Final Report

Strategic Assessment of LTC Facility Needs and Path Forward

Prepared for the London Transit Commission
by IBI Group

February 14, 2019

Document Control Page

CLIENT:	The London Transit Commission
PROJECT NAME:	LTC Facility
REPORT TITLE:	Strategic Assessment of LTC Facility Needs and Path Forward
IBI REFERENCE:	112174
VERSION:	
DIGITAL MASTER:	J:\112174_LTC_Facility\10.0 Reports
ORIGINATOR:	Chris Prentice, Greg Hoy
REVIEWER:	Bruce Mori
AUTHORIZATION:	Bruce Mori
CIRCULATION LIST:	
HISTORY:	

Table of Contents

Table of Contents (continued)

Table of Exhibits

Table of Contents (continued)

Table of Appendices

1 Purpose

This report provides a strategic direction to the London Transit Commission (LTC) regarding its future operations and vehicle maintenance facility needs to accommodate transit growth and to effectively and efficiently deliver public transit services over the next 30 years to 2047.

The LTC has two operations and maintenance (O&M) facilities which accommodate the various administrative, operations and vehicle maintenance functions including storage for the conventional transit fleet and for managing the specialized transit service. The main facility is located at 450 Highbury Avenue North. There is a second smaller "satellite" facility at 3508 Wonderland Road South. The Highbury Avenue facility was originally constructed in 1950 as a manufacturing plant and was purchased by the LTC and converted for transit purposes in 1972. The Wonderland facility was constructed as a purpose-built building and opened in 2011.

The LTC undertook a Strategic Assessment of its future facility needs in 2006 which led to the construction of the Wonderland facility to provide needed operations and fleet storage capacity and to relieve vehicle maintenance and storage conditions at the Highbury facility.

The objective of this "Strategic Assessment of LTC Facility Needs and Path Forward" study is to revisit and confirm the LTC's future facility needs based on projections of service, fleet and employee growth, to revisit the conclusions of the 2006 Study with regard to the options for replacing the Highbury facility including the option of a new site, and to recommend the best facility strategy going forward.

In this study, the potential facility strategy options have been assessed and evaluated in terms of which one will most effectively and efficiently serve the future public transit needs of the city and the LTC. In this regard, such factors as the future service and vehicle needs, deadhead distance, time and operating costs from candidate locations are considered. A key factor in this current study, as summarized herein, is that the existing Highbury buildings are life-expired and in deteriorating condition; the entire complex needs to be replaced.

2 Background/Context

The London Transit Commission (LTC) provides conventional and specialized public transit services in the city of London. The conventional services are operated directly by the Commission while the vehicles and drivers for the specialized transit services are provided by a private company under contract to the Commission.

The conventional transit service consists of 48 fixed routes operated with 213 Commission-owned buses and over 580 full and part-time employees. A total of 614,210 revenue vehicle hours of service were provided in 2017 with over 22.9 million rides being taken on the system. A further 260,000 trips were taken on the specialized transit service. The vehicles for this service are provided and owned by the contractors.

The City and Commission have adopted an aggressive Transportation Master Plan and Rapid Transit Plan which have the objective of increasing the transit modal share and ridership significantly over the next 15 years.

Standard 40 foot/12.2 metre bus.
Photo credit – Luke Olszewski

LTC's 5-year service plan (2015 to 2019) aims to build on the existing network and enhance the overall level of service provided across the city. The plan seeks to strengthen the network of strategic corridors and a proposed 'Frequent Transit Network' aims to build ridership to achieve the Smart Moves 2030 transit modal split target of 20%. Additional express routes are also proposed to build upon the success of current express routes. The Post-2019 service framework identifies enhancements to LTC's services, and also accounts for the introduction of rapid transit.

To achieve these targets two major bus rapid transit (BRT) routes will be implemented along with improvements in transit service levels on other routes across the city. This will result in an increase in annual revenue vehicle hours and a consequent increase in the LTC's vehicle fleet, the number of employees and related office and functional needs.

2.1 Assessment of Highbury Facility

A detailed assessment of the Highbury facility was undertaken as part of the 2006 Strategic Assessment of Facility Requirements study. That assessment was reviewed and updated for this study with much the same result as in 2006 but with several critical factors:

- The main buildings are now 70 years of age and well past their economic and design life;
- The building materials and, particularly, the concrete floors in the maintenance and storage areas, are in poor condition and deteriorating. A significant capital investment would be required to replace, upgrade and ensure the integrity of the

building structures and flooring which is difficult to justify given the age of the buildings;

- The workplace areas and environment are sub-standard to current, modern facilities; and
- The existing buildings are energy inefficient and the interior layout, particularly in the maintenance and storage areas, presents on-going safety and operational challenges.

The original Highbury building was constructed in 1949 as a manufacturing plant. It was purchased by the LTC in 1968 and converted between 1968 and 1972 to serve as the LTC's administrative, operations and maintenance headquarters replacing a turn-of-the-century (c1900) former streetcar barn on Lyle Street. The facility occupies a site of 7.2 hectares (17.8 acres) with the area of today's buildings totalling some 23,045 m^2 (248,060 square feet). They accommodate the following functions:

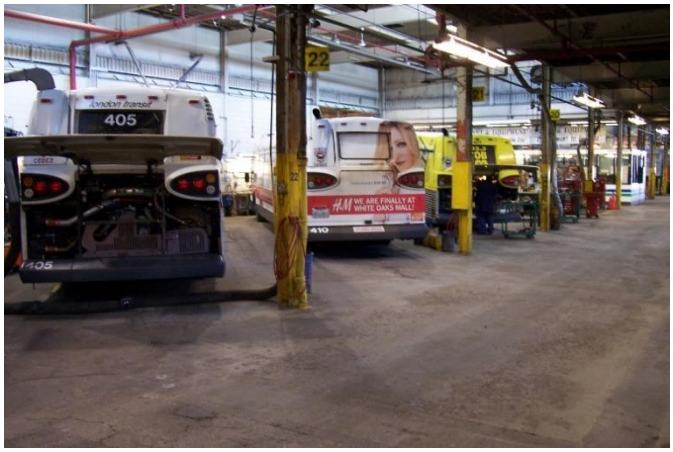
- Administration – all management and administrative activities associated with the delivery of transit services in London including finance, human resources, planning, purchasing, security, farebox revenue sorting and counting, and specialized transit brokerage;
- Operations – reporting and waiting areas for bus operators, lunch room, supervisory offices, meeting rooms, union office, locker room, washrooms;
- Maintenance – repair bays for vehicles, component overhaul area, parts stockroom, supervisory and staff support offices and meeting room. A new heavy body overhaul area and paint booth was added in 2002/03;
- Vehicle Storage – internal area to store buses and exterior area for staging vehicles prior to or after vehicle servicing and parking;
- Vehicle Servicing – internal areas for fuelling, cleaning and washing buses and external area for fuel and oil storage; and
- Roadways and parking – driveways and lanes for accessing the property, internal circulation and employee and visitor automobile parking.

Modifications and additions undertaken in 1990/91, 1993/94 and 2002/03 increased vehicle storage space, servicing and maintenance capacity as well as administrative office space. However, because of the design of the original structure, particularly with respect to roof height, spacing of column supports within the building and the office layout, the use of the building as a bus garage has involved compromises in the location of the vehicle maintenance, storage,

servicing functions and in the layout of the parts repair, stockroom and office areas. As well, the location and orientation of the original building on the site has meant that separate buildings have had to be constructed to accommodate added vehicle storage and servicing and maintenance requirements rather than having these functions conveniently grouped together.

Overall, the Highbury facility has a number of inherent design and functional deficiencies which limit the efficient utilization of existing spaces due to the origin of the complex as a manufacturing and warehouse facility. In addition, the design of the original structure complicates vehicle movements and restricts areas where vehicle maintenance can be undertaken as well as complicating vehicle exhaust ventilation.

The following is a summary of the key space and functional deficiencies:



- **Administration:**
  - Limited office space;
  - Office layout is functionally inefficient with offices separated by steps and walls due to differing floor heights and location of load-bearing walls; and
  - Additional meeting rooms are required.
- **Operations:**
  - Bus driver operator report and meeting areas are at capacity;
  - Meeting room space for operational purposes and consultation with employees is limited. Additional meeting rooms are required; and
  - Additional office areas for supervisory staff required.
- **Maintenance:**
  - The maintenance repair area is at capacity for the current fleet size;
  - Access to repair bays is constrained due to internal roof support columns;
  - Space to service and repair articulated buses is restricted; additional bays designed specifically for articulated buses are needed including a drive-through capability;
  - Central stock-room space is limited; parts are stored in multiple controlled areas throughout building. This results in inefficiency in parts handling; and
  - Space for component repair is limited.

- **Vehicle Servicing and Storage:**
  - Vehicle storage area is at capacity for current fleet size; and
  - Vehicle storage is divided amongst three buildings resulting in extended vehicle movements and additional circulation on site.

The LTC has invested some $8.3 million to repair and up-grade various building systems over the past 10 years to address past deficiencies as well as to maintain the buildings in a state of good repair. However, there remains significant physical repair and upgrade work to the buildings which can be expected to increase as the buildings age further.

For these reasons, it is time to replace the Highbury buildings with a modern, purpose-built, functional and efficient facility.

3 Defining Future Facility Needs

In order to determine the most appropriate future facility strategy including size, vehicle capacity and location, it is critical to project the needs of the transit system in terms of fleet size, number of employees and related functional requirements including employee vehicle parking. For this purpose, a 30-year projection of LTC's bus fleet size, number of employees and associated employee vehicle parking requirements has been prepared as the basis for developing preliminary space programming and concept design requirements for a transit operations and vehicle maintenance (O&M) facility to replace the existing Highbury complex.

In these estimates, the number of buses includes standard 12.2 m buses and articulated 18 m buses. Articulated buses are to be added to the LTC fleet beginning in 2023 for the new Bus Rapid Transit (BRT) services. Articulated buses proportionately increase the space requirement in specific areas of an O&M facility such as the service lane, maintenance and storage areas on the basis of an approximate 50% premium per articulated bus compared to 12.2m buses representing an overall facility capacity increase of 35% on a per vehicle basis.

With regard to projecting future fleet growth, it may be possible to pre-plan transit services (routes, frequencies, running times) in the short term (typically less than 10 years) in order to project future fleet requirements, if there is some certainty with regard to development plans within that timeframe. However, beyond 10 years, pre-planning transit services is highly conjectural and therefore uncertain, as future development plans and general transportation conditions (roads, traffic) are much less defined. Accordingly, the best approach is to use a population-per-transit-vehicle ratio to project future fleet growth.

The population-per-transit-vehicle method applies the ratio of population to transit vehicles from the base year and to future population estimates with adjustments to reflect increased transit service levels and anticipated increases in transit ridership. This process yields an estimate of the number of transit vehicles that may be required to provide transit service in the future.

For space planning purposes and primarily for the bus storage area, buses are expressed in terms of Standard Bus Equivalent (SBE) values with an articulated bus converted to 1.5 times the space of a 12.2m bus.

3.1 LTC Service Growth and BRT Plans

The 30-year fleet estimates to 2047 are based on the LTC's 10-year service and bus rapid transit plans to 2027 as well as population projections for the city to 2047 and are presented in 5-year increments.

Employee and associated employee vehicle parking estimates are based on 2017 LTC employee/bus and employee vehicle/parking ratios. These are:

- Employees: Highbury – 497; Wonderland – 83
- Employees per bus – 2.83 (H – 3.07, W – 1.93)
- Employee vehicle parking ratios: H – 0.57 spaces/employee; W – 1.83; Total – 0.73

Together, the LTC's 10-year service plan and BRT plans indicate the following fleet totals to 2027:

2017: Peak Vehicles – 171, Spares – 46, Total Vehicles = 217

2019: Peak Vehicles – 176, Spares – 42, Total Vehicles = 218

2021: Peak Vehicles – 186, Spares – 40, Total Vehicles - 226

2027: Peak Vehicles – 195 (178 + 17), Spares – 40, Total Vehicles - 235 + 30 BRT = 265

The 2027 total of 265 standard and articulated buses would represent 280 SBEs.

3.2 LTC Fleet Estimate to 2047

For projecting the LTC's fleet size to 2047, population estimates provided by the City's planning department to 2034 have been utilized. Based on a 2011 population of 366,200, the city's population is estimated to have been 385,439 in 2016 and then projected to increase to 423,917 by 2026, 454,700 by 2034 and 504,722 by 2047. For the projection to 2047, the growth factor for the period 2011 to 2034 has been used.

Using this data, the LTC's bus fleet is projected to increase as follows based on the LTC's 10-year service plan projection of fleet growth to 2027 and using a constant population/bus ratio as of 2027 for the period beyond 2027. The LTC fleet will increase from the planned 265 buses by 2027 to 278 buses by 2034 and 312 buses by 2047. These estimates are subject to future detailed service plans which would define service levels and, accordingly, fleet requirements. These fleet estimates are also for 12.2 m standard length buses.

Exhibit 3.1 summarizes these population and fleet estimates to the year 2047.

In addition to 40 foot buses, LTC has both 30 foot and 60 foot buses in its fleet.
Photo credit – Luke Olszewski

Exhibit 3.1: LTC Bus Fleet Growth Projection to 2047

Year	Population	Bus Fleet	Population/Bus
2016	385,439	213	1,810
2021	404,678	226	1,791
2027	423,917[1]	265[2]	1,600
2031	443,157	277	1,600
2034	454,700	278[2]	1,635
2039	473,939	290	1,635
2044	493,178	302	1,635
2047	504,722	312	1,618

Notes: [1] 2026 population [2] LTC estimate

With plans to add 30 articulated buses to the fleet by 2027 for the BRT service, the fleet size for facility space planning purposes can be considered to be 15 vehicles higher than the values shown for 2027 and beyond as articulated buses are 50% longer than standard 12.2 metre buses. Therefore, and subject to the purchase of additional articulated buses after 2027, the fleet totals for 2027 to 2047 when expressed as “standard bus equivalents”, or SBEs, would be:

2027 – 280

2031 – 292

2034 – 293

2039 – 305

2044 – 317

2047 – 327

3.3 Employee and Employee Vehicle Parking Estimates

The next step in determining the size, space and area requirements for a new transit facility is to estimate the number of employees and associated employee vehicle parking requirements. Using the LTC’s 2017 employee per transit vehicle ratio and the number of parking spaces currently at both the Highbury and Wonderland facilities, future estimates have been prepared.

Exhibit 3.2 summarizes the number of full-time and part-time employees currently working out of LTC’s Highbury and Wonderland facilities in the primary functional areas of General and Administration, Operations, and Maintenance (vehicle and facility). The number of employees are then expressed as full-time equivalents (FTE) which provides a fuller recognition of the employee resources required to deliver transit service.

As indicated, there are a total 580 full and part time employees on staff, with 497 at Highbury and 83 at Wonderland. On an FTE basis, there are 478 at Highbury and 80 at Wonderland.

At the Highbury facility specifically, the number of FTEs by functional area are:

Operations – 351

Maintenance – 74

General and Administration – 53

The resulting overall LTC employee per vehicle staffing ratio is 2.72 while the ratio for Highbury alone is 2.95. The ratio for Wonderland is lower at 1.86 recognizing that this facility is a satellite

of Highbury and is only operational during weekdays with correspondingly lower levels of vehicle and employee requirements.

To estimate future employee vehicle parking requirements, the LTC's current number of employee parking spaces at each facility has been utilized with a ratio per employee calculated as set out in Exhibit 3.3. The resulting ratios are 0.53 (approximately 1 space for every 2 employees) at Highbury, and 1.74 at Wonderland. However, for Wonderland, it should be noted that the facility is operating at approximately 50% capacity.

Exhibit 3.2: LTC Employees by Functional Area and Facility – 2017

Category	Full-time		Part-Time		FTE*		Total
	H	W	H	W	H	W	
Operations							
Bus Operators	322	62	32	6	335	65	400
Other Transportation Operations	16	-	-	-	16	-	16
Maintenance							
Vehicle Mechanics	36	9	-	-	36	9	45
Other Vehicle Maintenance and Servicing	38	6	-	-	38	6	44
Other							
General and Administration	51	-	2	-	53	-	53
Totals							
Total Employees	**463**	**77**	**34**	**6**	**478**	**80**	**558**
Buses	-	-	-	-	170	43	213
Employees Per Bus	**-**	**-**	**-**	**-**	**2.81**	**1.86**	**2.62**

Notes: H – Highbury W – Wonderland * Part-time calculated at 0.4 FTE

Exhibit 3.3: Parking Spaces for Employee Vehicles – 2017

Location	Highbury	Wonderland[1]	Total
Employees	478	80	558
Parking Spaces[2]	254[3]	139	393
Visitor parking	6	5	11
Visitor parking – Handicapped	1	4	5
Spaces/Employee	**0.53**	**1.74**	**0.70**

Notes: [1] Facility capacity at ~50% [2] Cars and motorcycles [3] Actual is 282 – 10% spare capacity

Using the foregoing employee per transit vehicle and employee parking ratios, Exhibit 3.4 presents the overall estimated number of LTC employees and parking space requirements to 2047 based on the fleet estimates developed in Exhibit 3.1. By 2047 with a projected fleet total of 312 buses, LTC would have approximately 818 employees and a requirement for approximately 433 parking spaces, using the current Highbury employee parking ratio of 0.53.

Exhibit 3.4: Total Employees Projection and Parking Requirements

Year	Bus Fleet		Employees (@2.62/vehicle)	Parking Spaces (@0.53/employee)
	Buses	SBEs		
2016	213	213	558	296
2021	226	226	592	314
2027	265	280	694	368
2031	277	292	726	385
2034	278	293	728	386
2039	290	305	760	403
2044	302	317	791	419
2047	312	327	818	433

3.4 Future Space Requirements for Highbury

Since the current study is focused on replacement of the Highbury facility, the fleet, employee and parking space requirements need to be determined specifically for Highbury. As noted at the outset, the Wonderland facility is currently designed for 90 buses but can be expanded to 100 buses. Accordingly, the potential number of employees able to be accommodated at Wonderland as well as the number of parking spaces is consistent with that future capacity.

On a go-forward basis and looking at the future spatial needs for a replacement Highbury facility, it is assumed that the Wonderland facility would be expanded to a 100-bus capacity and continue as a satellite to Highbury with hours of operation similar to today's practice (ie. weekdays). All general and administrative functions as well as heavy vehicle maintenance would continue to be handled at a "Highbury" facility. This would mean that employee/transit vehicle ratios would be similar to those in existence today (ie. 2.81 and 1.86).

Using these assumptions, by 2047, the bus capacity requirement at Highbury would be 212 individual buses (227 SBEs) on the basis that all articulated buses will be assigned to the Highbury facility.

In projecting future requirements beyond 2047 as well as to provide operational flexibility, it is good practice to marginally increase the total vehicle capacity by 10 per cent (10%). This would therefore bring the vehicle capacity requirement to approximately 233 buses or 250 SBEs.

3.5 Facility Space Estimate

On the basis of 250 SBEs (233 buses) and current general transit facility space planning guidelines of 130m^2 (1,400 sf) per bus, the estimated size including all key functional areas of General and Administration, Operations, Vehicle Maintenance, Vehicle Servicing and Vehicle Storage, would be approximately **32,500 m^2** (350,000 sf) (250 x 130 m^2), subject to detailed design.

Generally, the required site size for a 32,500 m^2 building together with parking and internal roads and driveways would be approximately **7.3 hectares** (18 acres), subject to the shape of the site and by-law requirements regarding setbacks. As noted earlier, the Highbury site is approximately 7.2 hectares (17.8 acres).

4 Future Facility Strategy Options

To confirm the most appropriate facility replacement option for the LTC, alternative new locations to Highbury were considered and compared in terms of transit operating costs (bus deadhead – the time and distance between the transit garage and the start and finish points of routes throughout the city).

4.1 Alternative Facility Site Locations

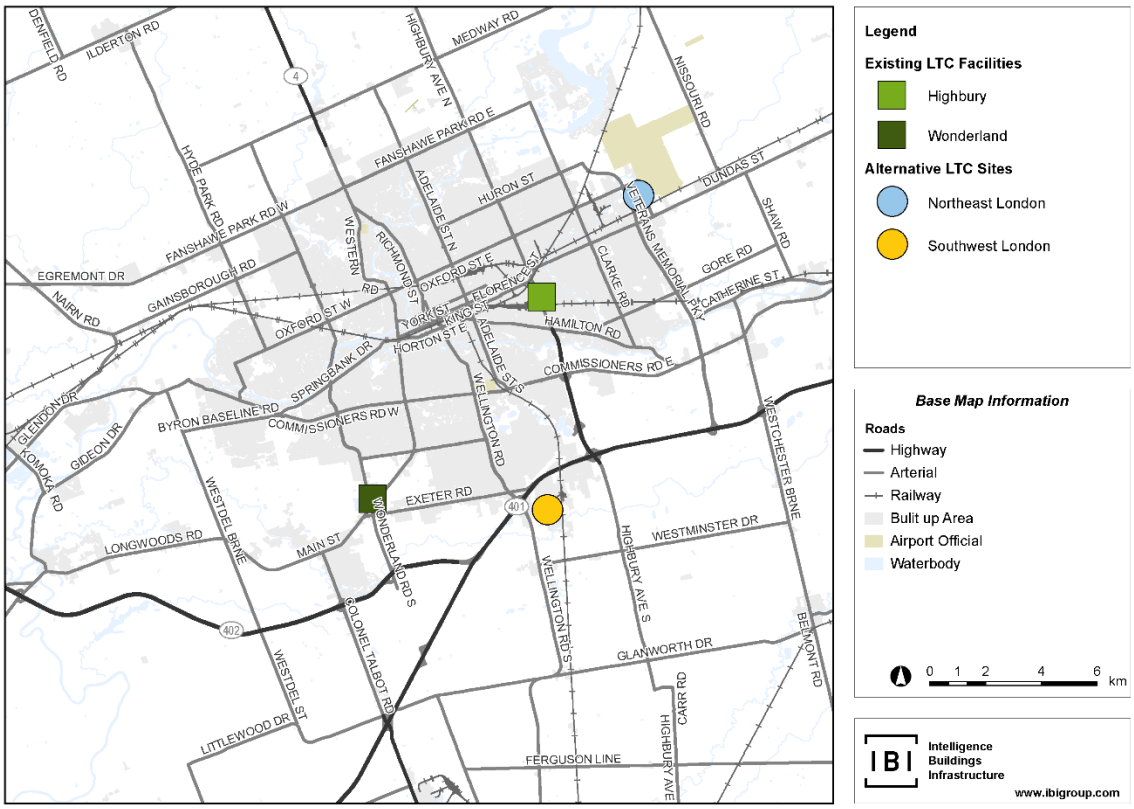
Remaining at the Highbury location and building a replacement facility will involve logistical issues as well as disruption to transit operations during the rebuilding process. This approach would involve interim costs as well as a potential capital cost premium associated with a phased approach to rebuilding. As a result, consideration has been given to obtaining a new site and building a new facility without the operational implications and restrictions.

Identifying potential sites of sufficient size (7.2 hectares) in London is challenging given the built-out nature of the city and limited vacant land. Only two currently available sites were identified in the process and these are located in southwest London, Wellington Street south of Highway 401. However, these sites are quite removed from the geographic centre of the city and LTC's service area as well as also being relatively close to the existing Wonderland transit facility. As such, they could be expected to increase transit operating costs for buses to access transit services across the LTC service area. Nevertheless, they have been retained to assess the operating cost implications of moving to a new location as an alternative to remaining at the Highbury facility.

For comparative purposes, and to evaluate the potential of a new site with potentially better access to the LTC's service area and balancing the Wonderland facility, a location in northeast London, theoretically in the vicinity of Oxford Street and Veterans Memorial Parkway, has been used.

Exhibit 4.1 presents the locations of the existing two LTC facilities (Highbury and Wonderland) and the two alternative locations (northeast London and southwest London).

Exhibit 4.1: Map of Existing and Alternative LTC Facility Sites



4.2 Transit Operating (Deadhead) Analysis

An analysis of transit operating (deadhead) time and cost was performed for the Highbury site and the alternative facility sites to identify the facility option with the lowest deadheading cost on a daily or annual basis. This analysis was based on four data sources:

- The current LTC fleet size at Highbury (170 conventional buses in 2018);
- The forecast LTC fleet size at Highbury in years 2024 (170 buses) and 2047 (233 buses, including a 10% contingency factor as described in Section 0);
- A schedule of Highbury and Wonderland bus pull-out times for an average weekday (September 2018, provided by LTC); and
- Average trip times between facility sites and trip start/end locations in London.

To estimate the number of deadheading hours required for an average weekday, trips between route start/end points and the Highbury facility were tallied from the pull-out schedule to identify all relevant start/end points and the current number of weekday trips. To account for return trips to Highbury, the number of pull-out trips to each route starting point was doubled, yielding 272 daily weekday trips to and from Highbury. Since all fleet growth vehicles are expected to be stored at the Wonderland facility between 2018 and 2024, it is assumed that 170 buses will operate from Highbury in 2024, making 272 daily weekday deadhead trips. To reflect growth in the bus fleet to 2047, these trips were then uniformly scaled up based on the projected fleet growth, yielding 373 daily weekday deadhead trips.

Average trip times between each trip start/end point and each potential facility site location were then obtained from Google Maps based on the list of all start/end points and the three site

locations. This involved simulating each trip as a driving trip departing the transit facility at 1:00 p.m. on a Wednesday, then calculating the average of the given high and low travel times. Using the number of trips to and from each start/end point and the estimated time for each trip, total weekday deadhead times were calculated for each site option, as shown in Exhibit 4.2. A full table showing individual LTC deadhead trips and trip times is provided in **Appendix A**.

The annual deadhead cost estimates for each facility, also shown in Exhibit 4.2, were calculated by first expanding the number of daily weekday deadhead hours to an annual total, then multiplying the annual number of deadhead hours by an hourly operating cost. Saturday and Sunday deadhead hours were estimated based on the proportion of LTC weekday routes operating on either Saturday (84%) or Sunday (79%). It was also assumed that LTC buses will follow a weekday schedule for 252 days per year, a Saturday schedule for 52 days per year, and a Sunday schedule for 61 days per year (including holidays). Finally, hourly operating costs were estimated to be $100.00 per hour – slightly higher than the cost of $97.14 per hour provided in 2017 CUTA statistical report prepared by the LTC.

Exhibit 4.2: Deadhead Trip Summary for LTC Facility Sites

Facility Site	Highbury	Northeast London	Southwest London
2018			
Number of Buses		170	
Number of One-Way Deadhead Trips		272	
Annual Deadhead Hours	20,373	30,336	26,702
Annual Deadhead Cost	$2,037,300	$3,033,600	$2,670,200
Difference from Highbury	**-**	**$996,300**	**$632,900**
2024			
Number of Buses		170	
Number of One-Way Deadhead Trips		272	
Annual Deadhead Hours	20,373	30,336	26,702
Annual Deadhead Cost	$2,037,300	$3,033,600	$2,670,200
Difference from Highbury	**-**	**$996,300**	**$632,900**
2047			
Number of Buses		233	
Number of One-Way Deadhead Trips		373	
Annual Deadhead Hours	27,843	41,623	36,521
Annual Deadhead Cost	$2,784,300	$4,162,300	$3,652,100
Difference from Highbury	**-**	**$1,378,000**	**$867,800**

Based on this analysis, the southwest locations would result in an estimated annual operating cost premium compared to the Highbury location of $632,900 both today and in 2024, increasing to $867,800 by 2047. A northeast location would have a higher operating cost premium of $996,300 today and in 2024, increasing to $1,378,000 by 2047. The difference between the Southwest and Northeast locations reflects the fact that a Northeast location would be more remote from the centre of the LTC's service area requiring buses to travel further.

As a result, the current Highbury site is preferred from a transit vehicle deadhead and operating cost perspective, given that it can save approximately 6,400 hours of annual deadhead time (or $632,900 of annual deadhead cost) over the southwest and 10,000 hours, $996,300 over the

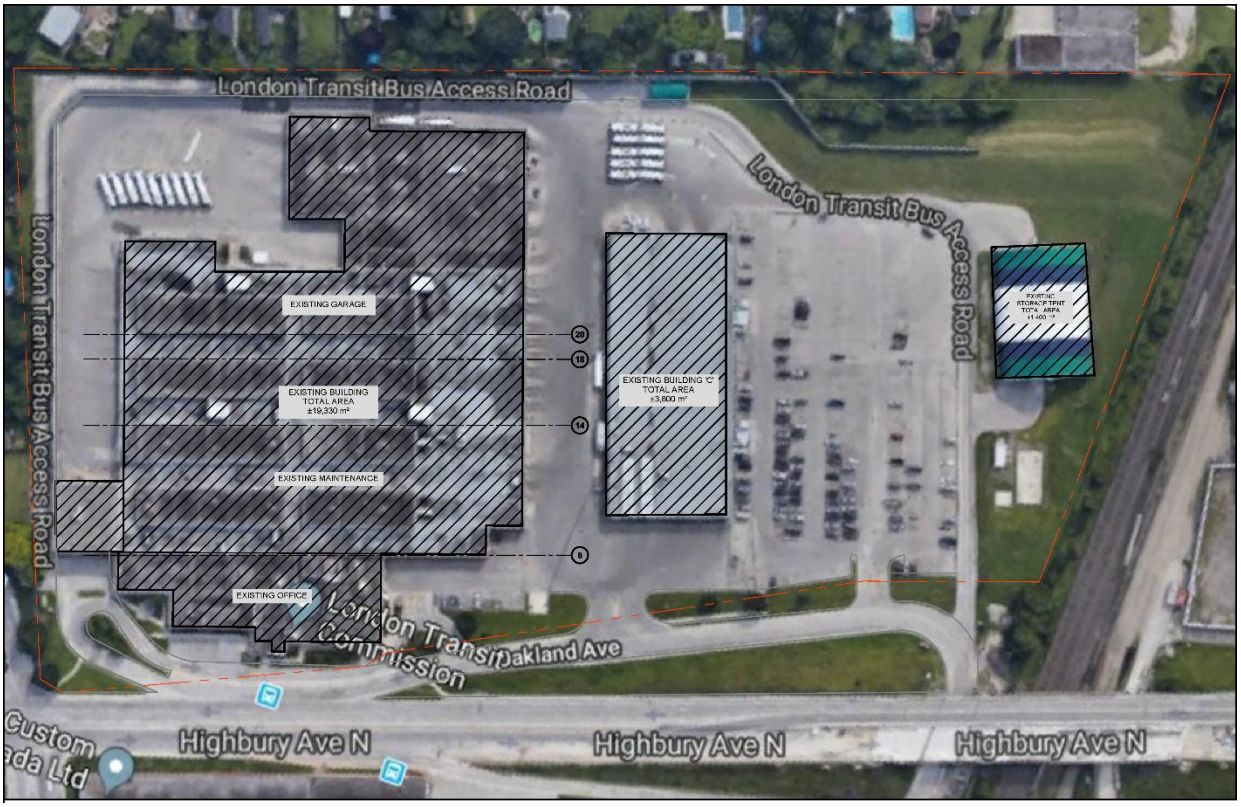
northeast London sites in 2024. As the LTC fleet grows between 2024 and 2047, the annual deadhead cost savings associated with the Highbury site will also grow to approximately $867,800 (southwest) or $1,378,000 (northeast) per year.

Over the long term, deadhead costs for the Highbury site would be between $996,000 and $1.37 million less than those for the northeast London site per year. This results in a potential savings of **$28 million** between 2024 and 2047. Similarly, deadheading costs for the Highbury site are expected to be between $630,000 and $867,000 less than those for the southwest London site per year, a potential savings of **$18 million** between 2024 and 2047.

5 Concept Plans – Highbury and New Site

The next step in the facility planning process was to prepare concept plans for a new 250-SBE, 32,500 m^2 facility for the Highbury and the two potential alternative "greenfield" locations. For Highbury, it was critical to determine the practicality and feasibility of being able to both accommodate a new, larger facility (250 SBE vs existing ~180 SBE) on the site, as well as to test the ability to phase the construction of a new facility while minimizing disruption to transit operations. For reference, the existing Highbury facility and site is illustrated in Exhibit 5.1.

Exhibit 5.1: Existing LTC Highbury Transit Facility



5.1 Highbury Site

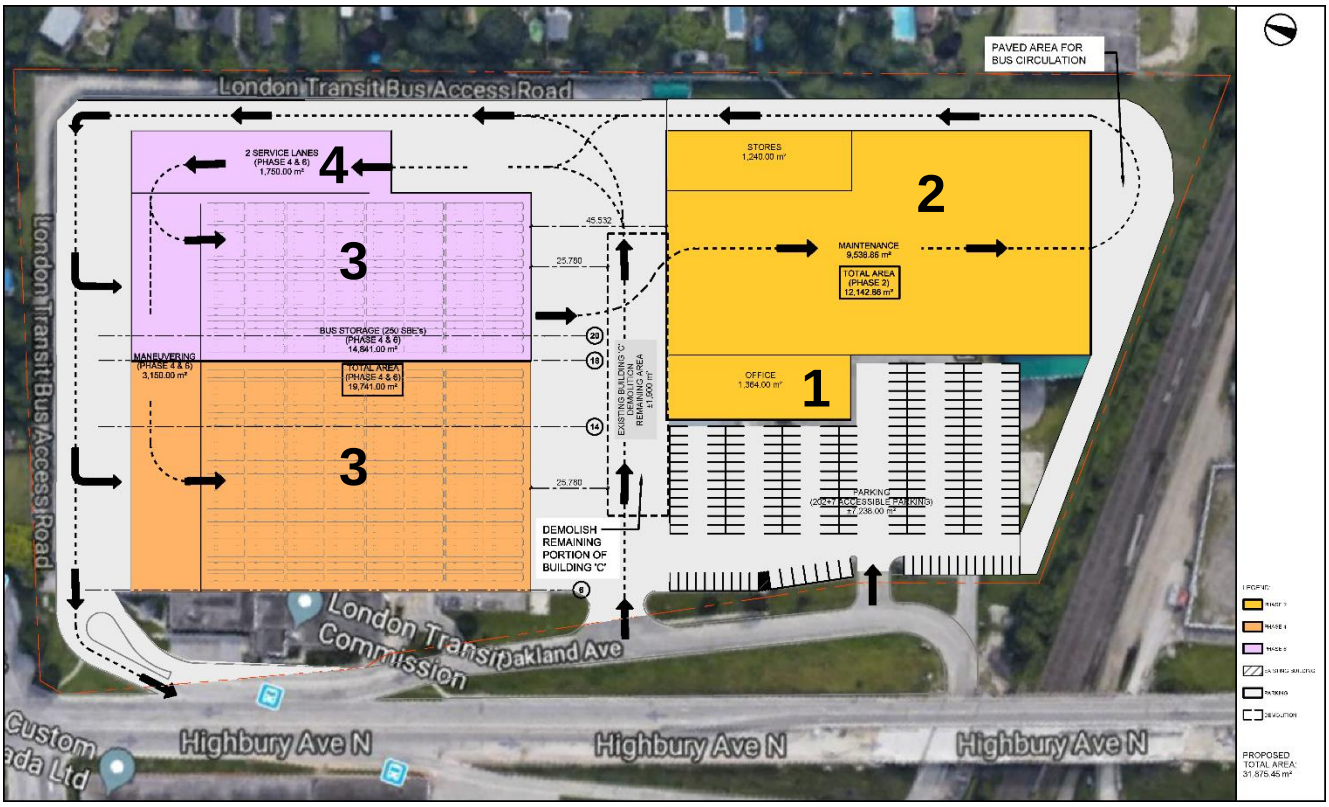
Initially, seven concept plans for locating a 250-SBE facility on the Highbury site were prepared and reviewed with LTC staff from the standpoint of functionality and layout. These plans are illustrated in **Appendix B**. They have variations in the orientation and layout of the key functional areas of the facility on the site along with variations in vehicle and pedestrian (employee) circulation patterns. The functional areas of the facility consist of:

- Administration/general management;
- Operations;
- Vehicle maintenance;
- Vehicle servicing; and
- Vehicle storage.

Two of the options illustrated how a new facility, on the premise of no requirement for phasing and the assumption that all transit functions could be relocated off-site during reconstruction, would look on the site. These options served the purpose of demonstrating that a new 32,500 m^2 facility could be located on the Highbury site. However, they were also eliminated immediately from further consideration in view of the fact that relocation of all transit functions, particularly with regard to vehicle servicing (fuelling, washing) and maintenance, could not easily be arranged elsewhere. In short, rebuilding on the Highbury site had to allow for vehicle maintenance and servicing to continue during reconstruction. As such, phased reconstruction was necessary to achieve this objective.

The remaining five concept plans each presented alternative approaches to the layout of the facility and the inter-related orientation of each of the primary functional areas on the site. Through discussions with LTC and guidance of the consulting team, one layout, option 5, was selected as the preferred option as it best represented the most practical way to phase construction while resulting in an effective and efficient facility design. This option was then carried forward to determine how best construction of the new facility could be phased while maintaining transit operations, particularly vehicle maintenance and servicing. Exhibit 5.2 presents the concept plan for Option 5 for the completed facility.

Exhibit 5.2: Concept Plan for Final Option 5 Facility



In order to reconstruct while maintaining and minimizing the impact on transit operations, the final facility would consist of four separate buildings, two of which would be constructed at the same time and linked:

- **Building 1** – New administration/general management and operations building;
- **Building 2** – New vehicle maintenance building including associated supervisory and employee office spaces as well as a parts stockroom;
- **Building 3** – New vehicle storage building constructed in two steps; and
- **Building 4** – New vehicle servicing building.

Buildings 1 and 2 would be linked and constructed at the same time as part of one construction step. Building 4 would be constructed at the same time as the second half of Building 3.

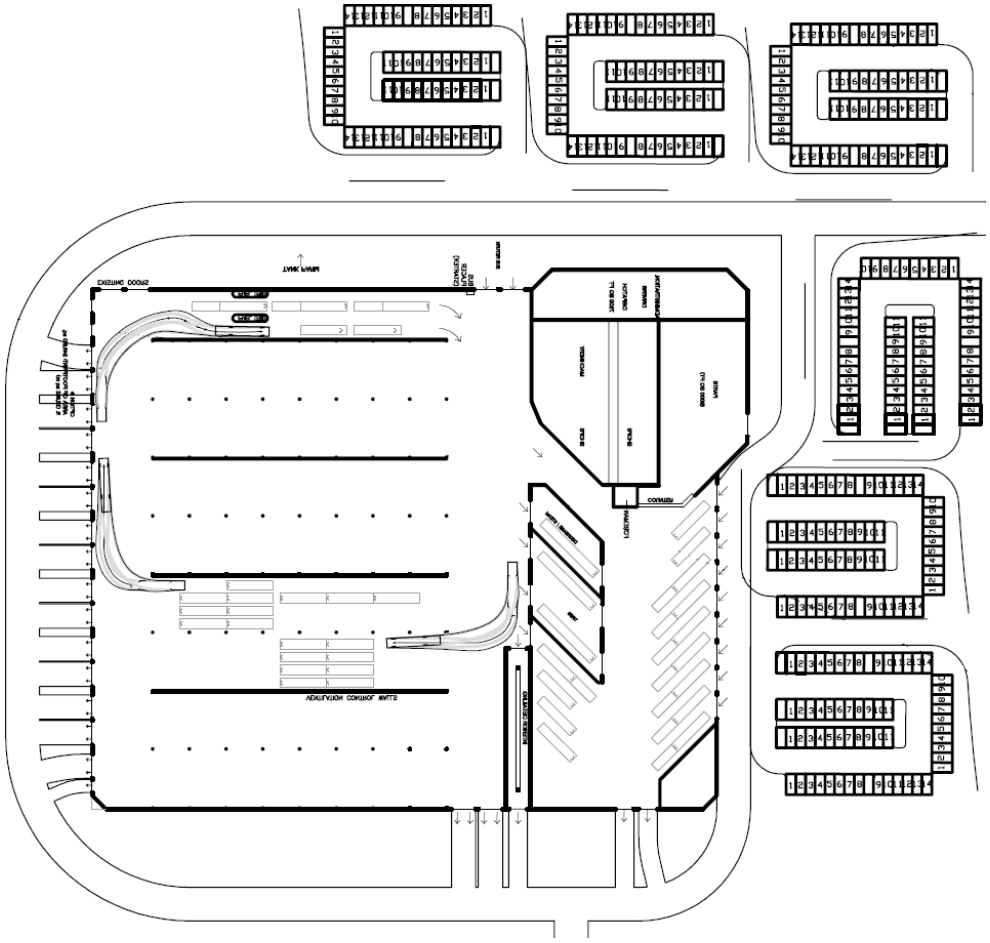
Demolition of the existing buildings would be phased as well and timed to release land for the construction of the new buildings. In all, reconstruction would involve seven phases consisting of demolition and new construction. Details of the phased construction are provided in Section 8: Highbury Facility Re-construction Logistics, which follows on page 19.

5.2 Alternative Sites

For the alternative sites, a generic 32,500 m^2 building and concept plan was prepared both to illustrate how a new facility might appear but also for cost estimating purposes. This generic building is illustrated in Exhibit 5.3 and, given that the location would be new, phasing of the building construction would not be required. As such, the facility would consist of a single-building complex. The actual size, orientation and layout of the building would depend on

detailed space programming, the dimensions and shape of the selected site along with applicable setbacks, or any other site encumbrances and topography. Should the option of constructing on a new site be pursued, then a new concept plan applicable to the selected site, prior to preparation of a preliminary design, would be necessary.

Exhibit 5.3: Concept Plan for a 250 SBE Facility on a New Site



6 Facility Strategy Cost Estimates

Based on the two facility strategy options of rebuilding on the Highbury site or on a new site, cost estimates for each alternative were prepared by a cost consultant, BTY Limited, who specialize in the construction of complex projects such as a transit operations and maintenance facility. As well, land cost estimates for both potential new sites and the sale of the Highbury site (should the new site option be pursued) were prepared by local real estate firm, Cushman & Wakefield. The following are the resulting cost estimates.

Facility Cost – New Site

- Construction – 32,500 m2 facility including land preparation/sitework, contingencies (@ 20%), fees and miscellaneous charges $160,942,000

Facility Cost – Highbury Phased Reconstruction

- Construction Cost – including premium for phased construction (5%), contingencies (20%), demolition of existing buildings, fees and miscellaneous charge $163,993,000

Land Cost (~ 7.3 hectares)

- Southwest London (Roxbourgh Road - $833,200/ha) $6,100,000
- Northeast London ($279,600/ha) $2,100,000

Sale of Highbury

- Potential value, subject to site remediation $1,800,000

6.1 Construction Cost Comparison

The difference in construction cost estimate between rebuilding on the Highbury site and a new site lies in three areas – land development cost, demolition and phasing. Demolition of the existing buildings at Highbury is estimated at $4,626,000, sitework at $1,809,000 and the phasing premium at $6,424,000, for a total of $12,879,000 plus 20% contingencies. Land development/site work costs for a new site would be $10,238,250 plus 20% contingencies, for a cost difference of approximately $3,000,000.

6.2 Land Value - Highbury

The Highbury site has some degree of contamination as a result of its pre-LTC ownership use as a warehouse. Although the area of contamination is limited, based on a previous investigation undertaken by the LTC, the cost of remediation would detract from the re-sale value of the Highbury site. As a comparison of potential value and effect of contamination, a 3.6 hectare site (EMCO) on Dundas Street with contamination issues, recently sold for approximately $750,000 suggesting that the value of the Highbury site may be in the range of $1,500,000 after allowing for remediation. Without contamination, or if the site is remediated, the value of the site could be in the range of $1,800,000. However, the cost to remediate the site could be in the order of $500,000.

6.3 Temporary Site Costs

To facilitate rebuilding on the Highbury site as discussed in Section 8: Highbury Facility Re-construction Logistics, LTC would need to acquire or lease two small parcels of land, each approximately 0.5 to 0.7 hectares, for staging and relocation purposes during reconstruction. These sites would need to be prepared for temporary use by vehicles and an office trailer. The estimated land development costs for these two sites would be $2.9 million. The cost of purchasing or leasing the sites would be extra. If purchased, the land cost could be recovered following completion of the project, therefore land cost is not included as a cost factor in this analysis. No lease cost estimate has been prepared as this would be highly dependent on the location and negotiations with the land owner.

Additional transit operational costs related to staffing the temporary locations and shuttling buses and employees between the temporary sites and either Highbury or Wonderland are estimated at $300,000 for each of two years of reconstruction, a total of $600,000.

Detailed construction cost estimates for each site alternative along with the land preparation cost estimates for the temporary sites are included in **Appendices D and E**.

Together, the comparative costs for re-constructing on Highbury including temporary land and operating costs, and constructing on a new site are summarized in Exhibit 6.1.

Exhibit 6.1: Summary of Cost Comparisons for Facility Strategy Options

	Facility Strategy Option		
		New Site	
Cost Item	Highbury	Southwest	Northeast
Construction	$164,000,000	$161,000,000	$161,000,000
Land – purchase	-	$6,100,000	$2,100,000
Land – sale	-	($1,500,000)	($1,500,000)
Temporary Sites	$2,900,000	-	-
Operating	$600,000	-	-
Total	**$167,500,000**	**$165,600,000**	**$161,600,000**
Difference versus Highbury	**-**	**($1,900,000)**	**($5,900,000)**

As indicated, based on the capital costs for construction, land and interim operating costs, a site in the Northeast area of London, on the strength of lower land costs, would have the lowest overall potential cost compared to either a site in the southwest or rebuilding on Highbury. However, it should be noted that no potential specific site in the northeast has been identified and therefore the estimated land cost is conjectural.

7 Selection of Preferred Location

In the preceding sections, the estimated operating and capital costs associated with the two primary facility location strategies have been developed and analyzed. From a **capital cost** perspective, a location in the northeast area of London has a lower financial commitment of $5,900,000 compared to reconstruction at Highbury, while a southeast location would be $1,900,000 less than Highbury.

Based on the **operating (deadhead) cost** analysis in Section 5, a northeast location has the highest cost premium compared to Highbury of approximately $936,000 annually rising to $1,378,000 by 2047. A southwest location would have an annual operating cost premium of $632,000 increasing to $867,800 by 2047.

Taken together, the capital and operating costs for each of the facility strategy options provide a fuller comparison of the financial implications and obligations of each option and, therefore, a better indication of the most cost-effective option.

Exhibit 7.1 presents a summary of this comparison with the operating cost premiums expressed as the equivalent ROI (Return on Investment of 5% annually) or capital investment required to fund the premium.

Exhibit 7.1: Summary of Capital and Operating Costs for Facility Strategy Options

Cost Item	Facility Strategy Option		
	Highbury	Southwest	Northeast
Capital	$166,900,000	$165,600,000	$161,600,000
Operating (ROI[1]) – Low	$6,000,000	$12,640,000[2]	$18,720,000[2]
Operating (ROI[1]) – High	-	$17,356,000[3]	$27,560,000[3]
Total	**$172,900,000**	**$178,240,000**[2] to **$182,956,000**	**$180,320,000**[2] to **$189,160,000**
Premium versus Highbury	**-**	**$5,340,000** to **$10,056,000**	**$7,420,000** to **$16,260,000**

Notes: [1] 5% interest rate [2] 2024 only; increases thereafter [3] 2047

While the northeast site has a lower capital cost of approximately $5,900,000 compared to Highbury, it has a significantly higher annual operating cost premium of $936,000 which is projected to increase to $1,378,000 annually by 2047. Similarly, a southwest site has a marginally lower capital cost compared to Highbury of $1,900,000 but an operating cost premium of $632,000 increasing to $867,800 by 2047. These premiums represent a required capital investment of between $12,640,000 and $17,356,000 for the southwest site, and $18,720,000 to $27,560,000 for a northeast location.

Of the two cost elements, capital and operating, the most significant cost factor is the operating cost. Capital construction cost is a one-time investment while operating costs represent an on-going and increasing cost commitment. *Compared to Highbury, a southwest location would have a financial premium of $5,340,000 to $10,056,000, while a northeast location would have a financial premium of $7,420,000 to $16,260,000.*

In conclusion, **reinvesting in the Highbury site presents the lowest cost and most cost-effective facility strategy option for London and the LTC.**

8 Highbury Facility Re-construction Logistics

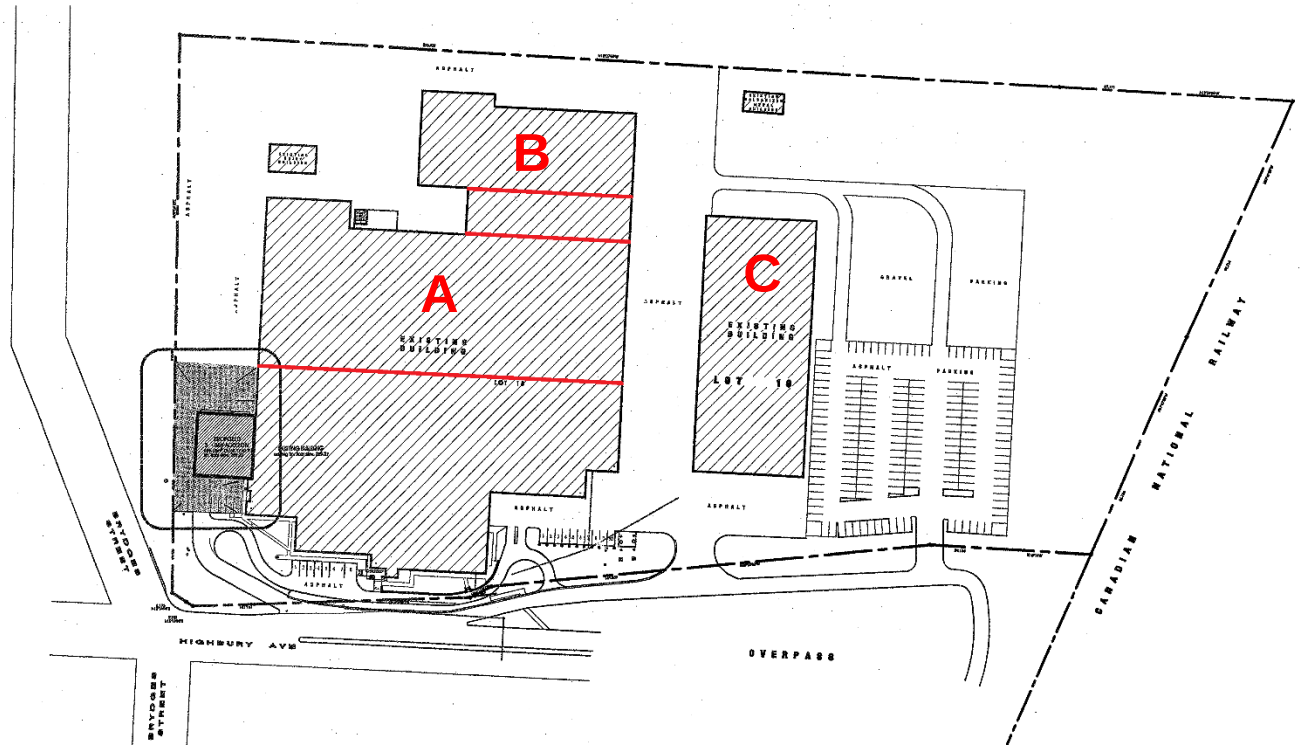
To replace and build a new Highbury facility on the existing site, a critical issue is how best to maintain transit operations during the reconstruction process. This section presents a summary of the steps involved in maintaining and minimizing disruption to transit operations including vehicle servicing and maintenance during reconstruction including the temporary relocation of some transit functions, employees and vehicles. These functions include:

- Administration;
- Operations including dispatch and control centre;
- Vehicle maintenance and servicing;
- Vehicle storage (transit buses and non-revenue vehicles); and
- Employee parking.

8.1 Highbury Re-construction Phasing

Based on the preferred concept plan for re-constructing Highbury (Option 5, Exhibit 5.2), the phasing of both demolition of the existing buildings and construction of the new buildings would be undertaken in seven phases. The concept plans illustrating each of the seven phases is included in **Appendix C**. Exhibit 8.1 illustrates Highbury and building designations.

Exhibit 8.1: Highbury Facility Building Designations



Phase 1:

- Demolish the south half of Building C (bus storage) leaving the fuel/wash lanes as the north half of the building;
- Existing employee parking area will be closed and the existing storage tent removed. The contents of the storage tent will need to be relocated; and
- Employee parking to be relocated to a temporary site, preferably close to Highbury, until the completion of Phase 2.

Phase 2 – Construct the new maintenance, stores, office building and employee/visitor parking area on the existing employee parking lot, storage tent area and site of the demolished south half of Building C. The office building will include the administrative, operations, dispatch and control centre areas.

Phase 3 – Demolish Building A including the existing office, maintenance and bus storage area, and demolition of Building B west of existing column line 20. This will eliminate storage for **63 buses** and allow the construction of the first portion of the new bus storage area as Phase 4.

Phase 4 – Construct new bus storage building for 144 SBEs in area formerly occupied by Buildings A and part of Building B.

Phase 5 – Demolish the remainder of the bus storage garage (Building B east end).

Phase 6 – Construct new storage building for 108 SBEs including service (fuel, wash, cleaning) lanes and interior manoeuvring area over site of Building B.

Phase 7 – Demolish remainder of Building C and complete all necessary site work and paving.

These phases would be preceded by the following steps:

- Retention of an architectural and engineering firm to prepare preliminary design plans and final construction cost estimates for the new facility;
- Approval of the plans by LTC and authorization to proceed with construction;
- Preparation of the detailed design and construction drawings;
- Preparation of tender documents for the construction of the new building as well as to demolish the existing facility and prepare the site for new construction based on the above phasing plan; and
- Identification and lease/rent of two temporary sites for bus storage, employee vehicle parking, and temporary operations offices.

8.2 Vehicle and Employee Assignments to Facilities

The current assignment of LTC's 213 buses and 580 employees between the two facilities is:

Highbury – 463 full-time employees and 34 part-time employees; 170 buses.

Wonderland – 77 full-time employees and 6 part-time employees; 43 buses.

For clarity, full-time equivalent employees (FTEs) have been used in the following sections. One FTE is equivalent to one full-time employee, or 2.5 part-time employees. LTC currently has 558 FTEs – 478 at Highbury and 80 at Wonderland.

The Highbury facility has three buildings ("Barns"), A, B and C. Barn A accommodates administration, operations, all vehicle maintenance and a portion of the vehicle storage functions. Barn B accommodates vehicle storage and the body shop. Barn C accommodates fuelling, washing, general cleaning and vehicle storage functions. The vehicle storage capacity for each of the buildings is:

Barn A – 108 buses;

Barn B – 36 buses; and

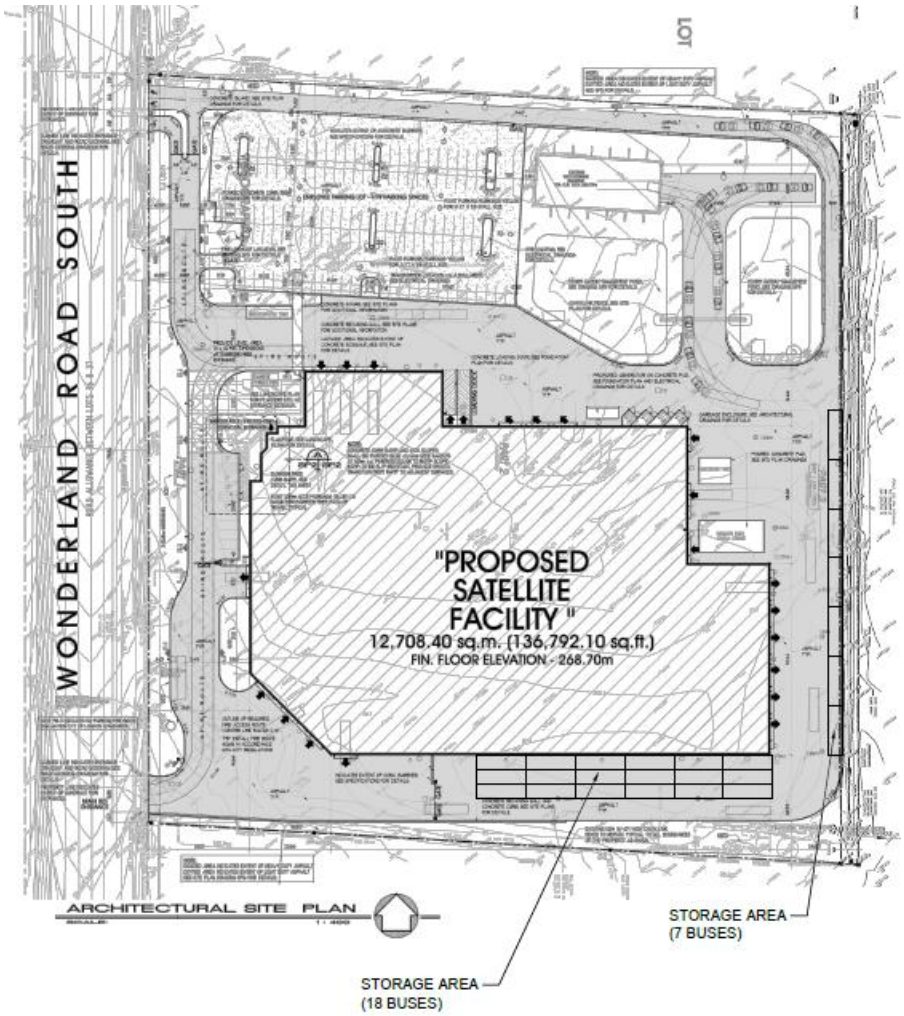
Barn C – 36 buses.

Highbury has a current bus storage capacity for 180 buses.

The Wonderland facility has some limited office space for administration and operations functions as well as vehicle servicing (fuel, wash), maintenance and storage functions. It is designed for indoor storage of 90 buses meaning there is spare capacity for 47 buses based on the current fleet assignment. There is vacant office space available.

A review of the Wonderland site indicates that, for a temporary period, 25 buses could be stored outdoors. Together with the spare indoor capacity, a total of 72 buses could be assigned to the Wonderland facility on an interim basis during reconstruction of Highbury as indicated on Exhibit 8.2.

Exhibit 8.2: Wonderland Facility Indicating Additional Bus Parking Areas



8.3 Future Fleet Growth

With the timeline for reconstruction of Highbury estimated to extend for three years between 2021 and 2024, the LTC fleet and employee complement is projected to increase by approximately 20 buses and 53 FTEs (20 buses x 2.62 FTEs/bus) bringing the total fleet to approximately 233 buses and FTEs to 611. The majority of the employee increase will be bus operators and maintenance staff.

8.4 Relocation of Bus Fleet and Employees

Exhibit 8.3 summarizes the necessary relocation of employees, employee parking, and buses during all phases of reconstruction. Based on the projected fleet growth and reconstruction phasing, it is projected that up to 99 buses currently operating out of Highbury will need to be relocated over the period of reconstruction comprised of:

- 63 buses from Barns A and part of Barn B; and
- 36 buses from Barn C.

The 20 future growth buses would be additional to this total and would increase the total number of buses needing to be stored elsewhere to 119 buses. The number of employees required to be relocated will be consistent with the number of buses being relocated and associated transit service levels and functions.

This will leave approximately 71 buses at Highbury in Barn B during reconstruction Phases 1, 2 and 3.

With available indoor and outdoor storage for 72 buses at Wonderland, temporary storage space for up to 47 buses will be required "off-site" during Phases 3 and 4 of reconstruction (up to 2 years). While space for all 47 buses will not be required at the start of reconstruction, it is best to obtain the ultimate space requirement from the outset.

Along with land for bus storage, land will be needed for employee car parking and portable offices for general administration and operations employees and related functions including washrooms/change rooms. It is estimated that the required office space would be for approximately 107 FTEs for the 47 buses (27 buses x 2 FTEs/bus + 20 buses x 2.62 FTEs/bus). Space for 75 employee vehicles (0.7 spaces per FTE) will be required.

The land requirement for 47 buses, 75 employee vehicles and portable office units is estimated to be 0.51 hectares (1.25 acres):

- 31,725 sf for 47 buses (12.5 ft x 45 ft + 20% for circulation);
- 20,000 sf for 75 employee cars;
- 800 sf for portable office units; and
- 2,000 sf for miscellaneous storage.

An additional temporary site of approximately 75,000 sf (0.7 hectares) to park up to 282 employee vehicles will be required during Phases 1 and 2. This site should be close to Highbury.

Both of the temporary sites would need to be serviced, graded, paved, fenced and lighted.

Exhibit 8.3: Vehicle and Employee Relocation during Construction Phasing

	Highbury			Wonderland			Temp A	Temp B		
Phase	Bus	FTEs	Park[1]	Bus	FTEs	Park	Park	Bus	FTEs	Park
Current	170	478	282	43	80	139	-	-	-	-
1	134	406	-	43+36	80+72	139	282	-	-	-
2	134	406	-	79	152	139	282	-	-	-
3	71	280	+282	79+36	152+72	139	-	+27	+54	+38
4[2]	71	280	282	115	224	139	-	27+20	54+53	38+37
5	71+47	280+107	282	115	224	139	-	-	-	-
6	118	387	282	115	224	139	-	-	-	-
7	118+52	387+91	282	63	133	139	-	-	-	-
Final	170	478	282	63	133	139	-	-	-	-

Notes: [1] 282 spaces is interim requirement. Final number of spaces is approximately 347

[2] Includes growth buses (20) and corresponding employees (61) and employee parking (43)

8.5 Vehicle Servicing and Maintenance

Servicing

The remaining buses at Highbury (71) would continue to be serviced at Highbury in the remaining north half of Building C until the new servicing area is constructed as part of Phase 6.

The 72 buses relocated to Wonderland would be serviced at Wonderland. The 47 buses located off-site could be serviced either at Wonderland or Highbury depending on the location of the temporary site.

Maintenance

For vehicle maintenance, the remaining 71 buses at Highbury would continue to be maintained in Building A until completion of new maintenance building as part of Phase 2. The 72 buses relocated to Wonderland would be maintained at Wonderland for minor repairs and at Highbury for major repairs. The 47 buses located off-site would be maintained at either Highbury or Wonderland depending on the location of the off-site lot.

8.6 Employee Relocation

The following employee relocations will be required as part of Phases 3 and 4:

- Administrative and operations staff remain in Building A until the new office building is constructed as part of Phase 2;
- Maintenance staff would remain in Building A/B until the new maintenance building is constructed as part of Phase 2;
- Operations staff (bus operators and supervisors) would be relocated to Wonderland according to re-assignment of buses and routes prior to commencement of reconstruction; and
- Operations staff (bus operators and supervisors) relocated to the Off-Site location consistent with number of buses at the location (up to 47).

8.7 Employee Parking

Temporary parking for all of the administrative, operations and maintenance staff vehicles at Highbury will be required during reconstruction for Phases 1 and 2. Some of the parking could be accommodated at Wonderland and/or at an off-site location nearby. Upon completion of Phase 2, the parking of employee vehicles can return to Highbury except for those employees associated with the relocated buses and related transit services. For the final building layout a total of approximately 347 parking spaces (655 employees @ 0.53 spaces/employee) will be available.

8.8 Logistics Steps

The logistical steps involved in relocating functions, people and vehicles from Highbury during construction are summarized as follows:

Step 1 – Relocate employee parking at Highbury to off-site location during construction of new maintenance and office buildings.

Step 2 – Relocate 36 vehicles and related operations employees from Building C to Wonderland.

Step 3 – Return employee parking from off-site location to Highbury.

Step 4 – Relocate 63 buses from Buildings A/B to Wonderland and an off-site location. 71 buses remain at Highbury during reconstruction.

Step 5 – Continue fuelling and servicing of buses at Highbury in remaining portion of Building C until completion of Phase 4:

- Fuel, service and maintain 72 buses from Highbury at Wonderland;
- Fuel and service 47 buses (including 20 growth buses) stored on temporary site at Wonderland or Highbury, depending on location of temporary site; and
- Maintain 47 buses (including 20 growth buses) stored on temporary site at Wonderland or Highbury, depending on location of temporary site.

Step 6 – Relocate 71 buses from Barns A and B to new Storage building.

Step 7 – Return 47 buses, related employees and employee parking from temporary site to Highbury.

Step 8 – Return 52 buses, related employees and employee parking from Wonderland to Highbury. 20 growth buses remain at Wonderland.

9 Conclusions

This strategic assessment of the LTC's transit facility needs has projected future operations and maintenance facility needs to the year 2047 (a 30 year horizon) based on estimates of fleet growth, increases in employees and related employee needs such as parking. These are the critical factors which influence both the size of future facilities as well as site requirements. The process has included a review of the previous 2006 facility strategy study and consideration of facility location options, concept plans and analysis of the process and logistics that would be involved in building a new facility on the Highbury site while minimizing disruption to transit operations. The key conclusions from this study are:

- The transit fleet is projected to grow to approximately 312 buses (327 SBEs), 818 employees and a requirement for 433 parking spaces by 2047.
- The Wonderland facility has future maximum capacity of 100 buses/SBEs resulting in a remaining future facility requirement for 212 buses/227 SBEs, or 233/250 with a 10% contingency factor.
- The Highbury buildings are at the end of their life and deteriorating; the facility must be replaced.
- Based on preliminary concept designs, a new 250-SBE, 32,500 m^2 can be accommodated on the Highbury site.
- It is feasible and practical to rebuild the Highbury facility on site while maintaining transit operations through phased construction and some relocation of fleet, employees and operational activities to the Wonderland facility and to temporary sites during reconstruction.
- The estimated capital cost to replace the Highbury facility with a new, modern, efficient complex on site is **$164.0 million** plus $2.9 million for the purchase of two temporary sites and $0.6 million for short-term increased operating costs for two years.

- Comparatively, the capital cost to construct a new 250-SBE 32,500 m^2 facility on a new site would be approximately **$161 million** plus land cost estimated at between **$2.1 million** (northeast) and **$6.1 million** (southwest).
- Operational (deadhead) cost analysis indicates that alternate site locations in either the southwest or northeast areas of London would increase LTC's annual operating costs compared to Highbury by between $632,900 (southwest) and $996,300 (northeast) in 2024 (potential opening date for a replacement facility) and between $867,800 and $1,378,000 annually by 2047.
- Together, the capital and operational (ROI) costs for the Highbury site and potential alternative sites in the southwest and northeast areas of London (where a required 7.3 hectare would most likely to be found), indicate that the **Highbury** site represents the **lowest long term operating cost location** with a capital and operating ROI total of **$172.9 million**, compared to $178.2 million to $183.0 million for a southwest location or $180.3 million to $189.2 million for a northeast location.
- Considering the condition of the Highbury facility and timeline to replace the facility together with projected continued growth of transit services and the transit fleet and employee complement, the LTC and City should proceed as soon as possible to replace the Highbury facility.

10 Recommendations and Path Forward

Based on the findings of this study and the identified strategy for meeting the LTC's future transit operations and maintenance facility needs, the following recommendations are provided:

1. Approve the rebuilding and replacement of the existing Highbury facility with a new modern facility on the existing Highbury site;
2. Refer the project and related operating and capital costs identified in this report for inclusion in the Commission's 5-year capital and operating budget;
3. Advise the City of London of the recommended plan and budget for replacing Highbury; and
4. Update the project budget estimates at the time of proceeding with the project and final design of the new facility.

10.1 Implementation Plan

The following steps and timeline are proposed as the Path Forward towards replacement of the Highbury facility for consideration once funding for the project has been secured:

1. LTC to locate and acquire two sites of approximately 0.7 acres for temporary employee parking and 1.25 acres for bus storage, employee parking and portable offices, up to 2 years, in proximity to Highbury and Wonderland (subject to availability).
2. Commence detailed design of the replacement Highbury facility.
3. Revise route and bus operator schedules accordingly for additional buses and employees working out of Wonderland and temporary lot.
4. Finalize arrangements for servicing and maintaining buses including staffing requirements at either Highbury or Wonderland depending on location of temporary site.

5. Review and confirm vehicle maintenance schedules, staffing levels and arrangements at both Highbury and Wonderland.
6. Determine need for additional spare buses and employees for shuttling or other purposes during the period of reconstruction.
7. Determine additional staffing needs for operations and maintenance during the period of reconstruction.
8. Tender construction of Highbury.
9. Tender land preparation for temporary lots (paving, lighting, fencing).
10. Award tenders and commence re-construction of Highbury, changes to Wonderland bus parking and preparation of temporary lots.

The timeline for these action steps is presented in Exhibit 10.1.

Exhibit 10.1: Path Forward Timeline

Action Steps	Activity	Timeline
1	Commission receive and approve facility strategy report; capital cost for project included in LTC Capital plan	Year 1
2	Confirmation of Budget Approval	Year 1
3	Following project approval, commence preliminary and detailed design of Highbury	Year 1
4	LTC approve detailed design	Year 2
5	Prepare and issue tender documents and RFP for construction of Highbury facility	Year 2
6	Acquire or lease two temporary sites	Year 2
7	Award construction tender, commence project	Year 3
8	Construct Highbury facility, relocate required transit activities, staff and vehicles	Year 3, 4
9	Complete construction, commission new Highbury facility	Year 5

Appendix A – Deadhead Trip Times for Facility Site Options

To/From Highbury

Start/End Point of Trip	Daily Trips (2018)	Trip Time (minutes)
Argyle Mall	22	7
Barker & Huron	6	11
Beaverbrook & Blythwood	4	25
Bluebell & Sunningdale	2	19
Bonaventure & Trafalgar	2	8
Brydges & Highbury	8	2
Capulet & Oxford	2	24
Cherryhill Mall	2	19
Commissioners & Highbury	4	8
Deveron & Commissioners	2	9
Dufferin & Waterloo	2	12
Dundas & Adelaide	2	9
Dundas & Highbury	10	3
Fanshawe & Adelaide	6	19
Fanshawe College	10	7
Hale & Brydges	10	2
Halls Mills & Commissioners	4	26
Highbury & Hamilton	6	5
Huron & Adelaide	8	14
Huron & Highbury	16	8
King & Richmond	6	13

Start/End Point of Trip	Daily Trips (2018)	Trip Time (minutes)
King Edward & Thompson	6	7
Kipps & Adelaide	4	15
Masonville Mall	16	22
Natural Science	10	21
Oxford & Highbury	8	5
Oxford & Hyde Park	2	28
Oxford & Proudfoot	6	21
Oxford & Wonderland	2	24
Parkwood Hosptial	2	13
Pond Mills & Thompson	2	6
Queens & Richmond	18	13
Richmond & Queens	6	13
Seagull & Hyde Park	4	28
Shelborne & Deveorn	2	9
Southdale & Ernest	2	16
Southdale & Nixon	4	16
Victoria Hospital Zone C	6	11
Wellington & Dundas	2	12
Westmount Mall	14	25
White Oaks Mall	20	15
Wonderland & Sarnia	2	25

To/From Northeast London

Start/End Point of Trip	Daily Trips (2018)	Trip Time (minutes)
Argyle Mall	22	9
Barker & Huron	6	12
Beaverbrook & Blythwood	4	29
Bluebell & Sunningdale	2	16
Bonaventure & Trafalgar	2	5
Brydges & Highbury	8	11
Capulet & Oxford	2	28
Cherryhill Mall	2	24
Commissioners & Highbury	4	15
Deveron & Commissioners	2	15
Dufferin & Waterloo	2	19
Dundas & Adelaide	2	17
Dundas & Highbury	10	12
Fanshawe & Adelaide	6	15
Fanshawe College	10	8
Hale & Brydges	10	10
Halls Mills & Commissioners	4	36
Highbury & Hamilton	6	13
Huron & Adelaide	8	14
Huron & Highbury	16	9
King & Richmond	6	25

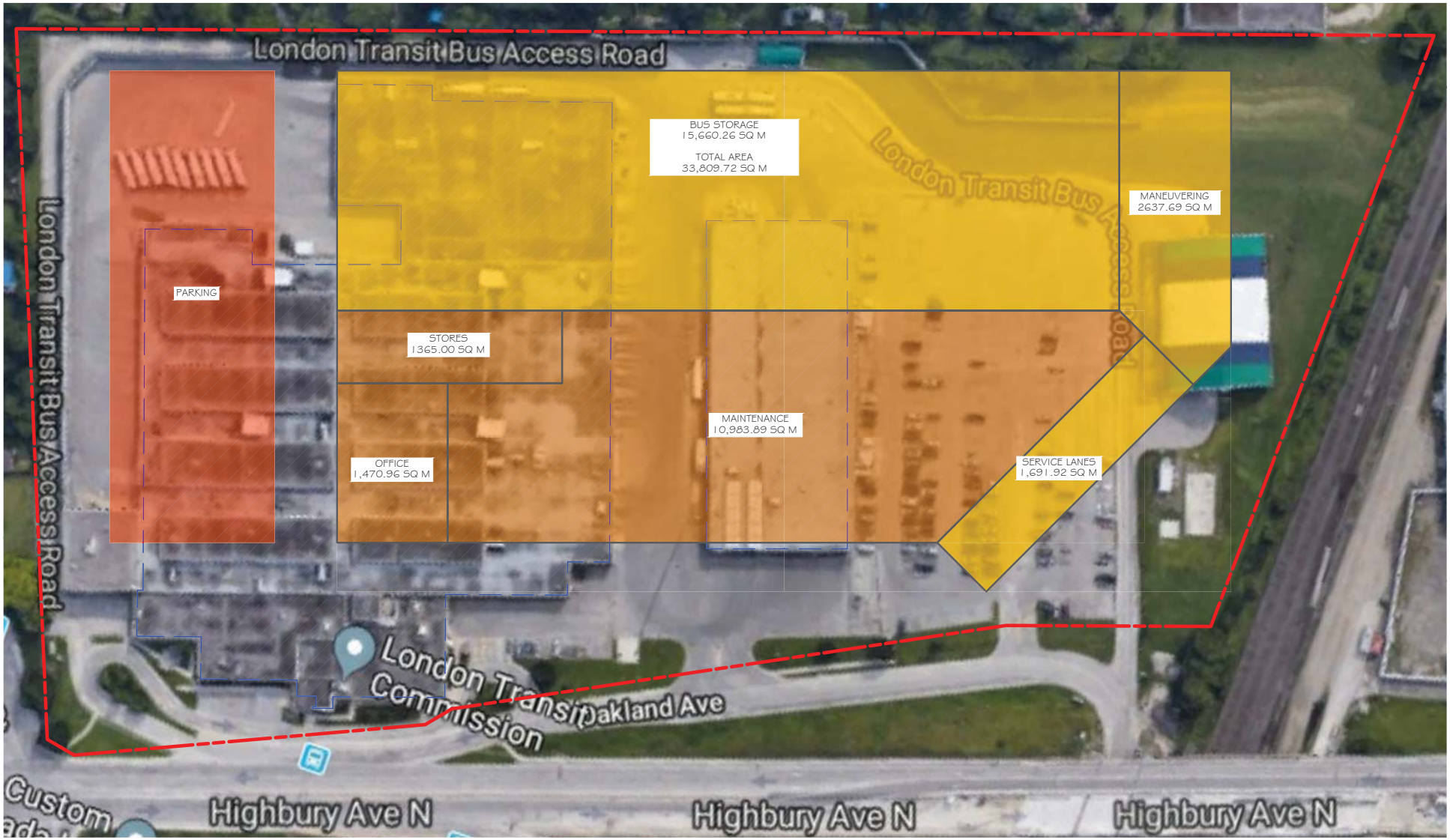
Start/End Point of Trip	Daily Trips (2018)	Trip Time (minutes)
King Edward & Thompson	6	16
Kipps & Adelaide	4	14
Masonville Mall	16	20
Natural Science	10	21
Oxford & Highbury	8	09
Oxford & Hyde Park	2	31
Oxford & Proudfoot	6	24
Oxford & Wonderland	2	28
Parkwood Hosptial	2	20
Pond Mills & Thompson	2	16
Queens & Richmond	18	20
Richmond & Queens	6	21
Seagull & Hyde Park	4	28
Shelborne & Deveorn	2	15
Southdale & Ernest	2	22
Southdale & Nixon	4	22
Victoria Hospital Zone C	6	20
Wellington & Dundas	2	20
Westmount Mall	14	28
White Oaks Mall	20	20
Wonderland & Sarnia	2	29

To/From Southwest London

Start/End Point of Trip	Daily Trips (2018)	Trip Time (minutes)
Argyle Mall	22	18
Barker & Huron	6	23
Beaverbrook & Blythwood	4	26
Bluebell & Sunningdale	2	31
Bonaventure & Trafalgar	2	15
Brydges & Highbury	8	11
Capulet & Oxford	2	26
Cherryhill Mall	2	28
Commissioners & Highbury	4	10
Deveron & Commissioners	2	10
Dufferin & Waterloo	2	21
Dundas & Adelaide	2	20
Dundas & Highbury	10	14
Fanshawe & Adelaide	6	30
Fanshawe College	10	17
Hale & Brydges	10	13
Halls Mills & Commissioners	4	21
Highbury & Hamilton	6	9
Huron & Adelaide	8	25
Huron & Highbury	16	20
King & Richmond	6	24

Start/End Point of Trip	Daily Trips (2018)	Trip Time (minutes)
King Edward & Thompson	6	12
Kipps & Adelaide	4	26
Masonville Mall	16	35
Natural Science	10	31
Oxford & Highbury	8	16
Oxford & Hyde Park	2	24
Oxford & Proudfoot	6	26
Oxford & Wonderland	2	26
Parkwood Hosptial	2	13
Pond Mills & Thompson	2	12
Queens & Richmond	18	23
Richmond & Queens	6	23
Seagull & Hyde Park	4	30
Shelborne & Deveorn	2	10
Southdale & Ernest	2	11
Southdale & Nixon	4	11
Victoria Hospital Zone C	6	15
Wellington & Dundas	2	21
Westmount Mall	14	18
White Oaks Mall	20	6
Wonderland & Sarnia	2	30

Appendix B – Concept Plan Options for Highbury Site



PHASE 1 | EXISTING BUILDING

PHASE 2 | PARKING

OPTION 1

TOTAL AREA

33,809.72 SQ M

IBI

PHASE 1 | EXISTING BUILDING

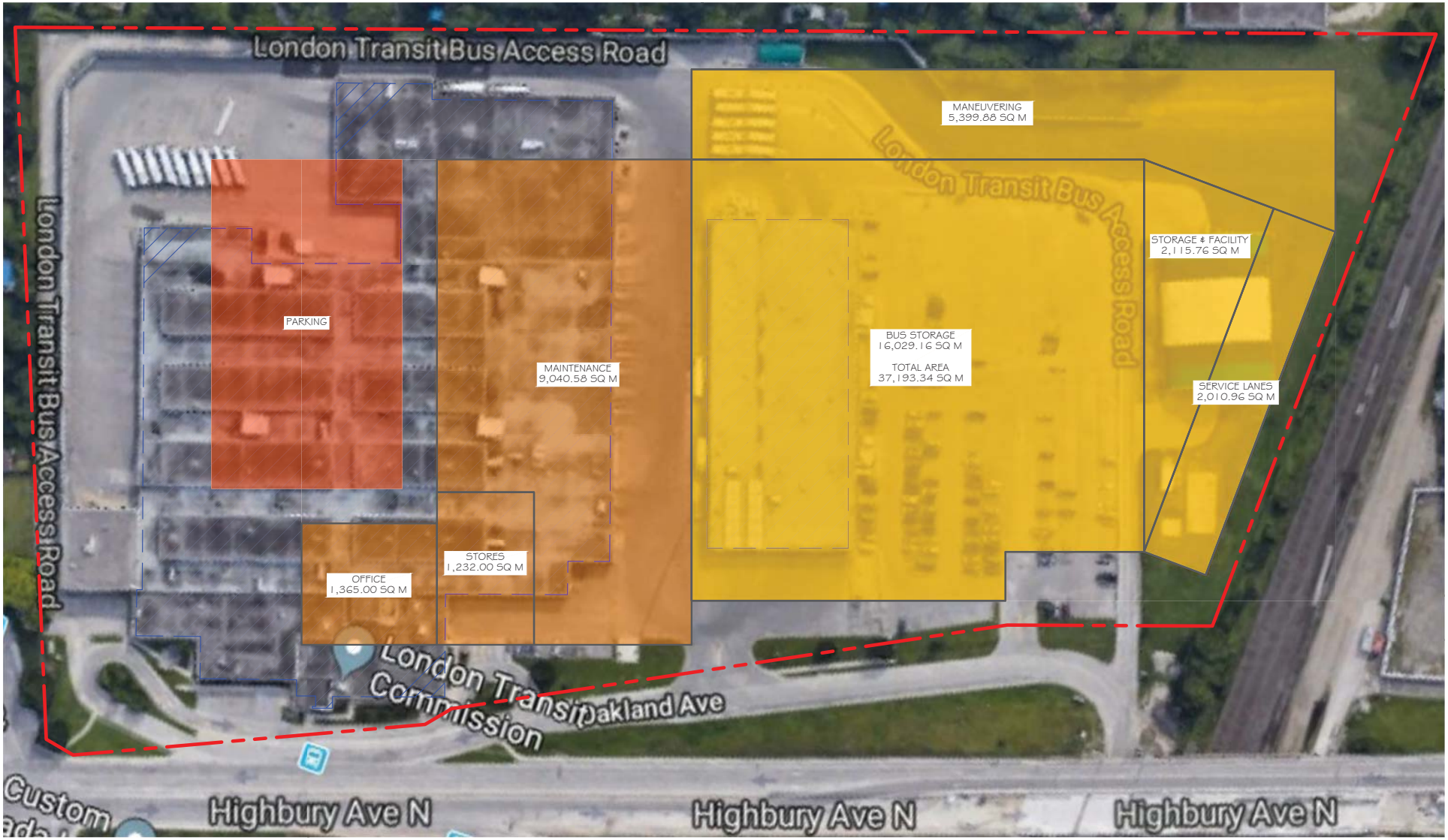
PHASE 2 | PARKING

OPTION 2

TOTAL AREA

37,193.34 SQ M

IBI



PHASE 1 | EXISTING BUILDING

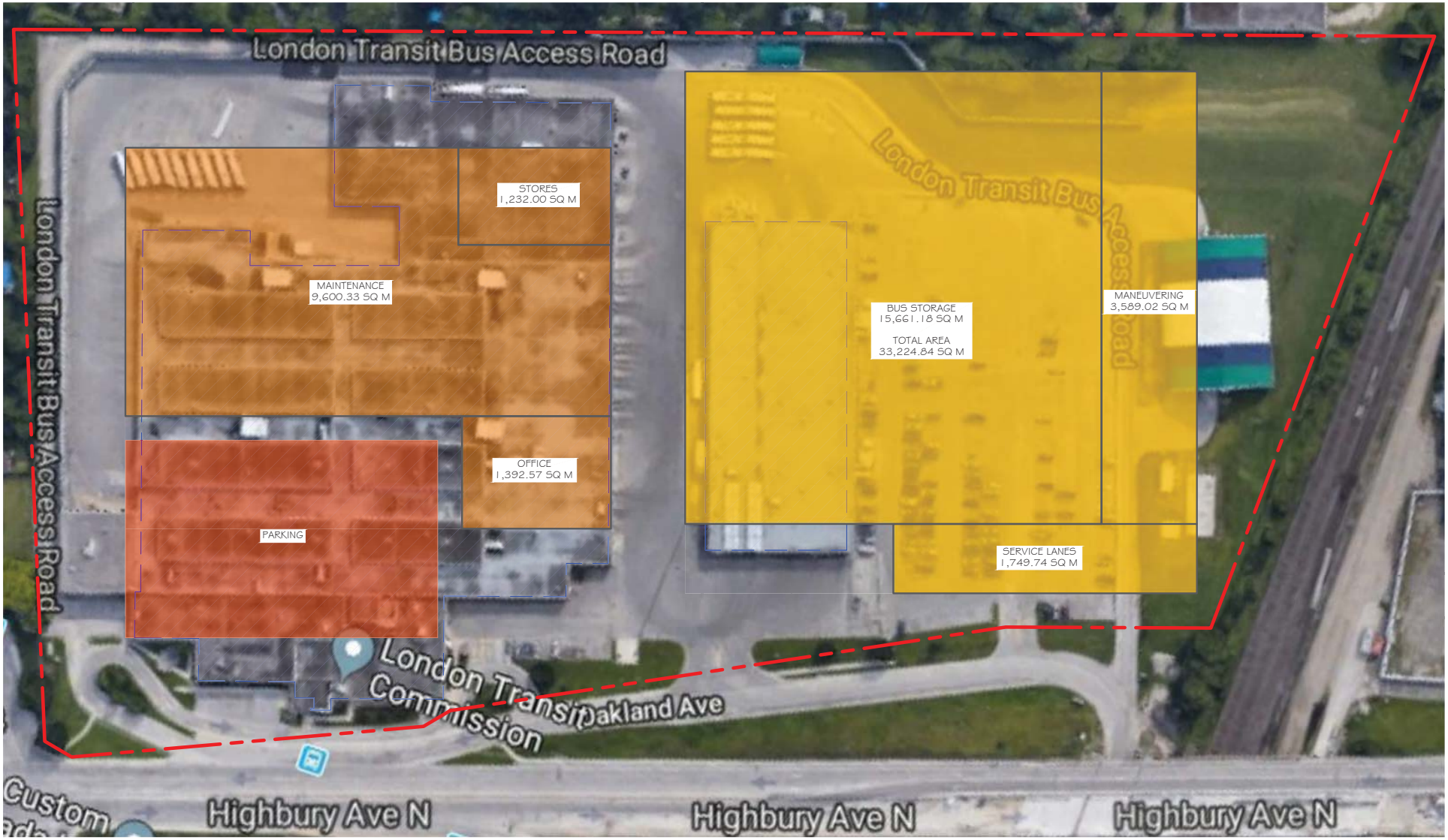
PHASE 2 | PARKING

OPTION 3

TOTAL AREA

37,193.34 SQ M

IBI



PHASE 1 | EXISTING BUILDING

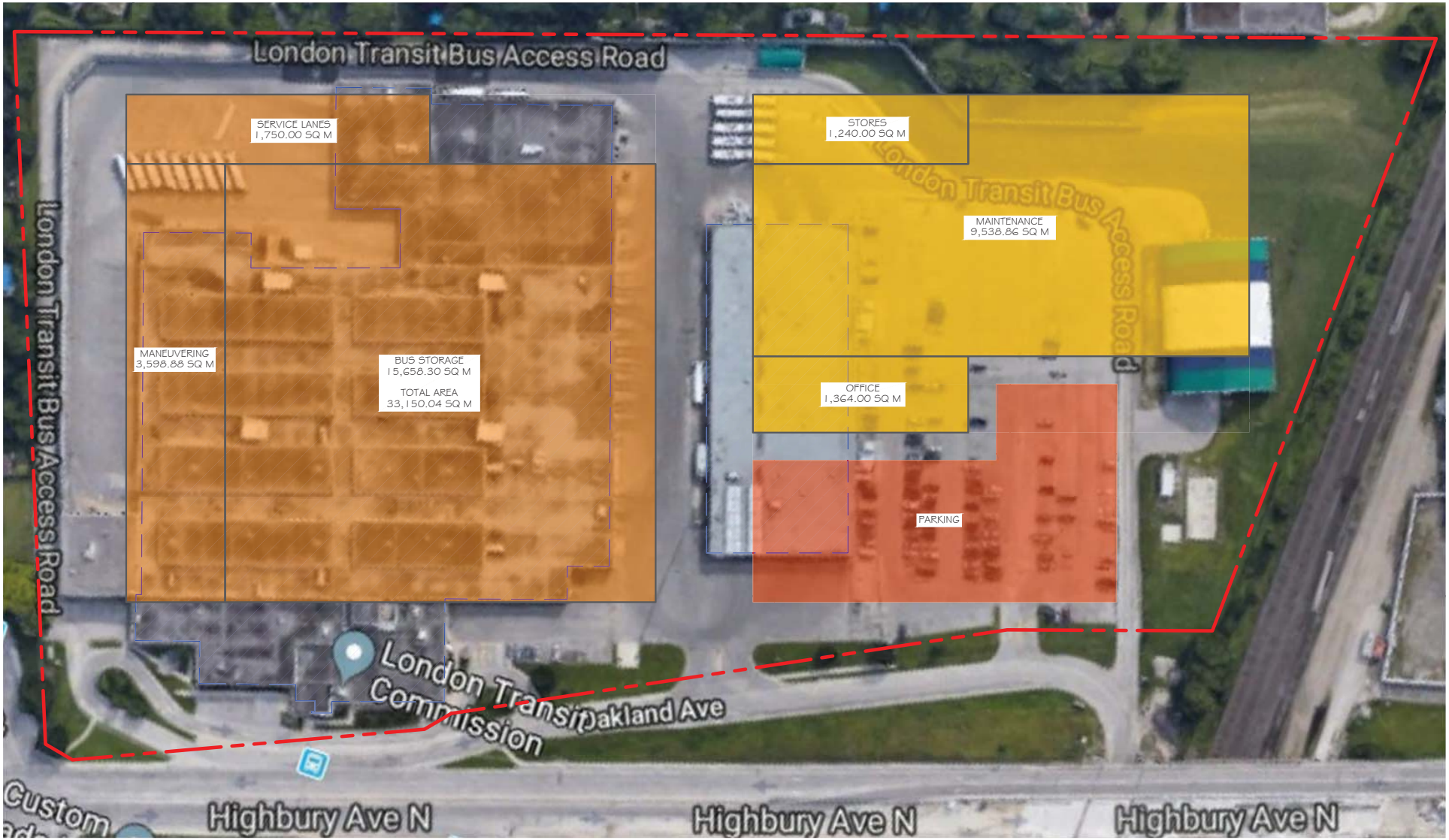
PHASE 2 | PARKING

OPTION 4

TOTAL AREA

33,224.84 SQ M

IBI



PHASE 1

PHASE 2

EXISTING BUILDING

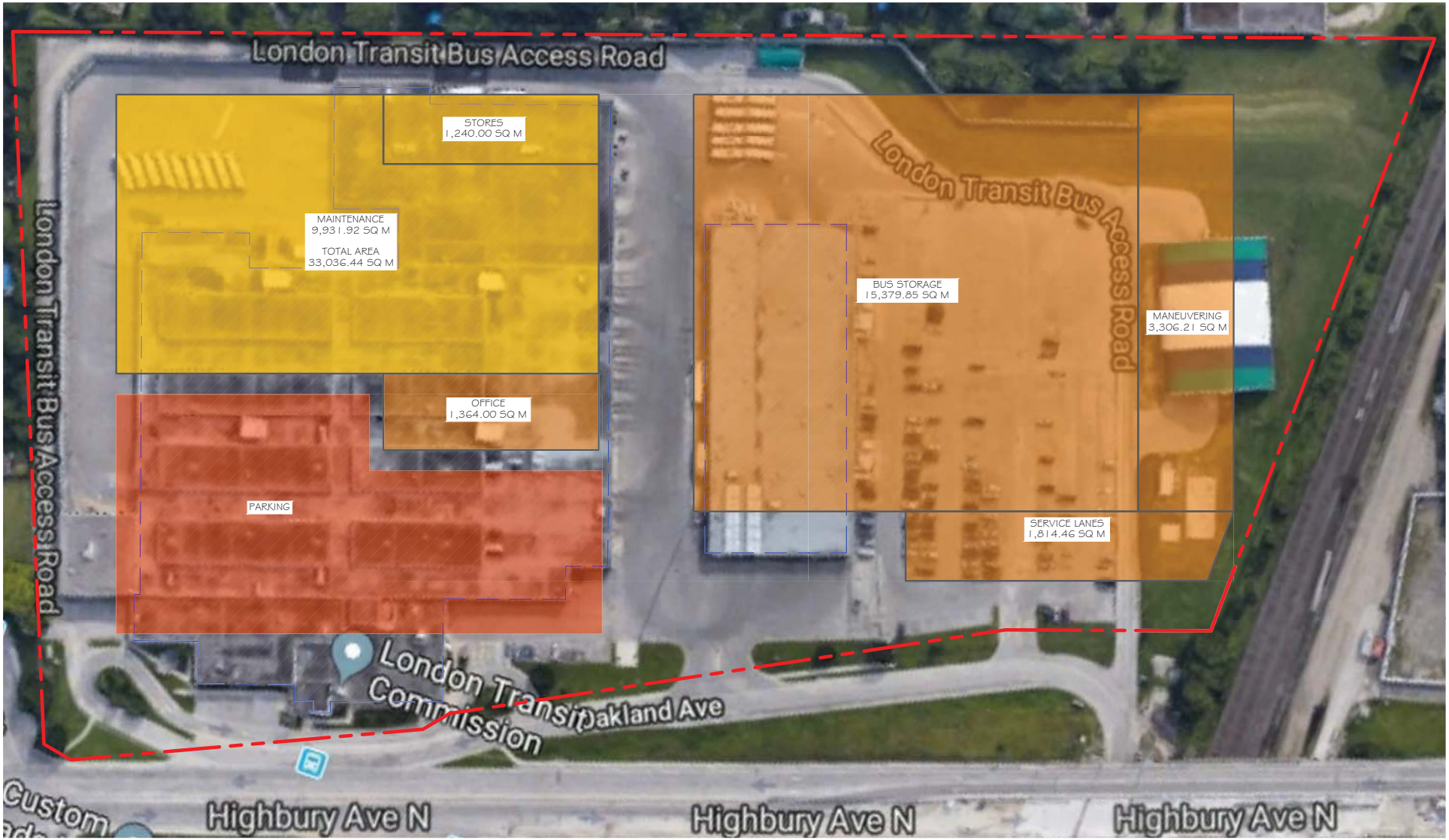
PARKING

OPTION 5

TOTAL AREA

33,150.04 SQ M

IBI



PHASE 1 | EXISTING BUILDING

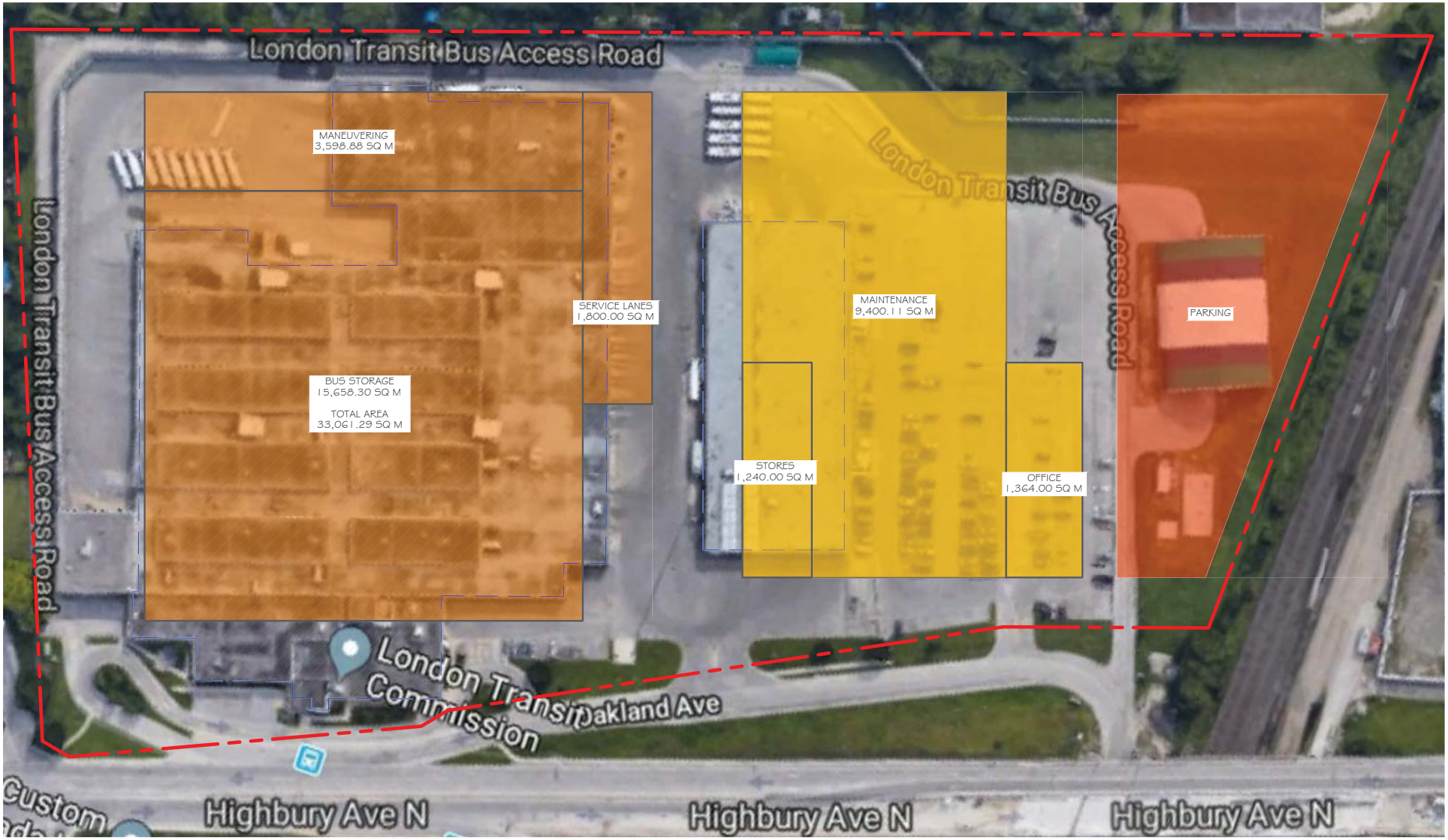
PHASE 2 | PARKING

OPTION 6

TOTAL AREA

33,036.44 SQ M

IBI



PHASE 1 | EXISTING BUILDING

PHASE 2 | PARKING

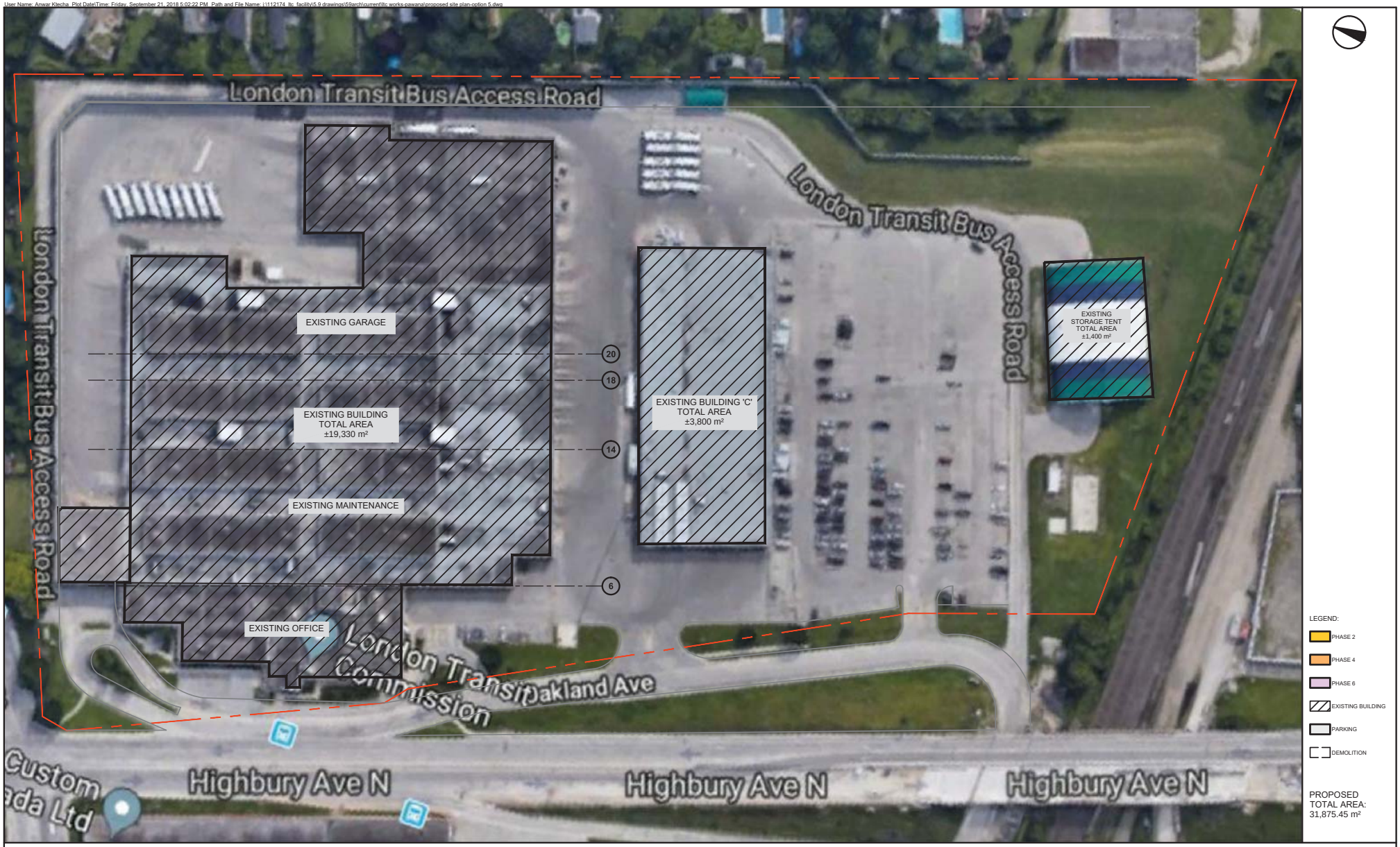
OPTION 7

TOTAL AREA

33,061.29 SQ M

IBI

Appendix C – Phasing Plans for Highbury Option 5



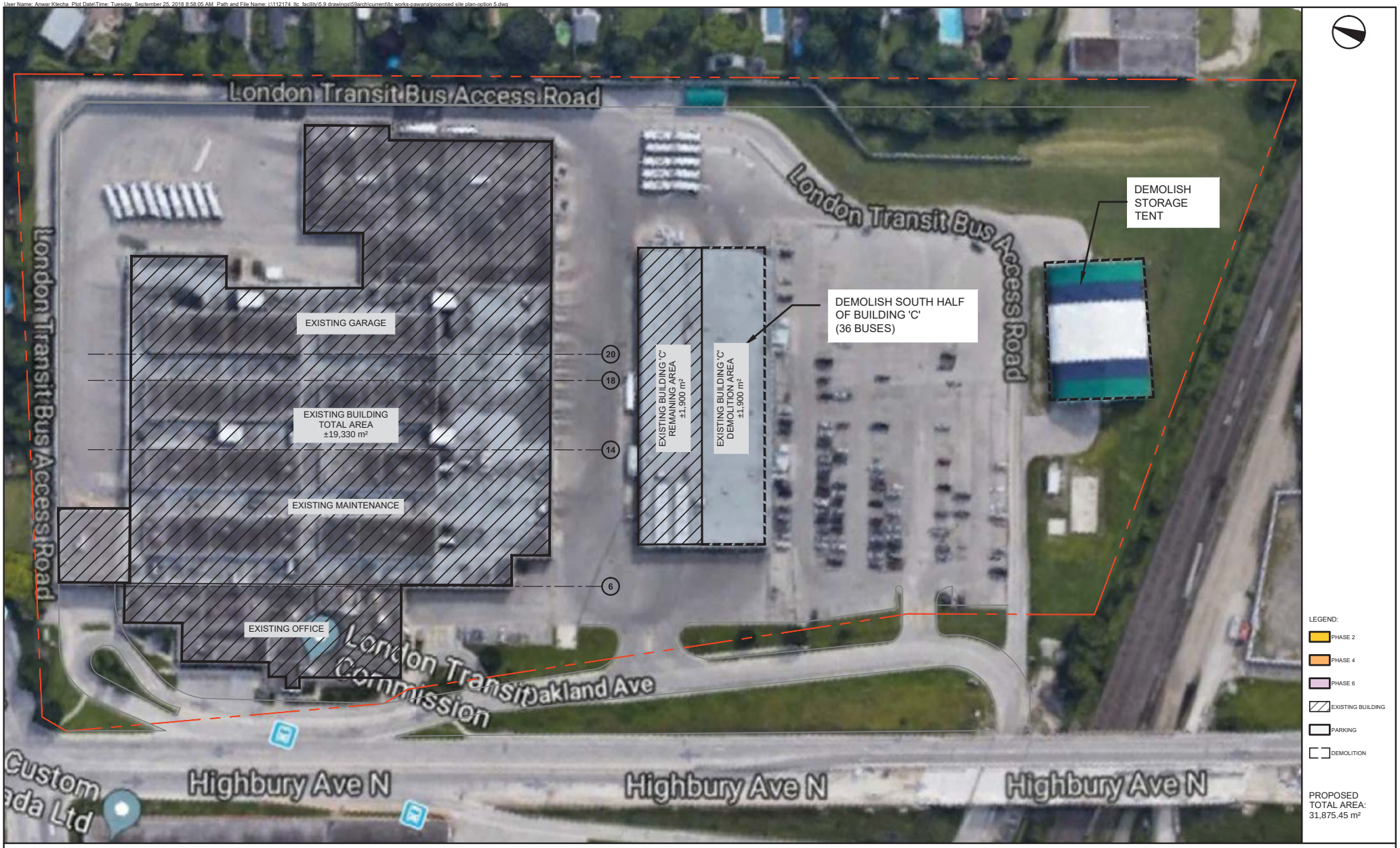
LONDON TRANSIT COMMISSION

STRATEGIC ASSESSMENT OF LTC FACILITY NEEDS AND PATH FORWARD

OPTION 5 - EXISTING CONDITION

SCALE 1:500

IBI GROUP
100-175 Galaxy Boulevard
Toronto ON M9W 0C9 Canada
tel 416 679 1930 fax 416 675 4620
ibigroup.com



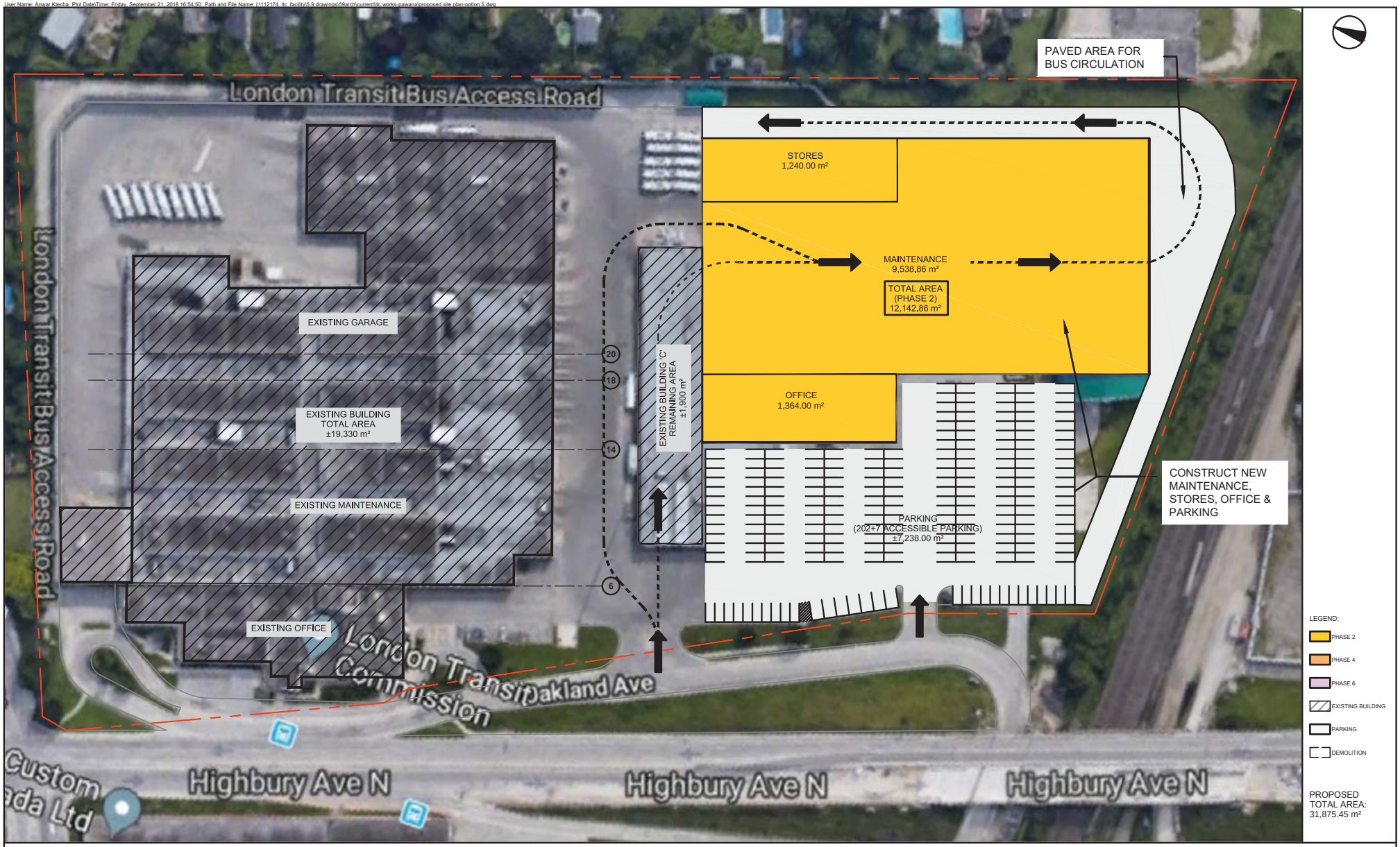
LONDON TRANSIT COMMISSION

STRATEGIC ASSESSMENT OF LTC FACILITY NEEDS AND PATH FORWARD

OPTION 5 - PHASE 1

SCALE 1:500

IBI GROUP
100-175 Galaxy Boulevard
Toronto ON M9W 0C9 Canada
tel 416 679 1930 fax 416 675 4620
ibigroup.com



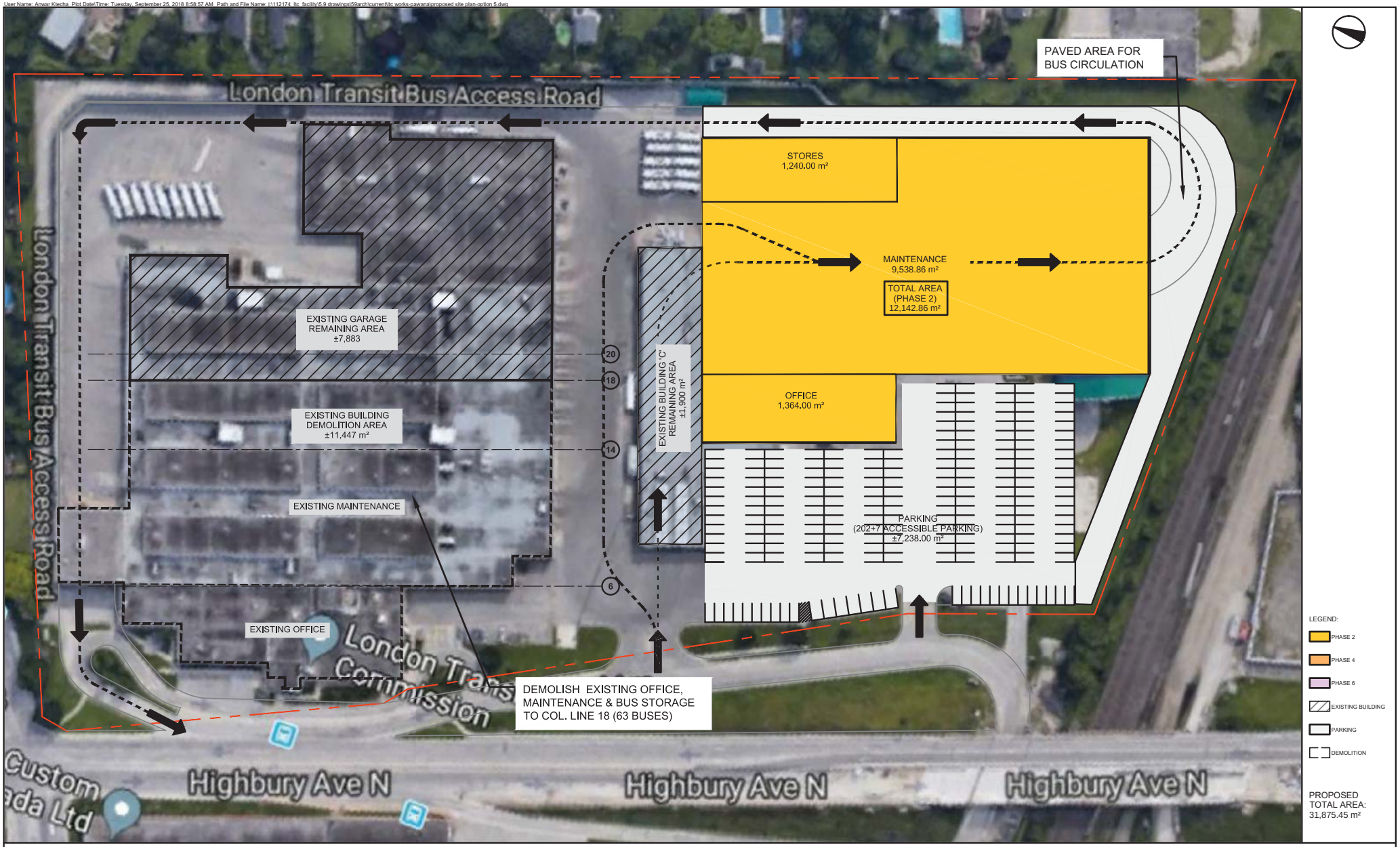
LONDON TRANSIT COMMISSION

STRATEGIC ASSESSMENT OF LTC FACILITY NEEDS AND PATH FORWARD

OPTION 5 - PHASE 2

SCALE 1:500

IBI GROUP
100-175 Galaxy Boulevard
Toronto ON M9W 0C9 Canada
tel 416 679 1930 fax 416 675 4620
ibigroup.com



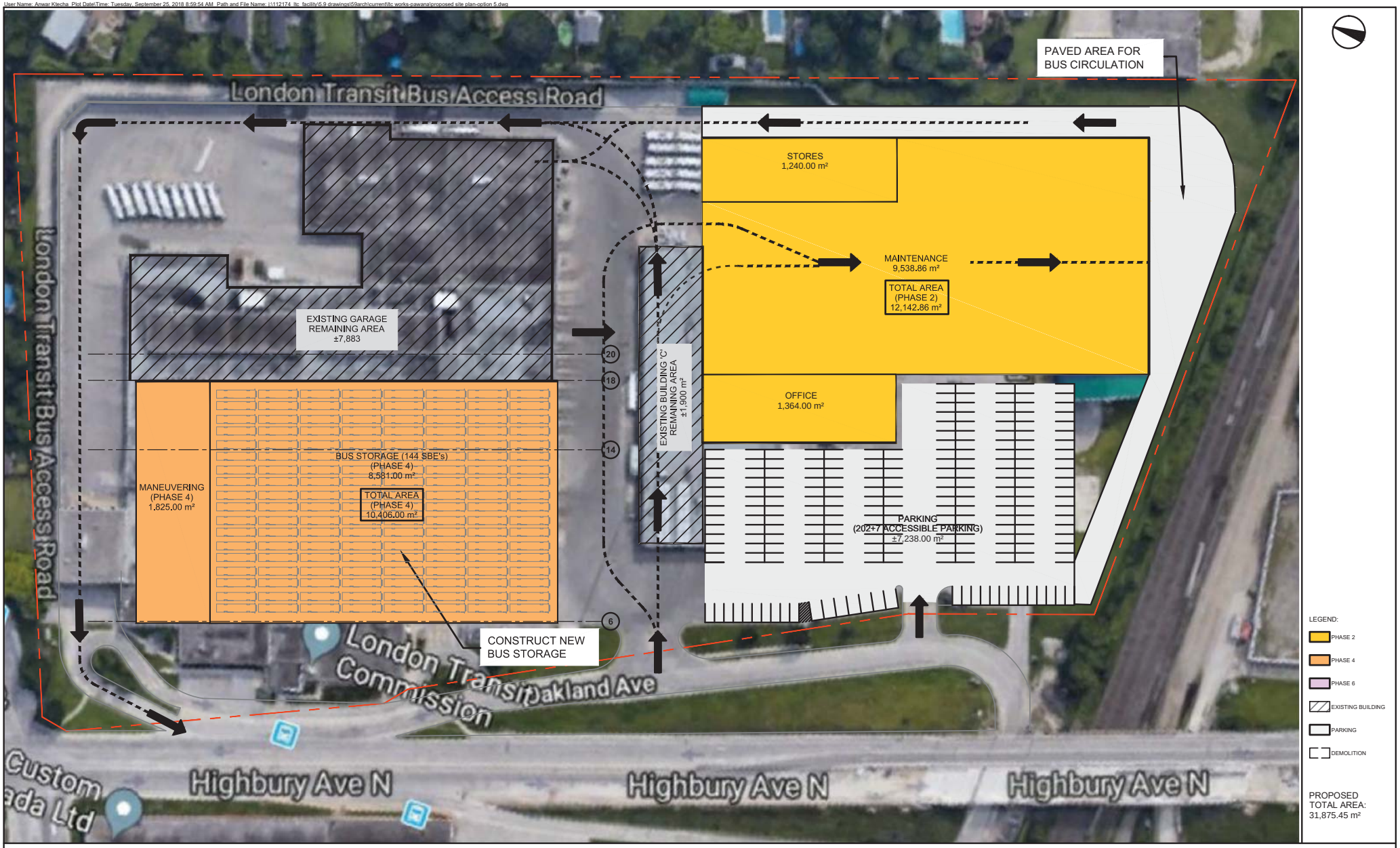
LONDON TRANSIT COMMISSION

STRATEGIC ASSESSMENT OF LTC FACILITY NEEDS AND PATH FORWARD

OPTION 5 - PHASE 3

SCALE 1:500

IBI GROUP
100-175 Galaxy Boulevard
Toronto ON M9W 0C9 Canada
tel 416 679 1930 fax 416 675 4620
ibigroup.com



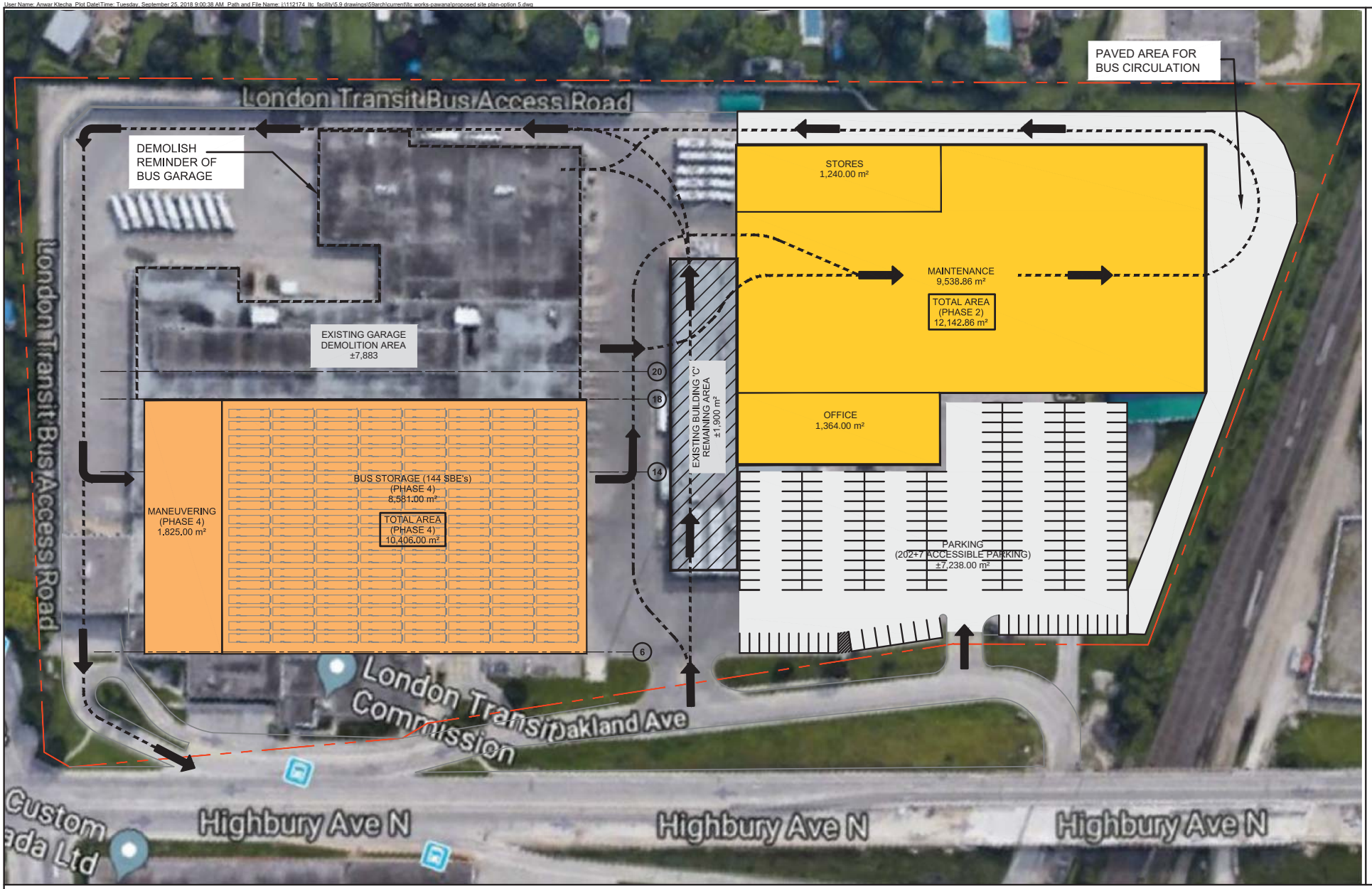
LONDON TRANSIT COMMISSION

STRATEGIC ASSESSMENT OF LTC FACILITY NEEDS AND PATH FORWARD

OPTION 5 - PHASE 4

SCALE 1:500

IBI GROUP
100-175 Galaxy Boulevard
Toronto ON M9W 0C9 Canada
tel 416 679 1930 fax 416 675 4620
ibigroup.com



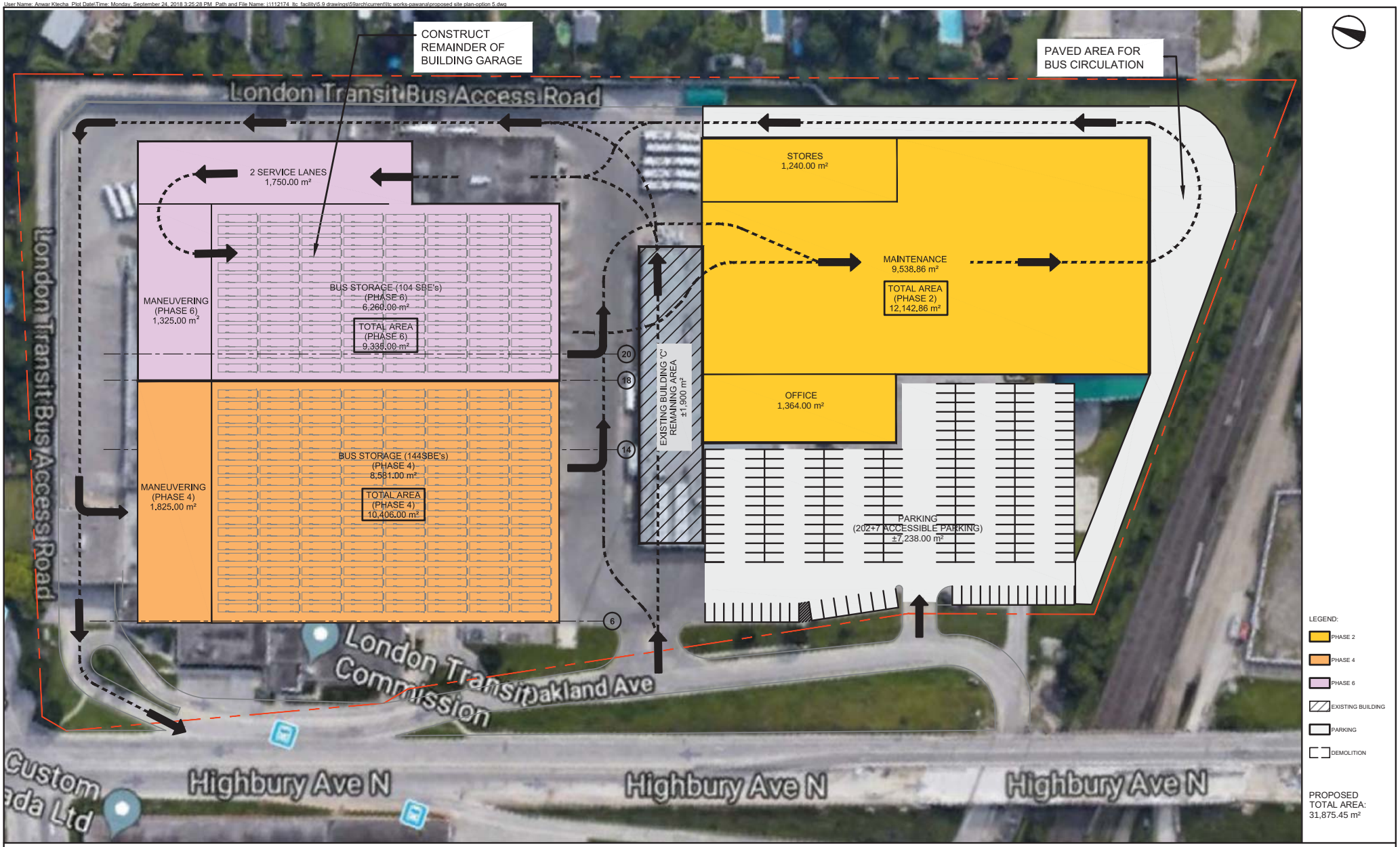
LONDON TRANSIT COMMISSION

STRATEGIC ASSESSMENT OF LTC FACILITY NEEDS AND PATH FORWARD

OPTION 5 - PHASE 5

SCALE 1:500

IBI GROUP
100-175 Galaxy Boulevard
Toronto ON M9W 0C9 Canada
tel 416 679 1930 fax 416 675 4620
ibigroup.com



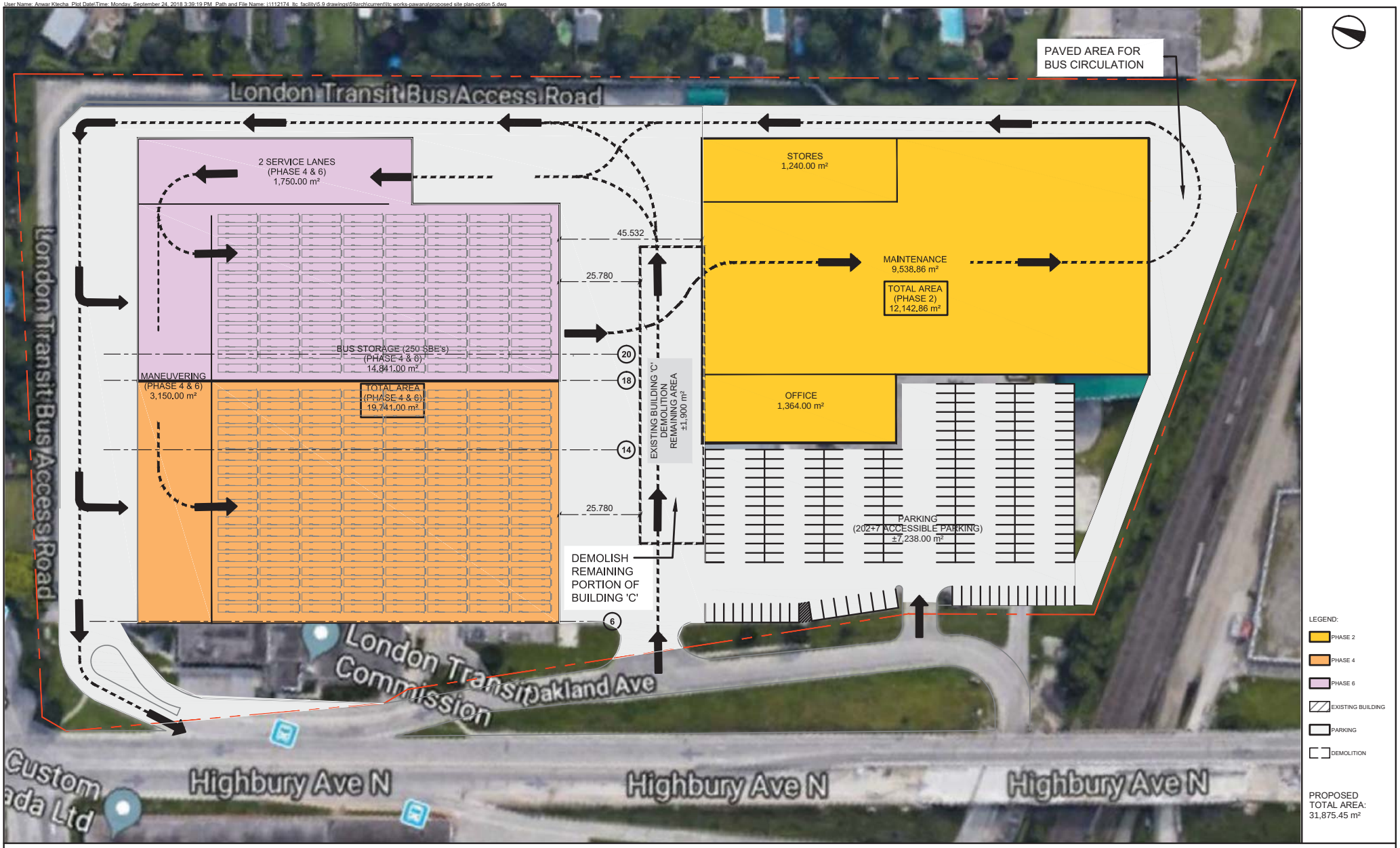
LONDON TRANSIT COMMISSION

STRATEGIC ASSESSMENT OF LTC FACILITY NEEDS AND PATH FORWARD

OPTION 5 - PHASE 6

SCALE 1:500

IBI GROUP
100-175 Galaxy Boulevard
Toronto ON M9W 0C9 Canada
tel 416 679 1930 fax 416 675 4620
ibigroup.com



LONDON TRANSIT COMMISSION

STRATEGIC ASSESSMENT OF LTC FACILITY NEEDS AND PATH FORWARD

OPTION 5 - PHASE 7

SCALE 1:500

IBI GROUP
100-175 Galaxy Boulevard
Toronto ON M9W 0C9 Canada
tel 416 679 1930 fax 416 675 4620
ibigroup.com

Appendix D – LTC Facility Study Class D Cost Estimate

London Transit Facility Study

Class D Estimate R1

Prepared For: IBI Group
7th Floor - 55 St. Clair Avenue West
Toronto ON.
Dec 11, 2018

Prepared By: Terry Harron, PQS

Our Reference: YYZ7179-2

London Transit Facility Study
Class D Estimate R1

Project Details

Description

Basis of Estimate

This estimate has been prepared at the request of IBI Group and is to provide a Class D estimate of probable construction cost for the London Transit Facility Study located in London, ON.

The estimate is based upon measured quantities and built-up rates prepared from the design information dated Aug. 22, 2018, prepared by IBI Group.

Where information was insufficient, assumptions and allowances were made based wherever possible on discussions with the architect and engineers.

It is assumed that the project will be competitively bid by four to six general contractors and that the awarded contractor and all subcontractors will be required to pay prevailing wage rates.

Unit pricing is based on September 2018 costs.

Our 'Class D Estimates' are presented in Uniformat II Elemental Unit Cost format based upon a comprehensive list of requirements and assumptions, including a full description of preferred schematic design options, construction/design experience & market conditions.

This estimate is meant to reflect the fair market value for the construction of this project and is not a prediction of a low bid. Pricing assumes competitive bidding for every aspect of the work.

RLB | Rider Levett Bucknall has prepared this estimate in accordance with the Canadian Institute of Quantity Surveyors (CIQS) generally accepted practices and principals.

RLB | Rider Levett Bucknall has no control over the cost of labour, materials or equipment, the general contractors or any subcontractors' method of determining prices, or competitive bidding and market conditions. This opinion of probable cost of construction is made based on experience, qualifications, and best judgment of the professional consultant familiar with the construction industry.

RLB | Rider Levett Bucknall cannot and does not guarantee that proposals, or actual construction costs will not vary from this or subsequent estimates.

RLB | Rider Levett Bucknall recommends that the owner and the design team carefully review this cost estimate report, including line item descriptions, unit price clarifications, exclusions, inclusions and assumptions, contingencies, escalation, and mark-ups. If the project is over budget, or if there are unresolved budgeting issues, alternative systems or schemes should be evaluated before proceeding into the bidding phase.

It is recommended that a final estimate be produced by RLB | Rider Levett Bucknall using final documents to determine overall cost changes, which may have occurred since the preparation of this estimate. The final update estimate will address changes and additions to the documents as well as addenda issued during the bidding process.

RLB | Rider Levett Bucknall cannot reconcile bid results to any estimate not produced from bid documents including all addenda.

London Transit Facility Study
Class D Estimate R1

Project Details

Description

Items Specifically Included

Option 1 - Phased Development on Existing Site: $163,993,267

Building Construction - $122,047,000 Before Margins & Adjustments

Building Demolition - $4,626,000 Before Margins & Adjustments

Sitework (Reuse existing utilities, New paving, New curbs, etc.) - $1,809,500 Before Margins & Adjustments

Option 2 - New Site: $160,942,403

Building Construction - $122,047,000 Before Margins & Adjustments

Sitework (Site grading, New utilities, Paving, Curbs etc.) - $10,238,250 Before Margins & Adjustments

Items Specifically Excluded

- Furniture
- Staff relocation costs
- Work outside the site boundaries
- Land and legal costs
- Items marked as "Excl." in the estimate
- Harmonized sales tax
- Escalation allowance

Documents

OPTION 5_AUG 22 2018

London Transit Facility Study
Class D Estimate R1

Location Summary - Option 1 Phased Development on Existing Site — Rates Current At December 2018

Location		Total Cost
OPT1	**PHASED DEVELOPMENT ON EXISTING SITE**	
PH1	Phase 1 - Demolition of South Half of Building C	380,000
PH2	Phase 2 - Construction of New Buildings and Site	61,160,500
PH3	Phase 3 - Partial Demolition of Building A and B	2,289,400
PH4	Phase 4 - Construction of New Bus Storage Building	31,560,000
PH5	Phase 5 - Demolition of the Remainder of Bus Storage Garage	1,576,600
PH6	Phase 6 - Construction of New Storage, Service Lanes and Manoeuvring Area	31,136,000
PH7	Phase 7 - Demolition of the Remainder of Building C	380,000
	OPT1 - PHASED DEVELOPMENT ON EXISTING SITE	***$128,482,500***
	ESTIMATED NET COST	**$128,482,500**

MARGINS & ADJUSTMENTS		
Phasing Premium	5 %	$6,424,125
Special Testing & Inspections		$250,000
Utility Tap Fees & Charges		$100,000
Permits & Plan Reviews Fees		$275,000
Owner's Contingency	10 %	$13,553,163
Architectural, Engineering & Other Professional Fees	10 %	$14,908,479
	ESTIMATED TOTAL COST	**$163,993,267**

London Transit Facility Study
Class D Estimate R1

Element Summary - Option 1 Phased Development on Existing Site | Rates Current At December 2018

Description			Total Cost
D	**Demolition**		**$4,626,000**
NS	**New Store**		**$6,200,000**
NM	**New Maintenance**		**$47,695,000**
NO	**New Office**		**$5,456,000**
P	**Sitework (Reuse existing utilities, New paving, New curbs, etc.)**		**$1,809,500**
NBS	**New Bus Storage**		**$43,866,000**
NMV	**New Manoeuvring**		**$10,080,000**
NSL	**New Service Lanes**		**$8,750,000**
	ESTIMATED NET COST		**$128,482,500**
MARGINS & ADJUSTMENTS			
Phasing Premium		5 %	$6,424,125
Special Testing & Inspections			$250,000
Utility Tap Fees & Charges			$100,000
Permits & Plan Reviews Fees			$275,000
Owner's Contingency		10 %	$13,553,163
Architectural, Engineering & Other Professional Fees		10 %	$14,908,479
	ESTIMATED TOTAL COST		**$163,993,267**

London Transit Facility Study
Class D Estimate R1

Location Summary - Option 2 New Site

Rates Current At December 2018

Location			Total Cost
OPT2 NEW SITE			
A	Building		122,047,000
B	Site		10,238,250
		OPT2 - NEW SITE	***$132,285,250***
		ESTIMATED NET COST	**$132,285,250**
MARGINS & ADJUSTMENTS			
Special Testing & Inspections			$250,000
Utility Tap Fees & Charges			$200,000
Permits & Plan Reviews Fees			$275,000
Owner's Contingency		10 %	$13,301,025
Architectural, Engineering & Other Professional Fees		10 %	$14,631,128
		ESTIMATED TOTAL COST	**$160,942,403**

London Transit Facility Study
Class D Estimate R1

Element Summary - Option 2 New Site

Rates Current At December 2018

Description			Total Cost
S	**Stores**		**$6,200,000**
MS	**Maintenance / Service Lanes**		**$56,445,000**
O	**Office**		**$5,456,000**
BSM	**Bus Storage / Manoeuvring**		**$53,946,000**
SITE	**Sitework (Site grading, New utilities, Paving, Curbs etc.)**		**$10,238,250**
	ESTIMATED NET COST		**$132,285,250**
MARGINS & ADJUSTMENTS			
Special Testing & Inspections			$250,000
Utility Tap Fees & Charges			$200,000
Permits & Plan Reviews Fees			$275,000
Owner's Contingency		10 %	$13,301,025
Architectural, Engineering & Other Professional Fees		10 %	$14,631,128
	ESTIMATED TOTAL COST		**$160,942,403**

Appendix E – LTC Temporary Site Estimate

London Transit Temporary Facilities

1. Temporary Transit Operations - 1.25 Acres

Description	Qty	Unit	Unit Cost	Subtotal
Site Preparation	5,184	m2	$5.00	$25,920
Rough Grading	5,184	m2	$10.00	$51,839
Asphalt Paving & Base	5,184	m2	$75.00	$388,800
Fencing	260	m	$300.00	$78,000
Gates	2	ea	$5,000.00	$10,000
Signage	1	Sum	$25,000.00	$25,000
Servicing				
Stormwater	1	Sum	$450,000.00	$450,000
Sanitary	1	Sum	$100,000.00	$100,000
Water Service	1	Sum	$75,000.00	$75,000
Electrical Service				
Incoming Service	1	Sum	$35,000.00	$35,000
Lighting	1	Sum	$100,000.00	$100,000
Security	1	Sum	$10,000.00	$10,000
Telephone / Data	1	Sum	$7,500.00	$7,500
Temporary Trailers				
Office Trailer Rental	36	Mos	$1,200.00	$43,200
Washroom Trailer Rental	36	Mos	$1,000.00	$36,000
Delivery / Set up	1	Sum	$1,000.00	$1,000
Ramps /Canopies etc.	1	Sum	$10,000.00	$10,000
Site Decomissioning	1	Sum	$50,000.00	$50,000
Subtotal				**$1,471,339**
General Requirements	12	%		$176,561
Subtotal				**$1,647,900**
Contingency	10	%		$164,790
Permits / Development Charges				$10,000
Design / Consulting Fees				$182,269
Total Estimated Cost				**$2,004,960**

Notes:
Costs based on 3rd Quarter 2018
The following are not included:

London Transit Temporary Facilities

Land Rental / Purchase
Permits / Development Charges
Design / Consulting Fees
Contaminated Soil / Site Remediation
HST

1. Temporary Employee Parking - 1.00 Acres

Description	Qty	Unit	Unit Cost	Subtotal
Site Preparation	4,147	m2	$5.00	$20,736
Rough Grading	4,147	m2	$10.00	$41,470
Granular Paving	4,147	m2	$50.00	$207,350
Fencing	208	m	$300.00	$62,400
Gates	1	ea	$5,000.00	$5,000
Signage	1	Sum	$10,000.00	$10,000
Stormwater	1	Sum	$200,000.00	$200,000
Lighting	1	Sum	$50,000.00	$50,000
Security	1	Sum	$10,000.00	$10,000
Site Decomissioning	1	Sum	$50,000.00	$50,000
Subtotal				**$636,220**
General Requirements	12	%		$76,346
Subtotal				**$712,566**
Contingency	10	%		$71,257
Permits / Development Charges				$10,000
Design / Consulting Fees				$79,382
Total Estimated Cost				**$873,205**

Notes:
Costs based on 3rd Quarter 2018
The following are not included:
Land Rental / Purchase
Permits / Development Charges
Design / Consulting Fees
Contaminated Soil / Site Remediation
HST