was prepared for the Aloft & Element project by using D4Cost 2002 Estimating software. A separate D4Cost estimate was prepared for each building on site. The total cost of the project was estimated at \$25.8 million and \$123.35 per square foot using this software. Please refer to Appendix B to view the breakdown of this estimate.

A square foot cost estimate was also prepared using R.S. Means 2007 Square Foot Cost Data. Each of the three buildings to be constructed was estimated separately. The pool room was estimated separately as well, being that the data sheets for hotels did not include costs for a swimming pool. The cost of this pool room has been included in the cost for the Aloft hotel, since it is attached to the Aloft. Table II on the following page reports the estimated construction costs of the buildings. Please also reference Appendix C. to view the R.S. Means data used and Appendix D. to view the calculations implemented which resulted in the totals listed on the following page.

Table II. R.S. Means 2007 Square Foot Estimate

BUILDING	ESTIMATED COST
Aloft*	\$ 11,697,000
Element	\$ 14,197,000
Parking	\$ 1,714,000

*The estimated cost of the Aloft hotel includes the cost of the swimming pool room.

Table III below compares the approximate actual building costs with the estimated costs using D4Cost 2002 and R.S. Means 2007.

Table III. Comparison of Actual Building Costs and Estimated Costs

	ALOFT		ELEMENT		PARKING STRUCTURE		BUILDING TOTAL	
	<i>Amount</i>	<i>Cost/SF</i>	<i>Amount</i>	<i>Cost/SF</i>	<i>Amount</i>	<i>Cost/SF</i>	<i>AMOUNT</i>	<i>COST/SF</i>
Actual*	\$ 14,520,000	\$ 189.86	\$ 15,820,000	\$ 161.56	\$ 961,000	\$ 27.69	\$ 32,700,000	\$ 156.12
D4Cost†	\$ 10,727,143	\$ 139.49	\$ 13,658,941	\$ 139.49	\$ 1,451,260	\$ 41.82	\$ 25,837,344	\$ 123.35
R.S. Means	\$ 11,697,000	\$ 152.14	\$ 14,197,000	\$ 144.98	\$ 1,714,000	\$ 49.39	\$ 27,608,000	\$ 131.81

* Costs are mere approximations.

† Includes site work costs.

The actual reported costs and estimated costs of the project vary greatly. The estimated price of the project using D4Cost 2002 is nearly \$7 million less than the actual costs reported. This large difference can be attributed to fact that the Element hotel is an extended stay hotel with a small kitchen in each guestroom. The projects included in the D4 database were not extended stay hotels. The \$7 million difference can also be attributed to the high-end quality of the state of the art Aloft and Element hotels with many unusual features not found in typical hotels. The hotels used in the D4 estimate were much more typical. The estimate for the building cost using R.S. Means also varies greatly from the actual costs. The R.S Means estimate is more than \$5 million less than the actual costs. This extremely large difference can also be attributed to the extended stay issue and quality issue that were prevalent in the D4 estimate.

It is important to note that the actual cost of the parking structure is much less than the estimates. Data for parking garages was used in calculating both the D4Cost and R.S. Means estimates. The actual parking structure to be built is very basic and does not include many of the intricacies that a typical parking garage may contain.

1.5 Local Conditions

Recently the designers in the Baltimore area have defied traditional steel and cast in place concrete design trends and moved towards steel structures with precast concrete decking. This new structural trend not only cuts down on the schedule, but it is also extremely economical. There is, however, a bit of a learning curve for many building contractors. The general contractor, Whiting-Turner (WT), on this project is no exception. For all members of WT's Aloft and Element project team, the structural system is one that they have never taken part in constructing before.

The availability of construction parking provides a challenge for all parties involved. The site, shown in Appendix E., visually depicts this challenge. Early in the project, most vehicles will be required to park along Teague Road. The construction trailer will also be placed along Teague Road during the early phases. Once the parking structure is complete, most vehicles will be required to utilize the two levels of parking provided by the structure. The job trailer will also later be moved to this location.

Typical to much of Anne Arundel County, the soils found on site range from red stiff clay to silty soil with gravel. Ground water should not be an issue on site, being that the construction site is elevated from much of the surrounding area.

1.6 Client Information

LTD Management, LLC is no stranger to construction. With the addition of several new hotel properties to its assets, LTD plans to expand its revenue to nearly \$1 billion. The addition of the Aloft & Element Hotels will consequently assist them in achieving their goal.

LTD has recently had an extensive list of hotel projects were they have assumed the owner's role. Previously, LTD had brought Whiting-Turner on board as the GC for a hotel project in Fredrick, Maryland. The key to WT landing the Aloft & Element project was WT's mission to treat LTD fairly throughout the previous project, specifically with regards to change orders. As was also the case with the project in Fredrick, LTD has strived to reduce the costs of the Aloft & Element projects with several rounds of value engineering. In order to satisfy LTD, Whiting-Turner had made it their mission to cut costs, keep to a tight schedule, and coordinate with LTD's FF&E installation.

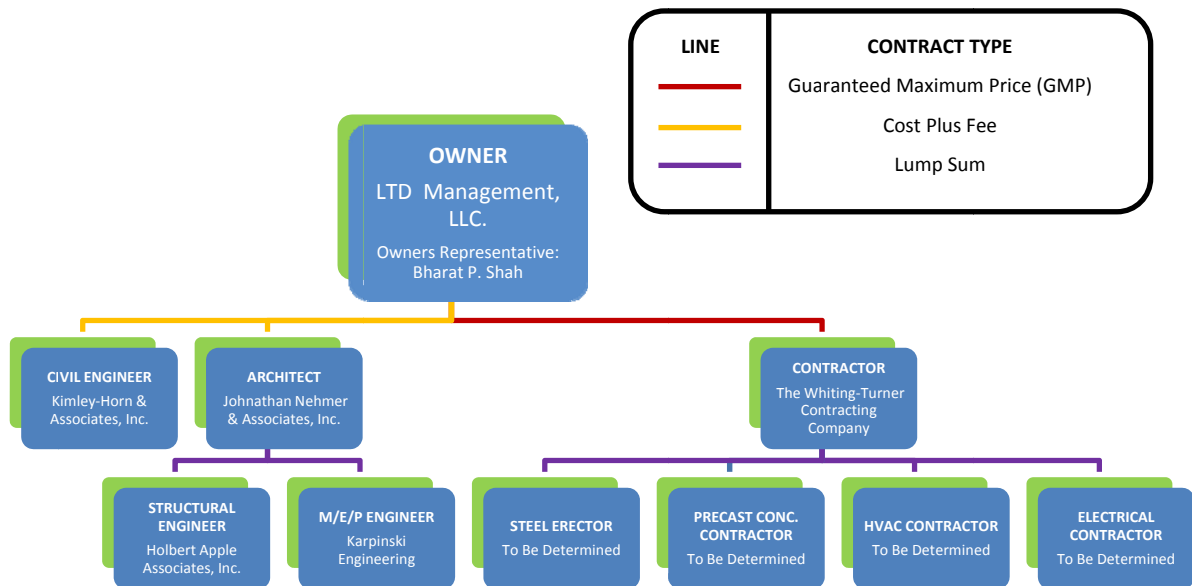
1.7 Project Delivery System

After LTD and Whiting-Turner established a good working relationship from a previous project, LTD came to WT with a plan to build the Aloft & Element hotels. WT gladly assumed the role of a construction manager at risk after they negotiated their fee for constructing the project. By adding their fee to subcontractors' bid proposals, WT will eventually establish a guaranteed maximum price (GMP) for the project. Currently, WT is negotiating prices with subcontractors and will partner up with LTD to award the work of the construction trades. In order to reduce project costs, subcontractors will not be required to obtain a bond and were originally contacted to bid based on their reputation. The selected subcontractors will, however, be required to obtain insurance with limits typical to the Aloft & Element project size.

Aside from the construction side of the project, LTD also holds separate contracts with designers. In an attempt to begin site work early in the project and cut the schedule, LTD contracted with both a civil engineer (Kimley-Horn & Associates, Inc.) and an architect (Jonathan Nehmer & Associates, Inc.).

Figure I below visually depicts the construction manager at risk delivery method implemented in this project. Both the designers and GC have subcontracted out much of the work for the project.

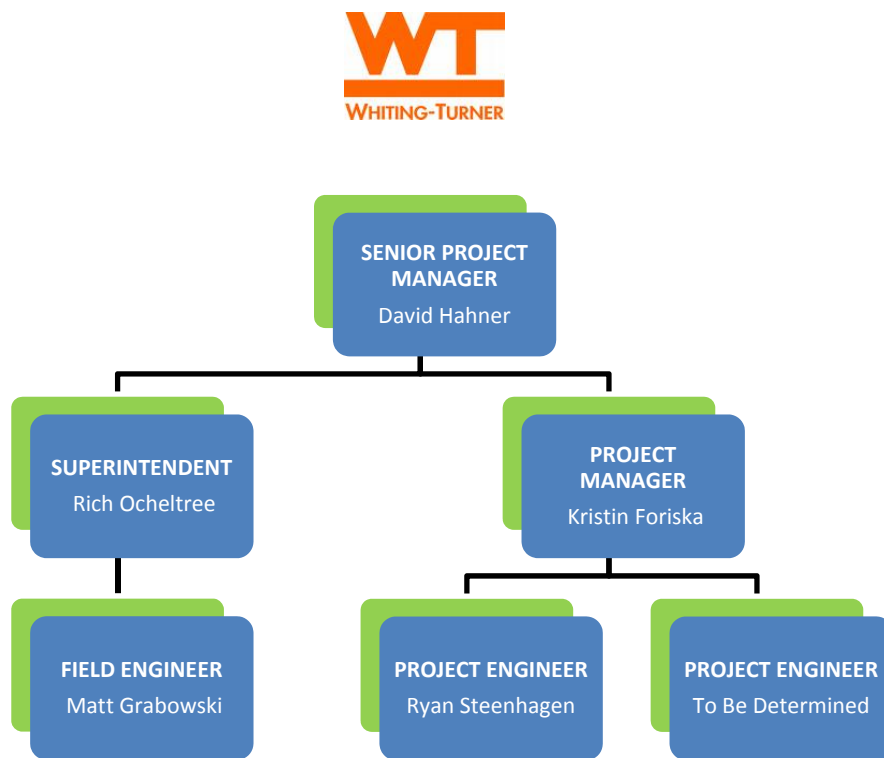
Figure I. Project Organizational Chart



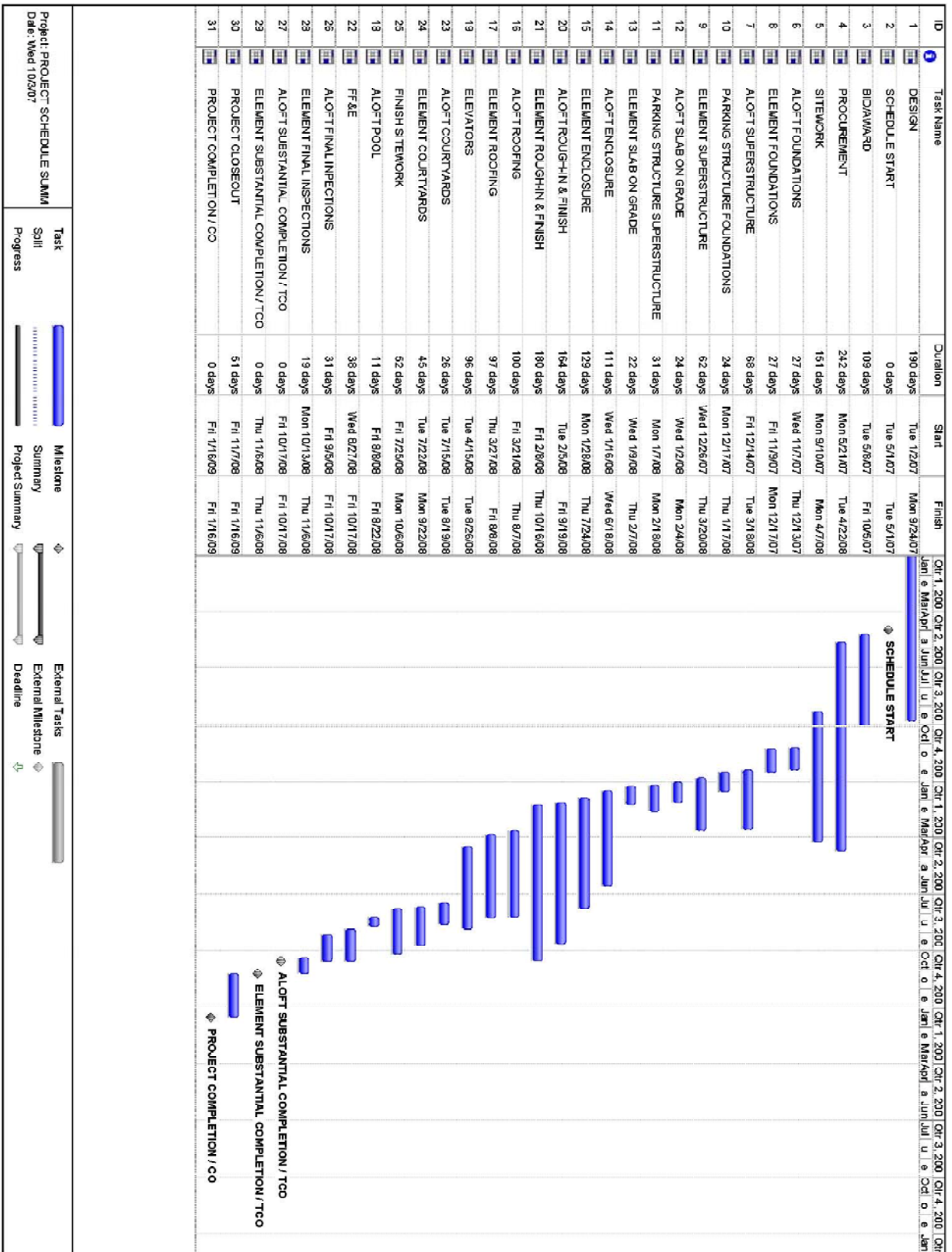
1.8 Staffing Plan

Typical to many Whiting-Turner projects, the senior project manager (SPM) took charge and set out to obtain the Aloft & Element Hotel project at Arundel Mills. Originally the SPM negotiated WT's fee and obligations and later initiated the bidding process. Later, the project manager (PM) took charge of not only the bidding process, but also other aspects including scheduling. Under the supervision of the PM, WT's project and field engineers have assumed the responsibility of bidding out the majority of the trades. Throughout the project, the SPM will oversee construction with biweekly site visits keeping a close eye on progress. The superintendent and PM will work hand in hand during construction. The superintendent will oversee all on site activities, while the PM will manage the cost, schedule, and other activities and will be the primary contact for the owner. The field engineer will provide assistance to the superintendent, while the project engineers will alleviate some of the PM's workload. Please refer to figure II for a chart of Whiting-Turners project staff.

Figure II. Project Staff of Whiting-Turner



Appendix A.
Project Summary Schedule



Appendix B.

Breakdown of D4Cost 2002 Estimate

I. Aloft

Sunday, September 23, 2007

Estimate of Probable Cost

Page 1

Aloft1 - Sep 2007 - MD - Baltimore				
Division		Percent	Sq. Cost	Amount
00	Bidding Requirements	9.79	13.66	1,050,278
	Bidding Requirements	9.79	13.66	1,050,278
02	Site Work	4.14	5.78	444,348
	Site Work	4.14	5.78	444,348
03	Concrete	22.60	31.52	2,423,718
	Concrete	22.60	31.52	2,423,718
04	Masonry	0.30	0.42	32,316
	Masonry	0.30	0.42	32,316
05	Metals	1.51	2.10	161,581
	Metals	1.51	2.10	161,581
06	Wood & Plastics	5.57	7.78	597,850
	Wood & Plastics	5.57	7.78	597,850
07	Thermal & Moisture Protection	3.24	4.52	347,400
	Thermal & Moisture Protection	3.24	4.52	347,400
08	Doors & Windows	5.23	7.29	560,687
	Doors & Windows	5.23	7.29	560,687
09	Finishes	18.61	25.96	1,995,528
	Finishes	18.61	25.96	1,995,528
10	Specialties	0.56	0.78	59,785
	Specialties	0.56	0.78	59,785
13	Special Construction	0.86	1.20	92,101
	Special Construction	0.86	1.20	92,101
14	Conveying Systems	2.14	2.98	229,445
	Conveying Systems	2.14	2.98	229,445
15	Mechanical	14.83	20.68	1,589,959
	Mechanical	14.83	20.68	1,589,959
16	Electrical	10.62	14.82	1,139,147
	Electrical	10.62	14.82	1,139,147
Total Building Costs		100.00	139.49	10,724,144

II. Element

Thursday, October 4, 2007

Estimate of Probable Cost

Page 1

Element1 - Sep 2007 - MD - Baltimore				
Division		Percent	Sq. Cost	Amount
00	Bidding Requirements	9.79	13.66	1,337,699
	Bidding Requirements	9.79	13.66	1,337,699
02	Site Work	4.14	5.78	565,950
	Site Work	4.14	5.78	565,950
03	Concrete	22.60	31.52	3,086,999
	Concrete	22.60	31.52	3,086,999
04	Masonry	0.30	0.42	41,160
	Masonry	0.30	0.42	41,160
05	Metals	1.51	2.10	205,800
	Metals	1.51	2.10	205,800
06	Wood & Plastics	5.57	7.78	761,460
	Wood & Plastics	5.57	7.78	761,460
07	Thermal & Moisture Protection	3.24	4.52	442,470
	Thermal & Moisture Protection	3.24	4.52	442,470
08	Doors & Windows	5.23	7.29	714,126
	Doors & Windows	5.23	7.29	714,126
09	Finishes	18.61	25.96	2,541,629
	Finishes	18.61	25.96	2,541,629
10	Specialties	0.56	0.78	76,146
	Specialties	0.56	0.78	76,146
13	Special Construction	0.86	1.20	117,306
	Special Construction	0.86	1.20	117,306
14	Conveying Systems	2.14	2.98	292,236
	Conveying Systems	2.14	2.98	292,236
15	Mechanical	14.83	20.68	2,025,071
	Mechanical	14.83	20.68	2,025,071
16	Electrical	10.62	14.82	1,450,889
	Electrical	10.62	14.82	1,450,889
Total Building Costs		100.00	139.49	13,658,940

III. Parking Structure

Sunday, September 23, 2007

Page 1

Estimate of Probable Cost

Aloft & Element Parking - Sep 2007 - MD - Baltimore				
Division		Percent	Sq. Cost	Amount
00	Bidding Requirements	3.29	1.37	47,702
	Bidding Requirements	3.29	1.37	47,702
01	General Requirements	8.51	3.56	123,446
	General Requirements	8.51	3.56	123,446
02	Site Work	12.87	5.38	186,771
	Site Work	12.87	5.38	186,771
03	Concrete	54.06	22.61	784,582
	Concrete	54.06	22.61	784,582
04	Masonry	0.61	0.25	8,795
	Masonry	0.61	0.25	8,795
05	Metals	4.28	1.79	62,163
	Metals	4.28	1.79	62,163
06	Wood & Plastics	0.02	0.01	303
	Wood & Plastics	0.02	0.01	303
07	Thermal & Moisture Protection	1.94	0.81	28,222
	Thermal & Moisture Protection	1.94	0.81	28,222
08	Doors & Windows	1.75	0.73	25,348
	Doors & Windows	1.75	0.73	25,348
09	Finishes	0.44	0.19	6,437
	Finishes	0.44	0.19	6,437
10	Specialties	0.20	0.08	2,835
	Specialties	0.20	0.08	2,835
11	Equipment	0.05	0.02	735
	Equipment	0.05	0.02	735
14	Conveying Systems	3.28	1.37	47,590
	Conveying Systems	3.28	1.37	47,590
15	Mechanical	3.06	1.28	44,405
	Mechanical	3.06	1.28	44,405
16	Electrical	5.65	2.36	81,926
	Electrical	5.65	2.36	81,926
Total Building Costs		100.00	41.82	1,451,261

Appendix C.

R.S. Means 2007 Data Sheets

I. Hotel

**COMMERCIAL/INDUSTRIAL/
INSTITUTIONAL**

M.350

Hotel, 4-7 Story



Costs per square foot of floor area

Exterior Wall	S.F. Area	35000	55000	75000	95000	115000	135000	155000	175000	195000
	L.F. Perimeter	314	401	497	555	639	722	754	783	850
Face Brick with Concrete Block Back-up	Steel Frame	159.60	149.60	145.30	141.65	139.90	138.70	136.80	135.30	134.65
	R/Conc. Frame	161.75	151.75	147.45	143.80	142.10	140.85	138.95	137.50	136.90
Glass and Metal Curtain Walls	Steel Frame	153.05	144.30	140.50	137.40	135.90	134.80	133.25	132.05	131.50
	R/Conc. Frame	155.40	146.70	142.85	139.80	138.20	137.20	135.60	134.40	133.90
Precast Concrete Panels	Steel Frame	165.65	154.50	149.75	145.55	143.70	142.35	140.10	138.30	137.65
	R/Conc. Frame	168.85	157.60	152.80	148.50	146.55	145.25	142.90	141.15	140.40
Perimeter Adj., Add or Deduct	Per 100 L.F.	8.35	5.30	3.90	3.05	2.55	2.15	1.90	1.70	1.50
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	2.30	1.95	1.70	1.55	1.45	1.40	1.25	1.20	1.15
For Basement, add \$ 28.30 per square foot of basement area										

The above costs were calculated using the basic specifications shown on the facing page. These costs should be adjusted where necessary for design alternatives and owner's requirements. Reported completed project costs, for this type of structure, range from \$ 95.40 to \$ 183.10 per S.F.

Common additives

Description	Unit	\$ Cost	Description	Unit	\$ Cost
Bar, Front bar	L.F.	345	Laundry Equipment		
Back bar	L.F.	277	Folders, blankets & sheets, king size	Each	64,000
Booth, Upholstered, custom, straight "L" or "U" shaped	L.F.	182 - 335	Ironers, 110" single roll	Each	34,600
Closed Circuit Surveillance, One station	L.F.	188 - 320	Combination washer extractor 50# 125#	Each	11,900
Camera and monitor	Each	1675	Sauna, Prefabricated, complete	Each	31,800
For additional camera stations, add	Each	910	6' x 4'	Each	4950
Directory Boards, Plastic, glass covered			6' x 6'	Each	5925
30" x 20"	Each	570	6' x 9'	Each	7300
36" x 48"	Each	1375	8' x 8'	Each	8600
Aluminum, 24" x 18"	Each	555	10' x 12"	Each	11,900
48" x 32"	Each	885	Smoke Detectors		
48" x 60"	Each	1850	Ceiling type	Each	171
Elevators, Electric passenger, 5 stops			Duct type	Each	440
3500# capacity	Each	130,800	Sound System		
5000# capacity	Each	136,300	Amplifier, 250 watts	Each	2125
Additional stop, add	Each	7675	Speaker, ceiling or wall	Each	174
Emergency Lighting, 25 watt, battery operated			Trumpet	Each	335
Lead battery	Each	265	TV Antenna, Master system, 12 outlet	Outlet	288
Nickel cadmium	Each	770	30 outlet	Outlet	185
			100 outlet	Outlet	173

152


Important: See the Reference Section for Location Factors

II. Swimming Pool Building

COMMERCIAL/INDUSTRIAL/
INSTITUTIONAL

M.650

Swimming Pool, Enclosed



Exterior Wall	S.F. Area	10000	16000	20000	22000	24000	26000	28000	30000	32000
	L.F. Perimeter	420	510	600	640	660	684	706	740	737
Face Brick with Concrete Block Backup	Wood Truss	213.40	195.50	191.70	190.00	187.40	185.35	183.55	182.50	179.95
	Precast Conc.	245.45	224.10	219.70	217.70	214.55	212.15	210.00	208.80	205.65
Metal Sandwich Panel	Wood Truss	211.25	197.65	194.65	193.40	191.50	189.90	188.60	187.80	186.00
	Precast Conc.	221.95	206.20	202.80	201.30	199.05	197.30	195.65	194.80	192.60
Precast Concrete Panel	Wood Frame	211.15	197.95	195.05	193.85	191.95	190.50	189.20	188.40	186.65
	Precast Conc.	225.80	209.20	205.65	204.10	201.65	199.85	198.15	197.20	194.90
Painted Concrete Block	Wood Frame	211.15	197.95	195.05	193.85	191.95	190.50	189.20	188.40	186.65
	Precast Conc.	225.80	209.20	205.65	204.10	201.65	199.85	198.15	197.20	194.90
Perimeter Adj., Add or Deduct	Per 100 L.F.	14.55	9.05	7.25	6.65	6.00	5.60	5.20	4.85	4.60
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	1.80	1.35	1.30	1.30	1.15	1.15	1.10	1.10	1.00

For Basement, add \$31.50 per square foot of basement area

The above costs were calculated using the basic specifications shown on the facing page. These costs should be adjusted where necessary for design alternatives and owner's requirements. Reported completed project costs, for this type of structure, range from \$90.60 to \$266.35 per S.F.

Description	Unit	\$ Cost	Description	Unit	\$ Cost
Bleachers, Telescoping, manual			Souna, Prefabricated, complete	Each	4950
To 15 tier	Seat	110 - 153	6' x 4'	Each	5925
16-20 tier	Seat	226 - 278	6' x 6'	Each	7300
21-30 tier	Seat	240 - 291	6' x 9'	Each	8600
For power operation, add			8' x 8'	Each	9600
Emergency lighting, 25 watt, battery operated	Each	265	8' x 10'	Each	11,900
Lead battery	Each	770	10' x 12'		
Nickel cadmium	Opening	161 - 292	Sound System	Each	2125
Lockers, Steel, single tier, 60" or 72"	Opening	102 - 135	Amplifier, 250 watts	Each	174
2 tier, 60" or 72" total	Opening	55 - 78	Speaker, ceiling or wall	Each	335
5 tier, box lockers	L.F.	20	Trumpet	Each	1700
Locker bench, lam. maple top only	Each	61	Steam Bath, Complete, to 140 C.F.	Each	1900
Pedestal, steel pipe			To 300 C.F.	Each	5425
Pool Equipment	Each	9050	To 800 C.F.	Each	8275
Diving stand, 3 meter	Each	6375	To 2500 C.F.		
1 meter	Each	3700			
Diving board, 16' aluminum	Each	3050			
Fiberglass	Each	1875			
Lifeguard chair, fixed	Each	1250			
Portable	Each	1500			
Lights, underwater, 12 volt, 300 watt					

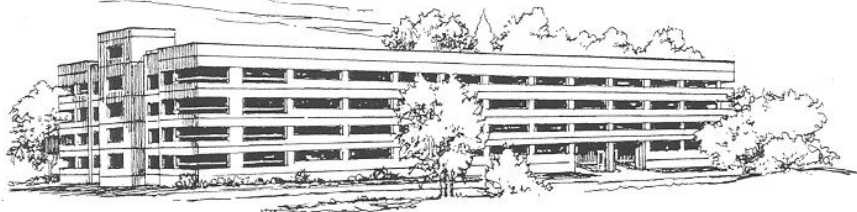
Important: See the Reference Section for Location Factors

III. Parking Garage

**COMMERCIAL/INDUSTRIAL/
INSTITUTIONAL**

M.270

Garage, Parking



Costs per square foot of floor area

Exterior Wall	S.F. Area	85000	115000	145000	175000	205000	235000	265000	295000	325000
	L.F. Perimeter	529	638	723	823	923	951	1037	1057	1132
Face Brick with Concrete Block Back-up	Steel Frame	54.15	52.80	51.95	51.40	51.00	50.40	50.15	49.75	49.60
	R/Conc. Frame	42.30	41.00	40.10	39.60	39.20	38.60	38.35	38.00	37.75
Precast Concrete	Steel Frame	57.25	55.70	54.60	53.95	53.45	52.65	52.35	51.80	51.60
	R/Conc. Frame	44.90	43.30	42.20	41.50	41.05	40.25	40.00	39.45	39.20
Reinforced Concrete	Steel Frame	54.00	52.80	52.05	51.55	51.20	50.65	50.40	50.05	49.90
	R/Conc. Frame	41.30	40.10	39.35	38.85	38.45	37.95	37.70	37.40	37.20
Perimeter Adj., Add or Deduct	Per 100 L.F.	1.25	.95	.70	.60	.55	.50	.45	.35	.30
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	.40	.40	.35	.30	.30	.25	.30	.25	.20
Basement—Not Applicable										

The above costs were calculated using the basic specifications shown on the facing page. These costs should be adjusted where necessary for design alternatives and owner's requirements. Reported completed project costs, for this type of structure, range from \$28.10 to \$108.75 per S.F.

Common additives

Description	Unit	\$ Cost
Elevators, Electric passenger, 5 stops		
2000# capacity	Each	123,800
3500# capacity	Each	130,800
5000# capacity	Each	136,300
Barrier gate w/programmable controller	Each	3,950
Booth for attendant, average	Each	12,200
Fee computer	Each	14,900
Ticket splitter with time/date stamp	Each	7,425
Mag strip encoding	Each	20,900
Collection station, pay on foot	Each	125,500
Parking control software	Each	25,200 - 103,000
Painting, Parking stalls	Stall	10.30
Parking Barriers		
Timber with saddles, 4" x 4"	L.F.	6.45
Precast concrete, 6" x 10" x 6"	Each	.66
Traffic Signs, directional, 12" x 18", high densit	Each	.71

Appendix D.

R.S. Means 2007 Estimate Calculations

I. Aloft & Swimming Pool

ALOFT

POOL AREA 60' x 32' = 1920 SF STORY HT 16'

PERIM 178 LF

EXTRAPOLATE

	8000	6000
SF	1920	10000
PERIM	295.8	420
METAL SANDWICH PANEL (WOOD TRUSS)	229.56	211.25
PERIM ADJ	21.96	14.55
HT ADJ	2.41	1.80

PERIM ADJ $295.8 - 178 = \frac{117.8}{100} = 1.178$

$= 1.178 (-21.96) = -\$25.87$

HT ADJ $24' - 16' = 8'$

$= 8 (-2.41) = -19.28$

BASE COST/SF	229.56
PERIM ADJ	- 25.87
HT ADJ	- 19.28
ADJ COST/SF	<u>\$184.41</u>

BASE BUILDING COST
 $184.41 (1920 SF) = \$354,067.20$

<u>ALOFT ADDS</u>		<u>POOL ADDS</u>
STO# ELEV	(2) 130 800 = 261,600	NONE
FRONT BAR	38 LF x \$345 = 13,110	
SPONT BAR	28 LF x \$345 = 9,660	
BACK BAR	19 LF x \$277 = 5,263	

ALOFT TOTAL	POOL TOTAL
\$11,343,101.91	354,067.20

ALOFT & POOL TOTAL = 11,697,169.11

ALOFT	SF ESTIMATE	R.S. MEANS																																		
<p>BUILDING PERIMETER</p> <p>ALOFT $81 + 116 + 16 + 1 + 38 + 14.5 + 5 + 8 + 26 + 51 + 18 + 18 = 267.5$ $267.5 \times 2 = 535 \text{ LF}$</p> <p style="text-align: center;">↑ CONVERSION FOR SCALE</p> <p>NOTE: INTERIOR WALLS THAT CONNECT TO ELEMENT WERE <u>NOT</u> COUNTED TOWARDS PERIMETER</p>																																				
<p>POOL</p> <p>$7 + 3 + 30 + 16 + 33 = 89$ $89 \times 2 = 178$</p> <p style="text-align: center;">↑ CONVERSION FOR SCALE</p> <p>NOTE: INTERIOR WALLS THAT CONNECT TO ALOFT WERE <u>NOT</u> COUNTED TOWARDS PERIMETER</p>																																				
<p><u>ALOFT</u></p> <p>76,883 SF</p>																																				
<table border="1"> <tr> <td>INTERPOLATE SF</td> <td>.906</td> <td>75000</td> <td>76883</td> <td>95000</td> </tr> <tr> <td>PERIM.</td> <td></td> <td>497</td> <td>502.45</td> <td>555</td> </tr> <tr> <td>GLASS & METAL CURTAIN WALLS</td> <td></td> <td>140.50</td> <td>140.21</td> <td>137.40</td> </tr> <tr> <td>STEEL FRAME PERIM</td> <td></td> <td>3.90</td> <td>3.82</td> <td>3.05</td> </tr> <tr> <td>STORY HT</td> <td></td> <td>1.95</td> <td>1.93</td> <td>1.70</td> </tr> </table>	INTERPOLATE SF	.906	75000	76883	95000	PERIM.		497	502.45	555	GLASS & METAL CURTAIN WALLS		140.50	140.21	137.40	STEEL FRAME PERIM		3.90	3.82	3.05	STORY HT		1.95	1.93	1.70	<table border="1"> <tr> <td>BASE COST/SF</td> <td>=\$140.21</td> </tr> <tr> <td>PERIM ADJ</td> <td>= + 2.46</td> </tr> <tr> <td>HT ADJ</td> <td>= + 1.10</td> </tr> <tr> <td>ADJ COST/SF</td> <td>=\$143.77</td> </tr> <tr> <td>BASE BUILDING COST</td> <td></td> </tr> </table>	BASE COST/SF	=\$140.21	PERIM ADJ	= + 2.46	HT ADJ	= + 1.10	ADJ COST/SF	=\$143.77	BASE BUILDING COST	
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BASE BUILDING COST																																				
<p>PERIM ADJ</p> <p>$535 - 502.45 = \frac{64.55 \text{ LF}}{100} = 0.6455$</p> <p>$0.6455 (3.82) = \\$ 2.46$</p>		<p>$\\$143.77 \times 76883 =$ $\\$11,053,468.91$</p>																																		
<p>HT ADJ</p> <p>AVG STORY HT = $\frac{14 + 6(10)}{7} = 10.57$</p> <p>$0.57 (1.93) = \\$ 1.10$</p>																																				

II. Element

ELEMENT	SF. ESTIMATE	R.S. MEANS																								
<p><u>BUILDING PERIMETER</u></p> $83 + 75 = 11 + 4 + 50 + 57 + 1 + 4 + 14 + 4 + 11 = 314$ $314 \times 2 = 628 \text{ LF}$ <p style="text-align: center;">↑ ADJUSTED FOR SCALE</p> <p>NOTE: INTERIOR WALLS THAT CONNECT TO ALOFT WERE NOT COUNTED TOWARDS PERIMETER</p> <p style="border: 1px solid black; padding: 2px; display: inline-block;">97,923 SF</p>																										
<p><u>INTERPOLATE</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td>0.854</td> <td style="border: 1px solid black;">97,923</td> <td>.146</td> </tr> <tr> <td>SF</td> <td>95,000</td> <td style="border: 1px solid black;">567.26</td> <td>115,000</td> </tr> <tr> <td></td> <td>535</td> <td></td> <td>639</td> </tr> <tr> <td>GLASS & METAL CURTAIN WALLS (CFL FRAME)</td> <td>139.80</td> <td style="border: 1px solid black;">139.57</td> <td>138.20</td> </tr> <tr> <td>PERIM. ADJ</td> <td>3.05</td> <td style="border: 1px solid black;">2.98</td> <td>2.55</td> </tr> <tr> <td>HT. ADJ</td> <td>1.55</td> <td style="border: 1px solid black;">1.54</td> <td>1.45</td> </tr> </table>				0.854	97,923	.146	SF	95,000	567.26	115,000		535		639	GLASS & METAL CURTAIN WALLS (CFL FRAME)	139.80	139.57	138.20	PERIM. ADJ	3.05	2.98	2.55	HT. ADJ	1.55	1.54	1.45
	0.854	97,923	.146																							
SF	95,000	567.26	115,000																							
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PERIM. ADJ	3.05	2.98	2.55																							
HT. ADJ	1.55	1.54	1.45																							
<p><u>PERIM ADJ</u></p> $628 - 567.26 = \frac{60.74}{100} = 0.6074$ $.6074 (2.98) = \$1.81$		<p><u>ELEMENT ADDS</u></p> <p>2 3500# ELEV - \$261,600 FRONT BAR 14 LF x 345 4,830</p>																								
<p><u>HT ADJ</u></p> <p>AVG STORY HT = 10.57 0.57 (1.54) = \$0.88</p> <p>BASE COST/SF = \$ 139.57 PERIM ADJ = + \$ 1.81 HT ADJ = + \$ 0.88</p> <p>ADJ COST/SF \$ 142.26</p>																										
<p><u>BASE BUILDING COST</u></p> $142.26 \times 97,923 = \$13,930,525.98$		<p style="border: 1px solid black; padding: 5px; display: inline-block;">ELEMENT TOTAL</p> <p style="font-size: 1.2em; font-weight: bold;">\$14,196,955.98</p>																								

III. Parking Garage

PARKING GARAGE	SF ESTIMATE	R.S. MEANS		
BUILDING PERIMETER				
$(2)284 + (2)62 = 692 \text{ LF}$				
FLOOR TO FLOOR HT 10'6"				
34,700 SF				
EXTRAPOLATE	50300	30000		
SF	34,700	85000	11,5000	
LF	346	529	109	638
R/CONC. FRAME	43.042	41.30	420	40.10
PERIM	1.75	1.25	1.30	1.95
STEEP HT	.40	.40		.40
BASE COST / SF = \$43.04				
PERIM ADJ				
$692 \text{ LF} - 346 \text{ LF} = \frac{346}{100} = 3.46 \times 1.75 = 6.06$				
HT ADJ				
$10.5' - 10 = \frac{.5 \text{ ft}}{1 \text{ ft}} = 0.5 \times .40 = \0.2				
TOTAL BASE ADJ COST / SF = \$49.30				
BASE BUILDING COST				
$49.30 = \$1,710,710$				
ADDS				
PAINTING PARKING STALLS \$10.30 EA x 118 = \$1215.40				
PARKING BARRIERS (PRECAST CONC) \$66.00 EA x 31 = \$2046.00				
TOTAL = \$1,713,971.40				

IV. Multipliers and Total

TOTALS

MULTIPLIERS

LOCATION 0.93

TIME

$$\frac{4532.74}{4351.70} = \boxed{1.042}$$

$$\frac{4532.74-x}{x} = 0.036$$

$$4532.74-x = 0.036x$$

$$4532.74 = 1.036x$$

$$x = 4351.70 \leftarrow \text{JAN. 2007 COST INDEX}$$

PARKING

\$	1,713,971.40
LOC.	x 0.93
TIME.	x 1.042
<hr/>	
\$	1,713,971.4
<hr/>	
\$	1,714,000

ALOFT & POOL

\$	11,697,169.11
LOC.	x 0.93
TIME.	x 1.042
<hr/>	
	11,335,258.70
<hr/>	
\$	11,335,000

ELEMENT

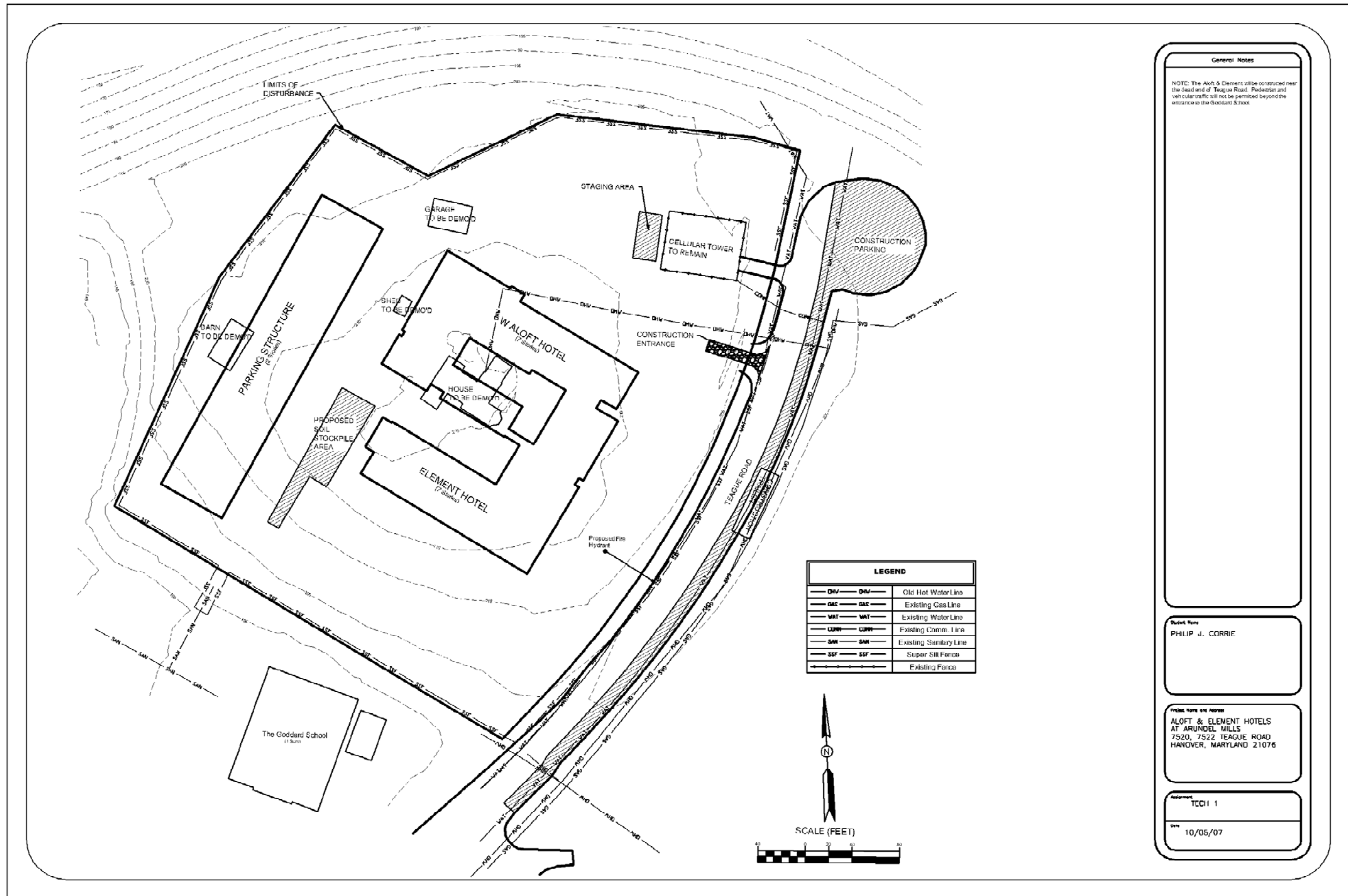
\$	14,196,955.98
LOC.	x 0.93
TIME.	x 1.042
<hr/>	
	\$13,757,702.16
<hr/>	
\$	13,758,000

TOTAL

\$	1,714,000
\$	11,335,000
\$	13,758,000
<hr/>	
\$	26,807,000

Appendix E.

Site Plan of Existing Conditions



General Notes

NOTE: The ALOFT & Element will be constructed near the lead end of Teague Road. Pedestrian and vehicular traffic will not be permitted beyond the entrance to the Goddard School.

Student Name
 PHILIP J. CORRIE

Project Name and Address
 ALOFT & ELEMENT HOTELS
 AT ARUNDEL MILLS
 7520, 7522 TEAGUE ROAD
 HANOVER, MARYLAND 21076

Assignment
 TCD1 1

Date
 10/05/07

LEGEND	
OHV	Old Hot Water Line
EGC	Existing Gas Line
WAT	Existing Water Line
CUM	Existing Comm. Line
SW	Existing Sanitary Line
SSF	Super Sil Fence
(Symbol)	Existing Fence

