Technical Report

Reston Site Redevelopment Project

CE 4991

April 21, 2020

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On our honor as University Students, we have neither given nor received unauthorized aid on this assignment.

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Technical Design Report

I. Proposal and Development Plan

Site Development Considerations

The objective we set out to accomplish in this project was to transform an underdeveloped parcel of land in Reston, VA into a welcoming, dense community development with a mix of residential and commercial uses that maximized the potential of the site and drew on today's trends for sustainable design. Our development plan and proposed site layout were heavily influenced by the impending opening of the Reston Town Center Metro Station on the Silver Line. Since the site is adjacent to this future metro stop, we wanted to take full advantage of the demand that this will create on our site for residential and office spaces with its close access to the metro. Assuming that future market conditions will increase demand for spaces to live and work so close to a major public transportation system, we decided to max out the available floor area ratio (FAR) of 4.0 to give the owners the maximum amount of rentable space, enabling them to bring in as much revenue as possible.

This decision to achieve the highest possible FAR was also a factor in our decision to demolish the existing buildings on the site. When the site was originally developed, the allowable FAR was only 0.75, so these buildings with only 6 to 10 stories were not designed to handle the capacity of high-density development with an FAR of over 4.0. We had also established early on that below-grade parking garages would almost certainly be necessary to accommodate a development of this size. The existing buildings without below-grade parking would significantly impede the effort to provide a transit oriented development with out of the way parking and a quality pedestrian experience.

Although we had to consider the higher costs associated with demolishing and building from the ground up, we also had to consider that even if we chose to keep the buildings, there would still be significant costs required to renovate them. Based off numbers given to us by consultants and renovation research, the cost to keep and renovate the two office buildings would be from $17,437,446 to $25,932,612 with the drawbacks being a significantly lower FAR and challenges finding room for the required residential portion of the mixed use zone as well as parking for that zone ("Commercial Renovation Estimates," n.d.). There would also be decreased economic opportunities with only 424,758.3 square feet of rentable space while the new design would have 1,891,575 square feet of rentable space, which is more than four times the original rentable space.

Another advantage of all new construction is that there is more demand for new buildings than older renovated buildings, thus it would be easier to lease out the space. One disadvantage of new construction is the cost because we estimated the demolition and new construction to be $403,521,012 to $436,843,140. When taking this number in, it's important to remember the surrounding area: Reston Town Center and several new high rise buildings. If we had proposed

the low FAR and low cost option, then we wouldn't be planning for the future growth of the area or the possible changes as the metro system expands. Another factor in our decision to demolish the existing buildings was our desire to create a large open space in the center of the site to serve as a central hub in the community. Keeping one or both of these buildings would have fragmented this central open space or perhaps disrupted the view of the space from the nearby metro stop.

In addition to replacing the existing buildings, we decided to demolish the existing parking garage and surface lots. Essentially the only features that remain the same in our proposed design are the locations of the two entrances. We needed to demolish the existing parking areas in order to maximize the FAR with the given height restrictions and parking requirements. We also wanted to have the opportunity to make the area a certified transit oriented development, which requires hidden or lessened parking. In order to maximize the parking capacity and open green space, we proposed constructing two large garage facilities - one underneath the three residential towers and one underneath the two office towers. These garages, termed the North Garage and South Garage, respectively, will both have 3 below-grade levels, and the first above-grade floor will be dedicated to retail space and vehicle entry/exit points. The North Garage will have 3 levels of above-grade garage on top of this retail level, and the South Garage will require 6 above-grade levels. In addition, several surface parallel parking spots will be provided along the roadway through the site. The total area and quantity of parking spaces provided in our proposed design will be detailed further below. It is also important to note that the area of these parking structures does not count towards the allowable FAR.

The buildings are located on the edges of the site that back up to Reston Parkway and the Dulles Access Toll Road. This way, the proposed roadway through the site, which is similar in alignment to the existing, will be able to service both garages and will section off a large area of open space in the center of the site and adjacent to Sunset Hills Road. This open space will feature about 2700 square feet of pop-up retail shops, an amphitheater space, and a water feature that will be adjacent to Sunset Hills Road and surrounded by the retail shops within the two main buildings. The first floor retail shops are located strategically so as to provide a central hub for the community of people living and working on the site, and it can be easily seen from both Sunset Hills Rd, where the two site entrances are located, and the new Reston Town Center Metro Station. Another one of the motivations for first floor retail and the outdoor retail shops is that it is one of the elements required for a Transit-Oriented Development (TOD) certification. Our site is ideally situated for this certification given the distance from the new metro stop and the bicycle friendliness of Reston in general. Reston, especially Reston Town Center, is a fairly walkable area. This certification would also not be new ground for Fairfax County as they have already started lowering parking requirements for areas near public transportation, and 9 years ago they not only lowered the parking requirements for the Tysons Corner development, but they also put limits on the maximum parking allowed. ("Fairfax County Lowers Parking

Requirements for Offices, Condos, Apartments and Retail Near Metro Stations | Land Development Services," n.d.)

Overall, there is 174,250 square feet of open space provided on the site, which amounts to 32% of the total site area, far exceeding the required 20%. This makes our site more pedestrian friendly, which is another element of a TOD. As the accessibility to public transportation increases, it is also likely that the desire for pedestrian friendly communities will become more popular and the need for cars and thus a lot of parking will diminish. In response to this trend, we have also increased the floor to ceiling heights in the top two floors of above-ground parking in the South Garage and all three floors of above-ground parking in the North Garage such that those floors could be renovated into more office space or gallery spaces in the future. This gives the owners flexibility in the future uses and expandability of the space, another trait of a TOD. Having expandability options and flexibility in a growing area allows for increased density and more opportunities to rent space in the future if those garage levels become unnecessary and are remodeled into office floors.

Development Plan

In order to create a successful development plan, we needed to not only create an optimal community layout for workers and residents to enjoy, but we also needed to maximize our potential revenue and return on investment. Accomplishing this involved maximizing the total rentable area in all of our buildings, including adequate parking, assigning appropriate lease and rental rates, and maximizing the desirability of our site.

The allowable ordinance for the entire site was 4.0 according to the Fairfax County Zoning Ordinance, however there were adjustments for each phase of the site. Phase 2 of the project, which encompassed three residential buildings with retail and a partially underground garage beneath it, was designed for LEED silver and thus had a total allowable FAR of 4.06. Phase 3 of the redevelopment included 2 office buildings with retail and a partially underground garage underneath them, and was designed for LEED gold, which increases the allowable FAR to 4.09 for 50% of the site, considering that about 50% of our FAR was commercial and 50% was residential. Provided and allowed gross square footage were allocated by type, in this case commercial or residential.The price increases due to LEED upgrades were calculated by phase and paid for individually. LEED is designated to buildings, thus while retail is included in both buildings they would only retain the LEED certification of the building they are included in. For example, there could not be LEED gold retail in a LEED silver building.

Starting with Phase 2 and the northernmost building, Residential Tower 1 has a GSF of 384,750 sf and total rentable square footage (RSF) equal to 307,800 sf. To the south of that, Residential Tower 2 has a GSF of 360,335 sf and an RSF of 288,268 sf. Adjacent to the office buildings, Residential Tower 3 has a GSF of 342,605 sf and an RSF of 274,08 sf. There is retail on the first floor with GSF equal to 21,912 sf and RSF equal to 20,816 sf. The North Parking Garage has a GSF of 543,274 sf and 1,212 parking spaces. After looking at the prices of other

apartment buildings around Reston with similar amenities and the prices of apartment buildings near metro stations and town centers in Fairfax, such as Tysons Corner, we determined the average rental rates for prospective tenants would be about $3500 per unit. (*Apartments.com: Apartments and Homes for Rent*, n.d.)

Next, the office building adjacent to the residential buildings, Office Tower 1, has a GSF of 495,933 sf and an RSF of 471,136 sf. Office Tower 2 has a GSF of 514,800 sf and an RSF of 489,060 sf. The South Parking Garage has a GSF of 826,546 sf and 2,154 parking spaces. The prospective office tenants could expect lease rates $45/RSF the first year with an increase to $50/RSF later on based on data from 2019 about office rentals near metro stations. (Alexander Paul, CRE, LAI et al., 2019)

In addition to the parking structure under the towers, there are also 18 street parking spots available for retail. After looking at parking rates and policies nearby, it seemed prudent to charge for all parking especially considering that if parking was free, the site would likely experience some parking load from the neighboring metro station in addition to the parking load of the site. The offices will have reserved spots for employees and there will likely be a parking pass system in place for the apartment buildings. The expected return on investment is 6.08% for the commercial development and 7.13% for the residential development. The total cost will be $794,610,493 and the total cost per square foot will be $427.52/sf.

II. LEED Proposal and Scorecard

Sustainable development is a major focus, not only in Fairfax County, but nationwide, and our redevelopment proposal includes several elements of sustainable design, guided by the specifications set forth by LEED. Using the LEED guidelines for building design and construction for new construction projects, we have outlined our plans to achieve sustainable design in all of our buildings. We will strive for a LEED silver certification on all of the residential buildings and the associated parking and retail in the North garage, and we will strive for a LEED gold certification on all of the office buildings and related retail and parking in the South garage. This will be within the guidelines set by Reston Realtors to strive for at least LEED certification. Because the parcel is in Fairfax County, achieving LEED certifications increases the maximum allowable FAR of the development. Achieving LEED Silver adds 0.06 to the allowable FAR, and LEED Gold adds 0.09 to the allowable FAR. Thus, with our proposed certification levels, we will be able to add 0.075 to the original maximum allowable FAR of 4.0 to get a final allowable FAR of 4.075.

According to the plan detailed below, we will achieve LEED Silver in the residential buildings and associated garage with a total of 51 points and LEED Gold in the office buildings and associated garage with a total of 61 points. The LEED scorecard for each complex (residential and office) is shown below, along with a more detailed explanation of how we will achieve the claimed credits in each major category.

Residential Buildings *(and associated garage and retail space)*
LEED Silver - 51 points

LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

Project Name: Reston Redevelopment - Residential Towers and Garage
Date: April 21, 2020

Y	?	N			
		0	Credit	Integrative Process	1

14	0	0	**Location and Transportation**		16
		0	Credit	LEED for Neighborhood Development Location	16
1		0	Credit	Sensitive Land Protection	1
		0	Credit	High Priority Site	2
5		0	Credit	Surrounding Density and Diverse Uses	5
5		0	Credit	Access to Quality Transit	5
1		0	Credit	Bicycle Facilities	1
1		0	Credit	Reduced Parking Footprint	1
1		0	Credit	Green Vehicles	1

4	0	0	**Sustainable Sites**		10
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
		0	Credit	Site Development - Protect or Restore Habitat	2
1			Credit	Open Space	1
		0	Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		0	Credit	Light Pollution Reduction	1

3	0	0	**Water Efficiency**		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
1			Credit	Outdoor Water Use Reduction	2
1			Credit	Indoor Water Use Reduction	6
		0	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

12	0	0	**Energy and Atmosphere**		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
2			Credit	Enhanced Commissioning	6
8			Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
		0	Credit	Demand Response	2
		0	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
		0	Credit	Green Power and Carbon Offsets	2

7	0	0	**Materials and Resources**		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3			Credit	Building Life-Cycle Impact Reduction	5
1			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
1			Credit	Construction and Demolition Waste Management	2

9	0	0	**Indoor Environmental Quality**		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1			Credit	Enhanced Indoor Air Quality Strategies	2
1			Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
		0	Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
2			Credit	Interior Lighting	2
2			Credit	Daylight	3
1			Credit	Quality Views	1
		0	Credit	Acoustic Performance	1

2	0	0	**Innovation**		6
1			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

0	0	0	**Regional Priority**		4
		0	Credit	Regional Priority: Specific Credit	1
		0	Credit	Regional Priority: Specific Credit	1
		0	Credit	Regional Priority: Specific Credit	1
		0	Credit	Regional Priority: Specific Credit	1

51	0	0	**TOTALS**	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

LEED Silver

Figure 1: LEED Scorecard - Residential Buildings

Location and Transportation:
This project will capitalize on its unique location, which offers nearby transit and community centers. The development will receive credit for being located on land that has been previously developed. It is also within ¼ mile of very dense residential and commercial developments, such as the Reston Town Center and the new Fannie Mae development, and it is within ½ mile walking distance to at least 8 diverse uses according to LEED code. The site also meets the criteria for having access to quality transit, since it is located within ¼ mile walking distance of a Metro stop on the Washington Metropolitan Area Transit Authority (WMATA) Silver Line. In addition, the development will include outdoor bicycle racks as well as garage bike storage

facilities, and it will provide bike lanes traversing through the site. The development will also reduce its parking footprint by locating parking in garage facilities under the buildings and providing only the minimum parking requirements. Efforts will also be made to accommodate green vehicles on the site by designating 5% of parking spaces as preferred parking for green vehicles.

Sustainable Sites:

In the sustainable sites category, this project will receive credit for performing a site assessment with the intent to use the information about the site characteristics to maximize sustainability. Since the site is being redeveloped, much of this information is already known. In addition, open space that encourages recreation and social and environmental interaction will take up over 30% of the total site area with 25% of that space vegetated. Heat island reduction will also be achieved with roof and non-roof measures, including providing shade over pavement, having parking under cover, and installing green roofs.

Water Efficiency:

The residential buildings will adopt several efficient water use measures to conserve water and earn credits in this category. The need for outdoor water use will be reduced by reducing the need for irrigation by 50% from the baseline. This will be accomplished by using alternative water supply sources and selecting less water-dependent plant species. The amount of indoor water use will be reduced by 25% by installing efficient equipment and appliances. Finally, water meters will be installed on the irrigation subsystem and indoor plumbing fixtures to track water consumption in order to identify additional water savings opportunities

Energy and Atmosphere:

In order to conserve and energy and reduce impacts on the atmosphere, these buildings will implement enhanced envelope commissioning to monitor the building's thermal envelope. The energy performance in the buildings will also be optimized, achieving a 20% improvement in energy performance above the prerequisite energy savings requirement by optimizing systems such as the HVAC system. Additionally, advanced energy meters will be installed to track building-level energy demands. Finally, we will attempt to eliminate the use of refrigerants completely due to their negative impacts on the environment. Any refrigerants required will be certified low-impact refrigerants.

Materials and Resources:

Throughout the pre-construction and construction phases, a heavy focus will be placed on the choice of materials and resources used for the buildings. This will require good relations with suppliers and thorough documentation of specific products. A whole-building life cycle assessment will be conducted so that the development reduces greenhouse gases, ozone depletion, and eutrophication in the environment. These buildings will also receive LEED credit for optimizing and wholly disclosing building materials and products. The project will use at least 20 different products that have been analyzed for their life-cycle impacts, at least 20 products from suppliers that declare their raw material sourcing strategies and are perceived to be

socially responsible, and at least 20 different products whose chemical ingredients have been inventoried by the manufacturers. During the construction and demolition processes, 50% of total debris will be diverted by recovering, reusing, and recycling materials.

Indoor Environmental Quality:

A number of efforts will be taken to improve the indoor environmental quality. First, the project will take advantage of enhanced indoor air quality strategies by providing a mixture of naturally and mechanically ventilated spaces. It will also make use of low-emitting materials, namely flooring and interior paints/wall coverings that do not emit VOCs or harmful chemical compounds into the air. A construction indoor air quality management plan that outlines how indoor air quality will be managed during construction and after the building is first occupied will also be created. Thermal comfort for the buildings' residents will also be emphasized, as the HVAC and building envelope design will comply with standards for thermal comfort during occupancy. Occupants will also have control over interior lighting with the choice between at least three lighting levels. The lighting that is provided will be of high quality, complying with certain standards, such as luminance and reflectance. Furthermore, daylight will be an available source of light in as much of the buildings as possible. Credit will be obtained for this criteria by performing a simulation to show that daylight will adequately light at least 55% of the regularly occupied floor area. Quality views will also be available for most residents, as the project will achieve a direct line of sight to the outdoors in at least 75% of regularly occupied areas.

Innovation:

This project will propose to earn a credit for innovation by installing green roofs or permeable surfaces on over 90% of the rooftops to reduce impact on stormwater systems and to enhance views. In addition, at least one member of the project team will be a LEED Accredited Professional in order to streamline the application and certification process.

Regional Priority:

This project will not strive for regional priority credits.

Office Buildings *(and associated garage and retail space)*
LEED Gold - 61 points

LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist
Project Name: Reston Redevelopment - Office Towers and Garage
Date: April 21, 2020

Y	?	N			
		0	Credit	Integrative Process	1

14	0	0	**Location and Transportation**		16
		0	Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
		0	Credit	High Priority Site	2
5			Credit	Surrounding Density and Diverse Uses	5
5			Credit	Access to Quality Transit	5
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

4	0	0	**Sustainable Sites**		10
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
		0	Credit	Site Development - Protect or Restore Habitat	2
1			Credit	Open Space	1
		0	Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		0	Credit	Light Pollution Reduction	1

6	0	0	**Water Efficiency**		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
1			Credit	Outdoor Water Use Reduction	2
3			Credit	Indoor Water Use Reduction	6
1			Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

17	0	0	**Energy and Atmosphere**		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
2			Credit	Enhanced Commissioning	6
11			Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
2			Credit	Demand Response	2
		0	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
		0	Credit	Green Power and Carbon Offsets	2

7	0	0	**Materials and Resources**		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3			Credit	Building Life-Cycle Impact Reduction	5
1			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
1			Credit	Construction and Demolition Waste Management	2

11	0	0	**Indoor Environmental Quality**		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1			Credit	Enhanced Indoor Air Quality Strategies	2
1			Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
2			Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
2			Credit	Interior Lighting	2
2			Credit	Daylight	3
		0	Credit	Quality Views	1
1			Credit	Acoustic Performance	1

2	0	0	**Innovation**		6
1			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

0	0	0	**Regional Priority**		4
		0	Credit	Regional Priority: Specific Credit	1
		0	Credit	Regional Priority: Specific Credit	1
		0	Credit	Regional Priority: Specific Credit	1
		0	Credit	Regional Priority: Specific Credit	1

61	0	0	**TOTALS**	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

LEED Gold

Figure 2: LEED Scorecard - Office Buildings

Location and Transportation:
This project will capitalize on its unique location, which offers nearby transit and community centers. The development will receive credit for being located on land that has been previously developed. It is also within ¼ mile of very dense residential and commercial developments, such as the Reston Town Center and the new Fannie Mae development, and it is within ½ mile walking distance to at least 8 diverse uses according to LEED code. The site also meets the criteria for having access to quality transit, since it is located within ¼ mile walking distance of a Metro stop on the WMATA Silver Line. In addition, the development will include outdoor bicycle racks as well as garage bike storage facilities, and it will provide bike lanes traversing through the site. The development will also reduce its parking footprint by locating parking in

garage facilities under the buildings and providing only the minimum parking requirements. Efforts will also be made to accommodate green vehicles on the site by designating 5% of parking spaces as preferred parking for green vehicles.

Sustainable Sites:

In the sustainable sites category, this project will receive credit for performing a site assessment with the intent to use the information about the site characteristics to maximize sustainability. Since the site is being redeveloped, much of this information is already known. In addition, open space that encourages recreation and social and environmental interaction will take up over 30% of the total site area with 25% of that space vegetated. Heat island reduction will also be achieved with roof and non-roof measures, including providing shade over pavement, having parking under cover, and installing green roofs.

Water Efficiency:

The residential buildings will adopt several efficient water use measures to conserve water and earn credits in this category. The need for outdoor water use will be reduced by reducing the need for irrigation by 50% from the baseline. This will be accomplished by using alternative water supply sources and selecting less water-dependent plant species. The amount of indoor water use will be reduced by 35% by installing efficient equipment and appliances. Additionally, water used for the cooling tower systems will be conserved and buildup of harmful substances in the system will be prevented. Finally, water meters will be installed on the irrigation subsystem and indoor plumbing fixtures to track water consumption in order to identify additional water savings opportunities

Energy and Atmosphere:

In order to conserve and energy and reduce impacts on the atmosphere, these buildings will implement enhanced envelope commissioning to monitor the building's thermal envelope. The energy performance in the buildings will also be optimized, achieving a 26% improvement in energy performance above the prerequisite energy savings requirement by optimizing systems such as the HVAC system. Additionally, advanced energy meters will be installed to track building-level energy demands. A fully-automated demand response program will be implemented to distribute energy more efficiently. Finally, we will attempt to eliminate the use of refrigerants completely due to their negative impacts on the environment. Any refrigerants required will be certified low-impact refrigerants.

Materials and Resources:

Throughout the pre-construction and construction phases, a heavy focus will be placed on the choice of materials and resources used for the buildings. This will require good relations with suppliers and thorough documentation of specific products. A whole-building life cycle assessment will be conducted so that the development reduces greenhouse gases, ozone depletion, and eutrophication in the environment. These buildings will also receive LEED credit for optimizing and wholly disclosing building materials and products. The project will use at least 20 different products that have been analyzed for their life-cycle impacts, at least 20

products from suppliers that declare their raw material sourcing strategies and are perceived to be socially responsible, and at least 20 different products whose chemical ingredients have been inventoried by the manufacturers. During the construction and demolition processes, 50% of total debris will be diverted by recovering, reusing, and recycling materials.

Indoor Environmental Quality:

A number of efforts will be taken to improve the indoor environmental quality. First, the project will take advantage of enhanced indoor air quality strategies by providing a mixture of naturally and mechanically ventilated spaces. It will also make use of low-emitting materials, namely flooring and interior paints/wall coverings that do not emit VOCs or harmful chemical compounds into the air. A construction indoor air quality management plan that outlines how indoor air quality will be managed during construction and after the building is first occupied will also be created. After construction is complete, a flush-out of the indoor air will be conducted before occupancy to establish better quality indoor air for the tenants. Air testing will then be conducted to ensure compliance with standards. Thermal comfort for the buildings' residents will also be emphasized, as the HVAC and building envelope design will comply with standards for thermal comfort during occupancy. Occupants will also have control over interior lighting with the choice between at least three lighting levels. The lighting that is provided will be of high quality, complying with certain standards, such as luminance and reflectance. Furthermore, daylight will be an available source of light in as much of the buildings as possible. Credit will be obtained for this criteria by performing a simulation to show that daylight will adequately light at least 55% of the regularly occupied floor area. Quality views will also be available for most residents, as the project will achieve a direct line of sight to the outdoors in at least 75% of regularly occupied areas. Finally, the project will comply with acoustic requirements for HVAC background noise, sound transmission, and sound reinforcement in all interior spaces.

Innovation:

This project will propose to earn a credit for innovation by installing green roofs or permeable surfaces on over 90% of the rooftops to reduce impact on stormwater systems and to enhance views. In addition, at least one member of the project team will be a LEED Accredited Professional in order to streamline the application and certification process.

Regional Priority:

This project will not strive for regional priority credits.

III. Site Design Proposal

Design Layout Overview

The layout of our site was designed with the intent to enhance the commercial viability of the site while creating a well-connected community that residents, workers, and visitors can enjoy. Of central importance to our design decisions was the desire to incorporate as many principles of transit-oriented design as possible. Transit-oriented development is the term used to describe a high-density mix of commercial, residential, office, and leisure space within walking distance of public transport. It has become a fast growing trend that is shaping urban development projects across the nation as public transportation is gaining more popularity. Central to transit-oriented development is an increased focus on pedestrian and bike connectivity and a decreased focus on cars as a means of transportation. Thus, more importance is placed on pedestrian safety and open communal areas for people to gather in this type of development. We wanted to create a design that was both practical today, when cars are still assumed to be the preferred mode of transportation, and in the future, when we anticipate more of the occupants will turn to the metro as their main mode of transportation.

Our proposed design features three residential towers, located on the North Garage, and two office towers, located on the South Garage. The North Garage provides the 1,212 parking spaces necessary for these residential spaces as well as the retail that is located on the first floor of the garage complex. The South Garage provides 2,154 parking spaces for the office space and first floor retail. We chose to place the office buildings on the part of the site that abuts the Dulles Access Toll Road so that it is most readily seen by the heavy traffic that uses the toll road so that tenants could put up their logo in places that would receive the highest overall visibility. The North Garage, along with its associated residential towers, is located along the side of the site that backs up to Reston Parkway so that it would be further away from the noise generated on the Dulles Toll Road but would still have high visibility to potential tenants. As stated before, this allowed for the creation of a large open space area in the center of the site. This open area will serve as a central gathering area for the occupants and visitors as they shop, dine, or explore the site. The pop-up retail space located in the central open space will attract interested shoppers to the site and provide a unique experience for the occupants of the site. In addition, the open space will include a pond, fountain, amphitheater space, and plenty of trees and spaces for people to sit and relax. The pond with a central fountain will serve two purposes: it will add to the aesthetics and natural beauty of the site, and it will provide adequate detention capacity for our stormwater management plan.

There will also be an area of green, open space located between the western end of the South Garage and Sunset Hills Road. This open space will be adjacent to the future Reston Town Center Metro stop, so it will serve as a corridor from the metro stop into the site. A sidewalk located in this area will take pedestrians directly from the Metro stop onto our site. We attempted to make this entrance welcoming by ensuring a clear line of sight to the central open space and

lining the sidewalk with landscaping and an area for picnic tables and communal space. In addition, we hope to locate an entrance to the retail space located on the corner of the garage on the side of the building, so that it will be visible and accessible to pedestrians as they make their way onto the site. This could be a convenient location for a coffee shop, so that patrons could enjoy the use of the outdoor picnic area or grab a cup of coffee before heading to the Metro in the morning.

In addition, the North Garage will feature terraces surrounding the footprints of the residential buildings in some places, but these will be for exclusive use by the residents and not open to the public, so they do not count as open space for the purpose of zoning requirements. There will also be small sections of the rooftops of each residential tower and one of the office towers that will be designated as rooftop terraces accessible by the occupants of the tower. These areas will be clearly separated from the rooftop area that is considered green roof.

While we realized the importance of adhering to the current Fairfax County guidelines on the number of parking spaces required, we also recognized that with the site's proximity to the metro station and our use of other transit-oriented design principles, the number of parking spaces that are actually needed may be much lower than expected and/or dramatically lower in the future. Thus, we decided to design the parking garages for future flexibility by ensuring that the ceiling height on the two uppermost levels of the South garage and all three above-ground levels on the North garage were tall enough so that these levels could be retrofitted into office, residential, or gallery spaces sometime in the future when the demand for parking decreases. The typical floor-to-floor height for our proposed garages was 10', but these designated levels in the North and South garages were designed with floor-to-floor heights of 12' and 12.5', respectively. If the allowable FAR increases and the required parking decreases in the future, these levels could be retrofitted into rentable space to provide an increase in revenue for the owners of the site.

Another element of importance to the design was the aesthetics of the buildings and overall site. The aesthetics and organization of the site are enhanced by the central open space which is overlooked by the retail space and readily visible from Sunset Hills Road, where the two site entrances are located. Furthermore, the visual interest of the buildings is enhanced by their staggered, nonuniform heights. Each residential and office building is a different height, and most of the buildings contain at least two tiers, such that the footprint area of the higher tiers are smaller than the ones below it. This adds some visual interest to the site by creating staggered towers.

Local ordinances also required adequate tree cover on the site. The minimum tree coverage was 10% of the adjusted site area, equating to 37171 square feet. We exceeded this value, achieving 41650 square feet of cover. We were able to include a diverse mix of trees in our landscaping plan, incorporating large, medium, and small deciduous and evergreen trees. Some of these trees were located on the Level 2 intensive green roofs on top of the garages, but most were located strategically on the ground to offer both visual interest, noise and sight

barriers, and shade. Plenty of trees were placed in the central open space area to give people a natural setting to enjoy while offering shaded places to relax. Also, several trees were placed along the major roads bordering the site to give residents a sense of seclusion and to shield some of the noise. Trees also lined the main road corridor traversing through the site to contribute to the visual interest of the road. Unfortunately, due to the complete demolition and re-grading of the site, we were not able to incorporate any tree protection into the plan, but we will be able to plant more trees than were required, contributing to the natural beauty and sustainability of the site.

The vision set forth for this parcel of land in the Fairfax County Comprehensive Plan for the Reston Town Center Station Transit-Oriented Development District is to create a higher density of development with mid- to high-rise buildings and more diverse land use. The plan specifically states that according to the desired mix of uses for Transit Station Mixed Use areas, roughly 50% of the development should be used as residential space, and the other 50% should be used for non-residential purposes. We have followed this specification by providing 50.40% residential space, 47.21% office space, and 2.39% retail space. The retail space we have designed will serve to enhance the vibrancy of the pedestrian environment, and it will support many of the retail needs of the occupants, reducing their need to travel elsewhere in personally-owned vehicles. Examples of possible retail occupants could include coffee shops, quick-service or full-service restaurants, convenience stores, pharmacies, and specialty retail shops.

The Comprehensive Plan also emphasizes the importance of adding facilities that will make the land much more pedestrian-friendly, which we have attempted to do by including several crosswalks, a welcoming pedestrian trail directly from the metro stop to the site, and a large, open gathering space. One of the suggestions set forth by the Comprehensive Plan was to organize development around a large community gathering space near the transit station, which we have achieved through the central placement of our open space. Additionally, the plan encourages creative uses for the open space in new development; it suggests these open spaces could include urban plazas, parks, public art displays, and gathering places for festivals and community events. The central open space area in our proposed design is large enough to be able to host community events such as festivals, shows, and farmer's markets, and it will host several pop-up retail shops along a community plaza for pedestrians to enjoy. Overall, our design captures the intent of the Comprehensive Plan for Reston Transit Areas by providing a pedestrian-friendly development with a high-density mix of uses so that occupants and visitors can live, work, and relax in a vibrant community environment.

The proposed road design of the parcel emphasizes the circulation of multiple transportation modes. The ingress and egress patterns of automobile traffic consist of the site's existing entrances from Sunset Hills Road and provides access to the proposed retail locations, building garages, and public open spaces throughout the site. An alignment of 11' travel lanes stemming from the main corridor on site runs between the two garages on the southeastern part

of the site. These lanes feed into an intersection that allows additional access points to the North and South Garage as well as the loading docks located at the rear of the towers. The North Garage access is entirely separate from the road alignment used to get to that garage's loading docks, while the South Garage access is shared by the loading alignment. Loading traffic for the residential towers circulates behind the North garage structure, with trucks entering the one-way alignment on the north side of the site and exiting at the stop-controlled intersection in between the two garages. The loading traffic for the office towers stems from that same intersection and must enter a 35' radius turnaround to return to the intersection to exit. These loading roads also serve to provide emergency access, since the roads are located along the perimeter of the buildings. The roads surrounding the site may also be used as emergency access to provide full coverage for the buildings. Fire trucks should have full mobility to move around the site. A turn-around behind the South Garage with a radius of 35' allows fire accessibility around the entirety of the proposed office buildings.

To provide public accessibility to the open space area of our parcel, 18 parallel street parking spaces are available along the north side of the proposed alignment. One van-accessible ADA parking space is also available in this location. Three crosswalks along this corridor create access to the open space for the office and residential tenants. The majority of parking on site is located in the two parking garages beneath the office and residential towers. The South Garage located beneath the office towers houses 2,154 spots while the North Garage located beneath the residential towers houses 1,212 spots. Adequate ADA parking is available in the North and South garages, with 23 and 32 ADA spaces, respectively. Pedestrian circulation through the site consists of sidewalks of minimum 8' width along both sides of the main corridor that meet ADA standards. The north side of the corridor sidewalk circles around the open space area. The open space consists of sidewalks connecting the outdoor market to the amphitheater. Pedestrian access to the southeastern intersection between the two garages is available via a sidewalk on the eastern side of the road. Five foot bike lanes in both directions are provided on the main corridor, and designated bicycle parking facilities and bike racks are available in the open space area and in the North and South garages. The overall design of the site prioritizes and ensures accessibility for all visitors and residents. The pattern ensures efficient and accessible options of mobility throughout the site and to the surrounding existing infrastructure and facilities.

It is also important to note that our proposed design adheres to all zoning ordinance requirements. The site is currently zoned PRC (Planned Residential Community District) by Fairfax County. These requirements and our proposed conditions are detailed in Table 1. Although our proposed FAR of 4.019 is over the zoned maximum FAR of 4.0, we will be able to increase the allowable FAR to 4.075 by achieving a LEED certification levels of Silver and Gold on our buildings, as discussed in the LEED section of this report.

Table 1. Zoning Ordinance Requirements

Zoning Ordinance Requirements Currently Zoned: PRC (Planned Residential Community District) Site Area: 537,000 sq. ft. Gross Floor Area: 2158108 sq. ft.		
	Permitted	Proposed
Max. FAR	4.0*	4.019
Max. Building Height	300’	294’
Min. Open Space	107400 sq. ft.	174250 sq. ft.
Min. Parking	3333	3384
Min. Setbacks		
From Dulles Toll Road	75’	75’
From Reston Parkway	40’	70’
From Sunset Hills Road	40’	48’

*Achieving the proposed Silver and Gold LEED Certification Levels increases the allowable FAR to 4.075

Grading Plan

The grading plan was based off the site plan and stormwater. With the grading plan, it was necessary to consider how and where the water flowed. Ideally, water should flow away from buildings on a site and be collected in certain areas to then be piped away, so our grading design allowed for this to happen. The grading of the original site allowed water to flow towards the center of the site, where our open space is located. We kept this general pattern of grading, allowing runoff to flow towards the open space and the pond located inside it. There were some trouble areas within the site regarding how our site was laid out. One trouble area was behind the office and residential buildings because there was not much horizontal space between the buildings and the access roads behind them and the edge of the site to make up the significant change in elevation. The access roads had to be relatively flat which left the amount of space to climb back up very small. We had to add a retaining wall to stabilize the soil behind the office building. The total fill required for the site was 13,294.7 cubic feet, and the total cut for the site was 21,123.5 cubic feet. Although these numbers are not perfectly balanced, there is the possibility of using some of the cut material as fill in other areas of the site.

Utility Plan

The layout of the utilities was based primarily on the road design, as we attempted to run most of the utilities within the roadway. Slight deflections within the pipes will be needed to accomplish this design, but should not cause major issues. The sanitary sewer design was limited by the existing access points available. It was decided to extend the existing pipe on the site into the road on both ends of the site. This was done because of the topography of the site and the physics of gravity based sewer. A 10 foot horizontal separation between water and major sanitary sewer lines was maintained in part with regulations. Due to the large size of each tower, two sanitary laterals were run to each tower, with each lateral connecting to the major sanitary line with its own manhole. These two laterals running to each tower were spaced as far apart as was feasible.

The proposed water lines running through the site also traverse under the road alignment whenever possible. The water line was looped, as it tied into the existing water main in two locations - one at each entrance. This was done to provide redundancy if the line was broken in one place. A domestic water line and a fire water line were run into each tower from this main water line. In addition, FDC connections were located near the lobby entrances of each tower. It was ensured that all FDC connections were located within 50-100 feet of a fire hydrant. These fire hydrants were placed along the main road alignment so as to maximize the range of about a 350 feet radius of each hydrant, while still having hydrants available for each FDC connection. Placing the hydrants on the same side of the road as the buildings also prevents these hydrants from being blocked by parked cars. A fire hydrant was also placed on the side of the road near the pop-up retail, should a connection need to be made on the opposite side of the road. It should also be noted that the pop-up retail spaces were not connected to sanitary and water lines, as these are not expected to be full-service buildings.

The proposed stormwater lines running through our site connect to the existing stormwater lines at several points; however, some of the existing stormwater lines running through the site had to be demolished if they ran under the footprint of the proposed buildings or detention pond. The proposed stormwater lines connect the proposed curb inlets, detention pond, and bioretention basin to the existing storm lines.

IV. Building Architectural Proposal

The Reston Development Site consists of three residential towers sitting on top of a shared “North Garage” and two commercial towers sitting on top of a shared “South Garage”. The North Garage consists of three subgrade parking levels, a ground floor containing retail space and parking ramps, and three levels of parking above the ground floor. The South Garage consists of three subgrade parking levels, a ground floor containing retail space and parking ramps, and six levels of parking above the ground floor. There is one lobby per tower on the ground floor of both garages. Residential lobbies are between 2000 and 3000 sqft. Commercial lobbies are approximately 4000 to 5000 sqft. Each residential lobby houses two double sided elevators that open to the lobby and the garage. Each office lobby houses two sets of four double elevators that also open to the lobby and the garage. Each commercial and residential lobby houses a 169 square foot high density bicycle storage room for the convenience of tenants.

In order to increase visual appeal of the site, EIFS with timber grain and curtain walls make up the facades of every tower in the Reston Development. A main objective of this project was to create a transit-oriented community. A large component of achieving this goal is through the beautification of the built environment through the incorporation of the natural environment. Timber EIFS possesses an organic, warm tone that helps the design team create a transit-oriented community without sacrificing the performance requirements of exterior walls. The implementation of curtain wall facades produces a lighter environment for tenants and offers a visual juxtaposition to timber. Residential towers have a high proportion of timber EIFS with punch windows to curtain walls in order to protect the privacy of apartment residents. Commercial towers have a high proportion of curtain walls to EIFS in order to allow light to reach occupants throughout the buildings. The majority of facades facing Dulles Toll Road and Reston Parkway are timber EIFS in order to limit noise pollution and increase privacy for building occupants from vehicle traffic. Conversely, the majority of facades facing the interior of the site are curtain walls in order to open sight lines to foliage, the pond, the amphitheater and the pop-up shops in the plaza below. The above grade garage levels are adorned with 6’ brick walls that allow ventilation through the building and augmented sight lines for pedestrians on the ground and building occupants. Retail space is housed in storefront curtain walls enabling passerby from the plaza to visually engage with retail tenants.

The northernmost residential tower, “Tower 1” consists of 27 floors and is 294 ft tall. The building has three 30-foot stepbacks from the western facade. The stepbacks occur at levels 19, 22, and 25. Residential Tower 2 consists of 26 floors and is 284 ft tall. Similarly, the building has three 30-foot stepbacks. They differ from Tower 1 in that the first and third stepback occur on the western facade, while the second stepback occurs on the eastern facade. The stepbacks occur at levels 18, 21, and 24. Residential Tower 3 consists of 25 floors and is 274 ft tall. This building also has three 30-foot stepbacks. The first and third stepback occur on the western facade, while the 2nd stepback occurs on the easter facade. They occur at levels 17, 20, and 23. The

easternmost commercial tower, “Tower 1” consists of 24 floors and is 292 ft tall. There is one 50-foot stepback at level 23. Commercial Tower 2 is 294 ft tall and has 25 floors and no stepbacks.

The floor plan layouts of the residential towers were designed to accommodate a variety of tenants. Each residential tower includes a mix of studio, 1-bedroom, and 2-bedroom units to attract young urban professionals who want to live or work in the area or near the Metro. The proportion and size of each correlates to market research of future development across Sunset Hills Road. Studios are approximately 550 sqft. 1-bedroom apartments are approximately 700 sqft. 2-bedroom apartments are approximately 150 sqft. Residential Tower 1, 2, and 3 have 1160 units in total, averaging approximately 390 per building. The floor plan layouts for both of the office buildings were left open in order to allow maximum flexibility for future tenants to adjust the layout to accommodate their specific needs. Stairways are included in each tower such that no desk or apartment is further than 150 ft from a stair exit. Stairwells are 18’ x 18’. Hallways in all of the towers are 6’ wide. Shafts for 2 double elevators are 16’ 8” x 10’, while shafts for 4 double elevators are 33’ 4” x 10’. Retail and lobbies have a depth of 75’ into the ground floor of each building.

In order to make our residential buildings appealing to potential renters, we wanted to add adequate amenity space inside the buildings to augment the common area spaces on the outside of the buildings. Each residential tower features its own lobby and separate entrance so that each tower could potentially be owned and operated by a different entity. Each tower is also equipped with amenity space on several floors in the building for private use by residents of the building. Each residential tower contains three 1500 sqft gyms located at the first residential floor, halfway up the tower, and the second highest level respectively as well as a rooftop terrace that is accessible to residents and sectioned off from the designated green roof areas. The rooftop terraces are 530 sqft, 550 sqft, and 560 sqft on top of Residential Towers 1, 2, and 3, respectively.

Similarly, amenity space was included in the commercial office buildings that could be shared by all prospective office tenants. The first floor of rentable space houses a 4000 sqft gym with locker rooms and a 2100 sqft lounge. Commercial Tower 1 supports a 1035 sqft rooftop terrace that is available to office tenants. Again, this terrace will be separated from the dedicated green roof spaces. Due to maximum building height restrictions, a rooftop terrace could not be included on Commercial Tower 2. In addition, these two office towers each have separate lobbies with separate entrances.

As previously mentioned in this report, the top two levels of above-grade parking in the South garage and all three levels of above-grade parking in the North garage have adequate heights - 12 ft and 12.5 ft, respectively - so that they could potentially be converted into additional office space or amenity space in the future to accommodate for reduced parking demand. This amenity space could include ballrooms, conference centers, or additional physical recreation or lobby space.

Table 2 below shows a breakdown of the gross square footage and rentable square footage of each building use. We assumed a rental efficiency of 0.8 for the residential buildings and 0.95 for the commercial buildings. The area study in Appendix I tabulates the gross area, amenity area, height, and perimeter of each building per floor.

Table 2. GSF and RSF of Each Proposed Building

Name	**GSF**	**RSF**	**Rental Efficiency**
Residential Tower 1	384750	307800	0.8
Residential Tower 2	360335	288268	0.8
Residential Tower 3	342605	274084	0.8
North Garage Retail (attached)	21,912	20816.4	0.95
Office Tower 1	495933	471136.4	0.95
Office Tower 2	514800	489060	0.95
South Garage Retail (attached)	26,998	25648.1	0.95
Pop-Up Retail	2,796	2656.2	0.95

V. Stormwater Design Proposal

For stormwater management of the site, the first step taken was to determine the pre and post-development land cover and soil composition of the area. These composition areas were calculated so that they could be inputted into the Virginia Runoff Reduction Method spreadsheet to determine the amount of phosphorus needed to be treated. Once completed, it was determined that about **3.20 lb/yr** was required to be treated on site. With green roofs on top of all of the proposed buildings and two bioretention sites it was enough to meet and exceed the requirements. There was a total of 0.71 acres of level two green roofs and a total of 2.45 acres of level one green roofs. There was one level two bioretention with a surface area of 570 sq.ft. and a level one bioretention with a surface area of 540 sq.ft. Green roofs were chosen because of the ease of implementation, space requirements, and high treatment percentages. Bioretention areas were added because of treatment and the additional benefit of adding green scenery to the site. One consideration with the stormwater management plan is to exceed the treatment requirements so that the site can potentially sell the extra credits or save them for later if they wish to add more impervious areas within the site. This can be done with rain gardens bordering the roads or within the open space to treat the runoff from these areas. This allows for less construction of stormwater management facilities down the road. It would be up to the developer if they wanted to invest in this opportunity.

With the quality of water taken care of with the green roofs, one major concern that still exists is the quantity of water released from the site. Virginia law dictates that developers must provide a 20% reduction in energy leaving the site. This is to prevent erosion and other damages that come with large amounts of water flowing through a system. Through these calculations, it was determined that storage would be required but that the pond would have sufficient storage for that water. The reason storage was minimal was because the BMPs and design of the site lowered the Curve Number (CN) value of the site. A lower CN value allows the rainfall to soak into the site therefore reducing runoff.

VI. Development Cost Proposal

Total cost is $749,610,493 and the total cost per square foot is $427/sf. The total sitework cost is $13,676,019 or $6.42/sf. This number includes all soft- and hardscaping such as trees, rain gardens, sidewalk pavers, pavement, and more. Structured parking costs for the North Parking Garage include the total cost of $72,389,090, a unit space cost of $59,705 per space, and an underground cost of $32,478,478,840. The South Parking Garage costs include a total cost of $111,479,750, a unit space cost of $51,755/space, and an underground cost of $59,170,875. There are also 18 street surface parking spots which are $18,000/sf.

The residential total building cost and unit cost per GSF are $325,070,672 and $541/sf, respectively. The unit cost per RSF for the residential buildings is 676.71/sf. The commercial total building cost and unit cost per GSF are $555,482,801 and $534/sf. The total development cost per RSF for the commercial development is $562/sf. The allowance unit price for tenant work in the office buildings is $80/sf for 960,196 sf.

The outside of the buildings were comprised of curtain walls, timber textured EIFS, and punched windows. For the residential buildings, the timber textured EIFS was $32/sf for 226,977 sf which leads to a unit GSF price of $6.68/sf. The curtain wall was $115/sf for 161,862 sf which leads to a unit GSF price of $17.11/sf. The punched window unit price was $95/sf for 9,624 sf which leads to a unit GSF price of $0.92/sf. The retail under the residential towers had 8,349 sf of curtain wall for $115/sf, which leads to a $/GSF of $43.82/sf. For the office buildings, the curtain wall was $115/sf t for 158,433 sf which leads to a unit GSF price of $18.39/sf. The timber textured EIFS was $37/sf for 142,547 sf which leads to a unit GSF price of $6.00/sf. The punched windows were $95/sf for 158,433 sf which leads to a unit price per GSF of $0.92/sf. The retail under the office towers had 8,105 sf of curtain wall for $115/sf, which leads to a $/GSF of $35.21/sf. The 2,796 sf of pop-up retail was estimated to be built at $125/sf.

VII. Development and Construction Schedule

Construction Phasing Plan

Construction of the Reston development will consist of three phases. The first phase will be the demolition of all existing structures, including the parking garage and two existing office buildings. The second phase will include the construction and opening of the North garage and the three residential towers on top. The third phase will complete the construction of the South garage, office towers, pop-up retail, and landscaping features in the central open space.

This phasing strategy was developed with the following considerations. The current office buildings will be vacant, since the leases will have expired and the tenants will have been moved out prior to the start of construction. Therefore, demolition of all existing building structures can occur without interruption of new construction. After thorough research of the residential and commercial markets of the surrounding area, we decided to prioritize the construction of the three new residential towers in order to earn the most revenue as soon as possible. With the existence of multiple commercial sites nearby, we believe the addition of our proposed three residential buildings will provide optimal residential opportunities for their employees, thus increasing the demand for our residential structures. Another motive for this phasing strategy is to be able to create a connection with the passengers of the WMATA as soon as possible. As the site's proximity to one of the Silver Line's newest spots is one of its greatest advantages, it would prove fruitful to construct the residential portion of the site's development first in order to provide residents' access to the metro as soon as possible. While Phase 3 is under construction, this construction zone will be located in between the Metro stop and residential buildings, but easy pedestrian access will be maintained throughout the construction process. The pedestrian access connecting the site's residential towers to the adjacent site's WMATA Silver Line Metro Station will be achieved by providing two ADA accessible routes. The first route will ensure the most direct access by constructing a temporary pedestrian access route with two pathways of temporary asphalt and appropriate and safe maintenance of traffic through the construction site. These pathways will be modified throughout the phase by construction workers and by flaggers, when necessary, to provide the safest access through ongoing construction work. The second route will bypass the site's construction by detouring pedestrians to the existing sidewalks on Sunset Hills Rd. These two pedestrian access routes will be in effect until all construction is completed at the end of Phase 3 and the site's new sidewalks are open and accessible to all.

A more detailed description of the work to be completed during each phase is provided below:

Phase 1 (Estimated Start: October 2020; Estimated Complete: September 2021):

After site prep, this phase will commence with the demolition of all existing structures and surface lots. First the free-standing parking garage will be demolished. Next, the eastern

office building, 12011 Sunset Hills Road, will be destroyed, and then the western office building, 12021 Sunset Hills Road, will be demolished. Once each structure has been destroyed, sitework and excavation can begin on the existing surface. As detailed in the erosion and sediment control plan, a safety fence and silt fence will enclose the entire site during this phase, and two construction entrances will be provided at the locations of the existing entrances. The sediment basin will be located in the center of the site at the location of the future pond. Water, sanitary sewer, and stormwater structures that will no longer be of use in the proposed site plan will be removed.

Phase 2 (Estimated Start: October 2021; Estimated Complete: December 2023):

Phase 2 can begin as soon as the existing garage has been demolished; however, it can start later if there are permitting or financing issues. This phase will include the establishment of temporary surface lots for construction site trailers. Construction of Phase 2 will begin with the groundwork for the construction of the eastern portion of the proposed main road alignment, along with any utilities in this section. This includes the construction of the secondary road providing circulation around the residential garage and towers prior to any structural work. Next, the excavation and construction of the residential garage will be able to commence. After the completion of the garage, the superstructure for all three towers will be built with the intention of opening the first tower as soon as possible.

In terms of erosion and sediment control, the locations of the safety fence, silt fence, sediment basin, and construction entrances will not change from Phase 1. At the end of Phase 2, the North Garage, residential towers, and associated retail spaces will be open and operational. Access to these buildings will be provided through the eastern half of the road that is constructed during this phase. Patrons and residents will be able to enter the road using the northeasternmost entrance on the site (off of Sunset Hills Rd). At first, only the garage entrance on the front of the building will be accessible, and the entrance on the side of the building will open as soon as possible during the third phase.

Phase 3 (Estimated Start: March 2024; Estimated Complete: February 2026):

Phase 3 will commence with the excavation and construction of the below-grade portion of the South garage. Once the below-grade garage has been constructed, the road through the site can be finished, and the second side entrance to the North Garage can be opened. Construction of the main road alignment will continue from the eastern portion completed in Phase 2 to connect to the existing western entrance and intersection on Sunset Hills Rd. The circulation road for the commercial office structures from the secondary road alignment will also be established and completed before any building structures commence construction. Next, the above-ground portion of the South garage will be constructed and both office towers will be built. The construction of the site's open space components of the pop-up market commercial structures, amphitheater, and pond will occur during this phase. As mentioned above, the residential

buildings will be occupied and residents and pedestrians will be able to access the newly operational WMATA Silver Line Metro Station through two accessible temporary pedestrian pathways. The temporary pedestrian route through the construction zone will be constructed and maintained throughout Phase 3 through path 1A and path 1B. Flaggers will be utilized to maintain the western construction entrance access and pedestrian path 1B access until the site's proposed sidewalks are constructed and deemed safe for foot traffic. The project will be complete once all construction is finished and all road markings and signages are set and complete.

Construction Schedule

See Appendix A for the construction schedule sequencing for Phase 2 of construction, in which the North garage and three residential towers will be built.

Design Overview Questions

I. Problem Formulation

Our task was to create a redevelopment plan for a parcel of land in Reston, Virginia adjacent to the planned Silver Line Metro stop and just down the road from Reston Town Center. The development needed to be in compliance with the recent changes to the Fairfax County Comprehensive Plan, which called for a much more dense community. The parcel had been rezoned since its initial development, when the allowable FAR was 0.75, to allow for a maximum FAR of 4.0. Our main objective in this project was to design a site within the existing parcel boundaries to satisfy the client with a dense mixture of commercial and residential buildings (about 50% each), adequate parking space, open space, an effective utility and stormwater design, a road design that eases traffic flow, and an overall plan that will meet standards and create a space that's inviting to all citizens. In support of this goal, we also needed to plan for the construction of the site. This included creating a phasing plan for construction with a detailed construction schedule for one of the phases, as well as a full construction cost estimate so that we could estimate our return on investment.

The initial success of our civil design elements such as grading, road design, and stormwater design will be determined by the approval of our plan by the local government officials, as portrayed by our advisors. Additionally, we could measure our economic success by calculating the return rate of the commercial and residential buildings on our site. This can be quantified on our pro forma using the construction costs and the revenue rates we determine. Since we ended up with a commercial ROI of 6.08% and a residential ROI of 7.13%, we could say that our project was successful to some degree because we were able to earn profit off of all the costs we incurred to construct the design. These return rates are in the range of generally acceptable return rates for residential and commercial projects. It is harder to quantify the success related to the desirability of our designed community for the public. We hope that we have created a successful design that is inviting for residents, office tenants, and retail shoppers that is a pleasant place to live, work, and spend leisure time, but this can only be estimated and inferred from the layout and components of our design.

In our design, we were constrained by the spatial boundaries/property lines of the parcel we were working on. In addition, the zoning ordinance of our site's local government presented requirements that we had to abide by in the design of our site. This included things like setbacks, maximum height, minimum open space, and maximum total FAR requirements. While meeting these constraints, we also had to design a site in accordance with the Fairfax County Comprehensive Plan, which presents suggestions for land use. Although our expenses on the site were not limited by a set budget, we also needed to be conscious of the costs that certain design elements incurred.

In order to complete our design, knowledge of hydraulics, grading, and stormwater design were required. We also needed to understand the basics of transportation and road design,

including acceptable grades and slopes for these features. Knowledge of AutoCAD Civil 3D and Revit was also required to complete renderings of the design for our final deliverable, which included architectural renderings and a final civil plan set for the design. Some of the data that was required to complete our project was the data from the existing site, including the locations of buildings and site entrances. The most important data from the existing site was the topographic data, which helped us to determine the stormwater and grading plans for our site. This information was given to us from our clients/advisors. In addition, to complete our pro forma worksheets, we needed data regarding unit construction costs for all possible materials and spaces we needed to construct, as well as potential revenue estimates. The construction unit cost data was mostly sourced from our mentors, but we needed to research current office and residential revenue rates in Reston, VA, in order to decide what we wanted to charge potential tenants.

The proposed design of our project was continuously changing in order to adapt with various challenges encountered throughout the entire redevelopment process. All members of the team had different areas of focus within the overall design, but we all had to be able to bring them together to create a final design that we all believed succeeded in accomplishing the project's objectives. Therefore, effective communication, most importantly, within team members and with our advisors was essential to the progression of the project. By prioritizing transparency and adaptability, we strived to always look for ways to improve our project while also making sure that all components still worked well together.

Feedback from our advisors were given at each checkpoint so that we were able to make updates to the plan. We had to continuously update our plan to meet the clients' requests. Updates to one aspect of the design would then impact other aspects, which then would need updating. These plans and documents associated with our plan were interconnected so updating became somewhat circular. The updating process became even more complex because different team members were usually responsible for different parts of the plan, which again emphasized the need for effective communication. Our group was able to establish effective communication and collaboration in the beginning of the project when we were trying to select a conceptual layout plan for the site. With each layout we had to consider what we wanted to achieve through our design and different building shapes. In the beginning, we each developed our own plan to see how each of us wanted to create the site. Each of us criticized our designs and eventually took advice from our advisors about aspects that they liked and made appropriate changes that ultimately lead to the agreement for the final proposed design.

II. Design Complexity

Due to the wide scope of our project, we faced various complexities throughout our entire design process. These design complexities included having no obvious solutions, conflicting constraints, diverse stakeholders, multiple disciplines, conflicting technical issues, and multiple

interacting subproblems. All of these complexities were components that affected the entire designing process, and ultimately, our final problem solution design submission.

Our solution, proposed as a site plan design, involved several complexities intertwined within each stage of its completion. The design of our solution needed to initially consider the constraint of the requirements identified by our diverse stakeholders. The stakeholders included the engineering design firm that we were to represent as its design engineers, the Fairfax County local government who was to give us approval for the parcel's redevelopment, the contractors that will be hired to complete the work, and the numerous individual users, visitors, residents, tenants, of our proposed development. These constraints often conflicted with each other, as our solution hoped to accomplish maximum levels of benefit for all of our stakeholders. Achieving desired aesthetics and circulation within the site was often limited by the extensive considerations needed for effective phasing and budgeting. Finding a balance between constraints was a challenge that had a great impact upon the final proposed site design. The complexity of proposing a site design solution was expanded as there were tight constraints for certain design decisions, but also no obvious solutions for other factors. The entire layout of the parcel was to be completely designed by us, which allowed a lot of freedom but also uncertainty when deciding upon a certain approach. Conflicting technical issues of limited Civil 3D/CAD and Revit experience within the group contributed to the complexity of designing a site plan that was a professional and realistic solution to the problem proposed. The design complexity also built upon the complexities of interacting subproblems. For example, the layout of the utilities was directly influenced by the overall site plan, but it also impacted it significantly. In addition, the design of the sub-grade elements of the buildings directly influenced grading but was also influenced by the stormwater management system.

Our group also had to ensure a constant stream of communication as our design evolved. Every aspect of the project was intertwined, so changing one part of the design had a cascading impact on the rest of the design that had to be communicated to the other team members so that they could make the appropriate changes in their plans. This communication process became increasingly complex as the design process shifted to a remote format due to COVID-19. Remote forms of communication including video calls and group messaging became even more essential to our process. One reason why our design was constantly evolving was because we discovered new challenges, opportunities, and constraints as we went along. For example, with the stormwater plan, we did not know the extent of stormwater management systems we would need to implement until we ran the numbers on our initial proposed design.

In order to cope with the complexities previously identified, we had to create opportunities out of them. With diverse stakeholders, we realized the importance of having each of their voices be highlighted in our design. By staying flexible and maintaining constant communication with our advisors during key decisions, we were able to find clarity when finalizing our design choices. We had to consider the underlying impact that each decision we made had on each aspect of our project by ensuring that all of the repercussions' layers were

considered and responded to in our future actions. It was also necessary to stick to our design and backup decisions that we made in order to stop the process from continuing inevitably. As long as we believed the design was sound we continued to progress forward. The fact that there was no obvious solution also provided us with endless opportunities, and we chose to deal with that by going through multiple iterations of design, considering the impacts that each design would have on the community overall and construction costs after each iteration. Our two main conflicting constraints were involved with fitting all of the necessary or desired elements within the boundaries of the site and accounting for the high costs that this often causes. We dealt with this by making sure that we include all required elements at whatever cost they require, but making sure that we are still able to make money off the site in the end using the pro forma worksheets and possibly identifying other cost-saving adjustments to our design.

III. Factors Consideration

A description of the role each of the factors played in our final design is provided below:

a) Public health - The aspect of our project that was most closely related to public health was the construction details. When proposing construction schedules, tasks, and building features (on the LEED scorecard), we were cognizant of using materials and practices that promoted public health. In general, our overall design promotes public health by encouraging people to gather outdoors and walk, bike, and use the Metro rather than drive everywhere, since our site is so close to a Metro stop.

b) Safety - Safety is of paramount importance in every engineering design, so we were sure to incorporate it in our final design. The aspect of our design that needed to account for safety the most was the design of the roads, sidewalks, and other pathways throughout the site. Since our development was modeled after transit-oriented development principles, in which pedestrian traffic is extremely common, we needed to design our sidewalks and open spaces with enough capacity and enough safe road-crossings so that a large volume of pedestrians can move around the site, staying safe from the vehicles that also must traverse the site. We will also have trucks traveling the site (to make deliveries, etc.), so we have designed truck-only routes towards the back of the site that will increase safety and traffic flow.

c) Welfare - In our final solution, we wanted to consider the welfare of all citizens. Even though we looked at the project through the lens of a developer, whose goal is to maximize profit, we still wanted to maximize the benefits for everyone who will live/work in our development. This was done by keeping costs as low as possible and by providing the occupants of the site with convenient access to several amenities such as shops, restaurants, leisure space. In addition, by increasing the supply of housing in this area with high demand, we were able to provide more

people with the opportunity to live conveniently, such that they have easy access to urban centers via the metro, but with the comforts of living in the suburbs.

d) Global Factors - Our site is just one relatively small land development project in the Washington Metro Area, but we still need to consider that our site might play a role in shaping future development trends worldwide. For example, since our site is located adjacent to a Metro stop, we designed our site so that it exhibits principles of transit-oriented design, which is an emerging global trend that may start to define how a lot of development is designed in the future. Also, by implementing these transit-oriented design principles, which include pedestrian-friendly amenities and high-density residential and commercial buildings with green community areas, we are contributing to sustainable development, which is very important in the global arena.

e) Cultural Factors - We considered many cultural factors in our design, particularly those relating to the gathering of people and communities. Right now, the United States' culture is largely centered around living in urban or suburban centers, and our project intends to provide people with the convenience and community living that urban centers also provide. Also, by providing an integrated living, working, and leisure space, we are encouraging the coming together of different cultures and groups of people who will be living and working in close proximity to each other.

f) Social Factors - Social factors were very important to our design since we ultimately wanted to create an environment that was desirable for as many people as possible. With the planned Metro stop adjacent to our site, we knew that this would create a large demand for nearby housing and office spaces, so that is what we provided. We also considered that people are drawn to convenience and a feeling of community living, which led us to provide many retail options and a community gathering space at the center of the site that provides a green amphitheater, water feature, and pop-up retail shops.

g) Environmental Factors - The fact that our site is adjacent to a Metro stop allowed us to really capitalize on making an environmentally-friendly design since we could anticipate that having living and working spaces right next to the Metro would result in a lower need for car travel. This allowed us to design our site with more of an emphasis on pedestrian and bicycle use, rather than vehicle use, which will have a positive effect on the environment. In addition, the stormwater management practices used on the site will have a large impact on the environmental impact of the site. We implemented several BMPs including green roofs and bioretention basins to meet the stormwater VRRM requirements. We also strived for LEED silver and gold levels in our buildings by completing a LEED scorecard that detailed the sustainable aspects of our design.

h) Economic Factors - Economic factors were very central to our entire design process as we tried to look at the project through the eyes of a developer who wants to maximize profit and potential. First, we had to weigh the economic costs and benefits in deciding to replace or renovate the existing buildings on the site. In general, we tried to be cost-conscious in all of our design decisions, while also making sure that we spent money on things that would make the site more desirable, such as outdoor amenities and underground garage parking. We have also seen the large influence that economic factors have over the phasing of the construction of a large development like ours. In deciding whether to build and open the residential or office buildings first, we learned that the residential buildings would be the optimal choice because they would bring in immediate revenue, especially in an area with high demand because of its proximity to the Metro and multiple office buildings, unless we could prove that there were clients lined up to lease the office building spaces, since office space is typically harder to fill.

Resources

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