PROJECT TITLE

Vancouver Board of Parks and Recreation
OUTDOOR POOL STUDY

November 8, 2021

PRESENTED TO

THE CITY OF VANCOUVER
VANCOUVER BOARD OF PARKS & RECREATION

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EXECUTIVE SUMMARY

Aquatic centres and swimming pools are an integral component of the Vancouver Board of Parks and Recreation's network of destination recreation facilities and parks. Ranging from unique and state-of-the-art multi-use aquatic facilities to humble pools, the Vancouver Board of Parks and Recreation's swimming spots are among the most popular facilities in the City. This is all the more true in the summer months when the City's outdoor pools are often in high-demand. Recognizing this and building on VanSplash's 25 Year Vision and VanPlay's Goals 1, 2, 3, the two test-fit designs included in this report will help clarify the impacts and advantages of new outdoor aquatic facilities at Mount Pleasant Park and Hillcrest Centre.

Mount Pleasant Park, adjacent Simon Fraser Elementary School, is a thriving community green space with a suite of existing amenities including a skate park, playground, and community garden. An outdoor leisure and lap pool is envisioned for this site with public toilet rooms, site services, change facilities, and a new administrative and mechanical building, which will enhance the accessible and welcoming family vibe of the park.

Hillcrest Centre is one of the premier recreation and fitness destinations in the City, an Olympic legacy that features one of Vancouver's busiest and most popular community centres, which features an indoor and outdoor leisure and fitness aquatic centre. Sharing a large site with destinations like Nat Bailey Stadium, Park Board is looking to increase capacity and enhance the offerings at Hillcrest with an outdoor lap pool, complete with change facilities adjacent to the existing outdoor leisure pool.

This multidisciplinary, comprehensive study has reviewed the site, program, costs, and other implications of realizing these two pools in their respective locations. This report is a solid baseline and foundation of key information, including site constraints and relationships with current uses, site specific needs within the context of VanSplash and VanPlay, high-level functional program, concept plans, and capital, operational, and maintenance cost projections. This key information is in service of evaluating the future facilities as they respond to community needs and allow the Park Board to prioritize these projects in future capital plans.

DISCIPLINE	COMPONENT	MOUNT PLEASANT	HILLCREST CENTRE
ARCHITECTURAL	POOL DESIGN	4 LANE LAP POOL + LEISURE	4 LANE LAP POOL + EXISTING FACILITY
	POOL SIZE - LAP	210 SQM	225 SQM
	POOL SIZE - LEISURE	154 SQM	EXISTING
	NEW BUILDING	255 SQM	60 SQM + EXISTING
	WASHROOMS	7 STALLS	3 STALLS + EXISTING
	CHANGE ROOMS	8 STALLS	4 STALLS + EXISTING
	SHOWERS	8 STALLS + 4 DECK SHOWERS	4 STALLS + 2 DECK SHOWERS
	POOL DECK	405 SQM	430 SQM + EXISTING
	GREEN SPACE	385 SQM	175 SQM
	FENCE	83 M	85 M + EXISTING
	EMPLOYEES	7	2 + EXISTING
	ESTIMATED SWIMS	49,224 SWIMS PER YEAR	19,200 SWIM + 60,000 SWIMS*
LANDSCAPE	TREE REMOVAL	4 MATURE TREES	12 SMALL TREES
	GREEN SPACE REDUCTION	30%	1%
MECHANICAL	MECHANICAL PLANT	REQUIRED	EXISTING
	SITE SERVICING	REQUIRED	EXISTING
	HEATING PLANT	REQUIRED	EXISTING
	WATER SEWER	REQUIRED	EXISTING
	CHEMICAL TREATMENT	REQUIRED	EXISTING
	CHEMICAL STORAGE	REQUIRED	EXISTING
	POOL TEMPERATURE	32° C	29° C + 32° C (EXISTING)
ELECTRICAL	HYDRO SERVICE	UPGRADES REQUIRED	EXISTING
	BUILDING	REQUIRED	EXISTING
TRAFFIC	PARKING DEMAND	14 PARKING SPACES	8 PARKING SPACES (EXISTING)
	VEHICULAR TRIP	29 TRIPS PER HOUR	16 TRIPS PER HOUR
COSTING	CLASS D COST ESTIMATE	**$ 11,439,100**	**$ 5,386,779**

* BASED ON 2019 VANSPLASH (ANNUAL CAPACITY FOR SWIMS AT OUTDOOR POOL)

Table 1 - Component Summary

INTRODUCTION

In 2021, Vancouver Board of Parks and Recreation (VBPR) retained Carscadden Stokes McDonald Architects Inc. (CAR) and their team of landscape, mechanical, electrical, traffic, and costing consultants to conduct a study for two new Outdoor Pools.

The study outlines the requirements for new outdoor pools at Mount Pleasant Park and the Hillcrest Centre. The schemes are 'test fits' and are intended to be broadly representative of a potential indicative design: while they a capture in general terms the major issues associated with each proposed pool, they do not constitute pool or facility designs in a formal sense.

Consultant reports are touched on in the main body of this report and included as appendices. Together with the architectural report (the report's main body) they have been used to provide high level costing and relative comparisons.

This report examines the implications and recommendations for two new outdoor facilities; a new stand-alone facility at Mount Pleasant Park and a new lap pool co-located with Hillcrest Centre. The report reviews each location's conditions, including site constraints and relationships with current uses, site specific needs within the context of VanSplash and VanPlay, high-level functional program, concept plans, and capital, operational, and maintenance cost projections. Each condition is reviewed with a multidisciplinary examination of each site, from the perspectives of architectural, mechanical, electrical, landscape, traffic engineering, and quantity surveying.

Each discipline has made recommendations for the two locations and have looked to provide site-specific test-fit designs. These test-designs of both outdoor pool facilities vary between the two locations, though the aspiration of the test-design is to equip each with equivalent recreation facilities. The designs and recommendations are responding to the site and operational services required at each location.

REFERENCES

APPLICABLE CODES AND STANDARDS

1. City of Vancouver Building By-Laws
2. City of Vancouver Plumbing By-Laws
3. Provincial Health Act for Swimming Pools
4. British Columbia Pool Design Guide
5. Model Aquatic Health Code (U.S. code used as a standard not a code)
6. FINA (Fédération Internationale De Natation)
7. American Society of Heating, Refrigeration and Air Condition Engineers (ASHRAE)
8. National Model Energy Code for Buildings
9. Provincial Fire Marshall Regulations
10. Applicable National Fire Protection Association Regulations
11. British Columbia Gas Code
12. British Columbia Boiler and Pressure Vessel Act
13. American Society of Plumbing Engineers (ASPE)
14. Sheet Metal Contractors Association of North America (SMACNA)

CITY OF VANCOUVER AND PARK BOARD DOCUMENTS

1. VanPlay
2. VanSplash
3. Healthy City Strategy
4. Climate Change Adaptation Strategy
5. Greenest City 2020 Action Strategy
6. Zero Emissions Building Plan
7. Renewable City Strategy
8. Mount Pleasant Community Plan
9. Parks Washroom Strategy

SITING

Mount Pleasant Park is a 1.12-hectare park located in the Mount Pleasant neighbourhood of Vancouver. It is bound by 15th and 16th Ave to the north and south, and Ontario Street to the east. To the immediate west of the park is Simon Fraser Elementary School and Our House Child Care Centre. The surrounding neighbourhood is zoned for residential, with two-family dwellings to the north, east and south, and multi-family dwellings to the west. It is immediately adjacent to the Mount Pleasant Business Association and within walking distance to the Mount Pleasant Community Centre.

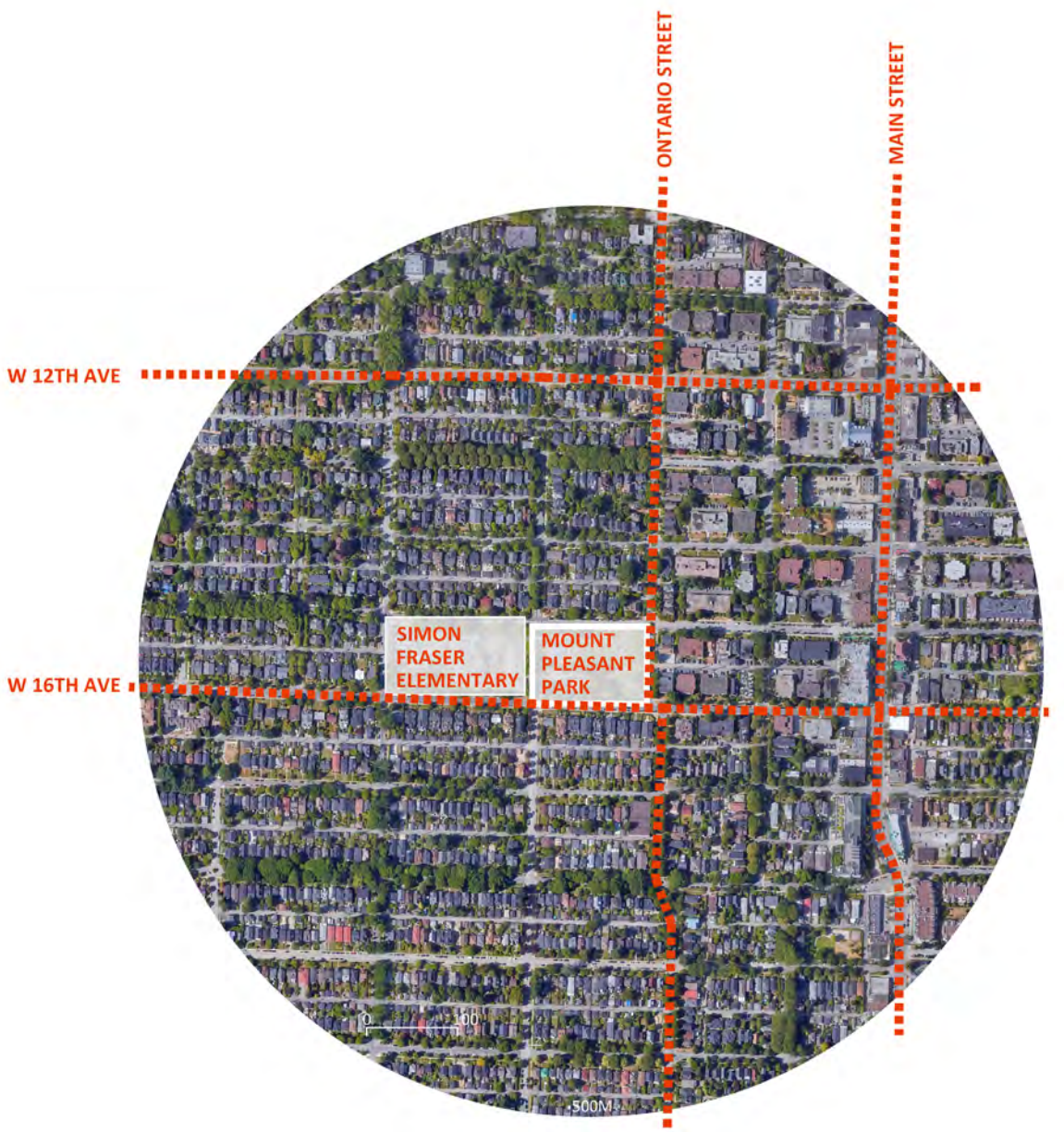

Figure 1 - Mount Pleasant Context Plan

EXISTING AMENITIES AND SITE USE

The Park amenities include a basketball court, skate park, community garden, children's' play structures, a covered seating area and two grass fields (a central field and a minor field located at the south-east end of the park). Both grass fields include seating such as picnic tables and park benches. The central field and minor field provide passive use to the park, allowing for both informal and formal park programming. The community gardens are well used and maintained throughout the year. While Mount Pleasant Park is not a designated off-leash, in practice dog owners rely on the park's central field, both abiding by the Parks Board leash laws and not. The elimination of this green space would impact the use for dog owners.

There is a parking lot on site that is shared with the adjacent elementary school and childcare centre. There is a bike share location at the corner of Ontario Street and 16th Avenue. The electrical services in the site's proximity are assumed to be adequate for the existing surrounding buildings and current park use.

Figure 2 - Mount Pleasant Existing Site Plan

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SITE SUITABILITY

VanPlay

The City of Vancouver's 2018 *VanPlay: Inventory and Analysis* report has identified the neighbourhood of Mount Pleasant as at risk of a low Park Provision Score. A low Park Provision Score can be understood as a designation for a neighbourhood that has a low availability of park and green space per capita. The addition of an outdoor pool at Mount Pleasant Park implies the loss of green space within the neighbourhood, reducing the park provision per capita. Though the outdoor pool would be adding recreational space it comes at the cost of the removal of green park space. The pool is a seasonal amenity and the park is losing access to year-round passive green space. The pool results in a 30% reduction in green space in the 1.12 hectare park. This is contrary to VanPlay's Goal 2: *Protect existing parks and spaces.*

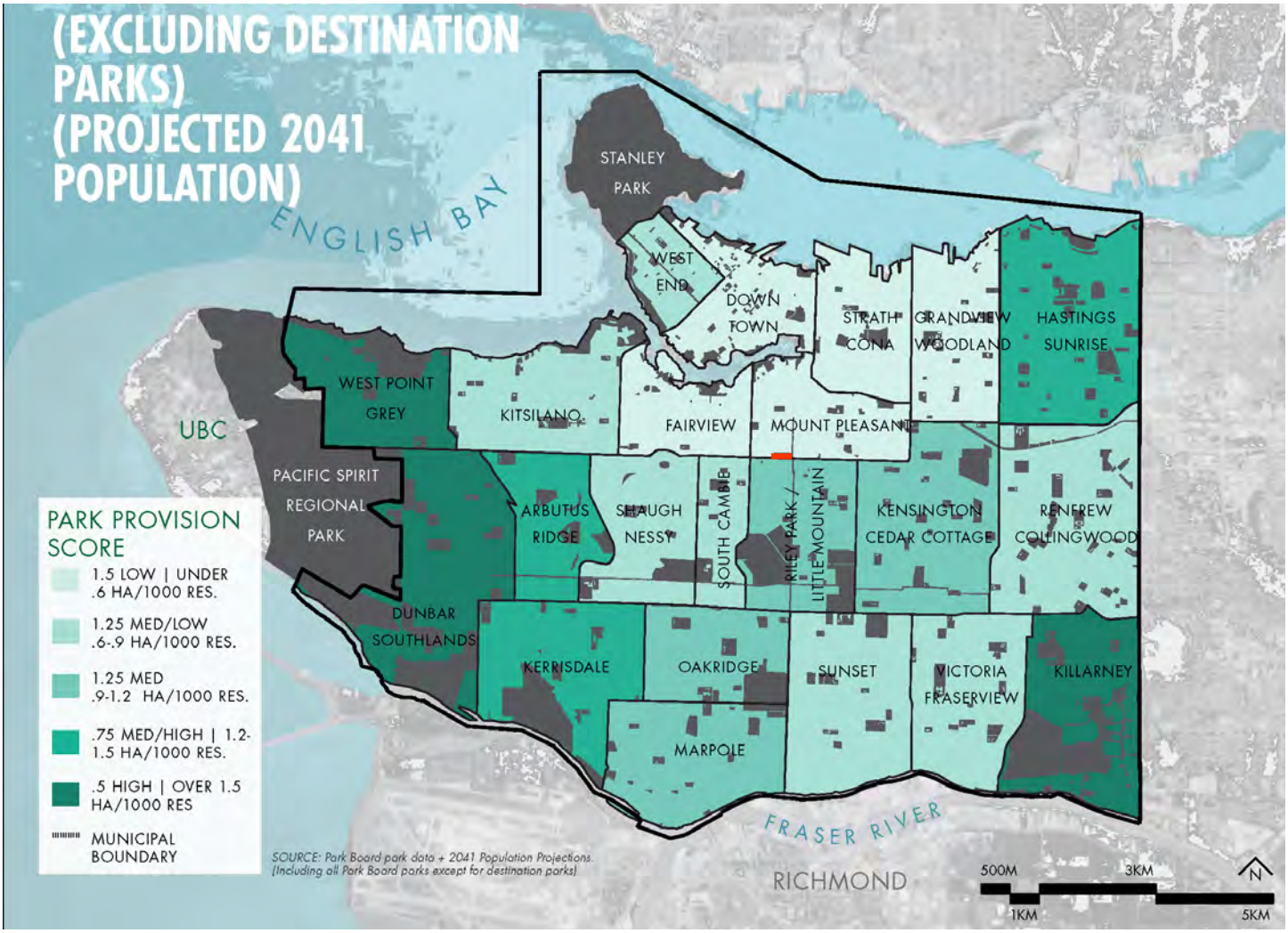

Figure 3 - Projected Park Provision, *Vanplay: Inventory and Analysis.* City of Vancouver (2018).
*Mount Pleasant Park is highlighted orange by Architect for reference.

SITE SUITABILITY

VanSplash

The City of Vancouver's 2019 *VanSplash* report has identified a goal of providing equitable access to recreation facilities throughout the city, focusing on multiple means of transportation (public transport, car, bike or walking). VanSplash has determined that a 4km radius is the target for meaningful and equitable access to outdoor pools for City of Vancouver residents. The figure below shows Mount Pleasant Park being designated as a new outdoor pool. The new outdoor pool service radius overlaps significantly with four existing outdoor pools; Kitsilano Pool, Marpole Pool, New Brighton Pool, and Hillcrest Centre. While there are service redundancies, the new outdoor pool would increase reach for the Downtown Eastside, Strathcona, and Chinatown neighbourhoods.

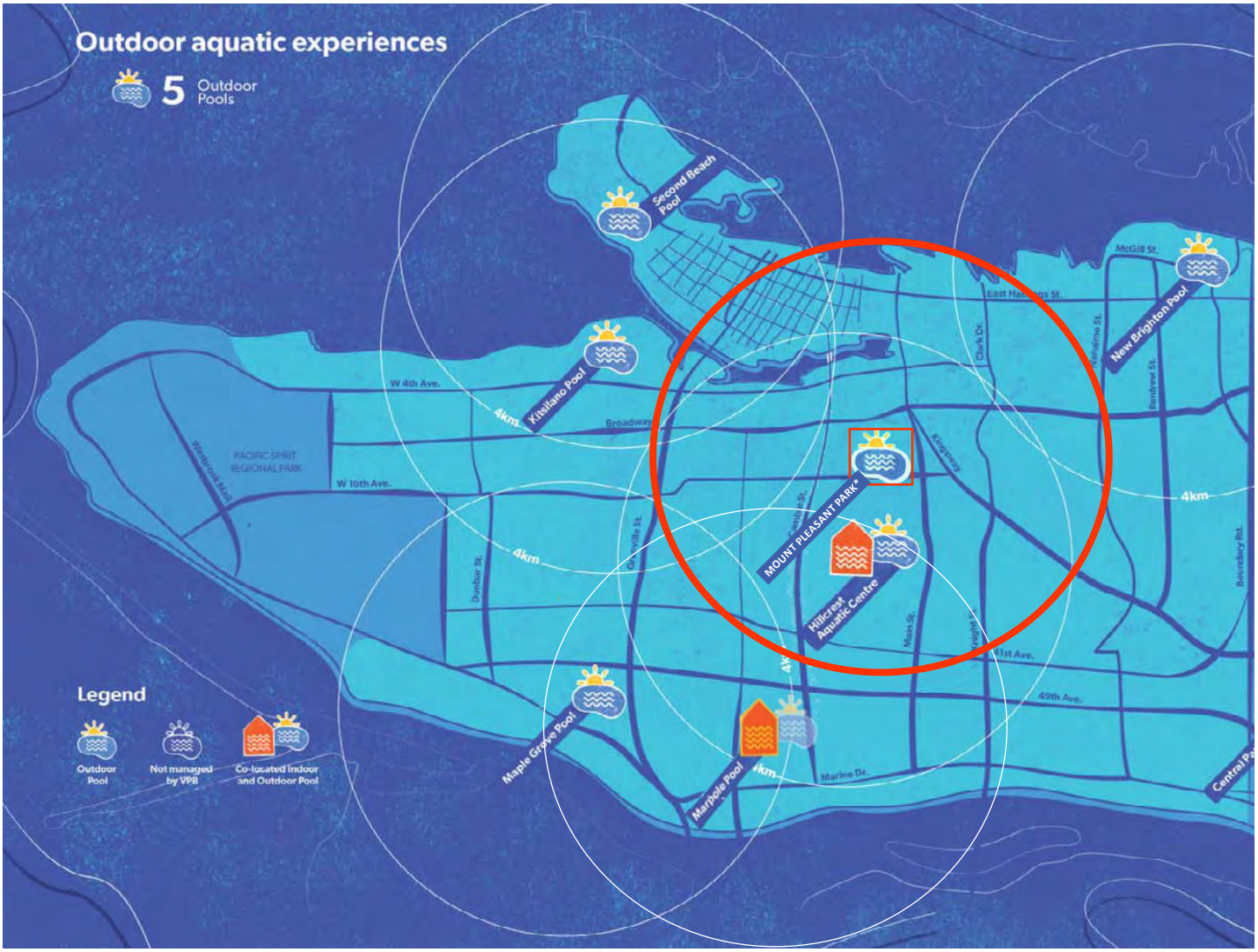

Figure 4 - Outdoor Aquatic Experiences Current Status, *VanSplash.* City of Vancouver (2019).
*Outdoor Pool at Mount Pleasant Park is added by Architect for reference.

SITE SUITABILITY

Parks Washroom Strategy

In the Board of Parks and Recreation's *Parks Washroom Strategy* (November 2020), Mount Pleasant Park is identified as one of nine parks recommended for a new washroom. The Parks Board described Mount Pleasant Park as the site for a small washroom facility, consisting of two to three universal single-user washrooms. The recommended time-frame for a washroom at Mount Pleasant Park is during 2023-2026 capital planning. Given the comprehensive construction of the outdoor pool, two public toilet rooms to satisfy the need outlined in the Parks Washroom Strategy are added to the test-fit design.

Environmental Site Assessment

In 2021 core6 Environmental conducted an Environment Site Assessment to identify the potential for contamination present on the site as a result of current and historical site activities. The environmental site assessment for Mount Pleasant Park is inconclusive with respect to the likelihood of site contamination, but does identify potential risks of ‘constituents of concern’.

The assessment is a result of the site's history, both recent and within the last century. Based on the provided environmental assessment, prior to the site's use as a park, it was a residential block with houses typical of the era. The site was converted to a park with an outdoor pool and community centre in the 1960s. In 2010 the park was renovated to its current state. While both conversions were significant, it is unclear if or how much material still exists from its residential and subsequent pool uses. Residential boilers and oil tanks may remain on-site, and it is possible that portions of the previous pool tank and mechanical equipment do as well. Absent further exploration and study it is impossible to know with certainty.

Based on available documentation, it is impossible to state with certainty the existing condition for either site. However, there appears to be an elevated risk of potential site contamination at Mount Pleasant Park. The cost implications of this risk are challenging to assess - unknowns by definition are unpredictable - however, it is reasonable to expect potential costs in the order of hundreds of thousands of dollars and a similarly unpredictable impact on schedule.

TEST-FIT DESIGN

Functional Program

The following designs are preliminary and are intended as provisional for Class D Costing. This *Test-Fit Design* follows Real Estate and Financial Management and Vancouver Board of Parks and Recreation programmatic requirements and staff input. The pool design satisfies the latest BC Health Act pool regulations and the British Columbia Guidelines for Pool Design, and the Vancouver Building Bylaw. The building design is in line with current Vancouver policies and goals. The program is as follows:

- 25m combined lap and leisure pool
- New pool facility with Office and Kiosk, staff room, communication room, electrical room, mechanical room and chemical room.
- Site service upgrades
- Two public toilet rooms.

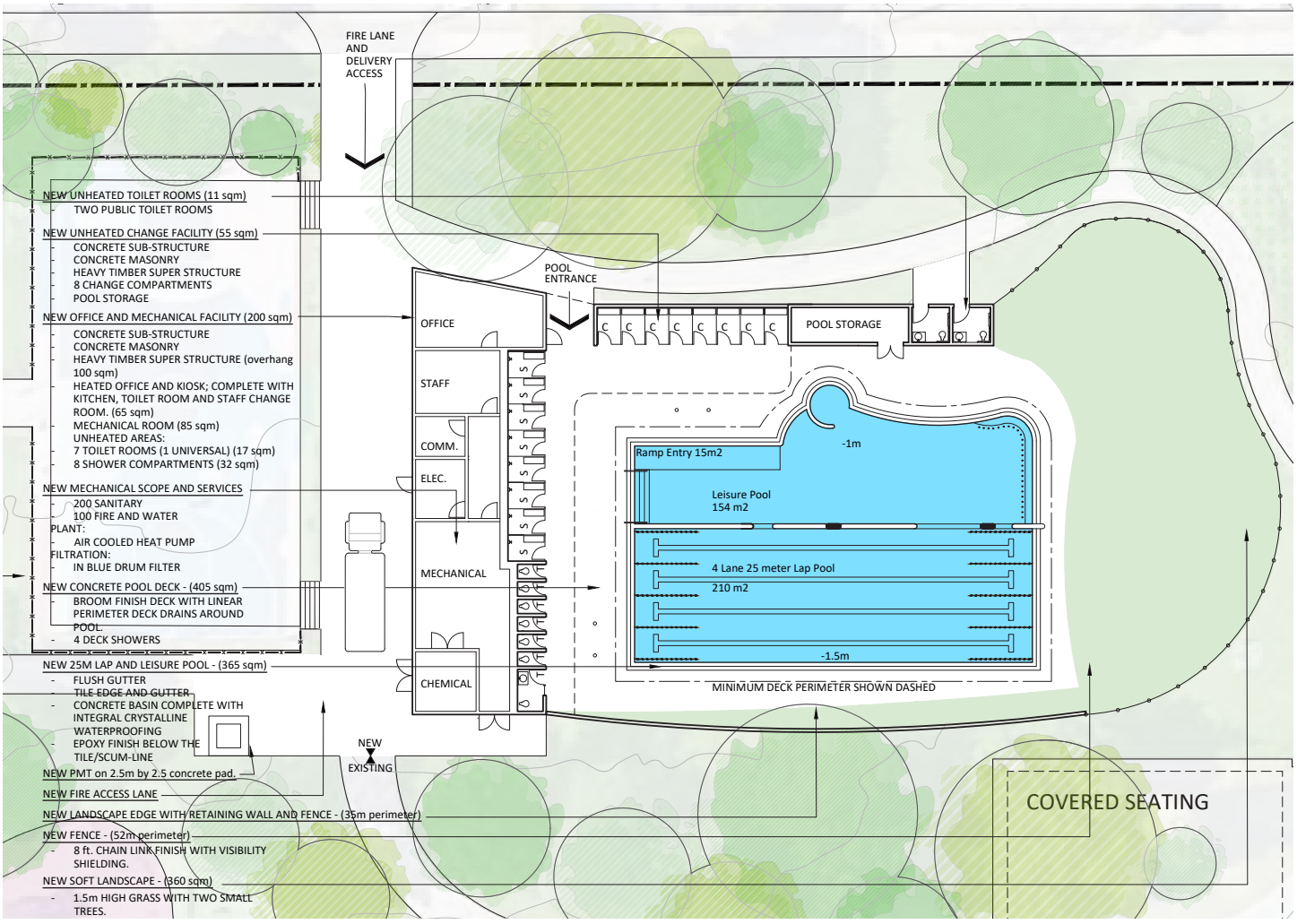

Figure 5 - Mount Pleasant Test-Fit Design

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TEST-FIT DESIGN

Pool Design

The outdoor pool at Mount Pleasant Park's test-fit design provides a balance of recreation, fun, socializing and fitness and aligns with the Outdoor Pool recommendations in VanSplash's (2019) Aquatic Strategy. The combination of leisure and lap would provide comprehensive aquatic services (i.e. Recreational Swimming, Skill Development, Lane Swimming, and Fitness programming). This balance of facility reflects the need for diverse and inclusive access to the neighbourhood and surrounding amenities such as the elementary school and daycare.

Lap Pool

The lap pool is 25m in length, with 4 lanes. It is 1.5m in depth. This depth is suitable for lane swimming, lessons, and general use. Its depth precludes activities like diving and water polo.

The pool would have a continuous flush gutter - where the water level is as high as the deck and the entire pool is surrounded by grates that permit displaced water to flow out of the pool and into a surge tank. This gutter type is consistent with current best practices: it facilitates improved dispersion of airborne chemicals (primarily chloramines) that linger at the water's surface, and is easier for children, the elderly and others with mobility challenges to enter and exit the pool.

Leisure Pool

The leisure pool includes both ramped and stair entries, as well as both a general leisure area, small bubble 'room,' and lazy river. The leisure area of the tank is 1m in depth. The intent is to provide accommodation to facility users while generally satisfying a like-for-like replacement strategy of the original pool, as well as keeping with contemporary pool programming and best practices. The pool has a ramp entry for universal access.

Pool Deck and Enclosure

The BC Health Act and Pool Design guideline stipulates that a pool deck is to be designed to sufficiently provide space for all patrons and for an ambulance gurney and to maintain a minimum of clear space of 1.2 metre around the pool's perimeter. The 1.2 metre perimeter is shown as a dashed line on Figure 5. In order to protect the pool from contamination, the pool deck must be designed to drain away from the pool edge. This means the entirety of the pool deck is to be sloped 2% to 4%. The pool deck must be include space for a seating area, and on deck pool storage space.

The BC Health Act requires all pools to have a pool enclosure with controlled access. A barrier, such as fencing, is required to be a minimum 1.5m and non-climbable. This requirement is included in the Pool Design Guidelines to minimize the risk of drowning and minimize the contamination of water by foreign materials. The recommendation is to add an 8ft perimeter fence, with visibility guards around the pool deck exposed to the remainder of the park. The fencing would work in conjunction with the ticketing kiosk at the pool entrance for operational controlled access.

TEST-FIT DESIGN

Change Rooms, Shower Rooms, and Toilet Rooms

Much of the accompanying program areas are set out by the BC Guidelines for Pool Design and the Vancouver Building Bylaw.

Plumbing fixture requirements are determined based on the Vancouver Building Bylaw and are outlined in the table below. Change area requirements are based on the BC Guidelines For Pool Design. Both are functions of the pool's geometries: both overall water surface area and the pool depth. The test-fit design includes gender-neutral change, toilet, and washroom facilities consistent with City policy and the above noted documents.

	<0.6M DEEP	S = 0.6M-1.5M DEEP	D = 1.5M DEEP
LAP POOL	-	-	210 SQM
LEISURE POOL	-	154 SQM	-
TOTAL	-	154 SQM	210 SQM
BATHING LOAD*	= D/2.5 + S/0.93		
	= 210/2.5 + 154/0.93		
	= 84 + 166		
	= 250		
MALE/FEMALE	= 125 BATHER/GENDER		
CHANGE AREA CALCULATION*	= 0.32M PER BATHER		
	= 0.32M (250)		
	=80 SQM		

Table 2 - Mount Pleasant Bather Load Calculations

REQUIRED FIXTURES	SHOWERS*	WC**	LAVATORIES**
MALE	4	3	2
FEMALE	4	5	3
TOTAL	8	8	5

* BASED ON 2014 BC POOL DESIGN GUIDELINES

** BASED ON 2019 VANCOUVER BUILDING BYLAW

Table 3 - Mount Pleasant Fixture Requirements

TEST-FIT DESIGN

Operations

Staff:

A typical stand-alone facility, such as the Mount Pleasant Park outdoor pool, requires the following daily staff:
- One (1) full-time head guard
- Two (2) part time assistant guards
- Four (4) life guards, dependent on bather loads (4 per 140-200 bathers)
- Two (2) administration staff (Cashier and Reception)

Approximate Usership:

VanSplash has outlined a metric for the maximum pool capacity of outdoor pools for the entirety of the season (100 days per year). This calculation is helpful to understand the estimated swims per annual year from a point of sale perspective. It does not reflect bather load calculations, nor is it a legacy capacity. Table 4 estimates that over the course of the season the new outdoor pool at Mount Pleasant Park might facilitate approximate 49,000 swims per year.

Landscape

The test fit design occupies the larger open space of Mount Pleasant Park. In principle, the design intent is to site the outdoor pool while preserving the current path network and park amenities. However, an expanded scope should be anticipated to properly account for the pool's impacts on the surrounding park. The new pool's impact to the site results in the loss of year-around flexible park program in the central green field, which limits passive use of the park in the neighbourhood.

Ground Permeability:

The pool, the pool deck, and the support buildings would result in the loss of permeable ground cover. The impact of this would be an increased demand on the City's storm system, distinct from the increased sanitary and storm demands from the building proper.

Tree Removal:

Tree removal is required to accommodate the pool deck and widening of the path to accommodate lane access. The three trees along the south side of the pool deck will require removal. The trees being removed are a mix of mature Pines and Japanese Maples. At the north-west corner adjacent to the new lane access, a small Japanese Maple tree will need to be removed.

	<1.5M DEEP	>1.5M DEEP
	216 SWIMS PER 1 SQM	76 SWIMS PER 1 SQM
	216 * 154 SQM	76 * 210 SQM
	33,264 SWIMS	15,960 SWIMS
TOTAL	49,224 SWIMS PER YEAR	

Table 4 - Mount Pleasant Maximum Pool Capacity (Swims per Square Metre, Per Year)

TEST-FIT DESIGN

Security and Public Safety

A significant feature of Mount Pleasant Park is that it is easy to visually survey the park, and that there are few physical barriers preventing direct access to program areas. The addition of the pool, and in particular its support buildings, will effectively eliminate site connectivity, physically and visually. This will have two primary impacts: first, visitors will not be able to maintain line-of-sight to friends or family as easily; second, the buildings will introduce hard to supervise blind spots, which will make some visitors uncomfortable and reduces a sense of safety, especially at night. The major blind spots, and disruptions to lines-of-sight are between the south end of the pool and the existing skate park, the North-West Corner looking South-East and looking both East and West on either side of the building.

Accessibility

All buildings and pool design features are to be accessible. The pool deck allows for a 1500mm path of travel around the entirety of the pool perimeter, as well as accessible showers and change rooms. The pool is accessible via a ramp and pool equipment for an alternative accessible entry is typically provided by pool operations. The test fit design tries not to impact the park's walking paths, which maintain an accessible paths of travel to the existing park program. The two toilet rooms are fully accessible as defined by the Vancouver Building Bylaw.

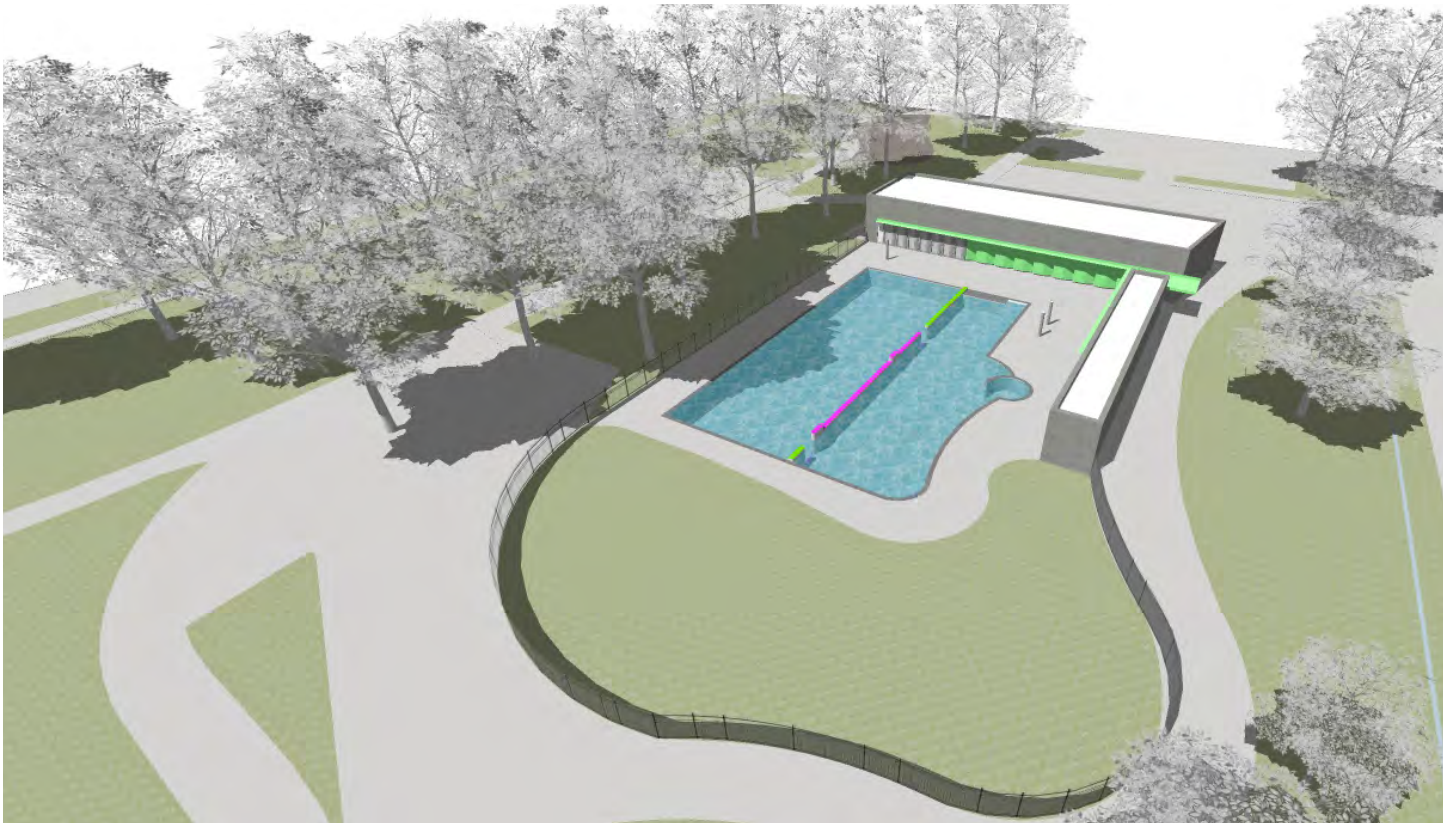


Figure 6 - Mount Pleasant Test-Fit Design

TEST-FIT DESIGN

Traffic

Parking Demands:

The test-fit design would result in 14 additional parking spaces required during the facilities operation. As the existing parking lot is relatively small, the recommendation is that these parking spaces are to absorbed into on-street parking, and a dedicated drop-off/pick-up street parking be designated. It is also acknowledged that the park with a relatively higher proportion of visitors that are assume to walk, bike or commute via public transportation.

Energy Standards

The City of Vancouver policy will require the proposed Mount Pleasant Park to be Passive House and LEED Gold certified, which will have a construction cost and project cost premium. Cost implications vary by project type for both certification paths, but a premium of 15% is common, and for an outdoor public aquatic facility could likely be higher.

Mechanical

As Mount Pleasant Park does not have an existing facility on site a new pool mechanical room, chemical storage, sanitary lines and fire and water are required. The sufficient mechanical room is required to service the new outdoor pool. The following inventory is recommended as per the current best practices.

Mechanical Room:

Heating Plant: A heating plant would be required to provide heating for occupied spaces, ventilation heat, domestic hot water, and pool heating. Low green house gases emitting Air Cooled Heat Pump is recommended, which would be mounted on the roof. A pool filtration system is required for chemical balance and water clarity. An InBlue Drum Filter is recommended. Minimum of two filtration pumps, a chemical injection pump and electronic flow meters are required. A strainer cleaning pit in the pump area is required for cleaning. A building management system is required to monitor the functionality of the pool during operation and maintenance. A chemical controller to monitor water chemistry is to be integrated.

Chemical Room:

A chemical room is required on site to adequately store chlorine, CO2 and acid for pool maintenance. A dedicated exhaust system is required for chlorine and acid storage. A dedicated delivery access lane is required for weekly chemical delivery. The recommendation is to widen the existing park path to create a new delivery access lane and fire lane.

Site Services:

A 200mm sanitary service and 100mm fire and domestic water supply is required.

Pool Temperature:

As the pool is a combination of a lap and leisure pool the temperature of the pool is 32° C. This temperature is considered uncomfortable to some for lane swimming and a result of the combined lap and leisure.

TEST-FIT DESIGN

Electrical

As Mount Pleasant Park does not have an existing facility on site a new electrical service room, communication room, BC Hydro service upgrades are required.

Communication Room:

A communication room is required for security, closed-circuit television (CCTV), access controls, fire alarm and networking equipment.

Electrical Service Room:

An electrical service room is required to service the mechanical and pool equipment.

Pad Mounted Transformer:

A service upgrade from BC Hydro is required to adequately supply power to Mount Pleasant Park, this includes a pad mounted transformer and a three-phase pole.

QUANTITY SURVEYOR COSTING ESTIMATE

Class D

The estimated project costs are based on Class D costing, which have an accuracy of 20-30% (CCA-ACC Guide to Cost Predictability). The costing takes into account many variables influencing construction price, such as final design, contract obligations, and market volatility. The costs are based on 2021 rates, and includes a 2 year cost escalation. It is a preliminary cost estimate and not a final construction cost.

ESTIMATED COST		
A	LAND, PROPERTY TAXES, ACCOUNTING & LEGAL FEES	EXCLUDED
	ESTIMATED NET CONSTRUCTION COST (NET Q4 2021 $)	$ 6,194,300
C	CONTINGENCIES (DESIGN PRICING, ESCALATION 2-YEARS & CONSTRUCTION)	$ 2,369,000
D	**ESTIMATED ESCALATED CONSTRUCTION COST (Q4 2021 $)**	**$ 8,563,000**
E	PROFESSIONAL FEES (ALLOWANCES)	$ 1,199,000
F	CONNECTION FEES & PERMITS (ALLOWANCES)	$ 512,000
G	OWNERS COSTS (ALLOWANCES)	$ 670,100
H	OWNERS SOFT COST CONTINGENCY (10% OF E TO G ALLOWANCE)	$ 238,100
I	LOOSE FURNISHINGS, FITTINGS & EQUIPMENT (3% ALLOWANCE OF D)	$ 256,900
J	GST (EXCLUDED)	EXCLUDED
L	FINANCING CHARGES (EXCLUDED)	EXCLUDED
M	**TOTAL PROJECT COST ESTIMATE (EXCLUDING GST & EXCLUSIONS)**	**$ 11,439,100**

Table 5 - Mount Pleasant Park Class D Costing

SCHEDULE

1. Pre-Design and Programming

The first phase establishes budgetary, schedule and overall project goals and commitments with the stakeholder groups, (stakeholders; client group and community).

2. Schematic Design

The second phase which involves identifying design options, materials and layout coordination, site coordination, code and standards, Mechanical and Electrical targets, super-structure, and Class C costing. The schematic design process ends with Stakeholder approval. Community stakeholder engagement is consistent through this phase.

3. Design Development

The third phase progresses with specific Architectural, Structural, Mechanical and Electrical system designs. During this phase the architect initiates the authority having jurisdiction, in this case the City of Vancouver Facilities, Park Board Planning, Park Development and Recreation, and Vancouver Coastal Health. Community stakeholder engagement is consistent through this phase.

4. Construction Documents

The fourth phase follows the client's approval of design development. Drawings and specifications are prepared for the construction phase. During this phase the architect procures the necessary licenses and permits prior to construction.

5. Bidding

In the fifth phase, the construction documents are made public and pre-qualified contractors bid on the project. This generally is managed in partnership with the owner.

6. Construction Administration Services

The final phase is construction. During this process the contractor takes possession of the site. The contractor determines the construction schedule, with a agreed upon date of substantial completion.

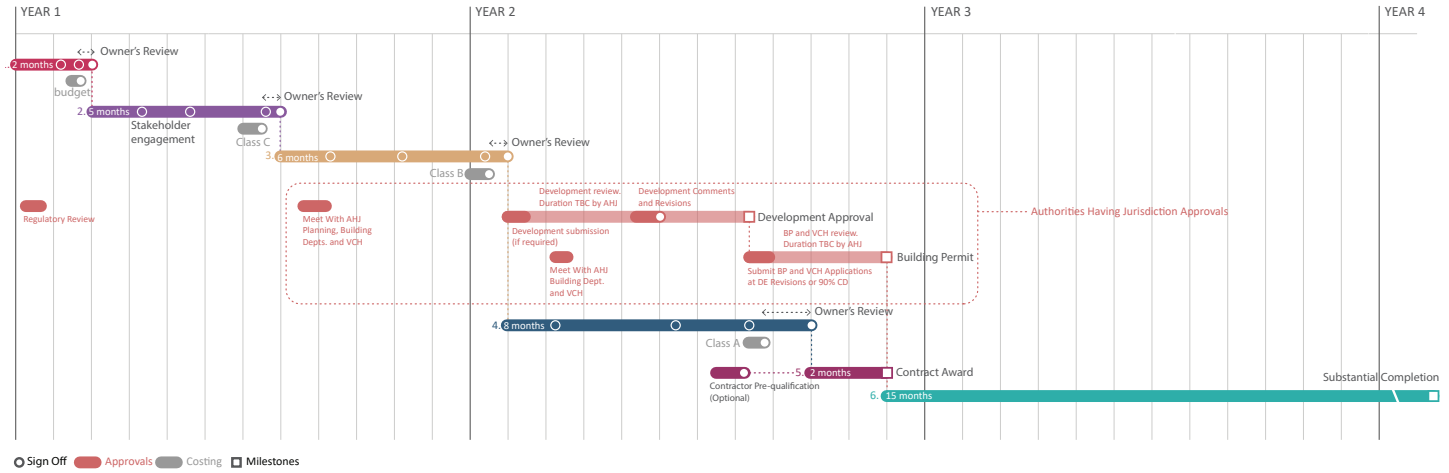


Figure 7 - Mount Pleasant Park Project Schedule

COSTING AND RISK

Mount Pleasant Park is an important neighbourhood amenity. The design and construction of an outdoor pool would attract significant attention from community members wishing input on the pool siting, design, and impacts on other park elements and program areas. It is reasonable to anticipate a significant level of engagement with community stakeholder group(s) in the schedule. Engagement with a community stakeholder group have schedule and budget implications. Depending on the level of engagement and support for the designs that are developed, the design process could take anywhere from an additional six to ten months (pre-design to contract documents). At this stage, it is anticipated that the Mount Pleasant Park Pool would require additional design time as a result of:

A. An engaged surrounding community: it is anticipated that the community will seek regular repeated chances to provide input on pool and park design. The design revisions required to satisfy the community are likely and the project may expand beyond the program described in this report.

B. Mount Pleasant Park is more complex: the test fit pool and associated buildings must respond to a more complex set of adjacent program areas, and the test fit design's parameters did not include the design implications of the entire park. In addition, because the Mount Pleasant Park Pool requires an entirely new mechanical service (rather than relying on an existing service as the case at Hillcrest Centre) the coordination and construction time is also extended.

The protracted schedule has material implications on budget, and in the current economic climate where escalation costs have proven tenacious, delayed construction will have a cascade effect on project costs:

1. Cost impacts accrue as a direct function of escalation. A delay of six to ten months to the start of construction will result in higher construction tender results.

2. Secondary cost impacts will accrue at the level of non-construction costs, including consultant fees, site servicing, and City Staff costs.

Costs impacts are recursive: a protracted design process will likely further delay the start of construction, which will result in an increased likelihood of over-budget tenders. Addressing project overruns at a late stage (post-tender) would further delay the project, requiring additional staff time, additional consultant costs, and either a construction budget increase or program reduction. In the case of Mount Pleasant Park, these effects would serve to increase the construction and project costs presented in the Quantity Surveyor's report.

Based on the above schedule and risk assessment, this report includes an adjusted cost based on the Quantity Surveyor's report, but accounting for these factors. The result is an overall probable Project cost increase of 26% (from $11.4M to $14.4M) over the Quantity Surveyor's estimate for Mount Pleasant Park.

ADJUSTED COSTING

ELEMENT	BASED COST	ADJUSTED COST	
LAND, PROPERTY TAXES, ACCOUNTING & LEGAL FEES	EXCLUDED	EXCLUDED	
ESTIMATED NET CONSTRUCTION COST (NET Q4 2021 $)	$ 6,194,000	$ 6,194,000	
HOUSE/LEED GOLD	EXCLUDED	$929,100	15% PREMIUM
SITE & ENVIRONMENTAL REMEDIATION COSTS (RISK CASH ALLOWANCE)	EXCLUDED	$150,000	ALLOWANCE
ADJUSTED ESTIMATED NET CONSTRUCTION COST	$ 6,194,000	$ 7,273,100	
CONTINGENCIES (DESIGN PRICING, ESCALATION 2-YEARS & CONSTRUCTION)	$ 2,369,000	$ 3,485,179	1 YEAR ADDITIONAL TIME
ESTIMATED ESCALATED CONSTRUCTION COST (Q4 2021 $)	**$ 8,563,000**	**$ 10,758,279**	
PROFESSIONAL FEES (ALLOWANCES)	$ 1,199,000	$ 1,506,400	
CONNECTION FEES & PERMITS (ALLOWANCES)	$ 512,000	$ 643,300	
OWNERS COSTS (ALLOWANCES)	$ 670,100	$ 841,900	
OWNERS SOFT COST CONTINGENCY (10% OF E TO G ALLOWANCE)	$ 238,100	$ 299,100	
LOOSE FURNISHINGS, FITTINGS & EQUIPMENT (3% ALLOWANCE OF D)	$ 256,900	$ 322,800	
GST	EXCLUDED	EXCLUDED	
FINANCING CHARGES	EXCLUDED	EXCLUDED	
TOTAL PROJECT COST ESTIMATE (EXCLUDING GST & EXCLUSIONS)	**$ 11,439,100**	**$ 14,371,779**	

Table 6 - Mount Pleasant Park Costing with adjustments.

SITING

Hillcrest Park is a 7.51-hectare park located in the Riley Park-Little Mountain neighbourhood of Vancouver. It is bounded by Peveril Ave to the north-east and Dinmont Ave to the north-west, and Ontario Street to the east. To the south of the park is Midlothian Avenue and Queen Elizabeth Park. The surrounding neighbourhood is zoned for single-family residential.

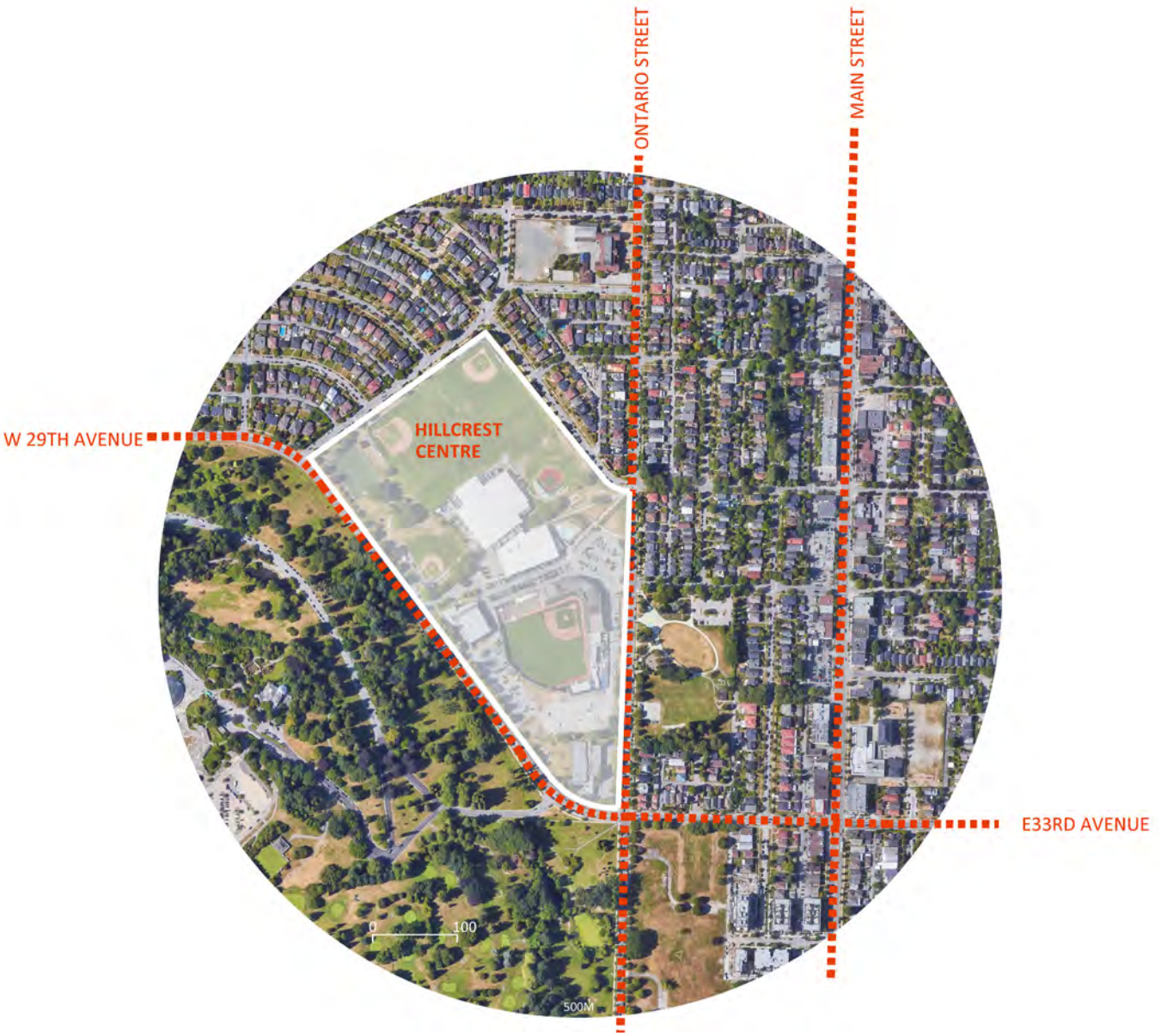


Figure 8 - Hillcrest Centre Context Plan

EXISTING AMENITIES AND SITE USE

Hillcrest Centre is composed of Nat Bailey Stadium, the Vancouver Racquet Club to the south of the site, the Pacific Indoor Bowling Club and Little Mountain Baseball clubhouse to the West, and a building complex that includes the Hillcrest Rink, Hillcrest Aquatic Centre, Vancouver Curling Club and Terry Salman Branch of the Vancouver Public library. Site amenities include a turf field, three soccer fields, four baseball diamonds, an outdoor leisure pool, field house, a modest playground and jogging trails. There is a 6,500 square foot dog park south of Nat Bailey stadium and the north half of the park is intended for athletic field play. Presently, the proposed pool location does not serve as an informal dog park.

Figure 9 - Hillcrest Centre Existing Site Plan

1 5 10

SITE SUITABILITY

The City of Vancouver's 2018 *VanPlay: Inventory and Analysis* report has identified the neighbourhood of Riley Park - Little Mountain as a medium Park Provision Score. A medium Park Provision Score indicates a median availability of park and green space per capita. The addition of an outdoor pool at Hillcrest Centre implies the loss of green space within the neighbourhood, reducing the park provision per capita. The outdoor pool would result in the removal of 1% of the total park green space.

VanSplash directive is to co-locate new outdoor aquatic experiences with new aquatic and community centres to increase the geographic density of outdoor aquatic amenities. The new outdoor lap pool would revitalize the existing outdoor, and upgrade the existing change facilities serving the outdoor pools.

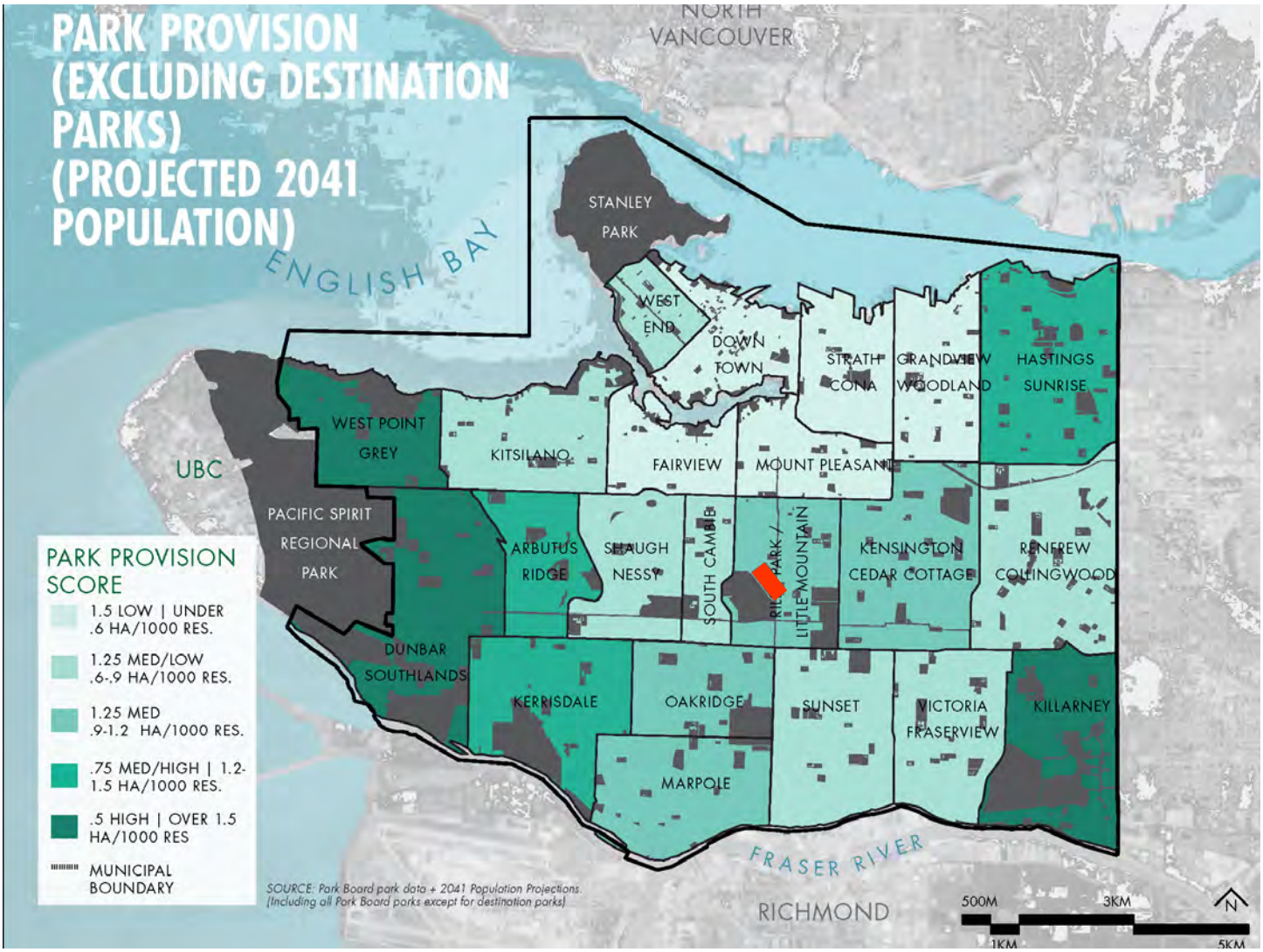


Figure 10 - Projected Park Provision, *Vanplay: Inventory and Analysis.* City of Vancouver (2018).
*Hillcrest Centre is highlighted orange by Architect for reference.

SITE SUITABILITY

Environmental Site Assessment

In 2021 core6 Environmental conducted an Environment Site Assessment to identify the potential for contamination present on the site as a result of current and historical site activities. The environmental site assessment for Hillcrest Centre is inconclusive with respect to the likelihood of site contamination, but does identify potential risks of 'constituents of concern'.

Hillcrest Centre and its immediate precinct is fairly well-understood. The construction of the Hillcrest Centre for the 2010 Winter Olympic Games was extensive and the proposed location for a new pool was part of the landscape scope for the facility when constructed. The period of construction is a significant factor here too: site remediation associated with an Olympic facility in 2010 was significantly advanced. Hillcrest was identified as having 1 Area of Potential Environmental Contamination (APEC), but located close to Nat Bailey Stadium which is outside the proposed pool location.

TEST-FIT DESIGN

Functional Program

The following designs are preliminary and are intended as provisional for Class D Costing. The proposed program in this *Test-Fit Design* is as follows:

- 25m Lap Pool, complete with a concrete pool deck, fencing, and green space,
- Unheated, covered change cabana, showers and toilet rooms.

Pool Design

For the test-fit design is to renovate Hillcrest Centre to include new four lane lap pool to the existing outdoor pool deck. The combination of leisure and lap would provide comprehensive aquatic services (i.e. Recreational Swimming, Skill Development, Lane Swimming, and Fitness programming) while being co-located at an existing facility to increase the recreation density as per VanSplash directive.

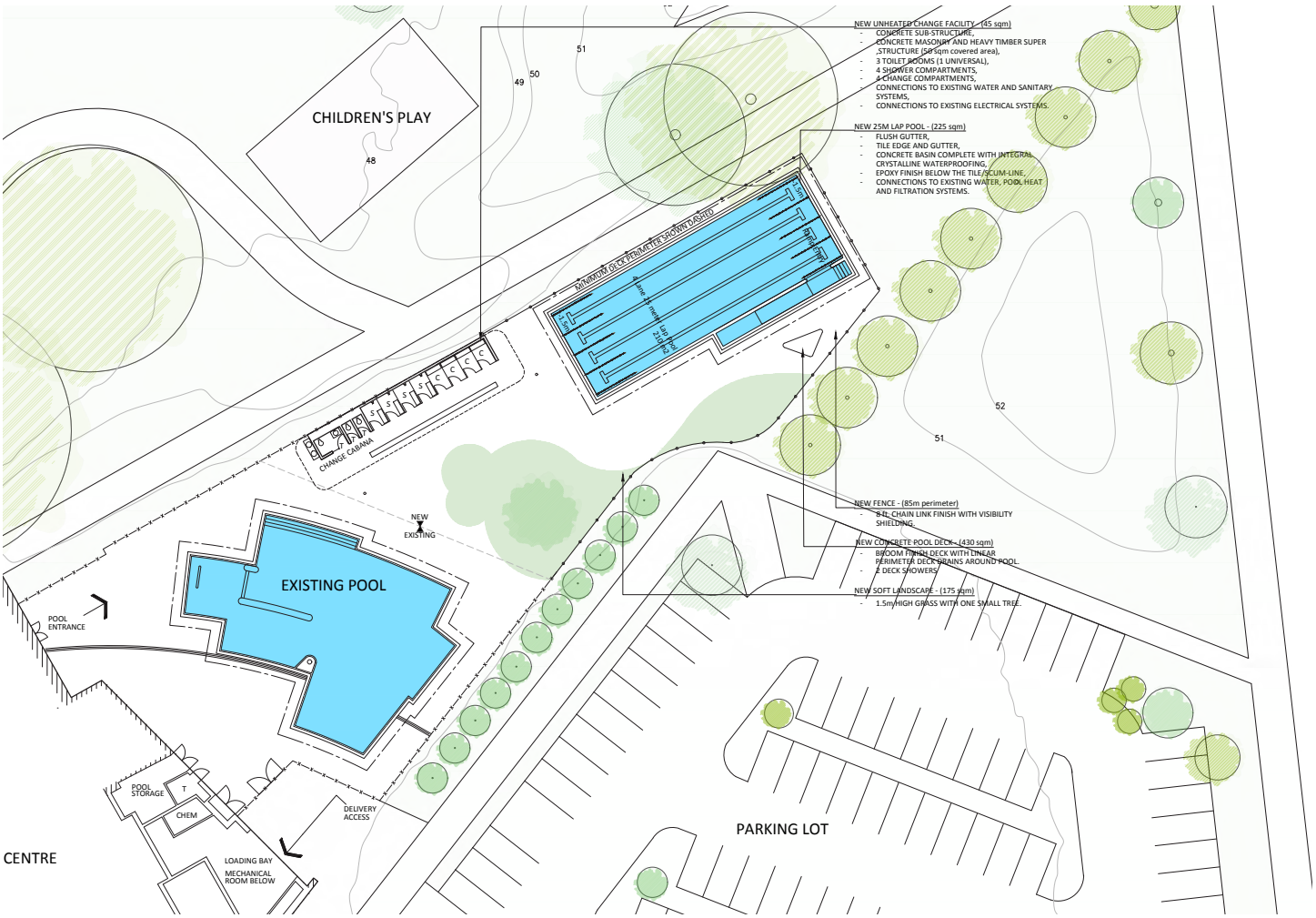


Figure 11 - Hillcrest Centre Test-Fit Design

1 5 10

TEST-FIT DESIGN

Lap Pool

The proposed lap pool is a 25m in length and four lanes. With a depth of 1.5m, it is suitable for lane swimming, lessons, and general use. Its depth precludes activities like diving and water polo.

Like the proposed Mount Pleasant pool, the lap pool would have a continuous flush gutter - where the water level is as high as the deck and the entire pool is surrounded by grates that permit displaced water to flow out of the pool and into a surge tank. As described earlier, and as is the case at Hillcrest Centre's existing pools, this method is consistent with current best practices. The pool has a ramp entry for universal access.

Pool Deck and Enclosure

As at the Mount Pleasant Park pool, the recommendation is to extend the existing 8ft perimeter fence, with visibility guards around the pool deck exposed to the remainder of the park.

Figure 12 - Hillcrest Centre Test-Fit Design

TEST-FIT DESIGN

Change Rooms, Shower Rooms, and Toilet Rooms

Much of the accompanying program areas are set out by the BC Guidelines for Pool Design and the Vancouver Building Bylaw.

Plumbing fixture requirements are determined based on the Vancouver Building Bylaw and are outlined in the table below. Change area requirements are based on the BC Guidelines For Pool Design. Both are functions of the pool's geometries: both overall water surface area and the pool depth. The test-fit design includes gender-neutral change, toilet, and washroom facilities consistent with City policy and the above noted documents.

	<0.6M DEEP	S = 0.6M-1.5M DEEP	D = 1.5M DEEP
LAP POOL	5 SQM	10 SQM	210 SQM
LEISURE POOL	-	-	-
TOTAL	5 SQM	10 SQM	210 SQM
BATHING LOAD*	= D/2.5 + S/0.93		
	= 210/2.5 +10/0.93		
	= 94		
MALE/FEMALE	= 47 BATHER/GENDER		
CHANGE AREA CALCULATION*	= 0.32M PER BATHER		
	= 0.32M (94)		
	= 30 SQM		

Table 7 - Hillcrest Centre Bather Load Calculations

REQUIRED FIXTURES	SHOWERS*	WC**	LAVATORIES**
MALE	2	1	1
FEMALE	2	2	1
TOTAL	4	3	2

* BASED ON 2014 BC HEALTH ACT

** BASED ON 2019 VANCOUVER BUILDING BYLAW

Table 8 - Hillcrest Centre Fixture Requirements

TEST-FIT DESIGN

Operations

Since the existing operations at Hillcrest Centre are well established, the current facility staff can accomodate the majority of the additional work required for a new lap pool. The result is that 2 additional life guards are required for the new pool's maximum bather load.

Approximate Usership:

VanSplash has outlined a metric for measuring the maximum pool capacity of outdoor pools for the entirety of the season (100 days per year). Table 9 estimates that over the course of the season the new outdoor pool at Hillcrest Centre might facilitate approximate 19,200 swims per year.

Landscape

The area examined in the test fit is part of the east entry sequence and serves primarily as a circulation forecourt to Hillcrest Centre. From a visitor's point of view, it does not have a specific dedicated program and its reduction in size will not meaningfully diminish the park's usefulness. The removal of the landscape berm is the has a minimal impact on the parks green space and will

Ground Permeability:

As with the Mount Pleasant Park test fit, there will be a loss of permeable ground cover and there will be as a result an increased demand on site services. As with the overall loss of green space, however, this will be minor.

Tree Removal:

The test-fit design results in the removal of 12 small Katsura Trees.

Security and Public Safety

The proposed test-fit design location does impact the sight lines from the children's play area to the parking lot, though both areas are visible from Hillcrest Centre.

	<1.5M DEEP	**>1.5M DEEP**
	216 SWIMS PER 1 SQM	76 SWIMS PER 1 SQM
	216 * 15 SQM	76 * 210 SQM
	3,240 SWIMS	15,960 SWIMS
TOTAL	**19,200 SWIMS (NEW)**	
	60,000 SWIMS (EXISTING OUTDOOR POOL) + 624,722 SWIMS (EXISTING INDOOR POOL)	
	703,922 SWIMS	

Table 9 - Hillcrest Centre Maximum Pool Capacity (Swims per Square Metre, Per Year).
Number reflects the new outdoor lap pool exclusively

TEST-FIT DESIGN

Accessibility

All buildings and pool design features are to be accessible. The pool deck allows for a 1500mm path of travel around the entirety of the pool perimeter, as well as accessible showers and change rooms. The pool is accessible via a ramp and pool equipment for an alternative accessible entry is typically provided by pool operations.

Traffic

The test-fit design would result in 8 additional parking spaces required during the facilities operation. As the existing parking lot is relatively large, the recommendation is that these parking spaces are to absorbed into the surrounding parking lot and street parking. It is also acknowledged that the park with a relatively higher proportion of visitors that are assume to walk, bike or commute via public transportation.

Energy Standards

Hillcrest Centre, will rely on existing mechanical and electrical systems and services, as well as the administration and control in the existing facility. The City would not require a program expansion to Hillcrest Centre to meet Passive House or LEED Gold standards and it is anticipated that the outdoor change facilities would be unconditioned spaces used only in the summer and late spring and early fall.

Mechanical

From the schematic planning, site facility reports, and site visits the existing Hillcrest Centre's pool infrastructure is adequate enough for the additional pool tank of the test-fit design. The existing building infrastructure would be required to be confirmed during the detailed planning process.

Pool Temperature:

As the lane pool is a standalone pool tank, the temperature of the pool is 29° C.

Electrical

The required electrical equipment for the additional pool tank and new change facilities can be added to the existing building's electrical power distribution equipment.

QUANTITY SURVEYOR COSTING ESTIMATE

Class D

The estimated project costs are based on Class D costing, which typically have +/- 25% in accuracy. The costing takes into account many variables influencing construction price, such as final design, contract obligations, and market volatility. The costs are based on 2021 rates, and includes a 2 year cost escalation. It is a preliminary cost estimate and not a final construction cost.

	ESTIMATED COST	
A	LAND, PROPERTY TAXES, ACCOUNTING & LEGAL FEES	EXCLUDED
B	ESTIMATED NET CONSTRUCTION COST (NET Q4 2021 $)	$ 2,890,000
C	CONTINGENCIES (DESIGN PRICING, ESCALATION 2-YEARS & CONSTRUCTION)	$ 1,105,400
D	**ESTIMATED ESCALATED CONSTRUCTION COST (Q4 2021 $)**	**$ 3,995,400**
E	PROFESSIONAL FEES (ALLOWANCES)	$ 559,000
F	CONNECTION FEES & PERMITS (ALLOWANCES)	$ 220,000
G	OWNERS COSTS (ALLOWANCES)	$ 318,400
H	OWNERS SOFT COST CONTINGENCY (10% OF E TO G ALLOWANCE)	$ 109,700
I	LOOSE FURNISHINGS, FITTINGS & EQUIPMENT (3% ALLOWANCE OF D)	$ 119,900
J	GST (EXCLUDED)	EXCLUDED
L	FINANCING CHARGES (EXCLUDED)	EXCLUDED
M	**TOTAL PROJECT COST ESTIMATE (EXCLUDING GST & EXCLUSIONS)**	**$ 5,322,400**

Table 10 - Hillcrest Centre Class D Costing

SCHEDULE

The schedule follows closely to Mount Pleasant Park. The two key differences is that Hillcrest Centre's schedule is a renovation of the existing facility and it is anticipated that there will not be a significant community stakeholder group involved throughout the design phases. These two differences contribute to a condensed timeline.

1. Pre-Design and Programming

2. Schematic Design

3. Design Development

4. Construction Documents

5. Bidding

6. Construction Administration Services

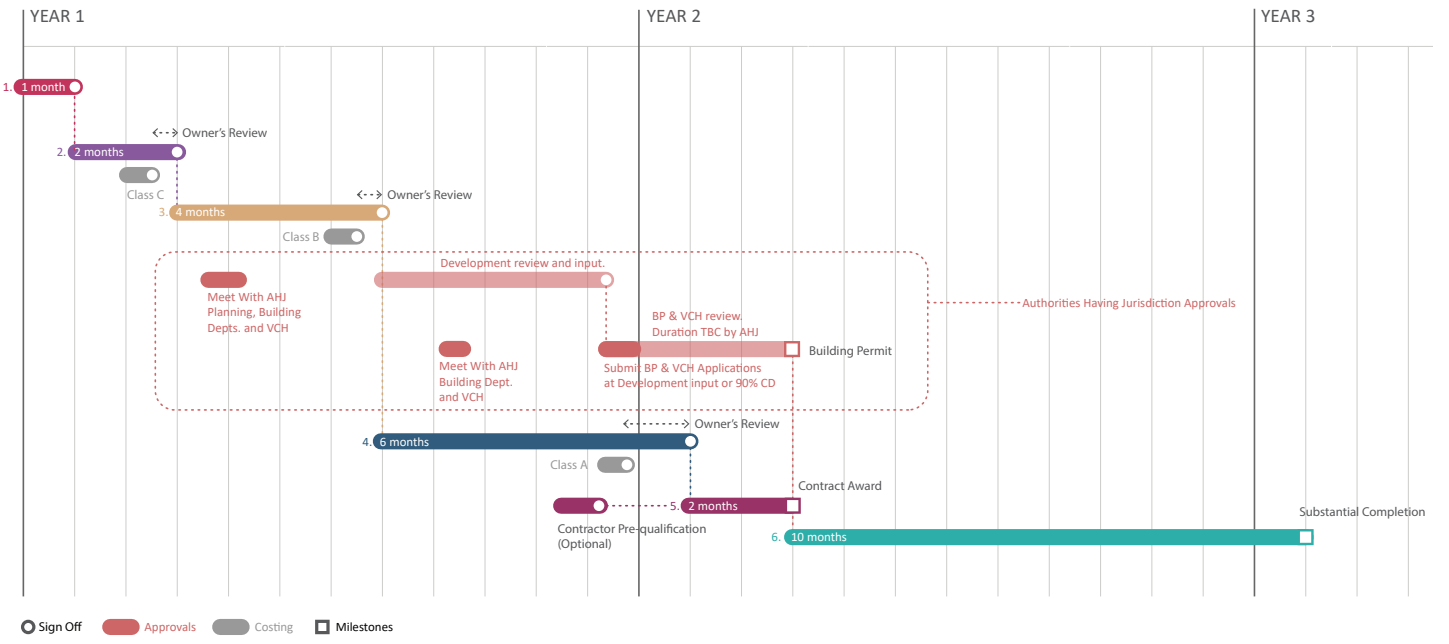


Figure 13 - Hillcrest Centre - Project Schedule

COSTING AND RISK

As the proposed outdoor pool at Hillcrest Centre is a renovation at a recently constructed recreation centre the existing building and site are well documented. The proposed outdoor pool at Hillcrest Centre is relatively low risk. However, based on the environmental site assessment it is recommended that the project carry a risk cash allowance for site and environmental remediation costs. The adjusted cost is reflected below in Table 11.

ELEMENT	BASED COST	ADJUSTED COST	
LAND, PROPERTY TAXES, ACCOUNTING & LEGAL FEES	EXCLUDED	EXCLUDED	
ESTIMATED NET CONSTRUCTION COST (NET Q4 2021 $)	$ 2,890,000	$ 2,890,000	
PASSIVE HOUSE/LEED GOLD	EXCLUDED	NOT APPLICABLE	15% PREMIUM
SITE & ENVIRONMENTAL REMEDIATION COSTS (RISK CASH ALLOWANCE)	EXCLUDED	$35,000	ALLOWANCE
ADJUSTED ESTIMATED NET CONSTRUCTION COST	$ 2,890,000	$ 2,925,000	
CONTINGENCIES (DESIGN PRICING, ESCALATION 2-YEARS & CONSTRUCTION)	$ 1,105,400	$ 1,118,787	
ESTIMATED ESCALATED CONSTRUCTION COST (Q4 2021 $)	**$ 3,995,400**	**$ 4,043,787**	
PROFESSIONAL FEES (ALLOWANCES)	$ 559,000	$ 565,800	
CONNECTION FEES & PERMITS (ALLOWANCES)	$ 220,000	$ 222,700	
OWNERS COSTS (ALLOWANCES)	$ 318,400	$ 322,300	
OWNERS SOFT COST CONTINGENCY (10% OF E TO G ALLOWANCE)	$ 109,700	$ 111,000	
LOOSE FURNISHINGS, FITTINGS & EQUIPMENT (3% ALLOWANCE OF D)	$ 119,900	$ 121,400	
GST	EXCLUDED	EXCLUDED	
FINANCING CHARGES	EXCLUDED	EXCLUDED	
TOTAL PROJECT COST ESTIMATE (EXCLUDING GST & EXCLUSIONS)	**$ 5,322,400**	**$ 5,386,779**	

Table 11 - Hillcrest Centre Class D Costing with adjustments.

EXTENDED SEASON

EXTENDED SEASONAL AND DAILY USE CONSIDERATIONS - MOUNT PLEASANT PARK

Considerations of an extended outdoor swimming season as well as evening programming are really just a distillation of the issues present in evaluating the viability of the outdoor amenity in the first place. The are a function of attendance, operational costs, and an operator's tolerance for subsidizing the gap between the two. Typically outdoor pools in Vancouver operate from the end of May until the first week of September (the May 24th long weekend to Labour Day weekend). An extended session is possible at Mount Pleasant Park from March to November.

Attendance

Attendance is the most challenging variable to predict as it is contingent on people and their responses to other factors like holiday timing and weather, both on a specific day as well as cumulatively over the season insofar as it establishes a mood or seasonal habit of attendance. This is likely the most salient point: it will be challenging to rely on regular attendance during extended season periods, either daily or for the extended period.

In the first instance, obligations to attend school effectively eliminate the ability for children, and therefore families, to visit the pool during the day, except on Saturday and Sundays. There is a second order implication here also: there is an existing ecosystem of afterschool programming - soccer, martial arts, language and music lessons - that are well-established and geared to serve not only as activities, but as child-minding services for parents. These programs are deliberately structured to provide service from the start of the school year until the end. In order to increase attendance during the week, and during the limited hours when children are out of school, the outdoor pool would have to a) provide a similar capacity for child-minding and b) be a compelling enough activity to prompt parents to forgo sunk costs in another service that they have already purchased.

Weather is the other dominant factor here: cool or cold weather reduce the appeal of outdoor swimming as a recreational activity. It is important to acknowledge that the fundamental appeal of an outdoor pool in the first place is the recreational lounge component that accompanies the actual swimming. Much or most of the appeal is the time spent on the deck - the people watching and in-and-out nature of the pool are critical. Without the promise of a warm afternoon sun, and without families (as noted above) pool attendees are typically dedicated individual swimmers who swim without lingering, not groups of families or friends who might plan several hours at the pool.

A contributing factor to a further decrease in attendance is the lack of complimentary amenities at Mount Pleasant Park. As observed above, dedicated lap-swimmers will come to the pool to swim expecting nothing else. A non-swimming friend, spouse, or teenager does not have the option to access another program at the facility - there simply aren’t any.

Staffing

The staffing requirements are outlined elsewhere in this report. The changes that result from extended season operations are fairly straightforward:

1. A full-time head guard is required.

2. Life guards and assistant life guard requirements would be reduced by an amount commensurate with the reduction in the batherload, though the savings here is modest since continued reliable service requires that back-ups and allowances for rotation would be required.

3. Administration staffing for the cashier and reception might enjoy some economies if the tasks and responsibilities are partially merged. This comes with some trade-offs, however, including increased stress on staff which can lead to increased staff turn-over, frustrated users at peak times, an overall decline in the quality of task completion, and increased risk of mistakes.

Item 3 is an operational choice and is primarily related to customer service, whereas items 1 and 2 relate to life-safety.

Design Considerations

The impacts of an extended season for the design of the facility relate directly and indirectly to accommodating lower seasonal temperatures. There are several related considerations:

1. Pool Cover. The pool would require a pool cover to mitigate heat and water loss. Often recommended for indoor pools as well, a pool cover is placed on the surface of the pool when not in use. The addition of the cover would require additional deck space in order to accommodate cover storage. It is a demanding staffing obligation: typically staffing requirements are the main reason cited for not using a pool cover since it takes time before and after a facility opens to remove and replace the cover. Outdoors it is also a maintenance challenge, requiring repair and ultimately replacement due to use, direct exposure to ultraviolet light and the elements, and animals.

2. Mechanical. Plumbing will be required to be entirely free draining (no lift stations), including accommodations in the mechanical room and surge tank. An extended season will require additional insulation. A related item to mechanical will be the increased amount of debris in the pool, in particular in the fall as park leaves fall and their decomposing material enters the mechanical system, further stressing it and demanding increased staff attention.

3. Lighting. The pool deck and tank will require lighting to address lower lighting levels in the extended season when daylight levels are generally lower and also during extended evenings. 200 lux is the required minimum. Lighting represents an additional capital and operating expense.

EXTENDED SEASONAL AND DAILY USE CONSIDERATIONS - HILLCREST COMMUNITY CENTRE

As with the case for Mount Pleasant Park, concerns for an extended outdoor swimming season parallel the factors of any public amenity: the strength of public attendance, operational costs, and the City's willingness to bridge the gap between the two. Outdoor pools in Vancouver typically operate from the end of May until the first week of September (the May 24th long weekend to Labour Day weekend). An extended session is possible at Hillcrest Community Centre from March to November.

Attendance

Attendance at a new outdoor pool at Hillcrest Community Centre will respond to most of the same variables as Mount Pleasant park, though with difference in degree. This is attributable primarily to the significant programming and activity options already present in Hillcrest Community Centre. Use of the new proposed outdoor pool will be similarly contingent on holiday timing and weather, but with the tendency to be higher as, for example, outdoor swimmers will be attracted by the option to enjoy hot tub and sauna experiences before and after their outdoor swim.

The challenges and constraints of school and afterschool programming apply equally to Hillcrest, with the notable difference that Hillcrest does provide many of the sought-after activities for children of a variety of ages, making the outdoor pool more accessible in this location. This applies also to teenagers, spouses, or friends who may prefer hockey or the gym to swimming outside, while still allowing the dedicated outdoor swimmer an opportunity to engage in their preferred activity.

Weather will have a similar direct impact on outdoor swimmers in the extended season or hours at Hillcrest Community Centre as it does at Mount Pleasant Park. Shoulder season and late night outdoor swimming do not have the broad appeal of summer daytime swimming.

Staffing

As with attendance, and noted in the staffing requirements outlined elsewhere, the changes that result from extended seasonal and daily operations are fairly straightforward: since Hillcrest benefits from an already established administrative and pool staff, only 2 additional life guards are required for the new lap pool. Likely 1 would be sufficient in most extended seasonal and daily times (a reduction of 1). The additional staff time would be an additional operational cost and would not likely impact users' sense of customer service.

Design Considerations

As with attendance and staffing, many of the factors that are impacted by extended seasonal and daily operations are similar at Hillcrest Community Centre.

1. Pool Cover. The pool would require a pool cover to mitigate heat and water loss. The cover would require dedicated storage on deck when not in use. Here too it is a demanding task, requiring 2 staff members to remove and replace it at the start and end of the day. The cover will be a persistent maintenance challenge, requiring repair and ultimately replacement.

2. Mechanical. The design implications of extended seasonal and daily use include a free draining strategy, and improved insulation where appropriate. Like Mount Pleasant Park, extending swimming into the fall will increase the amount of organic debris entering the mechanical system, increasing stress on the existing system and requiring increased maintenance.

3. Lighting. The pool deck and tank will require lighting to address lower lighting levels in the extended season when daylight levels are generally lower and also during extended evenings. 200lux is the required minimum. Lighting represents an additional capital and operating expense.

Centennial Outdoor Pool Rehabilitation
Coquitlam, British Columbia
Carscadden Stokes McDonald Architects

In 2017, Centennial Outdoor Pool underwent a renovation to the outdoor pool and change room facilities. The 6 lane, 25m lap pool was updated to extend the pools life-span and significantly modernize the existing pool with a flush-gutter. The existing change facility was renovated into an multipurpose classroom, and a new change room and operations facility was added. The change rooms are universal and gender-neutral. The consultants and client team embarked on effort to eliminate gendered washrooms and present a completely universal alternative. Privacy cubicles and separated toilet compartments allow the design to maintain a level of decorum and user comfort while offering open access to the pool deck from a universal change space. The change spaces are non-insulated and rely on natural ventilation.

The project is an example of how the renovation of public buildings traces and ushers in shifting social trends. It is a similar size to the pools proposed, with fully universal washrooms and change rooms. As well as moving away from providing mechanically conditioned spaces for seasonal recreational facilities.

Queen Elizabeth Pool at Kinsmen Park
Edmonton, Alberta
Group 2 Architecture

Queen Elizabeth Pool is a 25m, six-lane outdoor pool located at the 30 hectare Kinsmen Park in Edmonton, Alberta. The outdoor pool operates from June to August for both lap swimming and public swim. There are no pool fixtures, though there are both 1-m and 3-m diving boards. The pool has a beach-entrance, for accessibility. There is a supporting facility complete with a universal "family-style" change-rooms, and gendered washrooms. The showers are located on the pool deck. The pool deck also has a sun deck and grass space for pool patrons. The outdoor pool is an example of pragmatic, Canadian pool design.

The project is a similar size to the pools proposed, with fully universal change rooms, and public washrooms serving the surrounding parks.

Figure 14 - Centennial Outdoor Pool Rehabilitation, Carscadden Stokes Mcdonald Architects. Photo by Eric Scott (left)
Figure 15 - Queen Elizabeth Pool at Kinsmen Park, Group 2 Architecture. Photo by Jim Dobie. (right)

Cabana Style Change Rooms

A cabana-style change room is a change room typology commonly found in outdoor pool facilities and beaches. These change rooms consist of gender-netural single-user change and shower comparments. They are typically located on or immediately adjacent to the pool deck or beach-area. The compartments are open-air and accompanied by a roof or canopy, allowing for natural ventilation and lighting, as well as rain and sun protection.

There are no cabana-style change rooms found locally. However, there are local washroom that utilize gender-neutral, covered, and passively ventilation in their design, such as the Wreck Beach Washrooms. We have chosen three international examples of projects that impliement this style of change room.

Habitat Recreation Centre
Byron Bay, Australia
DFJ Architects

Renovation and extension of the Baths of Géronde
Sierre, Switzerland
NAU Architecture

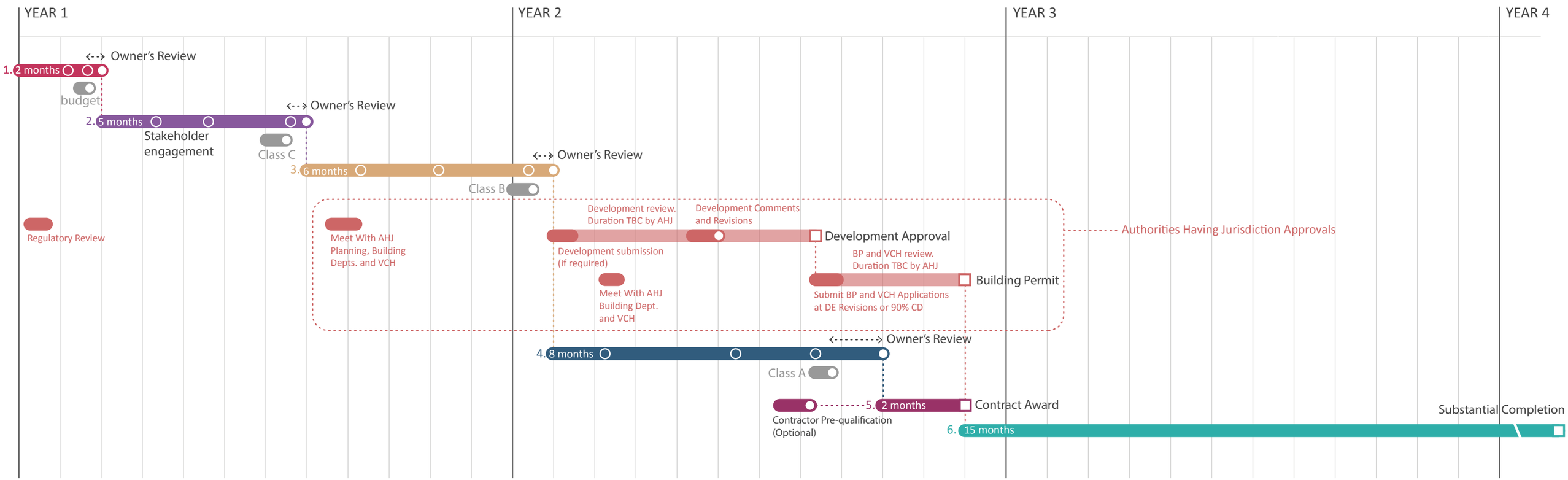
Théâtre d'eau Swimming Pool
Fumel, France
LOG Architectes

Figure 16 - Habitat Recreation Centre, DFJ Architects. Photo by Christopher Frederick Jones (left)
Figure 17 - Renovation and extension of the Baths of Géronde, NAU Architecture. Photo by Roger Frei. (top right)
Figure 18 - Théâtre d'eau Swimming Pool, LOG Architectes. Photo by Edouard Decam. (bottom right)

APPENDIX A - SCHEDULES

Sample Baseline Schedule

CITY OF VANCOUVER OUTDOOR POOL STUDY - MOUNT PLEASANT PARK



Sign Off | Approvals | Costing | Milestones

1. Pre-Design / Programming

2 months

- Program verification Stakeholder Consultation meetings
- Initial evaluation of schedule, budget for the Construction Cost and procurement options
- Regulatory Review
- Community stakeholder engagement - beginning, end

2. Schematic Design

5 months

- Identify 3 options during Design Sprint Workshop
- Develop preferred option
- Materials, layout coordination, site, and layout firm
- Codes & Standards
- M&E targets
- Super structure
- Schedule & Class C Costing
- Submit schematic design documents for City and stakeholder approval
- Community stakeholder engagement - beginning, middle, end

3. Design Development

6 months

- Define appropriate architectural, structural, mechanical and electrical systems
- Prepare project brief detailing area calculations, building systems and outline specifications
- Continue review of applicable codes, by-laws and statutes where necessary
- Review with authorities having jurisdiction
- Prepare and submit an Estimate of Construction Cost
- Submit design development documents for client's approval
- Community stakeholder engagement - beginning, middle, end.

4. Construction Documents

8 months

- Based on Clients approved design development, drawings and specifications will be prepared for the construction of the project
- Review application codes to obtain necessary approvals, Licenses and permits
- Prepare bidding information, bidding forms, conditions of the construction contract
- Update Estimate of Construction Cost
- Submit construction documents to the client
- Community stakeholder engagement - beginning, middle, end

5. Bidding

2 months

- Assist in review of bids

6. Construction Administration Services

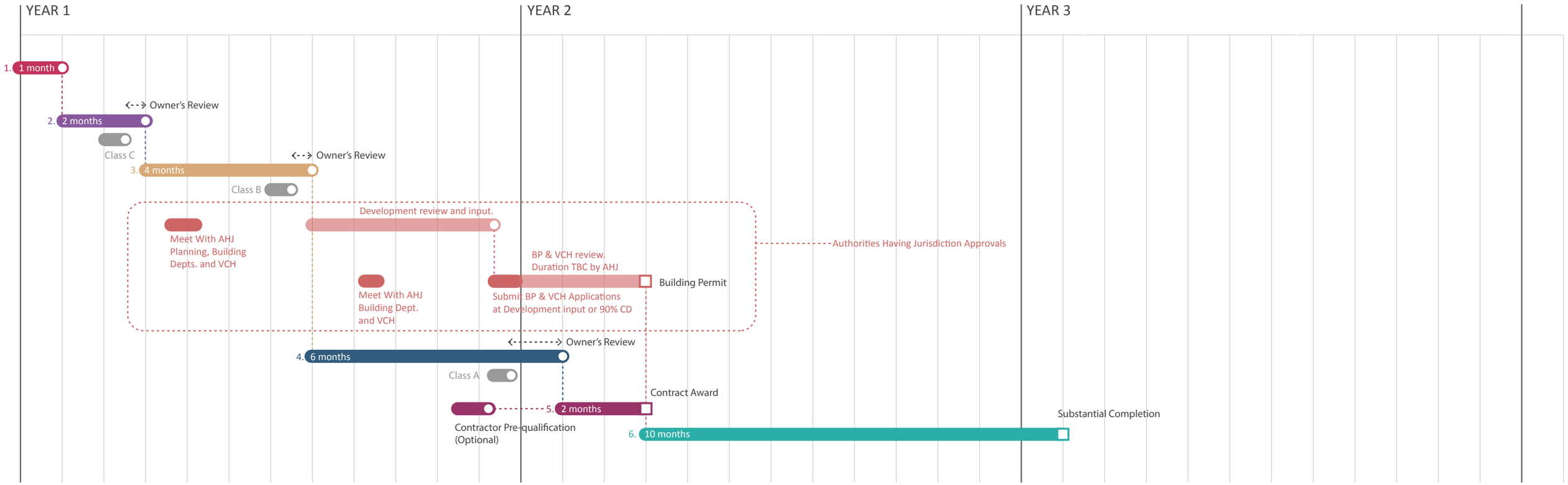
15 months

- Provide Construction Contract administration services as per client-architect agreement
- Attend bi-weekly construction coordination meeting
- Issue bi-weekly field review report
- Ensure the work conforms to contract documents
- Coordinate preparation of deficiency list with construction
- Substantial completion site review
- Issue completion of substantial performance
- Certify Payments

CARSCADDEN STOKES MCDONALD ARCHITECTS

Sample Baseline Schedule

CITY OF VANCOUVER OUTDOOR POOL STUDY - HILLCREST CENTRE



Sign Off Approvals Costing Milestones

1. Procurement / Pre-Design (Internal + Test Fit)

1 months

- Program verification
- Initial evaluation of schedule, budget for the Construction Cost and procurement options
- Consultant procurement

2. Schematic Design

2 months

- Develop 3 Concept Options
- Identify Preferred Option
- Layout coordination, materials, site.
- Codes & Standards
- M&E targets
- Super structure
- Schedule & Class C Costing
- Submit schematic design documents for City and stakeholder approval

3. Design Development

4 months

- Define appropriate architectural, structural, mechanical and electrical systems
- Prepare project brief detailing area calculations, building systems and outline specifications
- Continue review of applicable codes, by-laws and statutes where necessary
- Review with authorities having jurisdiction
- Prepare and submit an Estimate of Construction Cost
- Submit design development documents for client's approval

4. Construction Documents

6 months

- Based on Clients approved design development, drawings and specifications will be prepared for the construction of the project
- Review application codes to obtain necessary approvals, Licenses and permits
- Prepare bidding information, bidding forms, conditions of the construction contract
- Update Estimate of Construction Cost
- Submit construction documents to the client

5. Bidding

2 months

- Assist in review of bids

6. Construction Administration Services

10 months

- Provide Construction Contract administration services as per client-architect agreement
- Attend bi-weekly construction coordination meeting
- Issue bi-weekly field review report
- Ensure the work conforms to contract documents
- Coordinate preparation of deficiency list with construction
- Substantial completion site review
- Issue completion of substantial performance
- Certify Payments

CARSCADDEN STOKES MCDONALD ARCHITECTS

Existing Site Conditions & Impact of Proposed Pool on Parks

Date: October 27, 2021
Prepared by: space2place Design Inc.
Project: 20-004 Vancouver Outdoor Pool Study (Mt. Pleasant Park and Hillcrest Centre)

This document studies Mt. Pleasant Park and the park space in front of the Hillcrest Pool in their existing condition and the impact to the spaces if a new pool is constructed. Mt. Pleasant Park occupies approximately one city block within a predominantly residential neighbourhood. This includes single family residences west, south and north of the park and a dense neighbourhood of mid rise apartments east of the park. The potential pool location on the Hillcrest site is directly to the east of the existing pool along the Ontario Street Frontage. Other amenities on this site include: Nat Bailey Stadium, the Vancouver Curling Club, sport fields at Hillcrest Centre and the nearby Riley Park. Single family residential properties are West and North of the potential pool location.

As discussed in the VanPlay Report published in 2018 through Vancouver's Board of Parks & Recreation, it is essential to balance the needs and interests within continually changing communities. Each study site is situated within its own neighborhood context, and subsequently, the proposed intervention will have differing impacts for adjacent residents and the broader urban community. Hillcrest Centre, a regional destination facility situated adjacent to a network of large open spaces that have different considerations as compared with Mount Pleasant Park, a smaller community park within a moderately dense urban neighborhood.

Hillcrest Centre

The Hillcrest Aquatic Facility is currently home to a small outdoor pool, children's water play area and an open lawn area within a pool enclosure. Currently, the outdoor pool is not large enough to accommodate the needs of the community. The expansion would introduce a new lap pool, providing more space for outdoor pool users and a broader range of recreational opportunities. The proposed design locates the expansion adjacent to the existing pool with low impact on the overall use and character of the park.

The new pool is proposed within a low-use portion of the site consisting of open, sloped lawn. This area is not noted as a significant social hub or site for recreational activities. Rather, it is used more often as a circulation route, with little observation of community gathering or socializing. As there are several nearby sites offering space for passive recreation, the proposed loss of lawn at Hillcrest Centre would not have a significant impact on the neighborhood as a whole. Nearby community members have a variety of opportunities for gathering, picnicking and lounging at adjacent sites such as Riley Park, Queen Elizabeth Park, and even within other portions of Hillcrest Centre. With adjacent housing consisting primarily as single family residences, many of the surrounding community members will also have access to a backyard or private outdoor space for further opportunities of outdoor engagement and socializing.

As proposed, the pool expansion will not significantly alter the experience of surrounding features at Hillcrest Centre. The expansion will interfere with one primary circulation path. However, as the park has multiple direct routes across

the site, the impact will not be considerable. While the expansion will require re-grading of site topography and the removal of a lawn mound, the site will not need any major re-grading or retaining elements to accommodate the expanded facilities. The location of the expansion will also not impact the park's mature trees. Any of the trees that may require removal by the expansion are young and can be replaced without disruption of park character or ecology. There will also be less required to coordinate site services and utilities, as the expansion can be integrated with the connections servicing the existing pool.

Mount Pleasant Park

Mount Pleasant Park is a well-used community park that houses a variety of programming, including a children's play area, community garden, skate park, and open flexible spaces. There are currently no outdoor or indoor pool facilities at the site. Due to the constraints of the existing park features, the only area large enough to accommodate the proposed pool facility is within a high-use lawn centrally located at the heart of the park. The introduction of an outdoor pool as sited in the proposal will likely have a noticeable impact on the character and use of the park.

Mount Pleasant Park is a site of importance within the neighborhood context, acting as an extended backyard for the surrounding community and a safe place for people to socialize. The collective experience of the Covid-19 pandemic has only reinforced the park's popularity and demonstrates the significant role that open and flexible public spaces play within the urban fabric. Unlike the lawn at Hillcrest Centre, the central green and adjacent lawns at Mount Pleasant park, flanked by mature trees, are a beacon for social activity. People are consistently observed gathering in large and small groups for picnics, informal recreation and lounging. There are currently no other comparable sites in close proximity that provide similar opportunities for passive recreation afforded by Mount Pleasant Park. The reduction of this well-used lawn will create a void in the neighborhood, a loss made only more notable by the presence of many nearby mid-rise residences that lack access to private yards. As noted in the VanPlay Report, "Increased density means a growing number of people with limited to no access to personal outdoor space. This has many of us looking to our city parks to fill that need."

While the proposed facility does incorporate new lawn, it will be within a fenced boundary and not freely accessible to the public, dedicating a significant portion of the site to seasonal use by a single user group. The additional lawn areas within the park that support flexible use are not large enough to compensate for the loss of the central green. Additionally, these areas are also well-used by the community and would result in a similar loss if the proposed facility were relocated to an alternative location.

Due to the existing topographical conditions, accommodating a new pool facility would also require the introduction of large retaining walls. The retaining walls, along with the fenced enclosure will disrupt flow across the site. Mature trees too will be impacted by the proposed facility, with possibly 4-5 large trees requiring removal. These trees help shape the sensory experience of the park as well as provide habitat and forage for wildlife. As an outdoor pool facility would be a new feature to the site, there will also be more significant action required, as compared to Hillcrest Centre, to integrate utilities and services.

Detailed Analysis Comparison

The following chart provides a breakdown of existing site conditions for both Hillcrest and Mount Pleasant Park. As Hillcrest Center is large by area, the analysis provided is focused within a “study area” encompassing the areas closest to the proposed intervention. Please refer to the corresponding diagrams for reference (fig.1-18). Auxiliary diagrams with synthesised analysis can be found in figures 17-22.

1. Program Diagram (see fig. 1 & fig. 9)

This diagram illustrates the programming at each of the two study sites (Hillcrest and Mount Pleasant Park). The table below provides a brief description for each programmatic feature.

Existing Condition - Site Program	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Children’s Play: ● Incl. small playground (with low to medium use) and small water play / spray pad (public art) ● There is public art on one of the berms (a geyser that sporadically shoots a beam of water into the air) ● Observation: Some engagement in informal play activities along the west side outside of the designated playground area (under the trees, in the baseball field and in the lawn areas directly on the west side of the outdoor pool)	**Children & youth Play:** ● Incl. Basketball court, fenced skateboarding area, designated children’s playground
Parking: ● Large parking area for both outdoor and indoor pool facilities	**Parking:** ● Small size parking
Gathering Space: ● No central gathering space within the study area. ● Almost all extensive lawn areas within the study area are bermed and sloped. ● The big grass field of the baseball field on the west side used for some gathering events	**Gathering Space:** ● Midsize open gathering lawn area in the centre of the park, and smaller open lawn areas in the east and south side of the park ● These gathering areas are also actively used for picnicking, sunbathing, informal play, ...
Outdoor Pool: ● Fenced outdoor pool	**Outdoor Pool:** ● Not Applicable
Community Garden: ● Not Applicable	**Community Garden:** ● A neighbourhood community garden is located along the north-east entry to the park

Existing Condition - Site Program	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Washroom Building: ● Washroom building accessed from the outdoor pool deck	**Washroom Building:** ● Not Applicable ● Temporary 1 stall porta potty
Dog off-leash Area: ● As per People, Parks and Dogs Strategy, there is no designated official dog off-leash area in the study area in Hillcrest Centre. ● As per People, parks & Dogs Strategy, Hillcrest Centre is in a close proximity to two Dog off-leash areas	**Dog off-leash Area:** ● Mount Pleasant park is currently used as an un-official off-leash dog park, despite not being classified as an off-leash dog park according to the People, Parks & Dogs strategy ● People, Park & Dogs Strategy identifies Mount Pleasant area as being in general deficient of off-leash dog areas, with the majority of Mount Pleasant area being more than 1km (15 minute walk) from an existing off-leash area
Impacts of Pool Addition - Site Program	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Pros: ● Program expansion: an outdoor lap pool program will be added to the existing outdoor pool which will also expand the users age range ● Existing outdoor pool deck, which is currently too small to accommodate the current use, will be expanded with more space for users ● None of the currently existing programs on site will be impacted by the addition of the new outdoor pool	**Pros:** ● The Mont Pleasant Park will be provided with an outdoor pool program and its associated amenities (e.g. washroom building) that currently don't exist in this park
Cons: ● Two of the lawn berms will be removed for provision of the new pool ● This will not impact the current programing of the park, as lawn mounds have low-use	**Cons:** ● Based on the proposed pool design and it's associated amenities, the addition of a fenced outdoor pool area to Mount Pleasant Park will cause the park to lose its central gathering space, changing the character and the use of the park ● The central gathering area currently is one of the most utilized green spaces within the park and acts as the heart to the park used for picnicking, informal play, ect. This space will be lost after the addition of the outdoor pool facility ● The smaller gathering lawn areas in perimited of the park, due to their

Impacts of Pool Addition - Site Program	
Hillcrest Centre (Study Area)	**Mount Pleasant Park**
	Cons (cont.): character, size, proximity to adjacent streets and location in relation to the rest of park program, can not replace the main central gathering space ● Currently all existing spaces and programs such as basketball court, picnic areas, pavilion and playground surround the central gathering area at the heart of the park ● Based on the proposed pool addition to the central gathering area, the pavilion on the south and picnic tables on the west also will be removed

2. Spatial Use - Observations Diagram (see fig. 2 & fig. 10)

This diagram highlights the spatial use and popularity of the spaces within the study area for each of the two sites (Hillcrest and Mount Pleasant Park) by ranking them as **High Use, Medium Use** and **Low Use.**

Existing Condition - Spatial Use	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
High Use / Active: ● Observation: Hillcrest's most active spatial uses include parking, outdoor and indoor pool and baseball field	**High Use / Active:** ● Observation: Mount Pleasant Park's active spatial uses nearly include the entire surface area of the park, including the playground, skateboarding area, basketball court, central open lawn space ● These spaces are very well used areas within the park at all times of the day and all week long
Medium Use: ● Observation: Spaces with medium use include playground, lawn area next to baseball field and building entrance	**Medium Use:** ● Observation: Spaces with medium use are lawn areas along the perimeter of the park. This might vary depending on the time of the day, weekday or weekend

Existing Condition - Spatial Use	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Low Use: ● Observation: Most of bermed and sloped lawn areas located between the Pool Building and Ontario Street are low to no use ● The berm with water feature (public art) on top is more actively used when the water feature is activated ● Berms serve the purpose of shielding the outdoor pool area from the street	**Low Use:** ● Observation: This includes small planted areas scattered mostly along the north and south edge of the park
Impacts of Pool Addition - Spatial Use	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Pros: ● Based on the proposed design, the majority of the low use spaces within the study area will be utilized for the addition of the proposed lap pool ● The proposed outdoor lap in Hillcrest only adds to the already existing pool facility and does not noticeably change the spatial use of the park ● The impacted spaces will be two of the bermed lawn areas located between the Pool Building and Ontario Street ● None of the existing programs within the park, except from the two bermed area mentioned above, need to be removed ● These berms are not currently well used by the users and visitors of the park	**Pros:** ● The park will be provided with an outdoor pool program and its associated amenities that currently do not exist in the park
Cons: ● No cons for the design impact on the spatial use and popularity of the spaces	**Cons:** ● Based on the proposed design, one of the high use/ active spaces within the park (central gathering pavilion) will be removed ● Addition of outdoor fenced pool facility will change the dynamic of how various existing spaces within the park are visually and functionally connected to each other ● The proposed pool will reduce the visual connectivity and flow within the site ● Proposed pool will be a fenced facility in the park with a vehicular/ fire truck access

Impacts of Pool Addition - Spatial Use	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
	Cons: located in between the pool facility and basketball court ● Currently users of the park can relax and picnic in the central lawn area while they will have view to almost all the programs within and around the park. Addition of pool will obstruct the above mentioned character

3. Circulation Diagram (see fig. 3 & fig. 11)

This diagram locates the primary and secondary entrances, paths and vehicular circulation in and around each of the two study sites (Hillcrest and Mount Pleasant Park).

Existing Condition - Site Circulation	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Primary Entrance: ● Primary pedestrian entrance located at the northeast corner at Peveril Avenue and Ontario Street intersection	**Primary Entrance:** ● Primary pedestrian entrances provide access to the park from north (15th Ave.), east (Ontario St.) and south (16th Ave.)
Secondary Entrance ● Secondary pedestrian entrance located at east side along Ontario Street, between the parking area and main pedestrian entrance at Peveril Avenue and Ontario Street intersection	**Secondary Entrance** ● Secondary pedestrian entrance located along the south and east side providing a secondary access to the park from the back alley on the west side and from 16th Ave. along the south.
Primary Pedestrian Path ● Primary pedestrian (the most used) paths connecting the main pedestrian entrance and the parking area to the building entrance and outdoor pool entrance	**Primary Pedestrian Path** ● Connecting the Park primary entrances to the centre and all different programing located within the site (such as playground, basketball court, skateboarding and picnicking areas
Secondary Pedestrian path ● Secondary pedestrian paths connect the secondary park entrances and primary park paths together	**Secondary Pedestrian path** ● Connecting the Park secondary entrances to the primary pedestrian pathways within the park

Existing Condition - Site Circulation	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Vehicular Traffic ● Ontario Street along the north side and Peveril Avenue along the east side of the park	**Vehicular Traffic** ● Ontario Street, 15th and 16th avenue on the east, north and south side of the park
Impacts of Pool Addition - Site Circulation	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Cons: ● Based on the proposed design, one of the primary pedestrian pathways connecting the primary entrance (at the northeast corner at Peveril Avenue and Ontario Street intersection) to the south entry of the indoor pool building ● The east west secondary pedestrian pathway on the north side of the existing outdoor pool will be removed	**Cons:** ● Based on the proposed design, the existing primary and secondary pathways in the middle of the park will be impacted ● Based on the proposed design, all the circulation should happen around it, as nobody will be able to walk to the centre of the park to get to the different program in the park

4. On-Site Trees Diagram (see fig. 4 & fig. 12)

This diagram shows the overall tree canopy area in each of the two study sites (Hillcrest and Mount Pleasant Park). The size of the canopy (shown as green solid circles) indicates how big and mature the trees are relatively.

Existing Condition - On-Site Trees	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Existing Trees: ● Except for a few mature trees with large canopies on the west side of the outdoor pool area (along the west of the study area) the rest of the trees within the study area are very young and can be removed if needed for future revision to the park.	**Existing Trees:** ● Most of the existing trees at the park are mature, with large, healthy canopies. ● These trees provide excellent shade and picnicking areas under their canopies for the park users. Removing these trees is not recommended.

Impacts of Pool Addition - On Site Trees	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Pros: ● None of the mature trees will be impacted in the proposed design ● Only removal of small trees is required (about 12 small trees)	**Pros:** ● The Proposed location for the outdoor pool has the least amount of impact on the park trees compared to anywhere else in the park
Cons: ● Some small and immature trees will have to be removed (12 trees) : ○ Cercidiphyllum japonicum (6) 7” diameter ○ Cercidiphyllum japonicum (2) 8” diameter ○ Cercidiphyllum japonicum (3) 3” diameter ○ Cercidiphyllum japonicum (1) 5” diameter	**Cons:** ● Some mature trees on the north and south side of existing central gathering area may need to be removed (about 4-5 trees) ○ Carpinus betulus 13” diameter ○ Carpinus betulus 14”, 11” diameter (multi-stem) ○ Acer palmatum 8”, 4”, 7” diameter (multi-stem) ○ Acer palmatum 6”, 9”, 6”,6” diameter (multi-stem) ○ Acer palmatum 13”, 7”, 11” diameter (multi-stem)

5. Softscape Areas Diagram (see fig. 5 & fig. 13)

This diagram outlines the overall softscape area in each of the two study sites (Hillcrest and Mount Pleasant Park). The softscape includes all planting beds and lawn areas.

Existing Condition - Softscape	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Softscape Areas: ● Most of the softscape areas at this park are sloped lawn areas (with very low spatial use). There are also, some small or linear planting beds along the paths around the outdoor pool fence	**Softscape Areas:** ● Softscape areas consist of open lawn areas and planting beds. Lawn areas at this park are well utilized by the park users for different activities (incl play and recreational activities, picnicking, gathering, etc.)
Impacts of Pool Addition - Softscape	
● In both parks the pool is proposed to be located in the existing lawn softscape area. In Hillcrest Centre the lawn area with low use is proposed to be used for the addition of the outdoor pool, while in Mount Pleasant park the existing high actively used lawn area is where the outdoor pool is proposed	

6. Impermeable Surface Diagram (see fig. 6 & fig. 14)

This diagram depicts the impermeable surface area/ paved areas (hardscape surfaces paved with asphalt and concrete and unit pavers).

Existing Condition - Impermeable Surface	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Impermeable Surface: ● Incl. asphalt parking area, water play (spray pad), outdoor pool and pool deck and paved primary and secondary paths	**Impermeable Surface:** ● Incl. asphalt parking area, basketball court, skateboarding area and paved primary and secondary paths
Impacts of Pool Addition - Impermeable Surface	
● Based on the proposed design in both parks the proposed pool will convert the existing permeable surfaces to impermeable surfaces ● The impact will be greater in Mount Pleasant Park, as the whole facility will be new, while in Hillcrest the proposed lap pool will be an addition to the existing facility	

7. Elevation Analysis Diagram (see fig. 7 & fig. 15)

This diagram indicates the topographical elevation changes (grade changes) at each of the two study sites (Hillcrest and Mount Pleasant Park).

Existing Condition - Topographical Grade Changes	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Elevations: ● The site elevation decreases by 4 meters from the northwest to the southeast corner of the site ● Three berms within the study area are located at the north and northeast side of the existing outdoor pool, with high points 2-3 meters above the adjacent pathways	**Elevations:** ● The site elevation increases by 9 meters from northwest to the southeast corner of the site
Impact of Pool Addition - Topographical Grade Changes	
● See Slope Analysis below for impact on site grading	

8. Slope Analysis Diagram (see fig. 8 & fig. 16)

This diagram shows the slope percentage within the two study sites (Hillcrest and Mount Pleasant Park). The areas with steepest slopes are shown in darker blue and the least steep slopes shown in lighter green.

Existing Condition - Slope Analysis	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
Slope percentage: ● Slope varies across the site. The steepest parts of the site slope up to 25%. ● There is an accessible slope along the pathways. ● Most of Lawn spaces within the study area are steep and sloped between 10% to 25%	**Slope percentage:** ● Slope varies across the site. The steepest parts of the site slope up to 25%. ● There is a low amount of slopes overall which make the lawn area in the park accessible and well used by people
Impact of Pool Addition - Overall SIte Grading	
Hillcrest Centre (Study Area):	**Mount Pleasant Park**
● No retaining walls are needed for introduced pool facility ● The only impact on the existing grades in Hillcrest Centre is the low-use bermed lawn area on the north side of the existing parking ● These two mounds will be required to be mostly removed to accommodate the new pool addition, however this does not impact the grading of the existing pathway system	● A significant length of retaining walls are required to accommodate the new pool facility ● Retaining walls are required along the south side and at the northwest corner of the new pool facility ● Provision of retaining walls minimizes the impact that this new facility will have on the existing programs, pathways and mature trees in the park

LEGEND

- Study Area
- Children's Play
- Parking
- Gathering Space
- Outdoor Pool
- Washroom

Proposed Pool Location

PEVERIL AVENUE

ONTARIO STREET

WATER PLAY

LAWN MOUND

GATHERING SPACE

LAWN MOUND

BENCH

LAWN MOUND

CHIDLREN'S PLAY

CHILDREN'S PLAY

PARKING

OUTDOOR POOL

GATHERING SPACE

WASHROOM BUILDING

Fig.1

PROGRAM

HILLCREST CENTRE (study area)

0 5 15 30 m

N

Fig. 2

OBSERVED SPATIAL USE

HILLCREST CENTRE (study area)

LEGEND

- Study Area
- Primary Entrance
- Secondary Entrance
- Primary Pedestrian Path
- Secondary Pedestrian Path
- Vehicular Traffic
- Building Entrance
- Outdoor Pool Entrance
- Proposed Pool Location

PRIMARY ENTRANCE

PEVERIL AVENUE

ONTARIO STREET

SECONDARY ENTRANCE

OUTDOOR POOL ENTRANCE

BUILDING ENTRANCE

Fig. 3

CIRCULATION

HILLCREST CENTRE (study area)

0 5 15 30 m

N

LEGEND

Study Area

Existing Tree

Proposed Pool Location

PEVERIL AVENUE

ONTARIO STREET

QUERCUS RUBRA
14" DBH

CASTANEA SATIVA
12" DBH

ACER SACCHARINUM
10" DBH

PICEA SP
2" DBH

ACER PLATANOIDES
18" DBH

ACER PLATANOIDES
17" DBH

ACER RUBRUM (8)
8" DBH

CIRCIDIPHYLLUM JAPONICUM (3)
3" DBH

CIRCIDIPHYLLUM JAPONICUM
5" DBH

CIRCIDIPHYLLUM JAPONICUM (2)
8" DBH

CIRCIDIPHYLLUM JAPONICUM (3)
7" DBH

ACER RUBRUM
8" DBH

CIRCIDIPHYLLUM JAPONICUM (3)
7" DBH

THUJA PLICATA(11)
2" DBH

Fig. 4

ON-SITE TREES

HILLCREST CENTRE (study area)

0 5 15 30 m

N

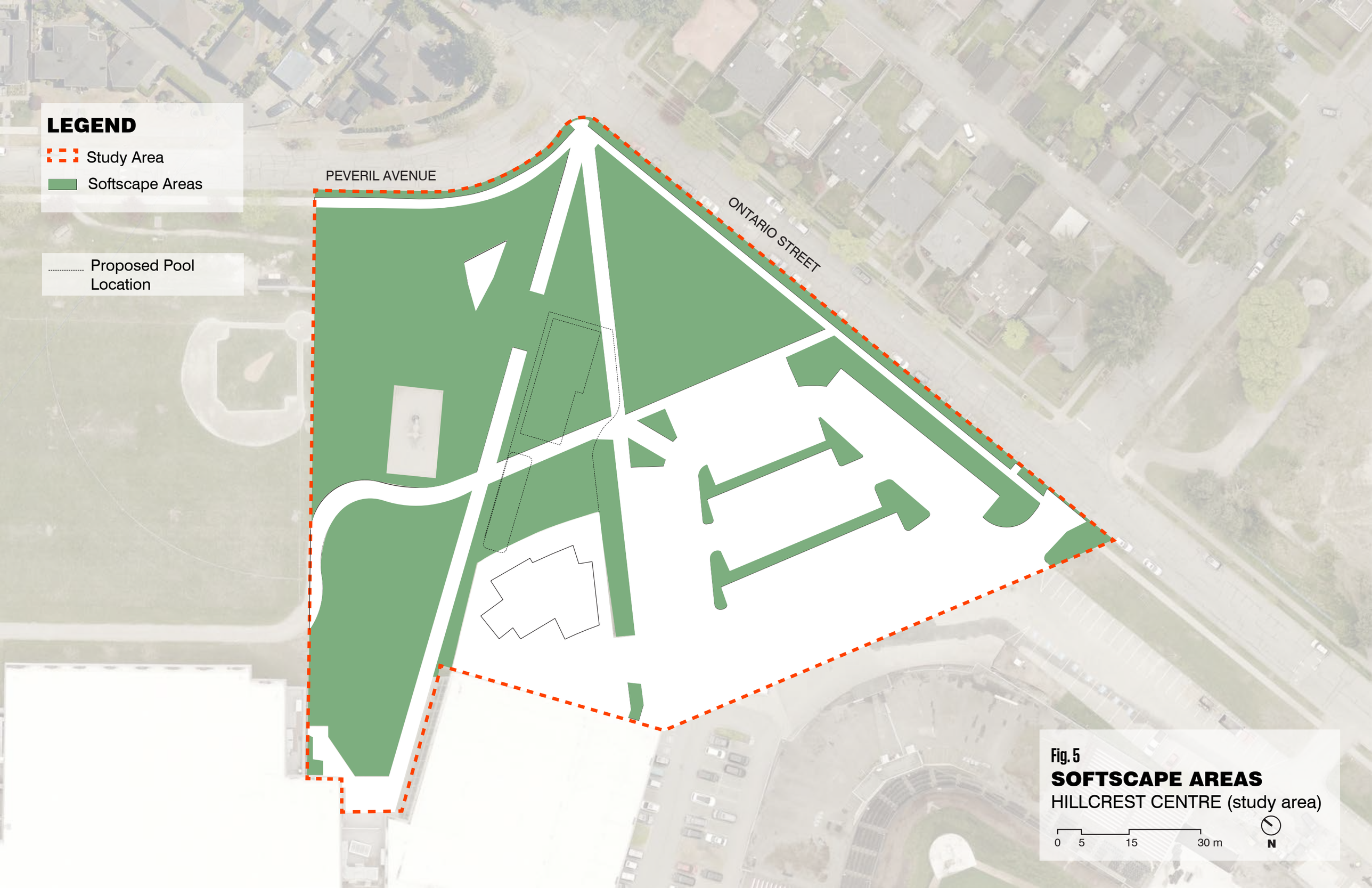


Fig. 5

SOFTSCAPE AREAS

HILLCREST CENTRE (study area)

LEGEND

- Study Area
- Impermeable Surface
- Outdoor Pool Outline

46.5% of impermeable surface within the study area.

- Proposed Pool Location

PEVERIL AVENUE

ONTARIO STREET

Fig. 6

IMPERMEABLE SURFACE

HILLCREST CENTRE (study area)

0 5 15 30 m

N

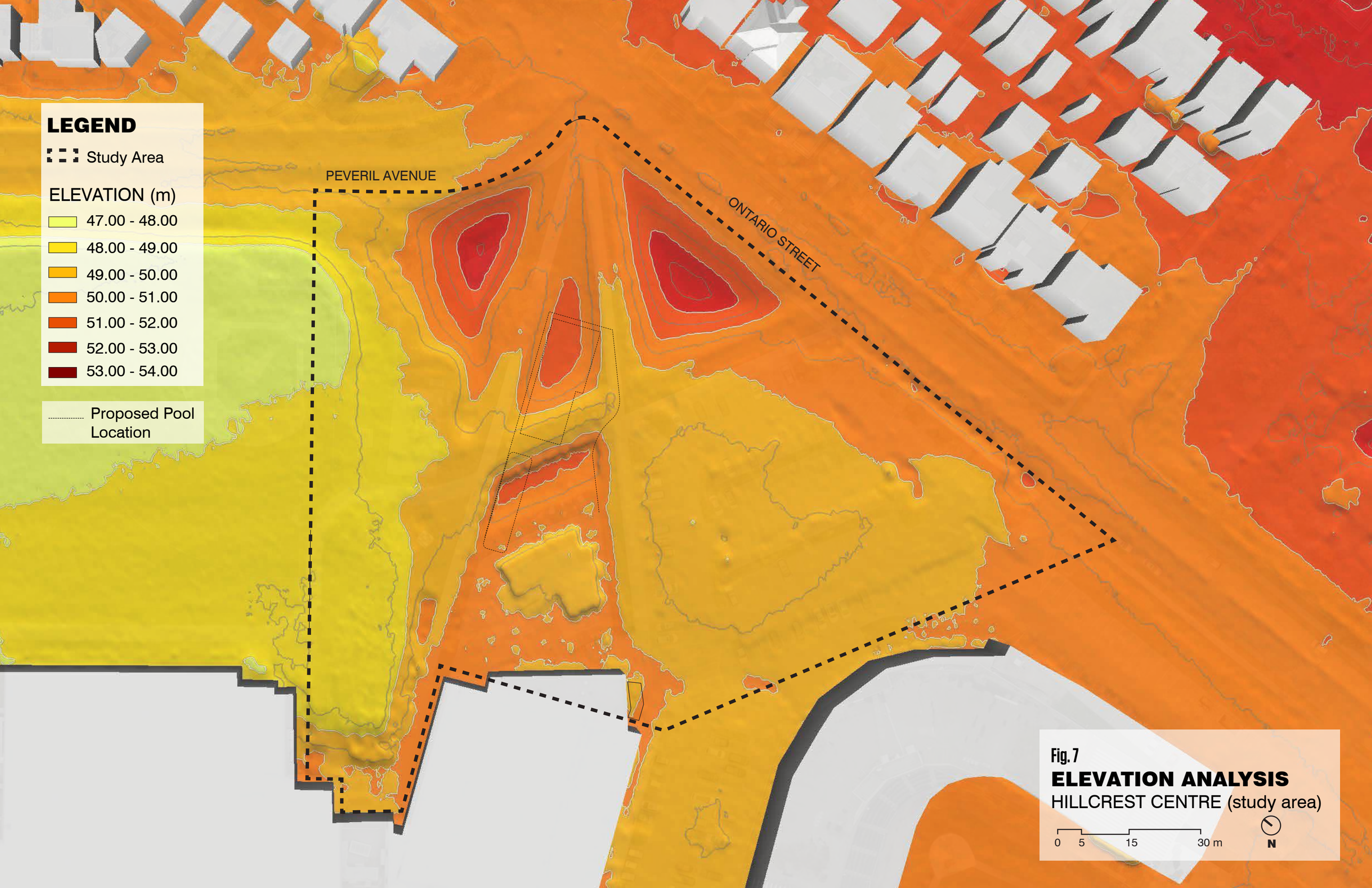


Fig. 7

ELEVATION ANALYSIS

HILLCREST CENTRE (study area)


LEGEND
Study Area
SLOPE %
0.00 - 5.00
5.00 - 10.00
10.00 - 15.00
15.00 - 20.00
20.00 - 25.00
Proposed Pool Location
PEVERIL AVENUE
ONTARIO STREET
Fig. 8
SLOPE ANALYSIS
HILLCREST CENTRE (study area)
0 5 15 30 m
N

LEGEND

- Study Area
- Children & youth Play
- Parking
- Gathering Space
- Community Garden
- Washroom

Proposed Pool Location

15TH AVENUE

ONTARIO STREET

ONTARIO STH

16TH AVENUE

PARKING

BASKETBALL COURT

BERM

BENCH

COMMUNITY GARDEN

PICNIC TABLE

CENTRAL GATHERING

TEMPORARY WASHROOM

BENCH

PAVILION

GATHERING

PLAYGROUND

DAYCARE CENTRE

SKATEBOARD PARK

PICNIC TABLE

source: ww.shutstein.com

Fig. 9

PROGRAM

MOUNT PLEASANT PARK

0 5 15 30 m

N

15TH AVENUE

LEGEND

- Study Area
- HIGH USE
- MEDIUM USE
- LOW USE

Proposed Pool Location

LOW USE

LOW USE

LOW USE

MEDIUM USE

HIGH USE

MEDIUM USE

HIGH USE

MEDIUM USE

HIGH USE

MEDIUM USE

ONTARIO STREET

HIGH USE

HIGH USE

HIGH USE

MEDIUM USE

MEDIUM USE

MEDIUM USE

MEDIUM USE

LOW USE

LOW USE

16TH AVENUE

Fig. 10

OBSERVED SPATIAL USE

MOUNT PLEASANT PARK

0 5 15 30 m

N

LEGEND

- Study Area
- Primary Entrance
- Secondary Entrance
- Primary Pedestrian Path
- Secondary Pedestrian Path
- Vehicular Traffic
- Proposed Pool Location

15TH AVENUE

ONTARIO STREET

16TH AVENUE

PRIMARY ENTRANCE

PRIMARY ENTRANCE

SECONDARY ENTRANCE

PRIMARY ENTRANCE

PRIMARY ENTRANCE

SECONDARY ENTRANCE

Fig. 11

CIRCULATION

MOUNT PLEASANT PARK

0 5 15 30 m

N

LEGEND

Study Area

Existing Tree

Proposed Pool Location

15TH AVENUE

ONTARIO STREET

16TH AVENUE

ACER PALMATUM
13" DBH

ACER PALMATUM
13", 7", 11" DBH (MULTI-STEM)

ARAUCARIA ARCAUCANA
13" DBH

PRUNUS SP.
27" DBH

PINUS SP.
9" DBH

PINUS SP.
23" DBH

PINUS SP.
21" DBH

PINUS SP.
20" DBH

ACER PALMATUM
6",9",6",6" DBH (MULTI-STEM)

ACER PALMATUM
8", 4", 7" DBH (MULTI-STEM)

CHAMAECYPARIS SP.
16" DBH

ACER PALMATUM
12",11",11" DBH (MULTI-STEM)

ACER PALMATUM
18" DBH (MULTI-STEM)

CARPINUS BETULUS
14", 11" DBH (MULTI-STEM)

CARPINUS BETULUS
15", 9", 12" DBH (MULTI-STEM)

CARPINUS BETULUS
13", 11", 11" DBH (MULTI-STEM)

CARPINUS BETULUS
13" DBH

Fig. 13

ON-SITE TREES

MOUNT PLEASANT PARK

0 5 15 30 m

N

15TH AVENUE

ONTARIO STREET

16TH AVENUE

LEGEND

Study Area

Softscape Area

Proposed Pool Location

Fig. 13

SOFTSCAPE AREAS

MOUNT PLEASANT PARK

0 5 15 30 m

N

15TH AVENUE

ONTARIO STREET

16TH AVENUE

LEGEND

Study Area

Impermeable Surface

26.3% of impermeable surface within the study area.

Proposed Pool Location

Fig. 14

IMPERMEABLE SURFACE

MOUNT PLEASANT PARK

0 5 15 30 m

N

15TH AVENUE

ONTARIO STREET

16TH AVENUE

LEGEND

Study Area

ELEVATION (m)

- 71.00 - 71.00
- 72.00 - 73.00
- 73.00 - 74.00
- 74.00 - 75.00
- 75.00 - 76.00
- 76.00 - 77.00
- 77.00 - 78.00
- 79.00 - 80.00

Proposed Pool Location

Fig. 15

ELEVATION ANALYSIS

MOUNT PLEASANT PARK

0 5 15 30 m

N

15TH AVENUE

ONTARIO STREET

16TH AVENUE

LEGEND

Study Area

SLOPE %

- 0.00 - 5.00
- 5.00 - 10.00
- 10.00 - 15.00
- 15.00 - 20.00
- 20.00 - 25.00

Proposed Pool Location

Fig. 16

ELEVATION ANALYSIS

MOUNT PLEASANT PARK

0 5 15 30 m

N

Impacts on Park After Pool Addition

Retaining wall on south side about 15m long

Softscape integrated within pool enclosure between pool deck and existing pathways on east and northeast side

Tree removal required for trees impacted by re-grading and elevation change caused by new pool facility and required retaining walls

Retaining wall about 45 m long

PARKING LOT

BASKETBALL COURT

CHILDREN'S PLAY AREA

SKATEPARK

COMMUNITY GARDEN

BIKE SHARE STATION

PICNIC TABLES

NEW UNHEATED TOILET ROOMS (11 sqm)
TWO PUBLIC TOILET ROOMS

NEW UNHEATED CHANGE FACILITY (55 sqm)
CONCRETE SUB-STRUCTURE
CONCRETE MASONRY
HEAVY TIMBER SUPER STRUCTURE
8 CHANGE COMPARTMENTS
POOL STORAGE

NEW OFFICE AND MECHANICAL FACILITY (200 sqm)
CONCRETE SUB-STRUCTURE
CONCRETE MASONRY
HEAVY TIMBER SUPER STRUCTURE (overhang 100 sqm)
HEATED OFFICE AND KIOSK, COMPLETE WITH KITCHEN, TOILET ROOM AND STAFF CHANGE ROOM. (65 sqm)
MECHANICAL ROOM (85 sqm)
UNHEATED AREAS
7 TOILET ROOMS (1 UNIVERSAL) (17 sqm)
8 SHOWER COMPARTMENTS (32 sqm)

NEW MECHANICAL POOL AND SERVICES
200 SANITARY
100 FIRE AND WATER
PLANT
AIR COOLED HEAT PUMP
FILTRATION
IN WATER DELIVERY

NEW CONCRETE POOL DECK - 1885 sqm)
BROOM FINISH DECK WITH LINEAR PERIMETER DECK DRAINS AROUND POOL
4 DECK SHOWERS

NEW ZERO ENTRY AND LEISURE POOL (787 sqm)
FLUSH GUTTER
TILE EDGE AND GUTTER
CONCRETE SHELL COMPLETE WITH INTEGRAL CRYSTALLINE WATERPROOFING
LADDERS AND/OR TRANSFER WALLS AT THE DEEP END

Ramp Entry 15m2
-1m
Leisure Pool
164 m2
4 Lane 25 meter Lap Pool
210 m2
1.0m
MINIMUM DECK PERIMETER SHOWN DASHED

Fig. 17
MOUNT PLEASANT PARK
PLAN

N

Impacts on Park After Pool Addition

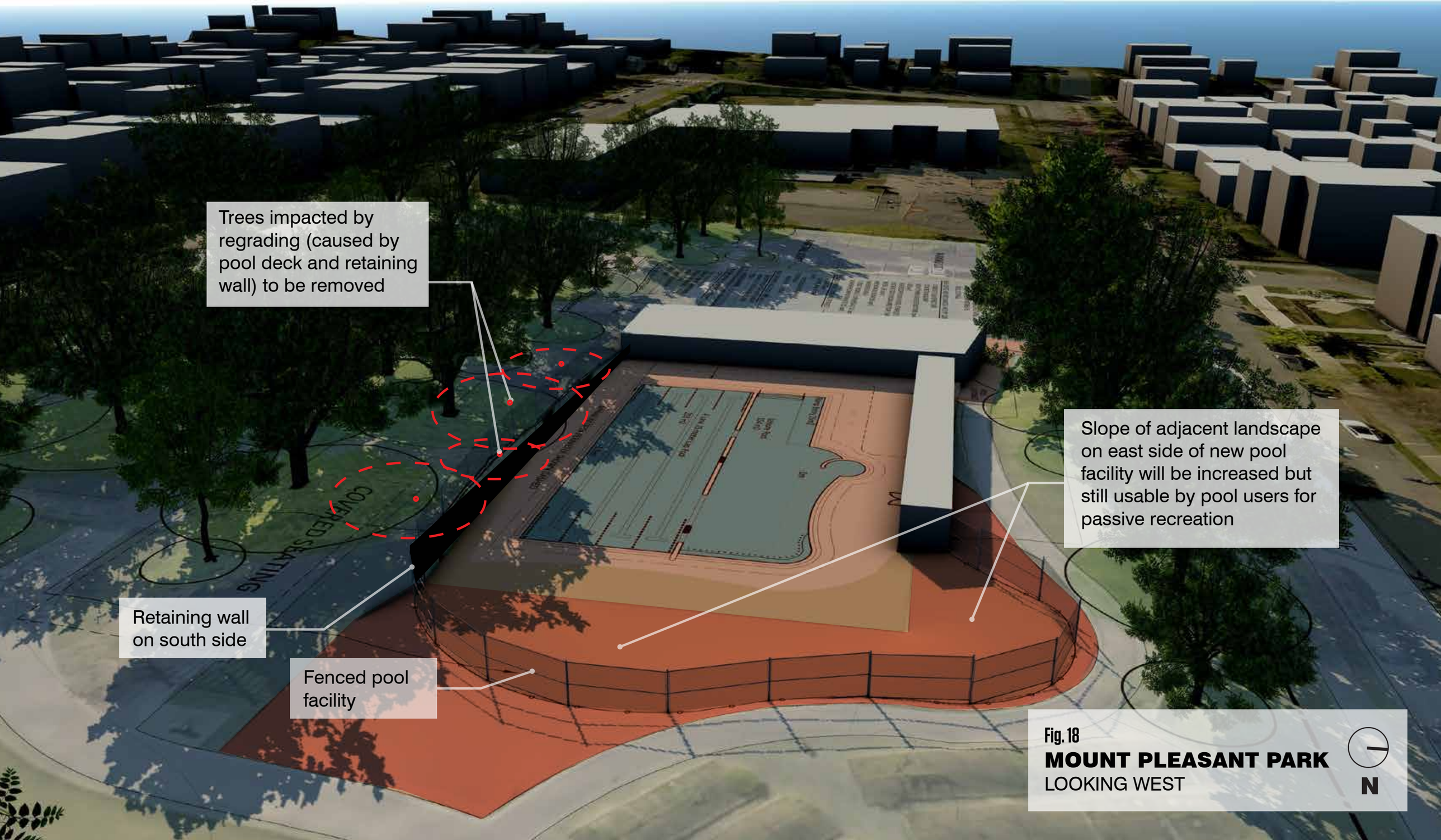


Fig. 18
MOUNT PLEASANT PARK
LOOKING WEST

N

Impacts on Park After Pool Addition

Existing path at northwest corner of proposed pool facility is required to be regraded to meet proposed pool deck grade

Fenced pool facility

Retaining wall on south side

New pool facility

Existing path to be widened to allow vehicular access to chemical room

Existing tree might required removal due to grade change at adjacent path

Fig. 19
MOUNT PLEASANT PARK
LOOKING SOUTHEAST

N

Impacts on Park After Pool Addition

Existing path to be removed

Outdoor pool facility addition

Adjacent lawn berm will be reduced in size or removed with lap pool addition

Potential softscape area within fenced pool enclosure

CHILDREN'S PLAY

MINIMUM DECK PERIMETER SHOWN DASHED

4 lane 25 metre Lap Pool 210 m2

CHANGE CABANA

EXISTING POOL

POOL ENTRANCE

DELIVERY ACCESS

PARKING LOT

NEW UNHEATED CHANGE FACILITY (370 sqm)

NEW 25M LAP POOL - (770 sqm)

NEW FENCE - (85m perimeter)
- 8 ft. CHAIN LINK FINISH WITH VISIBILITY SHIELDING

NEW CONCRETE POOL DECK - (430 sqm)
- BROOM FINISH DECK WITH LINEAR PERIMETER DECK DRAINS AROUND POOL
- 2 DECK SHOWERS

NEW SOFT LANDSCAPE - (175 sqm)

N

Fig. 20
HILLCREST CENTRE
PLAN

Impacts on Park After Pool Addition

Fig. 21
HILLCREST CENTRE
LOOKING NORTH

N

Impacts Park's After Pool Addition

Fig. 22
HILLCREST CENTRE
LOOKING NORTHEAST

APPENDIX C - AME CONSULTING GROUP - MECHANICAL REPORT

CITY OF VANCOUVER
OUTDOOR POOL STUDY

PROJECT NO.: 040B-121-21
MECHANICAL CONCEPT REPORT
OCTOBER 27, 2021

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TABLE OF CONTENTS

1. INTRODUCTION

The AME Consulting Group was commissioned by Carscadden Stokes McDonald Architects on behalf of the City of Vancouver to provide mechanical consulting services for an Outdoor Pool Feasibility Study. The purpose of the report is to outline the basis of design for the mechanical systems and to identify options that will contribute to the design criteria outlined. All information provided will meet current codes and standards and where applicable will identify future codes and standards being considered.

The basis of design is to provide excellent water quality at a capital cost that meets the budget requirements as well performance and operational considerations of the project. Additional mechanical system options have been provided, which address sustainability measures to meet the requirements of the project and the City of Vancouver's sustainability framework.

There are two mechanical system approaches proposed, which relate to each proposed site. At Hillcrest, existing infrastructure is proposed to support the new pool. This precludes the need for new site servicing and potentially any new mechanical plant components. At Mount Pleasant a new and complete system will be required, including site servicing. In addition to the site influences on mechanical systems, several options for system types are proposed that effect energy consumption, GHG emissions, and water quality.

This report includes proposed mechanical systems relating to plumbing, fire suppression, heating, ventilation, and air conditioning for amenity buildings, and pool mechanical systems. The mechanical system approach is based on drawings provided by Carscadden Stokes McDonald Architects dated August 21 as well as meetings conducted with the city of Vancouver stakeholders.

This report has been prepared by the AME Consulting Group for the exclusive use of Carscadden Stokes McDonald Architects and their design team along with the City of Vancouver. The material in this report reflects the best judgment of the AME Consulting Group with the information made available to them at the time of preparation. Any use a third party may make of this report, or any reliance on or decisions made based upon the report, are the responsibility of such third parties. The AME Consulting Group accepts no responsibility for damages suffered by any third party as a result of decisions made or actions taken based upon this report.

2. DESIGN CRITERIA

The mechanical, plumbing and fire protection systems will be designed in accordance with the intent of all applicable codes and standards, along with the practice guidelines provided by Engineers & Geoscientists British Columbia. The aquatic systems will be designed to meet or exceed the BC Health Act and the BC Pool Design Guide, with consideration of the Model Aquatic Health Code. The following is a list of the applicable codes and standards applied to the mechanical design.

2.1 Applicable Codes and Standards:

.1 British Columbia Plumbing Code

.2 British Columbia Building Code

.3 City of Vancouver Building By-Laws

.4 National Model Energy Code for Buildings

.5 Provincial Fire Marshall Regulations

.6 Applicable NFPA Regulations

.7 BC Gas Code

.8 BC Boiler and Pressure Vessel Act

.9 American Society of Heating, Refrigeration and Air Condition Engineers (ASHRAE)

.10 American Society of Plumbing Engineers (ASPE)

.11 Sheet Metal Contractors Association of North America (SMACNA)

.12 Provincial Health Act for Swimming Pools

.13 BC Pool Design Guide

.14 Model Aquatic Health Code (U.S. code used as a standard not a code)

2.2 Plumbing Criteria

The plumbing system will be designed to the current version of the city of Vancouver Building By-Laws, with the additional accommodation of filter backwashing and draining of the pools.

2.3 Fire Suppression Criteria

The fire suppression system will be designed to meet all requirements in National Fire Protection Association (NFPA). Any alternate solutions defined by the Code Consultant will be incorporate into this design.

2.4 HVAC Criteria

The HVAC (Heating Ventilation and Air Conditioning) system will be designed to meet all requirements in the current version of the BC Building Code, Vancouver Building By-Laws, and all applicable ASHRAE Standards

.1 Outdoor Environmental Conditions

The building heating and cooling loads will be calculated based on the following outdoor conditions specified in the BC Building Code, Appendix C, for the City of Vancouver.

Design Temperatures			Degree Days
January	July 2.5%		
1 % Design	Dry Bulb °C	Wet Bulb °C	
-8	28	20	2925

The design for the entire facility will include 10% safety factor for all primary heating unless specifically noted otherwise within this report.

.2 Indoor Space Environmental Conditions

Space Type	Winter °C db	Summer °C db	Relative Humidity
Changerooms	22	22	50%
Offices	22	24	Not Controlled

.3 Indoor Space Ventilation Rates

Ventilation rates will be provided in accordance with ASHRAE standard 62.1 (Ventilation for Acceptable Indoor Air Quality). Minimum Ventilation rates will be provided as indicated in the following table.

Occupancy Classification	Occupant Outdoor Air Rate (l/s /person)	Area Outdoor Air Rate (l/s /sq.m.)	Occupancy if not programmed (# of People/100 m2)
Changerooms	N/A	1.25 (exhaust)	12.5
Offices	2.5	0.3	5

2.5 Pool Design Criteria

.1 Turnover Rates

A pool's turnover rate is defined as the time it takes for its full water volume to be passed through the filtration plant. It is expressed in hours or minutes but can also be expressed as a volume flow rate when the pool's volume is taken into account. Lower turnover rates provide for better water quality, clarity, and a faster response to varying water chemistry.

Maximum pool turnover rates are determined by the BC Guidelines for Pool Design. In AME's experience, these are maximum values and do not achieve superior water quality. Best practice turnover rates are determined by applying a recommended rate by depth approach for each pool type. Shallow pools, regardless of designation, tend to see concentrated bathers and less water volume per bather, requiring lower turnover than deeper pools.

The following table summarizes the minimum and recommended turnover rates for the facility described in this report.

Parameter	Code Minimum (h)	Recommended (h)
Lap Pool	6	4 – 6
0-600mm		n/a
600-1200mm		2
1200-1800mm		4
≥ 1800mm		6
Leisure Pool	2	1 – 2
0-600mm		0.5
600-1200mm		1
1200-1800mm		2
≥ 1800mm		3

Where the lap and leisure pool is combined, a blended turnover rate will be calculated.

.2 Pool Operating Temperatures and Heat Up Times

AME recommends designing pool heating systems to generate pool temperatures based on information gathered from numerous facilities. The pool heating system will be designed to maintain those temperatures under normal operating conditions. Facility staff are free to operate their pools at lower rates than those indicated. Should the operator require higher temperatures than noted, the system would take longer to heat up the pool and could have operational effects on the HVAC system. As such we require final operational temperatures to be confirmed by the city.

The following table outlines the heat up times and operating temperatures for the various pool types. It is assumed that the pools will be operational between May and October, however the equipment selected allows for pool operation at the indicated temperatures at a minimum outdoor air temperature of 5degC. Additional information on the implications of this temperature as well as commentary on extending the operating season can be found in section 9 of this report.

Parameter	Recommended Operating Temperature (°C)	Design Heatup Time (h)
Lap Pool	29	72
Leisure Pool	34.5	48
Combined Lap/Leisure	32	72

The pool heat up time chosen does not effect the energy or GHG used to heat the pools, but does effect the capacity of the equipment required. For example, a shorter heat up time will consume the same amount of energy as a longer one, but one would need larger equipment with higher capacity. This would result in higher capital cost.

3. POOL MECHANICAL SYSTEMS

Pool mechanical systems consist of pool fittings, water features, piping, pumps, filters, chemical treatment, and controls. This section describes recommended mechanical systems and presents options for those subsystems whose selection will have an impact on pool operation and water quality.

3.1 Pool Tank and Fittings

The filtered and treated pool water will return to the pool through floor and wall inlet fittings. The inlet fittings will be spaced such that they achieve the required turnover rates, supply clean water to all areas of the pool and scour the pool bottom to promote suspended solids so they can be picked up from the gutter system. Inlets will be placed primarily on the pool floor to promote upward movement of suspended solids towards the gutters.

The pool water is returned to the filtration plant via main drains and the gutter system. Main drains collect the water at the bottom of the pool and are sized for 100% of the filtration rate. The drain configuration and piping will be designed to ANSI / APSP-7: 2006 American National Standard for suction entrapment avoidance in swimming pools. Furthermore, the specified drains will be ANSI 16 certified to prevent entrapment and entanglement.

A continuous gutter is also installed around the pool. The combination of the gutter and the gutter return pipe will be sized to return 150% of the pool water back to a balance tank. The over sizing of the system will allow for capture of the pool water from an instantaneous surge such as a group jumping into the pool all at one time.

The balance tank has three purposes, balance the flow between the main drains and gutter, capture tri-chloramines, and as a storage tank to quickly fill the pool. Facility operators can balance the pool gutter and main drain line through the balance tank. It is recommended that a minimum 50% of the circulation water flows through the gutter and the remaining through the main drains. The surge tank and main drain control valves provide this balancing.

3.2 Pool Piping

Below grade piping shall be concrete encased Schedule 40 PVC, while above grade piping shall be Schedule 80 PVC, with the following exceptions:

.1 Pool heat exchanger branch lines will be Schedule 80 CPVC.

.2 UV branch lines will be Schedule 80 CPVC or 316 Stainless Steel.

.3 Pool fill lines will be Schedule 80 PVC and feature water hammer arrestors.

.4 Air bubble piping from an air blower will be galvanized steel.

.5 Chemical feed piping will be high-density polypropylene (HDPP). Double-walled HDPP piping will be used for any chemical piping that is not contained within the chemical storage rooms. One example would be the piping which transfers the chemicals from the supply truck to the chemical room storage tanks.

3.3 Pool Pumps

Three-phase, base-mounted centrifugal pumps will be used for the filter pumps and larger water feature pumps. The pumps will have a protective coating to prevent corrosion from the chlorinated pool water. The pumps will be supplied with VFD's and controlled via a turbidity meter. The speed will range from design flow rate to BC health code minimum flow rate. The adjustable turbidity level will be set to maintain a 0.1 to 0.5 NTU (nephelometric Turbidity Units).

There will be a minimum of two filter pumps for redundancy. Should one pump fail the system will be sized to meet the minimum health code turnover rate. The result is that the pool can stay operational with one pump being serviced.

Smaller water feature pumps will be either stainless steel in-line circulators, or plastic end suction with integral strainer.

Chemical injection pumps will be plastic, fully modulating digital metering pumps. These will be capable of very precise variable dosing.

Electronic flow meters will be provided to allow the operator to log the flow rates to assure the design always meets the minimum health code required rate. The pumps will vary speed based on Turbidity however it will always range from design flow rate to code minimum flow rate from the flow meter signal. This ensures that the pumps are only using the minimum amount of energy required to meet the design flowrate, and will continuously adjust the pump speed as the filter loads.

As a safety feature, all secondary pumps will be provided with controls that will shut them down when circulation in a specific section of the pool piping stops, regardless of whether the main circulation pumps are running.

A 'strainer cleaning' pit will also be provided in the pump area to ease cleaning and limit the spread of debris generated by strainer cleaning.

3.4 Water Features

Each water feature will have a dedicated pump or pumps. Smaller volume pumps will be constructed of corrosion resistant, reinforced thermoplastic with an integral strainer. Larger pumps will be either base-mounted, end-suction type, or 316SS in line circulators.

A master control panel will be provided at the lifeguard station, allowing deck-level control of the water features by lifeguards. In addition, supplementary emergency stop buttons will be located strategically throughout the pool area to shut off all water features in case of a bather emergency, potential or real. Once the button is pushed, all of the pumps within that pool will shut down and can only be restarted from the MCC within the mechanical room. This assures that the pump isn't accidentally restarted during an emergency.

The lazy river pump will be provided with a variable speed drive that can be controlled and adjusted manually at the life guard station to allow staff to vary the speed of the river.

3.5 Pool Water Heating Systems

Pool heat will be provided by the central facility heating plant. Plate and frame type heat exchangers using 316L SS plates will be provided for each individual pool. This material has proven to be an excellent balance between longevity/resistance to corrosion and first costs. At Hillcrest, it is anticipated that the existing building heating plant will provide some, if not all of the heat for the new pool, as it has been indicated that there is ample heat available from the ice plant heat rejection and in summer months, the diversified load on the building will allow for heating of the new pool. This needs to be confirmed during detailed design.

Each individual pool heat exchanger will be sized to meet the peak heating load, which is typically during the pool fill. By sizing the heat exchangers on peak load, they are guaranteed to be large enough to meet the remaining heating demands – make-up water for backwashes, spillover, carryout, and evaporation.

Pool heat will be controlled through the BMS (Building Management System). Return water temperature will be monitored by a digital temperature sensor located downstream of the filtration plant. Heating water flow into the pool heat exchanger will be modulated to maintain pool temperature setpoints. A secondary temperature sensor will be located at the heat exchanger discharge, to act as a hi limit. Should the heat exchanger temperature increase to an unsafe temperature, the heating system will be prevented from delivering more heat to the pool.

3.6 Swimming Pool Filtration

The filtration system is responsible for providing water clarity and assisting in the chemical balance in the pool tanks. The filtration system requires the most labour and attention of all the pool maintenance tasks; and is typically both the largest piece of mechanical equipment and the largest consumer of water in the facility.

It is understood that the preferred filtration plant is hi rate sand. It is recommended that vertical filters be utilized for their deeper bed and subsequently more effective filtration when compared to horizontal filters.

Two alternative filter types are proposed for consideration, which have benefits over sand filters relating to water clarity, water usage, and energy consumption.

.1 Base Option: Vertical Sand Filters

Research from James Amburgey, Ph.D., P.E., Associate Professor of Civil & Environmental Engineering from the University of North Caroline has proven that you require a minimum of 800-mm filtration bed to achieve adequate filtration. As such we have horizontal filters have not been considered for this project.

A vertical pressure vessel consists of an influent supply header that diffuses the water over the filter bed evenly. The water passes through the filter media and is collected in a lower header called under drains. The media can consist of gravel bed with sand, fine sand or glass beads. To further improve the filtration process, flocculant and carbon is also recommended. Both have a minor cost premium over the traditional sand-bed media.

A single lever handle will connect multiple valves to allow the filter to move from filtration to backwashing. This simplified process minimizes the potential of closing off a valve and causing filter damage.

The recommended filter media for sand filters is activated glass with flocculant injection. This media provides better water clarity, less water use during backwashing, greater longevity of media, and reduction in biofilm generation.

.2 Alternate 1: Regenerative Media Filters

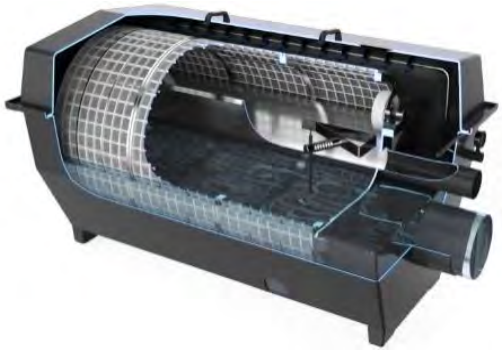
Regenerative media filters provide excellent water clarity and reduced water use during backwashing. However, they are more complex to service and require the use of Purelite, which can be hazardous to handle.

Water circulates upwards in the pressure tank rather than by gravity like traditional DE filters. Media is introduced into the tank through a vacuum hose. Once enough media is introduced, water is recirculated around the filter to allow the media to collect on the flexible hoses. Flexible hoses are spaced evenly and connected to the tank head were water is forced out and returned back to the pool.

This system has two cleaning processes, bump and backwash. Bumping will agitate the tubes within the filter to remove the media and the particulate on the media. Bumping is recommended daily and takes approximately 1 minute. A full backwash or dump occurs approximately every 2-weeks to 2 months depending on bather loads. Media is removed the system through the bottom drain valve. The media discharge into a trough and dumped to sanitary. This process takes approximately 10 minutes. The filter then requires pre-coating which takes another ten minutes.

The system can be fully automated, however it is recommended that the process is supervised by a qualified operator.

.3 Alternate 2: InBlue Drum Filters



Drum filters provide exceptional water clarity and significant energy savings, due to a gravity flow approach.

Drum filters have been used in municipal water treatment in North America for some time. A research and pool construction company in Europe called InBlue has modified this technology for use in commercial pools. The technology has not yet been utilized for commercial pools in Canada, however AME is in the process of designing a filter plant with drum filters for three new recreation centers in the lower mainland.

The filter uses a 5 micron mesh drum and pool water is moved through the filter by gravity. This reduces filter pump size requirements and reduces the energy required to operate the pool.

The drum mesh is segmented so that they can be replaced if damaged without replacing the entire drum. This filter type is often paired with a sidestream vertical low rate sand filter which polishes the water down to 1 micron. The drum filter does not utilize any media. And as such, is a simpler product than sand or regenerative.

Automatic backwashing occurs every 1-2 minutes as the filter loads. Water consumption is similar to that of sand filters, however with the reoccurring backwash process provides on going water dilution. The continuous backwash process also prevents biofilm generation in the piping system.

This filter type requires some unique design considerations. All of the pool water circulation occurs through the pool gutter and thus, the filters can only be used on gutter pools and gutter piping must be sized to accommodate the flow rate. Surge tanks must be segregated so that the balance portion of the tank maintains water pressure on the filtration pump suction. This reduces the pressure capacity of the pump further reducing energy consumption.

As this filter type has not yet been installed in the lower mainland, collaboration with the health authority is required. AME has been through this process with Vancouver Coastal Health and Fraser Health with provisional approval by both health authorities.

3.7 Chemical Disinfectant

A residual amount of chlorine is required to be maintained in a swimming pool. It is understood that the preference for this facility is liquid chlorine with muriatic acid for ph balance. This is consistent with the hillcrest facility, whereby the existing infrastructure could be utilized for the new pool.

At Mount Pleasant, it is recommended that a liquid chlorine and CO2 ph balance combination be utilized. CO2 provides for a more environmentally sensitive solution with much safer service requirements.

3.8 Chemical Controllers

The water chemistry control system shall provide continuous monitoring and control of sanitizers, oxidizers, pH, ORP, free chlorine, total chlorine, combined chlorine, temperature, system flow rate, total dissolved solids (TDS), turbidity and water chemistry balance calculations. The controller shall manage a VFD on the recirculation pump with a programmable Fireman Cycle feature, which automatically turns off the Heater, and UV systems prior to shutting off the recirculation pump. The controller shall abort VFD turndowns upon declining water chemistry and increase the circulation rate to satisfy minimum flow requirements of a heater or UV system.

The control system shall provide automatic control of the filtration system including backwash operation. Remote access shall be provided through BacNet.

The chemical controller will be provided with an interface to the Building Management System. This will allow the BMS to monitor and log pool chemical levels, chemical dose rates, and overall chemical usage over time. Trend logs can be reviewed for historical levels, should it be required.

3.9 Automatic System Control Strategy

.1 Thought must be given to the operator control strategy for the pool mechanical systems. The pool circulation pumps, filters, heating system, and chemical treatment system will operate with a degree of automation under normal operation, via the BMS or internal equipment programming. Typically, this equipment is fully disabled and restarted only through manual operator involvement.

4. PLUMBING SYSTEMS

Plumbing systems required for the project vary significantly depending on the site. The Mount Pleasant site will require new site services, plumbing distribution within the new buildings, a domestic hot water generating plant, and deck drain systems. At Hillcrest, there are no new buildings proposed. Therefore, the only plumbing system required is deck drains around the pool and servicing of any new plumbing fixtures added.

The following systems are applicable only to the Mount Pleasant site.

4.1 Site Service Requirements

The buildings will be fully serviced with connections coordinated with the City of Vancouver. Preliminary analysis indicates that the following site services are required. Piping connections will extend to 1.0 metre from the building, whereby they are extended within the civil scope. Systems will be designed such that gravity drainage is maximized.

.1 200mmØ sanitary service. At Hillcrest, the existing sanitary infrastructure, including backwash tanks can be utilized, precluding the requirement for additional sanitary service.

.2 100mm Ø combined fire and domestic water supply for the Mount Pleasant Site. At Hillcrest, the existing water service can be utilized.

Site service requirements must be reviewed by the civil consultant and confirmed to be feasible for the site.

4.2 Plumbing Distribution

.1 The domestic cold-water system will consist of:

- .1 Water entry station complete with water meter as per the city's requirements.
- .2 Central Backflow prevention.
- .3 Central pressure reducing valve.
- .4 Distribution system to the building's DHW tanks.
- .5 Distribution system to service individual fixtures.
- .6 Irrigation cap-off at the water entry room.
- .7 It is not expected that domestic water booster pumps will be required at this time. To be confirmed with the city water pressure data.

.2 The domestic hot water system will consist of:

- .1 Domestic hot water storage tanks.
- .2 Plate and frame heat exchanger served by the main heating plant.
- .3 Domestic hot water recirculation system with a pump.

.4 Distribution system to service individual fixtures.

.5 Central temperature mixing valve and stations for local tempering to supply 40°C (105°F).

4.3 Storm Drainage System

.1 The storm drainage system will collect all roof drains and overflow drains. The number and arrangement of roof drains will be designed to suit the building configuration and will be in accordance with the B.C. Plumbing Code with a minimum of 2 drains for every major roof surface. Internal rainwater leaders will be collected within the building and run below grade to the building storm connection.

4.4 Footing Drainage System

.1 Footing drainage will be provided for this project to protect sub grade footings and structural slabs, along with the pools and basement mechanical room. The capacity will be determined by the Geotechnical engineer.

.2 Submersible sump pumps will be provided as required.

4.5 Sanitary Waste and Vent Systems

.1 All plumbing fixtures will have drains connected to the sanitary waste and vent system. Plumbing vents will be collected and terminated above the roof level (one vent per building segment/washroom group). Sanitary waste system will discharge to the building sewer below grade.

.2 Sanitary submersible sump pumps will be provided if required.

4.6 Plumbing Fixtures

.1 All fixtures will be commercial grade, CSA approved.

.2 All public water closets will be low flow flush valve type.

.3 Urinals will be flush valve type for automatic flushes.

.4 Lavatories will be equipped with single temperature sensor metering type faucets. This will reduce water consumption.

.5 Barrier-free fixtures, including drinking fountains, will be provided where required.

.6 Sensor or button activated showers with narrow spray pattern will be provided.

.7 A drinking fountain/bottle filler will be provided in the changerooms. Deck mount exterior fountains to be provided by others.

.8 Non-freeze hose bibbs will be installed in areas subject to freezing.

.9 Interior hose bibs will be provided in change rooms (hot/cold), and mechanical rooms.

.10 Floor drains will be provided in mechanical rooms, washrooms and in any other rooms as required. Trench drains will be provided in changerooms and throughout the pool deck conforming with architectural layouts.

.11 Emergency eyewash and shower will be provided in the chemical storage area.

5. FIRE PROTECTION SYSTEMS

The new buildings at Mount Pleasant will be fully sprinklered with a wet system and will be complete with supervisory and tamper switches on all main isolation valves, backflow prevention, flow switches, and sprinkler flow control valve assemblies at each floor. Dry sprinklers will be used under combustible overhangs and other areas subject to freezing.

All interior areas will be sprinklered unless otherwise directed by the authorities having jurisdiction. This only applies to the Mount Pleasant site as the Hillcrest site does not have any proposed new buildings.

5.1 Fire Protection Accessories

The fire protection system will consist of the following accessories as required by NFPA and local building code:

.1 An exterior Siamese connection for the fire department and a test connection will be provided adjacent to the main entrance, consistent with the location of the enunciator panel as located by electrical. This connection location will be determined after coordination with the local fire department.

.2 Fire extinguisher cabinets complete with a 4.5-Kg fire extinguisher will be provided in accordance with NFPA 10 and reviewed and approved by the authority having jurisdiction.

.3 Test flow connections for the sprinkler system will be incorporated at the water entry room for each zone, and for testing each alarm device.

.4 It is not expected that a fire pump will be required. To be confirmed with city water pressure data.

6. HEATING, VENTILATION AND COOLING SYSTEMS

6.1 Heating Plant

Heating plant requirements for the pool vary significantly depending on the site chosen.

.1 Hillcrest Site

At Hillcrest, it is possible that the existing facility heating plant is of sufficient capacity to support the new pool. Facility staff have indicated that there is ample heat recovery from the local ice plant during the times at which ice is being generated (non summer months), allowing additional capacity availability. During summer months when there is potentially no ice generation, the building heating demands will be quite low, allowing for capacity for the new pool.

It is recommended that a study of available heat at Hillcrest be conducted to confirm capacity availability. However, at the time of the generation of this report, it is anticipated that the Hillcrest heating plant can support the new pool with little or no capacity increase. And, the heat exchanger described in the pool heating section would be the only heating infrastructure requirement along with connection to the existing heating water system.

.2 Mount Pleasant Site

At Mount Pleasant, a heating plant would be required to support pool heating, domestic hot water for change rooms, and space heating for office spaces. There are several options for this plant, which vary in capital cost, energy consumption, GHG production, operational complexity, and mechanical space requirements.

The plant provides space heating for occupied spaces, ventilation heat, domestic hot water generation, and pool heating. The estimated heating loads for this facility are summarized in the following table.

	Peak Heat Load (MBH)
Building Heating	200
Domestic Hot Water	800
Pool Heating	1,200
Total (Diversified)	1,400

The values indicated require detailed design to confirm and should be considered estimates at this time. The following assumptions have been made to generate them:

- The pool will operate between May 1 and September 30, but can be extended so long as the outdoor air temperature stays above that indicated below. The pool operation can be extended further, such that daytime temperatures stay above 5C, but night time temperatures can be lower with the use of pool covers.
- Minimum outdoor operating temperature is 5degC
- Pool covers will be used during unoccupied periods.
- Pool heating load includes for heating of the pool from an empty condition. Therefore, the diversified load is indicated. Pool heating will be interrupted to provide domestic hot water top up and there will be sufficient capacity under normal operation for space heating.

.3 Plant Option 1: Gas Fired Boilers

Modular gas fired condensing boilers would provide building, DHW, and pool heating.. With 95% AFUE efficiency, this would be a capital and operating cost effective approach, but would produce the highest amount of greenhouse gases on site, compared to the other options.

2@ 1,000MBH fire tube floor mount condensing boilers are recommended, complete with headers, pumps, and associated valves. This would provide redundancy and allow the pool to be in operation with one boiler off line.

This option would require the smallest mechanical space, but would require a gas service and combustion venting.

.4 Plant Option 2: Electric Boilers

Should GHG reduction be desired for the project, the boilers could be electric. This option would differ from option 1 in the following ways:

- No on site GHG production
- No gas service or combustion venting required
- Significant increase in power consumption and operating costs

.5 Plant Option 3: Air Cooled Heat Pumps

Should green house gas emission reduction be the primary goal in plant selection, and a reduction in power consumption/operating cost is also desirable, air-cooled heat pumps are recommended.

Air cooled heat pumps utilize refrigeration to transfer heat from the outdoor air to the heating loads. They consume approximately 1/3 of the energy that electric boilers do and as a result, significantly reduce site energy consumption. However, capital cost and operational complexity are substantially higher than a boiler systems. They also require outdoor space. At Mount Pleasant, it is recommended that the heat pump would be located on a concrete pad at grade adjacent to the building, or on the roof of the new building.

This equipment creates noise when operational, so this would need to be considered in the site design.

.6 Additional Energy Saving Measures

There are several systems that could be implemented at this site to further reduce the energy requirements for heating the pools. These include:

- Solar Hot Water Heating

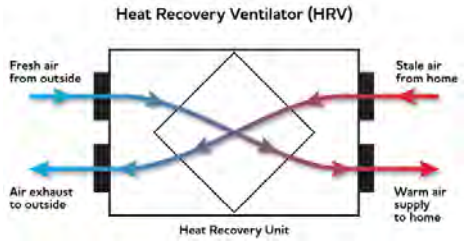
Site or roof mount solar hot water heating panels could preheat domestic hot water and contribute to pool heating, reducing run time of the heating plant.

- Sanitary Heat Recovery

Drainage from showers and pool backwashing could be collected in a tank whereby heat can be extracted for pool heating. A Sharc system could be installed to extract the heat. This system consists of water to water heat pumps suitable for use in the application.

6.2 Heating Ventilation and Air Conditioning Systems in Indoor Spaces

.1 Changing Rooms



It is recommended that air heat recovery for the Changing Room areas be installed, should they be enclosed conditioned spaces. The unit would consist of supply and return fans with variable speed drives, 100% fresh air mixing box with two position occupied / unoccupied dampers, bag filters and heating coil. 100% of the exhaust air heat will be recovered before discharging outdoors.

Each change room including staff room will have its own reheat coil to provide individual temperature control. The fresh air will be supplied to the change lockers. Exhaust air grilles will be located in the shower and toilet areas.

.2 Offices

A split system heat pump is recommended for the office spaces with supplementary heat from the heating plant.

6.3 Specialty Systems

.1 Pool Chemical Storage Room

Dedicated exhaust systems would be provided for the chlorine and acid storage room. The exhaust fan, ductwork and grille shall be of non-corrosive material. The make-up air and room conditioning will be done with transfer air.

7. CONTROL SYSTEMS

All major mechanical systems will be equipped with Direct Digital Control (DDC) systems. This will include all equipment located in mechanical rooms as well as the roof mounted systems.

The entire building will be controlled by BACnet compatible components. BACnet is an ASHRAE protocol that allows standardised data communication for complete automation and control of building systems, such as heating, ventilating, air- conditioning control, lighting control, access control and fire detection systems. Devices like chillers will use the BACnet protocol removing all redundant control points not applicable to the unit. All systems and equipment will be compatible with and operate with BACnet over IP protocols.

All devices installed into the facility will be completely BACnet compatible, i.e. thermostats, sensors, etc.

The majority of the wall mounted thermostats will be installed for zone temperature control, occupancy sensor and CO_2 sensor. Protective covers will be installed on the sensors within the public spaces. The administrative areas will allow a small amount of manual temperature control by the occupants. The rest of the sensors will be controlled centrally through the DDC interface.

Shower rooms and other applicable spaces will be equipped with humidity sensors in accordance with ASHRAE 55 standard.

Multi level access will be provided, such that portions of the system can be accessed independently. AME will work with municipal staff to determine the level of access required.

8. SITE SUITABILITY

From a mechanical perspective, both sites could accommodate the infrastructure proposed in the architectural drawing set, should there be sufficient civil site services available at Mount Pleasant. It should be noted, however, that given the existing infrastructure at Hillcrest, it would be substantially more cost effective to locate the new pool at that site. The following benefits of the Hilcrest site can be noted.

1. The existence of suitable domestic water and sanitary infrastructure preclude the need to add those systems.

2. The new pool could use the existing chemical treatment systems with only the addition of a chemical controller and injection pumps required. Staff have indicated that there is sufficient chemical storage to accommodate the new pool.

3. There is space available for a new filter plant in the existing pool mechanical room to accommodate the new filter plant. Therefore, no building revisions would be required to support the new plant. There is also adequate doors, walkways, and hatches available to bring the new equipment into the building.

4. The Hillcrest heating plant can likely provide enough capacity for the new pool. However, this would need to be confirmed through a study of the fully occupied operational loads versus system capacity.

5. At the hillcrest site, chemical deliveries would be handled I the same way as they are currently as the infrastructure to store chemicals would not change with the new pool. At the mount Pleasant site, adequate vehicle access would need to be provided for chemical deliveries to the new chemical storage rooms.

9. EXTENDED SEASONAL OPERATION

The equipment and systems proposed in this report have been sized to accommodate pool operation to a minimum outdoor air temperature of 5degC. Based on historical averages, this would allow operation between March and November, including uncovered night operation. This does not guarantee, however, that temperatures will not be below 5deg during those months as future weather is less predictable than a historical analysis.

Strategies for extending the operating season are summarized as follows:

1. Utilizing pool covers at night may allow extended operation through the winter as daytime temperatures rarely dip below 5degC. And, the additional heat loss experienced at night at lower

temperatures would be mitigated by the pool covers. This would require additional deck space for the covers as well as additional maintenance by operation staff to place and remove the covers after hours.

2. Increased mechanical plant size would also allow seasonal extension. As pool surface heat loss is relatively linear as a function of outdoor air temperature, reducing the design outdoor air temperature would increase plant size accordingly. The proposed equipment is intended to satisfy heat loss resulting from a water to air temperature differential of 24degC for a lap pool. Extending the service window by 1degC would increase the plant size by approximately 5%. And a 5degC delta increase would result in a 17% increase. This would have space, capital cost, and electrical implications.

It should be noted that extending the operating range will result in the following:

1. Additional equipment run hours resulting in increased maintenance, component replacement, and a reduced service life.

2. Operating into the freezing range would result in risk associated with plumbing systems. Additional freeze protection may be required.

3. Attention to the design of the pool piping systems such that they are free draining. This could potentially drop the floor of the basement mechanical room and result in an increased surge tank volume, should there be one in the project.

END OF REPORT

APPENDIX D - AES ENGINEERING - ELECTRICAL REPORT

Assessment Report for

Vancouver Board of Parks and Recreation Outdoor Pool Electrical Feasibility Study

Electrical Engineering Services

Prepared for:
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PROJECT NO. 2-21-410
October 27, 2021

DESIGNING A BETTER TOMORROW

Table of Contents

1. Purpose

The purpose of this assessment study is to provide information regarding electrical requirements for a new outdoor swimming pool at Mount Pleasant (MP) or Hillcrest Recreational Centre's (HRC) existing outdoor pool expansion. This report will identify existing electrical plant capacity at each site and the constraints in providing power to the mechanical equipment and supporting facility spaces such as administration space and change rooms.

The electrical system demand for aquatic facilities is directly correlated with the chosen mechanical heating plant. It is understood that the new outdoor pool at HRC will be supported by the existing mechanical plant with minimum impact as the existing systems likely have sufficient capacity due to heat recovery of the adjacent ice plant.

However, the MP outdoor pool will be a brand new facility requiring a new electrical service, mechanical plant and stand alone supporting building for services, administration and changerooms. There are 3 different mechanical heating plans considered for MP outdoor pool:

- Gas Fired Boiler
- Electric Boiler
- Air Sourced Heat pump

The electrical demand for an electric boiler and air source heat pump are comparable and align with the Vancouver Board of Parks and Recreation GHG reduction mandate. For the purpose of this report the electrical demand of an electric boiler plant (highest of the two) is considered.

The report also identifies upgrade requirements for all existing electrical services if required.

This report does not identify probable cost of electrical construction for the work identified in this assessment. It is assumed that all costing information will be provided by a qualified cost consultant or a contractor.

2. Hillcrest Recreation Centre

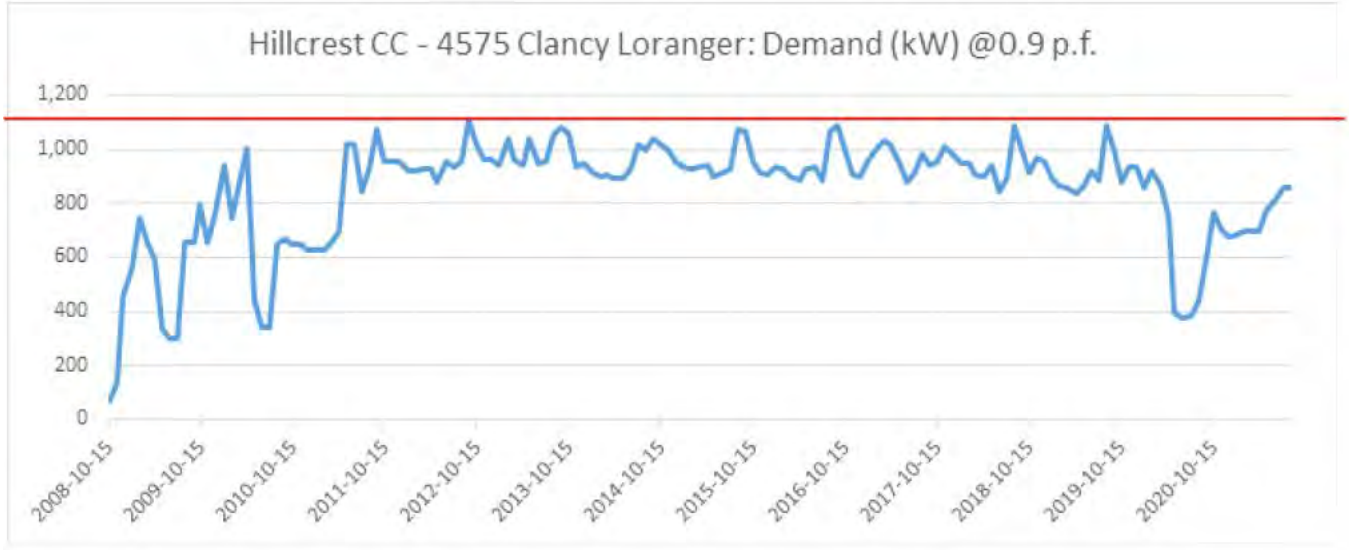
2.1 EXISTING SITE

The existing site address for Hillcrest Recreation Centre is 4575 Clancy Loranger Way. The proposed pool site is situated on the north-west corner of Nat Bailey Stadium with the parking lot bordering Ontario Street and Peveril Ave.

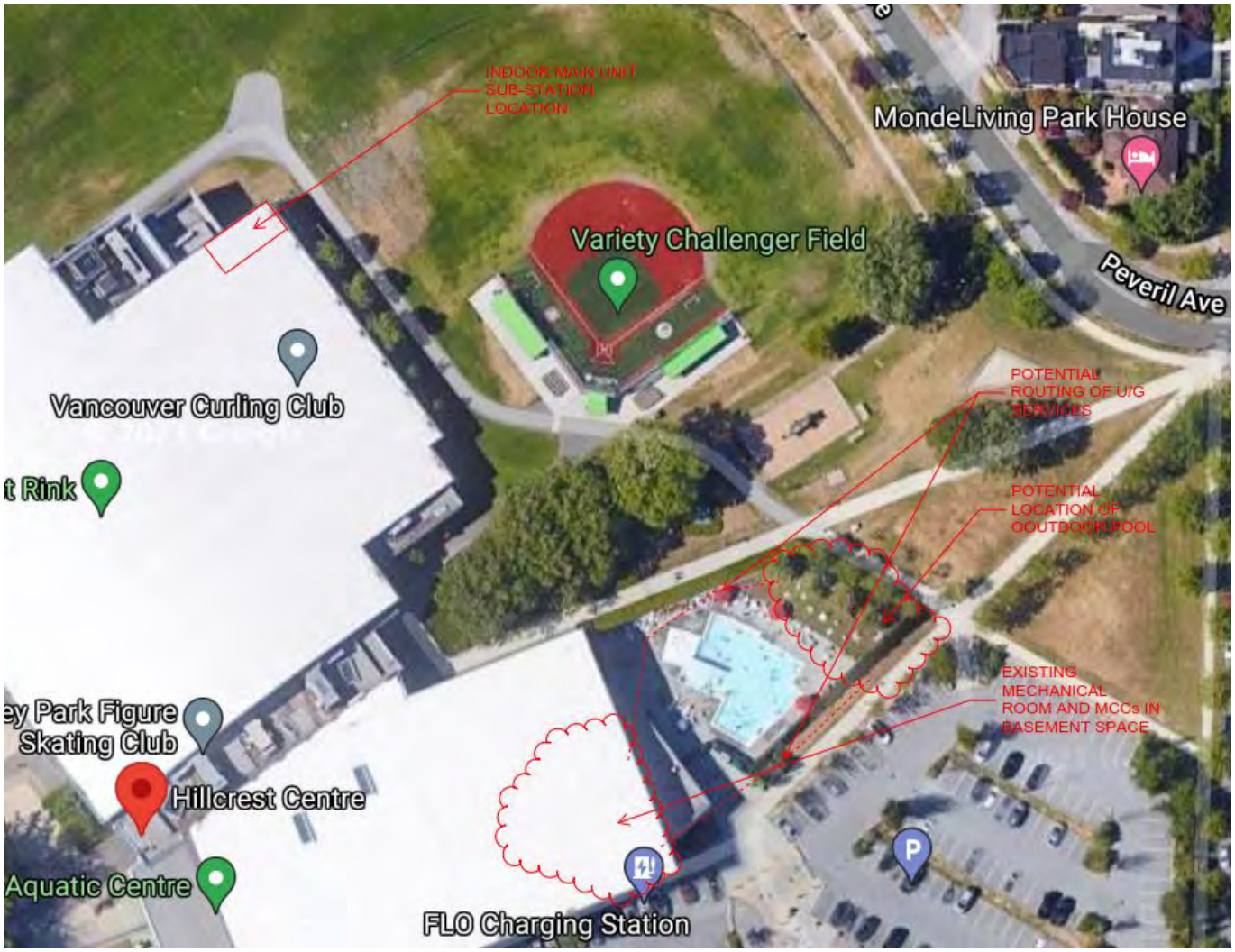
The following aerial photograph of the existing recreation centre site shows the recreation centre with the location of the main electrical service to the site and the approximate location of the existing mechanical room in the aquatic centre marked. The site photo also shows the potential routing location of electrical and other services from the aquatic centre to the potential new outdoor lap pool.

The main electrical service to the complex is located inside the curling club facility on the north-east corner. Information on the existing main service equipment is provided in subsequent sections of this report.

The maximum electric kilowatt demand on the main service recorded over a 12-month period prior to the COVID-19 lock-down was approximately 1087 kW. This represents a maximum current load of 1047 amps at 600 volts. The main electrical service secondary breaker is rated at 4000A, 100% rated; therefore, the spare capacity on the service is 2,916 amps. The potential pool addition project can therefore be accommodated by adding a secondary 600V breaker inside the unit substation, and a new feeder running from the unit substation room to the aquatic centre mechanical room will provide ample power to the addition. See subsequent sections for more details on the main electrical service.



LOAD PROFILE KILOWATT DEMAND



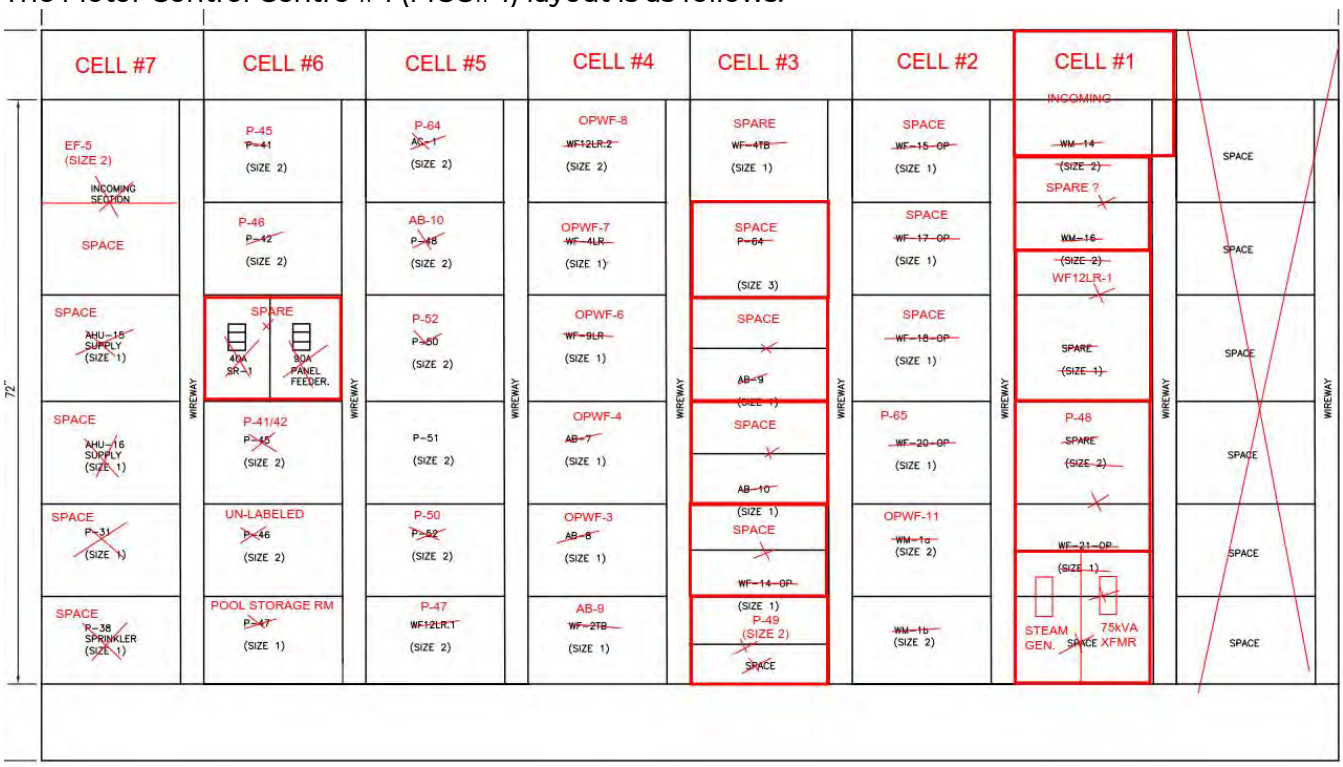
2.2 EXISTING MAIN ELECTRICAL SERVICE

The capacity and the location of the main electrical room for the complex is described in the previous section of this report. The aquatic centre is fed from the main unit substation with a 1600A-347/600v breaker and distribution CDP located in the aquatic centre sub-electrical room. The aquatic centre motor control centre MCC#3 is fed with a 600A-3P breaker, motor control centre MCC#4 is also fed by a 600A-3P breaker and MCC#5 is fed from a 200A-3P breaker. MCC#4 is located in the lower level nearest the exterior pool area and would be ideal for feeding the potential new exterior lap pool.

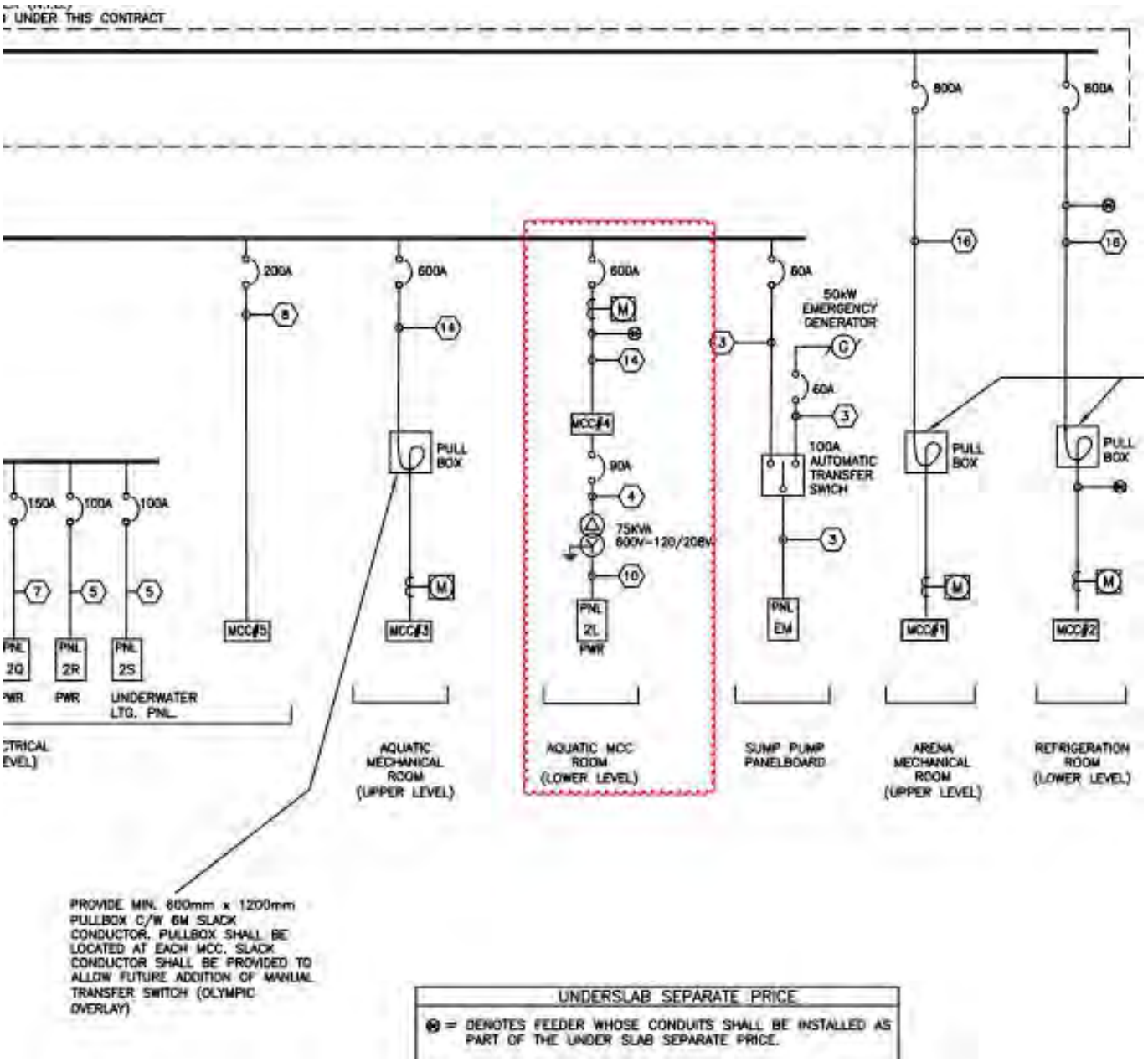
Existing equipment connected to MCC#4 is as follows:

SECTION # / CELL #	EQUIPMENT TAG	kW LOAD	COMMENTS
SECT 1 / CELL 1	INCOMING PULLING	N/A/	PULLING AND CONNECTION cell
SECT 1 / CELL 2	SPARE	N/A	
SECT 1 / CELL 3	WF12LR-1	25?	
SECT 1 / CELL 4	P-48	20	
SECT 1 / CELL 5	STEAM GEN/75KVA XFMR	100	
SECT 2 / CELL 1	SPACE		
SECT 2 / CELL 2	SPACE		
SECT 2 / CELL 3	SPACE		
SECT 2 / CELL 4	P-65	0.33	
SECT 2 / CELL 5	OPWF-11	??	
SECT 2 / CELL 6	SPACE		
SECT 3 / CELL 1	SPARE		
SECT 3 / CELL 2	SPACE		
SECT 3 / CELL 3	SPACE		
SECT 3 / CELL 4	SPACE		
SECT 3 / CELL 5	SPACE		
SECT 3 / CELL 6	P-49	0.33	
SECT 4 / CELL 1	OPWF-8		
SECT 4 / CELL 2	OPWF-7	2	
SECT 4 / CELL 3	OPWF-6	2	
SECT 4 / CELL 4	OPWF-4	5	
SECT 4 / CELL 5	OPWF-3	5	
SECT 4 / CELL 6	AB-9	5	
SECT 5 / CELL 1	P-64	4-	
SECT 5 / CELL 2	AB-10	5	
SECT 5 / CELL 3	P-52	0.33	
SECT 5 / CELL 4	P-51	15	
SECT 5 / CELL 5	P-50	20	
SECT 5 / CELL 6	P-47	3	
SECT 6 / CELL 1	P-45	25	
SECT 6 / CELL 2	P-46	25	
SECT 6 / CELL 3	SPARE	??	
SECT 6 / CELL 4	P-41/42	20/20	
SECT 6 / CELL 5	UNLABELED	??	
SECT 6 / CELL 6	POOL STORAGE ROOM	??	
SECT 7 / CELL 1	EF-5	??	
SECT 7 / CELL 2	SPACE	??	
SECT 7 / CELL 3	SPACE	n/a	
SECT 7 / CELL 4	SPACE	n/a	
SECT 7 / CELL 5	SPACE	5	
SECT 7 / CELL 6	SPACE	n/a	

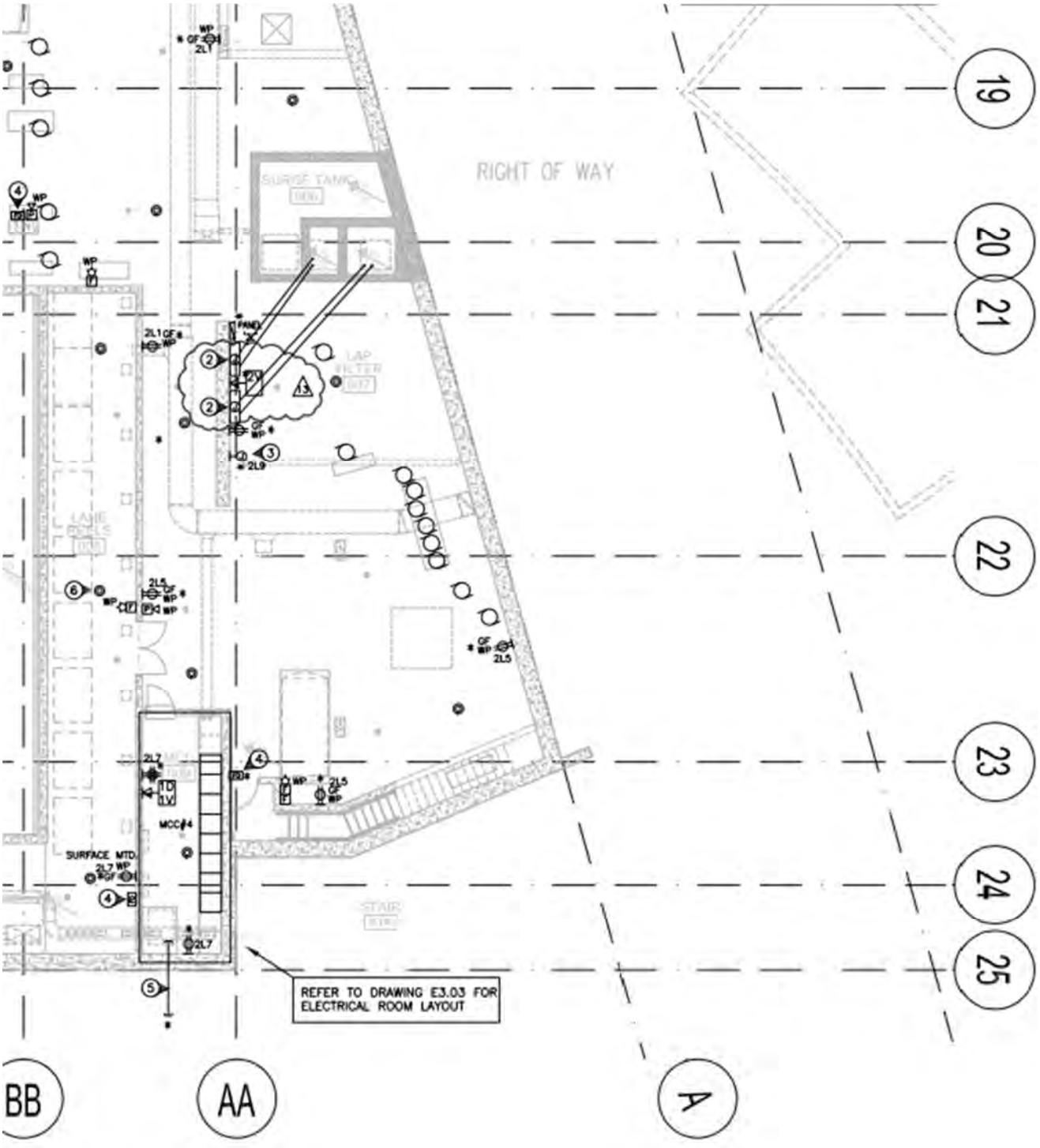
The Motor Control Centre #4 (MCC#4) layout is as follows:



The layout is marked up with information on photographs taken during our site visit. This motor control centre is not solely used for powering the outdoor pool. It also serves mechanical equipment for the leisure pool, the 50m pool and possibly other equipment. A set of record drawings would allow an accurate assessment of what is fed from this MCC.


UNDER THIS CONTRACT
800A
800A
200A
600A
600A
60A
50kW EMERGENCY GENERATOR
150A
100A
100A
PULL BOX
PULL BOX
PULL BOX
100A AUTOMATIC TRANSFER SWITCH
75kVA 600V-120/208V
90A
MCC#5
MCC#3
MCC#4
MCC#1
MCC#2
PNL 2Q
PNL 2R
PNL 2S
PNL 2L
PNL EM
PWR
PWR
UNDERWATER LTG. PNL.
AQUATIC MECHANICAL ROOM (UPPER LEVEL)
AQUATIC MCC ROOM (LOWER LEVEL)
SUMP PUMP PANELBOARD
ARENA MECHANICAL ROOM (UPPER LEVEL)
REFRIGERATION ROOM (LOWER LEVEL)
PROVIDE MIN. 600mm x 1200mm PULLBOX C/W 6M SLACK CONDUCTOR. PULLBOX SHALL BE LOCATED AT EACH MCC. SLACK CONDUCTOR SHALL BE PROVIDED TO ALLOW FUTURE ADDITION OF MANUAL TRANSFER SWITCH (OLYMPIC OVERLAY)
UNDERSLAB SEPARATE PRICE
⊗ = DENOTES FEEDER WHOSE CONDUITS SHALL BE INSTALLED AS PART OF THE UNDER SLAB SEPARATE PRICE.

The location of MCC#4 is in the basement east mechanical room as indicated in the following figure.



2.3 POTENTIAL SERVICING FOR NEW OUTDOOR POOL

Servicing the new outdoor pool can be achieved from the existing building power distribution system. The City has indicated that they wish to have the ability of shutting down the indoor pool facility for annual maintenance while keeping the outdoor pool facility operational. The existing exterior pool mechanical equipment is powered from motor control centre #4 (MCC#4) and this MCC also powers mechanical equipment indoor. If new outdoor lap pool equipment is fed from this MCC, the existing function of the pool is left unchanged and a shut-down of the indoor pool requires switching off inside mechanical equipment at the motor starter and locking it in the "off" position.

If the desire is to have the ability of servicing indoor equipment starters, a new motor control centre could be provided. From this new motor control centre, existing exterior equipment and new lap pool equipment can be fed with power and controls. A new feed from the main electrical room with a dedicated circuit breaker could possibly feed this new MCC. Since starters rarely fail and don't require on-going maintenance other than cleaning, there is no real advantage to this option.

VanSplash Recommendation 9 requires an investigation of the feasibility of operating outdoor pools with extended season. From an electrical perspective, operating the outdoor facility with extended season will require outdoor lighting on the pool deck that provides a minimum 200 lux over the deck and water surface.

3. Mount Pleasant Park

3.1 EXISTING SITE

The existing site is located at 3161 Ontario Street and situated north of 16th Avenue between Columbia and Ontario Streets. Utility services in the area are underground and BC Hydro have confirmed this.

SITE OVERHEAD UTILITIES

3.2 EXISTING MAIN ELECTRICAL SERVICE

This particular area does not have many electrical servicing options. There are three existing pole mounted overhead transformers feeding the school building or another unknown load adjacent the park. The existing pole cannot be used for a new primary service dip because of lack of physical space. The existing pole located along 15th Ave has double crossarms so a primary dip service cannot be provided at this pole either. The existing pole along 16th Ave also has existing pole mounted equipment and thus no space for a primary service dip. We would anticipate that BC Hydro will provide an overhead service dip from another pole along 15th Avenue. Existing overhead pole mounted primary voltage lines along 15th Ave adjacent to the park are single phase so one pole span will likely require upgrade to three phase primary service. An alternate solution may be to add a pole inside the property with a primary service dip; however, this needs final confirmation with BC Hydro.

3.3 POTENTIAL SERVICING FOR NEW POOL

The anticipated mechanical plant size for heating, filtration and supporting building HVAC is 670 kW. Therefore, the anticipated service requirement for the pool addition is **800A-347/600V, 3-phase**, 4-wire. For this service size, BC Hydro will provide a utility owned Pad Mount Transformer (PMT). BC hydro will have to reconfigure exiting overhead distribution via underground dip to the PMT location. From the PMT location underground service will be extended to service room. If there is a requirement for EV charging on the site, an allowance for six (6) EV level 2 chargers would add another 50kW or approximately 48 amps of additional load requiring a **1000A-347/600V, 3-phase, 4-wire** secondary service in lieu or the 800 amp service mentioned above.

We anticipate a new 3-phase primary pole along 15th Ave will be required for primary dip to PMT. It may be possible to add a pole along the existing primary service lines within the property and install but this is still unconfirmed with BC Hydro.

The main electrical service room will need to be minimum 12’ by 10’ internal clearance to accommodate most of the electrical equipment.

A main communication room is also required and likely needs to be 8’ wide by 8’ clear internal dimensions. The communications room will provide a location for all required low-voltage systems such as security, CCTV (if required), intrusion, access controls, fire alarm and networking equipment.

VanSplash Recommendation 9 requires an investigation of the feasibility of operating outdoor pools with extended season. From and electrical perspective and similar to the Hillcrest site, operating the outdoor facility with extended season will require outdoor lighting on the pool deck that provides a minimum 200 lux over the deck and water surface.

4. Conclusions

Our findings indicate that servicing for a new outdoor pool will be the simplest at the Hillcrest Recreation Centre because equipment can be fed from existing electrical power distribution equipment. This eliminates the need for a new main electrical room and thus a building.

At the Mount Pleasant Park site, a new BC Hydro service is needed along with a building to house electrical service equipment. The required service size assuming EV chargers are required is 100 amps-347-600V 3-phase 4-wire.

APPENDIX E - RTA - QUANTITY SURVEYOR CLASS D COSTING

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October 27, 2021

Carscadden Stokes McDonald Architects Inc.
310 - 1930 Pandora Street
Vancouver, BC V5L 0C7

Attention: Ian Ross McDonald
PARTNER ARCHITECT AIBC AAA NWTAA OAA

CITY OF VANCOUVER – OUTDOOR POOLS STUDY
VANCOUVER BOARD OF PARKS AND RECREATION
VANCOUVER, BC
CLASS D 'ORDER OF MAGNITUDE' PROJECT & CONSTRUCTION ESTIMATE

We have reviewed the design documents, prepared a revised Class 'D' 'Order of Magnitude' Project + Construction estimate (based on revised concept design information), and enclose our report.

Pricing has been included at Q4 2021 local unit rates noting the current uncertainty and volatility of the market. Supply chain issues currently being experienced may have unknown (short and long term) impacts on pricing levels and anticipated projected construction escalation.

Please note material supply prices have recently spiked with current market supply chain price increases affecting supply price of aluminium, copper, steel, silicone, tile, insulation, ipex, PVC/UPVC products etc. Container freight shipping costs have recently increased by +75-200%. Current market instability is a significant short and long term cost and schedule risk item (supply chain fulfilment of orders in a timely manner may create potential for critical path related construction delays).

Please note the conditions on which the costs are based, and the items excluded.

For RTAQS

Ross Templeton MRICS, PQS
Partner

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Daniel Holland MRICS
Partner

daniel@rtaqs.com

1437

PROJECT DESCRIPTION

The project scope involves two concept options for a proposed new build Vancouver Board of Parks and Recreation Outdoor Pool in Vancouver, BC with concept design scope defined by Carscadden Stokes McDonald Architects Inc. (and respective sub-consultants).

- Option 1: Hillcrest Centre
- Option 2: Mount Pleasant

ESTIMATED PROJECT CAPITAL COST SUMMARY

Element		Hillcrest Estimated Cost $	Mount Pleasant Estimated Cost $
A.	Land, Property Taxes, Accounting & Legal Fees	Excluded	Excluded
B.	Estimated Net Construction Cost (Net Q4 2021 $)	2,890,000	6,194,000
C.	Contingencies (Design Pricing, Escalation 2-years & Construction)	1,105,400	2,369,000
D.	Estimated Escalated Construction Cost	$ 3,995,400	$ 8,563,000
E.	Professional Fees (Allowances)	559,000	1,199,000
F.	Connection Fees & Permits (Allowances)	220,000	512,000
G.	Owners Costs (Allowances)	318,400	670,100
H.	Owners Soft Cost Contingency (10% of E to G Allowance)	109,700	238,100
I.	Loose Furnishings, Fittings & Equipment (3% allowance of D)	119,900	256,900
J.	GST (Excluded)	Excluded	Excluded
L.	Financing Charges (Excluded)	Excluded	Excluded
M.	Total Project Cost Estimate (Excluding GST & Exclusions)	$ 5,322,400	$ 11,439,100

Class D construction cost estimates are typically +/- 25% in accuracy with many variables influencing the final construction price including most importantly the final design scope parameters, final specifications (output specification, performance specifications, proprietary specifications), final drawings, contractors' contractual obligations, extent of supplementary conditions, number of compliant bidders, volatility of the market, supply chain issues and market activity at time of tender.

Pricing has been included at Q4 2021 local unit rates noting the current uncertainty and volatility of the market. Supply chain issues currently being experienced may have unknown (short and long term) impacts on pricing levels and anticipated projected construction escalation.

Please refer to the exclusions section and appended Class D estimate detail and project summary.

PROJECT CALENDAR

We have included an allowance for two (2) years of projected escalation to the assumed construction mid-point of Q4 2023. Please refer to the 'Escalation Contingency' section of this report.

AREA ANALYSIS

Approximate total buildable for Outdoor Pool Program areas (refer to the estimate detail for area breakouts).

- Option 1: Hillcrest Centre 700 m²
- Option 2: Mount Pleasant 1,035 m²

CONTRACT CONDITIONS

The costs are based on the work being executed through a fixed lump sum competitive tender contract or construction management on standard form documents with no onerous supplementary conditions. Tenders will be received from at least five qualified bidders with tenders received from three sub-contractors for each major sub-trade and supply contracts (earthworks, concrete, steel reinforcement, formwork, framing/structure, proprietary specifications, mechanical and electrical). Consideration of unknown market volatility and supply chain issues at the time of tender have been specifically excluded from this estimate.

EXCLUSIONS

- Legal, financing charges, accounting, property taxes, land costs are all excluded
- Soft costs not listed as included
- Soft costs exceeding budget allowances included
- Special foundations, piles, raft slab, rock blasting, slope stabilization etc.
- Unforeseen existing ground and/or non-standard dewatering conditions (non-standard tanking)
- Out of hours working premium / restricted working hours / restricted noise conditions
- Off-site works, off-site utility or infrastructure upgrades
- Costs exceeding BC Hydro allowance included for Mount Pleasant option only
- Utility company charges beyond allowances included
- Site works outside property line
- Site development works beyond allowances included
- Construction works outside the defined functional program scope
- Passive House, Net Zero design fees or certification
- Hazmat Abatement (if any, unknown)
- Phasing of the works or Accelerated Schedule
- Moving and decanting costs beyond allowance included
- Temporary facilities
- DCC and BP charges beyond allowances included
- CAC's or other Municipal Contributions
- Exhibits, Public Art and Artwork
- Goods & Services Tax (GST) (PST is included)
- Extraordinary market conditions, market volatility and supply chain issues
- Cost escalation past allowance included (refer to escalation section of report)
- Operating, Maintenance, Life Cycle Replacement and Facility Management Costs
- Loose fittings, furnishings and equipment beyond budget allowance included (CoV to develop FF&E list)
- Pricing based on BCBC 2018 Step Code and does not include future unknown code change cost implications
- Items listed as 'excluded' in the estimate detail

DESIGN PRICING CONTINGENCY

The project is at concept design stage and a design pricing contingency of fifteen percent (15%) has been included to cover quantity and pricing variances that may occur with changes to scope, design assumptions, detailing clarifications and specification changes through the remainder of the design process. This contingency will ultimately reduce to zero at tender stage.

CONSTRUCTION CONTINGENCY

Construction projects are rarely completed without some level of change and often additional scopes of work are required (Change Orders). We recommend the owner carry an additional sum of five percent (5%) of the construction cost in their budget to help offset any unforeseen costs that may arise during construction.

We have included this allowance within the project estimate.

This contingency is owner owned and will not be included in the tender returns but should be set aside in a separate budget for the owner to manage during the construction period.

ESCALATION CONTINGENCY

Pricing has been included at Q4 October 2021 local unit rates noting the current uncertainty and volatility of the market. Supply chain issues currently being experienced may have unknown (short and long term) impacts on pricing levels and anticipated projected construction escalation.

An escalation contingency of fourteen-point-five percent (14.5%) has been included in the estimate to cover anticipated projected construction escalation to the assumed mid-point of construction of Q4 2023 using a projected escalation rate of seven percent (7%) per annum (noting the above statement) compound calculated.

DOCUMENTS AND DATA

This cost plan estimate has been prepared using the following documents (file names noted for reference):

- Carscadden - OUTDOOR POOL STUDY – Hillcrest
- Carscadden - OUTDOOR POOL STUDY - Mount Pleasant

PROJECT COST ESTIMATE		HILLCREST CENTRE	MOUNT PLEASANT
A. LAND COST		**Excluded**	**Excluded**
1 Land		Excluded	Excluded
2 Legal Fees, Property Taxes, Accounting		Excluded	Excluded
B. ESTIMATED CONSTRUCTION COST (NET Q4 2021 $ Excluding Contingencies)		**$2,890,000**	**$6,194,000**
1 Outdoor Program Pools		2,679,900	5,693,700
2 On Site Works		187,400	500,300
3 Demolition & Ancillary Works		22,700	0
4 HazMat Abatement (if any)		Excluded	Excluded
5 Off Site Works		Excluded	Excluded
C. CONSTRUCTION CONTINGENCIES		**$1,105,400**	**$2,369,000**
1 Design Pricing Contingency	15.0%	433,500	929,100
2 Escalation Contingency (2 years allowance @ 7% p.a.)	14.5%	481,600	1,032,100
3 Post Tender Change Order Contingency	5.0%	190,300	407,800
D. TOTAL ESCALATED CONSTRUCTION COST INCLUDING CONTINGENCIES (B + C)		**$3,995,400**	**$8,563,000**
E. PROFESSIONAL FEES (ALLOWANCE)	14.0%	**$559,000**	**$1,199,000**
F. CONNECTION FEES & PERMITS (ALLOWANCES)		**$220,000**	**$512,000**
1 Allowance for Development Cost Charges	ls	152,000	224,000
2 Allowance for Building Permits	ls	18,000	38,000
3 Allowance for Utility Connection Fees (Hydro, Fortis, Telus Charges)	ls	50,000	100,000
4 Allowance for BC Hydro Offsite Upgrades (scope TBD)	ls	Excluded	150,000
G. OWNERS COSTS (ALLOWANCES)		**$318,400**	**$670,100**
1 Project Management (% of Item D)	3.5%	139,800	299,700
2 Owners Planning and Administrative Cost (% of Item D)	2.5%	99,900	214,100
3 Project Insurance (% of Item D)	1.5%	59,900	128,400
4 Commissioning, Testing ($ / sqft)	$2.5 /ft²	18,800	27,900
H. OWNERS SOFT COST PROJECT CONTINGENCY (% of Item E + F + G)	10.0%	**$109,700**	**$238,100**
SUB-TOTAL (Excluding FF&E)		$5,202,500	$11,182,200
I. LOOSE FURNISHINGS, FITTINGS & EQUIPMENT (% Allowance of Item D)	3.0%	**$119,900**	**$256,900**
SUB-TOTAL (Including FF&E)		$5,322,400	$11,439,100
J. GST (Excluded)		**Excluded**	**Excluded**
K. TOTAL PROJECT COST (Excluding Finance Charges & GST)		**$5,322,400**	**$11,439,100**
L. FINANCING CHARGES (Excluded)		**Excluded**	**Excluded**
M. ESCALATED PROJECT COST (Excluding Finance Charges & GST)		**$5,322,400**	**$11,439,100**

STATISTICS		
1 Gross Floor Area (m^2) (Item B1 Outdoor Program)	700 m²	1,035 m²
2 Net Q4 2021 Outdoor Program Cost $/$m^2$ (Item B1) (excluding contingencies)	$3,828/m²	$5,501/m²
3 Total Net Q4 2021 Construction Cost $/$m^2$ (Item B) (excluding contingencies)	$4,129/m²	$5,985/m²
4 Total Escalated Project Cost (including soft costs) $/$m^2$	$7,603/m²	$11,052/m²

CONSTRUCTION COST ESTIMATE (NET Q4 2021 $) - HILLCREST CENTRE

	Component	Quantity	Unit	Rate Q4 2021 $	Total Estimated Cost $
1. Outdoor Program					
1	25m lap pool (4 lane) (Existing M&E infrastructure)	225	m^2	4,095.00	921,400
2	Concrete pool deck with broom finish	430	m^2	2,993.00	1,287,000
3	Unheated change facility - Concrete pad and strip footings; concrete masonry and heavy timber superstructure (5 toilets, 4 shower compartments and 6 change	45	m^2	9,135.00	411,100
4	Roof overhang for covered area (excluded from GFA)	50	m^2	1,208.00	60,400
	1. NET TOTAL OUTDOOR PROGRAM (Net Q4 2021 $)	700	m^2	$3,828/m²	$2,679,900
2. On Site Works					
1	Site clear and grub	875	m^2	15.00	13,100
2	Allow for earthworks	1	sum	52,500.00	52,500
3	8' high chain link fence with visibility shielding	85	m	302.00	25,700
4	Soft landscaping including growing medium:				-
	- 1.5m high grass	175	m^2	242.00	42,400
	- Small Trees	1	no.	1,208.00	1,200
5	M&E site services - connections to existing water, sanitary, pool heat & filtration, and electrical systems	1	sum	52,500.00	52,500
6	Off-site works - Excluded		Excl.		-
	2. NET TOTAL ON SITE WORKS (Net Q4 2021 $)				$187,400
3. Demolition & Ancillary Works					
1	Remove existing trees	11	no.	604.00	6,600
2	Demolish existing concrete paths	136	m^2	103.00	14,000
3	Allow for make good and miscellaneous	1	sum	2,100.00	2,100
4	Demolish existing building (Excluded)		Excl.		-
5	Hazardous Materials (Excluded, if any)		Excl.		-
	3. NET TOTAL DEMOLITION & ANCILLARY WORKS (Net Q4 2021 $)				$22,700

Class D +/- 25% typical range of accuracy

Exclusions from Net Construction Estimates (refer to project pro-forma summary):

- Division 1 General Conditions and CM/GC Fee costs are built into the unit rates.
- The above estimate is for the outdoor pool and associated facilities, and site work construction cost only.
- Design pricing contingency is excluded (refer to project pro-forma summary).
- The above net estimate is priced in current Q4 2021 local dollars. No escalation contingency has been included (refer to project prc
- Construction contingency is excluded (refer to project pro-forma summary).
- Off-site works are excluded (refer to project pro-forma summary).
- Soft costs such as professional fees, DCCs and building permits, management, FF&E are excluded (refer to project pro-forma).
- Goods & Services Tax excluded, PST included.
- Refer to report for basis, assumptions, methodology and exclusions.

CONSTRUCTION COST ESTIMATE (NET Q4 2021 $) - MOUNT PLEASANT

	Component	Quantity	Unit	Rate Q4 2021 $	Total Estimated Cost $
1. Outdoor Program					
1	25m lap pool (4 lane) (New M&E infrastructure)	210	m^2	5,119.00	1,075,000
2	Leisure pool	154	m^2	5,631.00	867,200
3	Concrete pool deck with broom finish	405	m^2	2,993.00	1,212,200
4	Unheated change facility - concrete pad and strip footings; concrete masonry and heavy timber superstructure (8 change compartments)	55	m^2	9,135.00	502,400
5	Office and mechanical facility - Concrete pad and strip footings; concrete masonry and heavy timber superstructure				
	- Heated office and mechanical facility; designed to achieve LEED Gold and Passive House requirements.	200	m^2	9,078.00	1,815,600
	- Unheated toilet rooms and kiosk	11	m^2	9,135.00	100,500
	- Roof overhang for covered area (excluded from GFA)	100	m^2	1,208.00	120,800
	1. NET TOTAL OUTDOOR PROGRAM (Net Q4 2021 $)	1,035	m^2	$5,501/m^2	$5,693,700
2. On Site Works					
1	Site clear and grub	1,035	m^2	14.00	14,500
2	Allow for earthworks	1	sum	52,500.00	52,500
3	Concrete pad 2.5m x 2.5m for new PMT	1	no.	2,625.00	2,600
4	8' high chain link fence with visibility shielding	52	m	302.00	15,700
5	Allow for make good existing	1	sum	10,500.00	10,500
6	Soft landscaping including growing medium:				-
	- 1.5m high grass	360	m^2	242.00	87,100
	- Small Trees	2	no.	1,208.00	2,400
7	M&E site services - new water, sanitary, pool heat & filtration, and electrical systems to site boundary	1	sum	262,500.00	262,500
8	Allowance for new fire lane access (scope TBD)	1	sum	52,500.00	52,500
9	Off-site works - Excluded		Excl.		-
	2. NET TOTAL ON SITE WORKS (Net Q4 2021 $)				$500,300
3. Demolition & Ancillary Works					
1	Demolish existing building and site works (Excluded)		Excl.		-
2	Hazardous Materials (Excluded, if any)		Excl.		-
	3. NET TOTAL DEMOLITION & ANCILLARY WORKS (Net Q4 2021 $)				$0

Class D +/- 25% typical range of accuracy

Exclusions from Net Construction Estimates (refer to project pro-forma summary):

- Division 1 General Conditions and CM/GC Fee costs are built into the unit rates.
- The above estimate is for the outdoor pool and associated facilities, and site work construction cost only.
- Design pricing contingency is excluded (refer to project pro-forma summary).
- The above net estimate is priced in current Q4 2021 local dollars. No escalation contingency has been included (refer to project prc
- Construction contingency is excluded (refer to project pro-forma summary).
- Off-site works are excluded (refer to project pro-forma summary).
- Soft costs such as professional fees, DCCs and building permits, management, FF&E are excluded (refer to project pro-forma).
- Goods & Services Tax excluded, PST included.
- Refer to report for basis, assumptions, methodology and exclusions.

APPENDIX F - BINNIE ENGINEERING - TRAFFIC REPORT

R.F. BINNIE & ASSOCIATES LTD.
300 - 4940 Canada Way,
Burnaby, BC V5G 4K6
TEL 604 420 1721
BINNIE.com

Memorandum

To:	Ian Ross McDonald, Carscadden	From:	Po Sun, Binnie
Cc:		Date:	October 26, 2021
Project Title:	City of Vancouver Outdoor Pool Traffic Study	File No.:	21-0798-05
Re:	Comparative Traffic Analysis of Proposed Outdoor Pool Locations Memo		

R.F. Binnie & Associates Ltd. (Binnie) was retained by Carscadden Stokes McDonald Architects Inc. (the Architect) to conduct a comparative traffic study for the Vancouver Board of Parks and Recreation to determine the feasibility of an outdoor lap pool (the Project) at two proposed locations:

- Hillcrest Centre (4575 Clancy Loranger Way)
- Mount Pleasant Park (3161 Ontario Street)

The proposed outdoor lap pool at Hillcrest Centre is expected to consist of four 25-meter lanes with a ramp entry. The proposed outdoor lap pool at Mt. Pleasant Park will similarly have four 25-meter lanes but with an additional leisure pool area.

The objectives of this comparative traffic study are to:

- Estimate the projected vehicular trip generation from the proposed outdoor lap pool and how the existing transportation network could accommodate it.
- Estimate the projected parking demand and how it could be accommodated at each site.
- Identify potential access locations for an outdoor lap at each location.
- Provide a high-level comparison of the potential transportation impacts at the two proposed sites that could be generated by the provision of a new outdoor lap pool.

1 EXISTING CONDITION

1.1 Hillcrest Centre

Hillcrest Centre is a multi-purpose recreational and community centre with hockey and curling rinks, a gymnasium, and a library, located at Hillcrest Park. Currently, Hillcrest Centre features a leisure pool, a 50-meter lap pool, and an outdoor aquatic area. Hillcrest Centre is also located just north of the Nat Bailey Stadium, home to the Vancouver Canadians Baseball Club, which shares the same block.

1.1.1 Adjacent Road Network

Hillcrest Centre, located within Hillcrest Park, is bounded by Dinmont Avenue to the northwest, Peveril Avenue to the northeast, Ontario Street to the east, and Midlothian Avenue to the south. Clancy Loranger Way from Midlothian Avenue provides direct frontage access to Hillcrest Centre within Hillcrest Park. These roadways are discussed in further detail below.

Dinmont Avenue

Dinmont Avenue is a two-way local residential street that generally runs in a diagonal north-south direction from Midlothian Avenue to Peveril Avenue. On-street parking is available on both sides of the street.

Peveril Avenue

Peveril Avenue is a two-way local residential street that generally runs in a diagonal east-west direction from Dinmont Avenue to Ontario Street. There is no on-street parking along the park side of the street and there is no on-street parking along the residential side during events at the Nat Bailey Stadium, except for residents on the block.

Ontario Street

Ontario Street is a two-way local residential street that generally runs in a north-south direction from Peveril Avenue to Midlothian Avenue. There is on-street parking on the park side along portions of this corridor while on-street parking on the residential side is generally restricted to local residents only with few exceptions for 2-hour parking from 9am to 8pm, Monday to Saturday. A portion of Ontario Street towards Midlothian Avenue is currently closed off to vehicular through traffic.

Midlothian Avenue

Midlothian Avenue is a two-lane secondary arterial that generally runs in a diagonal east-west direction from Dinmont Avenue to Ontario Street with on-street bike lanes in both directions. There are limited on-street parking along portions of the corridor. Midlothian Avenue provides access to Clancy Loranger Way, which leads to the frontage of Hillcrest Centre.

Clancy Loranger Way

Clancy Loranger Way is a two-way street that provides direct access to the frontage of Hillcrest Centre and the surrounding surface parking lots. There is no on-street parking available.

1.1.2 Off-Street Parking

There are multiple existing surface parking lots concentrated around the south side of Hillcrest Centre and around the perimeter of the Nat Bailey Stadium. There are approximately 525 parking spaces available on-site based on Binnie's preliminary estimate.

1.2 Mount Pleasant Park

Mount Pleasant Park is a neighborhood park featuring a central lawn area, playgrounds, basketball courts, skateboard parks, a community garden, seating, universally accessible paths and picnic areas, and an accessory surface parking lot. Mount Pleasant Park shares the same block with Simon Fraser Elementary School and a childcare centre to the east. There is also a bikeshare station located at the southwestern corner of the park, on Ontario Street.

1.2.1 Adjacent Road Network

Mount Pleasant Park is bounded by West 15th Avenue to the north, Ontario Street to the east, West 16th Avenue to the south, and Columbia Street to the west. These roadways are discussed in further detail below.

West 15th Avenue

West 15th Avenue is a two-way local residential street that generally runs in an east-west direction from Columbia Street to Ontario Street. There is limited 2-hour parking from 8:00 AM to 6:00 PM, Monday to Friday, along portions of the street on the residential side, which currently only allows parking for residents on the block. Within the vicinity of the elementary school, there is limited 3-

minute pick-up and drop-off permitted between 8:00 AM to 5:00 PM on school days while on-street parking is available near the perimeter of the Mount Pleasant Park.

Ontario Street

Ontario Street is a two-way local residential street that generally runs in the north-south direction from West 15th Street to West 16th Street. On-street parking is available on both sides of the street.

West 16th Avenue

West 16th Avenue is a two-lane secondary arterial that generally runs in the east-west direction from Columbia Street to Ontario Street. On-street parking is available along both sides of the street, except near the vicinity of the elementary school, where it is currently limited to 3-minutes pick-up/drop-off between 8:00 AM to 5:00 PM on school days.

Columbia Street

Columbia Street is a two-way local residential street that generally runs in the north-south direction from West 15th Avenue to West 16th Avenue. Along the residential side, portions of the block allow 2-hour on-street parking from 8:00 AM to 6:00 PM, Monday to Friday while the remaining portions of the block only allow parking for residents of the block. On-street parking is available along the school side, except during school days where it is restricted to 30-minutes drop-off/pick-up from 8am to 5pm.

1.2.2 Off-Street Parking

There is an existing surface parking lot at the northwest corner of Mount Pleasant Park, adjacent to the Simon Fraser Elementary School playgrounds. There are approximately 22 parking spaces available on-site based on Binnie's preliminary estimate.

2 PROJECT CONDITIONS

2.1 Proposed Outdoor Lap Pool

2.1.1 Hillcrest Centre

Based on the site plans provided by the architect, the proposed outdoor lap pool at Hillcrest Centre is expected to consist of four 25-meter swimming lanes (210 square meters) with a ramp entry area and a capacity limit of 94 swimmers. Pool amenities will include accessory universal changing rooms and washrooms. The proposed outdoor lap pool will be accessible from the existing outdoor aquatic area, which is located east of project site and connected to Hillcrest Centre. It is anticipated that the proposed outdoor lap pool will be open for operation only during the summer season, sharing the same operational schedule as other outdoor pools in the City of Vancouver (the City), which typically runs from mid-June to early-September. Figure 2.1 illustrates the proposal pool location relative to Hillcrest Centre.

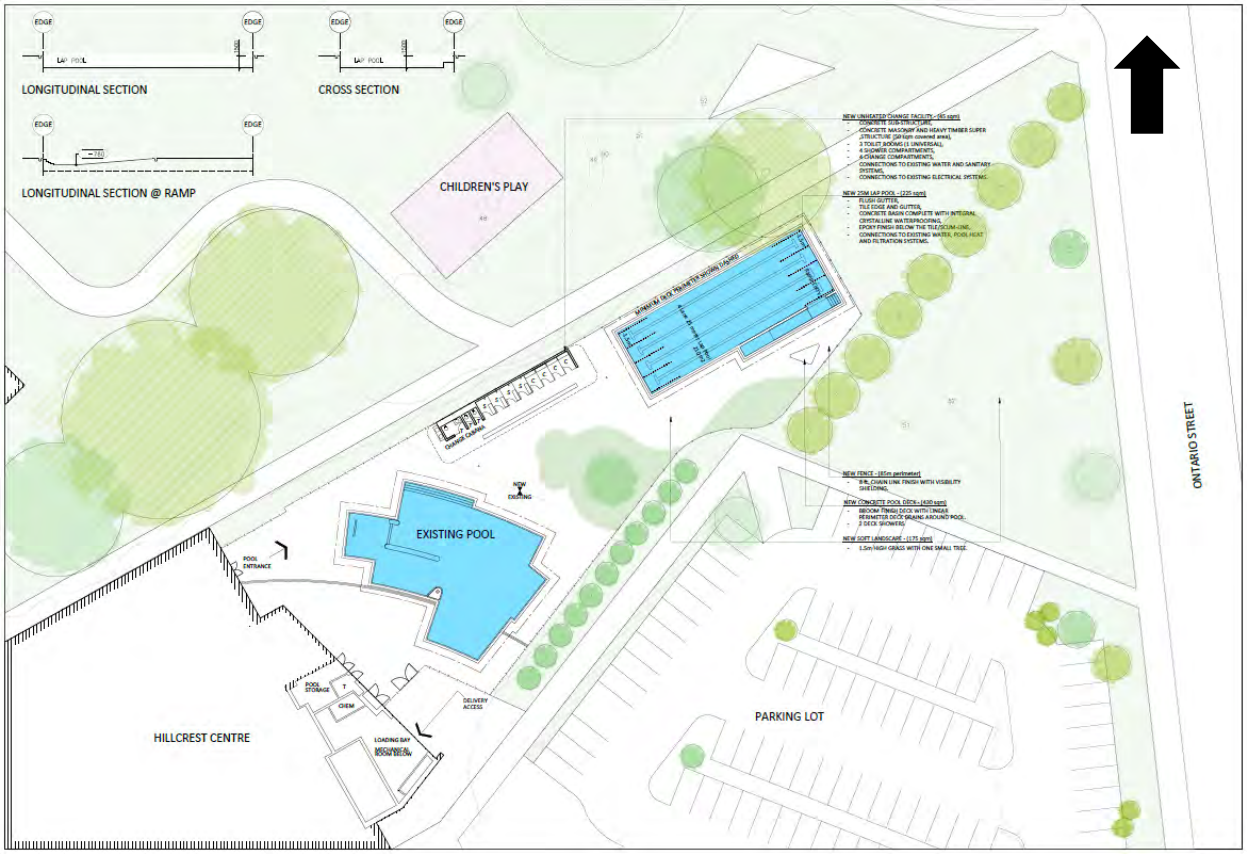

Figure 2.1 – Proposed Lap Pool Location, Hillcrest (Source: Carscadden)

2.1.2 Mount Pleasant Park

Based on the site plans provided by the architect, the proposed outdoor lap pool at Mount Pleasant Park is expected to consist of four 25-meter swimming lanes (210 square meters) with a ramp entry area. The proposed project at this location is expected to have an additional leisure pool area of 154 square meters and will have a capacity limit of 250 swimmers. Pool amenities will include accessory universal changing rooms and washrooms, and other supportive uses including a 200 square meter office and mechanical space. The proposed outdoor lap pool will be accessible from the pathways at the northern end of the park. It is anticipated that the proposed outdoor lap pool will be open for operation only during the summer season, sharing the same operational schedule as other outdoor

pools in the City, which typically runs from mid-June to early-September. Figure 2.2 illustrates the proposal pool location relative to Mt Pleasant Park.

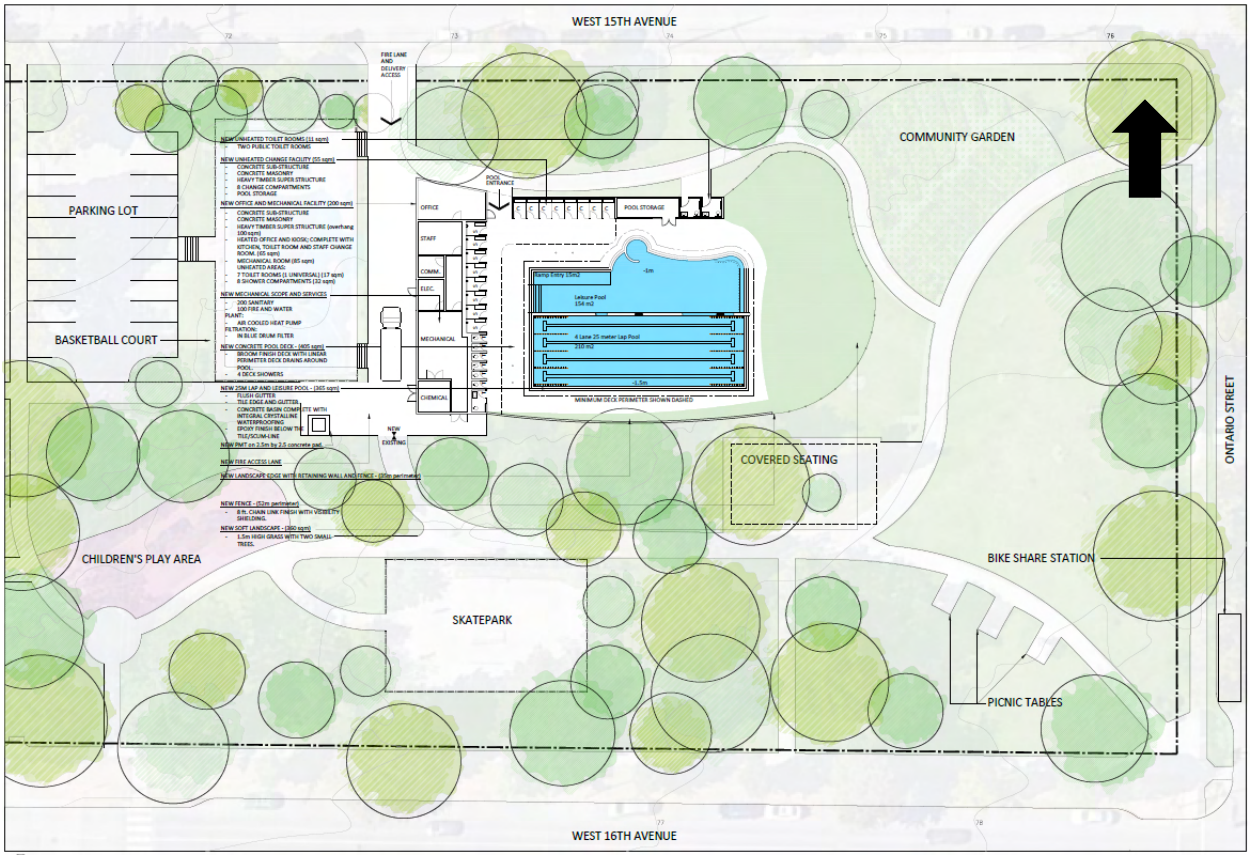

Figure 2.2 – Proposed Lap Pool Location, Mt Pleasant (Source: Carscadden)

2.2 Site Vehicular Access

2.2.1 Hillcrest Centre

As the project does not include additional surface parking or new access roads, it is expected that future users driving to Hillcrest Park will be able to access the proposed outdoor laps pool at existing vehicular entry locations. Currently the surface parking lots can be accessed from two entry locations on Ontario Street, one entry location on Midlothian Avenue, and one more entry location from Clancy Loranger Way. On-street parking is also available along portions of the park perimeter.

2.2.2 Mount Pleasant Park

As the project does not include additional surface parking or new access roads, it is expected that future users driving to the park will be able to access the proposed outdoor laps pool at existing vehicular entry locations. Currently the accessory parking lot can be accessed from West 15th Avenue. On-street parking is also available along the perimeter of the park.

3 TRAVEL AND PARKING DEMAND

3.1 Vehicular Trip Generation

3.1.1 Hillcrest Centre

Given the existing multi-purpose recreational facilities in Hillcrest Park, Hillcrest Centre is assumed to be a regional and destination facility where a higher proportion of users drive to the park from beyond the immediate surrounding neighborhood. The wide range of recreational facilities and amenities is also conducive for family and group activities and so a vehicular occupancy rate of two is assumed for this location. Based on the site plans provided by the architect, the capacity limit for the proposed outdoor lap pool at this location is expected to be 94. Referencing the City's Transportation 2040 Plan, which set a target vehicular mode-share of approximately 33%, it is anticipated that an outdoor lap pool at this location can potentially generate an additional 16 vehicle trips during the midday peak hour with the assumed vehicular occupancy rate and seasonal operations.

3.1.2 Mount Pleasant Park

Given its existing design, available amenities, nearby bikeshare station, and location, Mount Pleasant Park is assumed to be a local park where a higher proportion of users walk or bike to the park from the surrounding neighborhoods. Based on the site plans provided by the architect, the capacity limit for the proposed outdoor lap pool at this location is expected to be 250. The inclusion of a leisure pool in addition the lap lanes at this location is anticipated to attract families and recreational swimming, and so a vehicular occupancy rate of two is assumed for this location.

Referencing the City's Transportation 2040 Plan, which set a target vehicular mode-share of approximately 33%, it is estimated that an outdoor lap pool at this location will generate a relatively lower proportion of vehicle trips given the likelihood for visitors to walk and bike to the park. Applying a vehicular mode-share of 23%, it is estimated that the proposed outdoor lap pool will generate an additional 29 vehicle trips during the midday peak hour with the assumed vehicular occupancy rate and seasonal operations.

3.2 Parking Demand

The City of Vancouver's Parking Bylaw, Section 4 provides the following required parking spaces for a swimming facility with spectator facilities:

- One space for every 9.3 square meters of pool space.

However, given that the proposed outdoor lap pool at either of the proposed location will not consist of spectator facilities, the City of Burnaby's Parking Bylaw was used as an additional reference, which provides the following required parking spaces for a swimming facility:

- One space for every 46 square meters of pool space.

Taking the average of required parking spaces as described in both the City of Vancouver Parking Bylaw and the City of Burnaby Parking bylaw, the following parking demand rate was used for this study:

- One space for every 26 square meters of pool space.

3.2.1 Hillcrest Centre

Based on the site plans provided by the architect, the proposed outdoor lap pool at this location will have a total of 210 square meters of pool space, which will require approximately 8 parking spaces.

3.2.2 Mount Pleasant Park

Based on the site plans provided by the architect, the proposed outdoor lap pool at this location will have an additional attached leisure pool with a total of 365 square meters of pool space, which will require approximately 14 parking spaces.

4 CONCLUSION

4.1 Summary Comparison

The estimated vehicular trip generation and parking demand for an outdoor lap pool at the two proposed locations are summarized below:

Table 1: Vehicular Trip Generation and Parking Demand Comparison

Location	Vehicular Trip Generation	Parking Demand
Hillcrest Centre	Up to 16 vehicles / peak hour	8 additional parking spaces
Mount Pleasant Park	Up to 29 vehicles / peak hour	14 additional parking spaces

4.1.1 Hillcrest Centre

Hillcrest Centre/Hillcrest Park already has a variety of multi-purpose recreational facilities and is assumed to share the existing surrounding surface parking lots with Nat Bailey Stadium to the south. The provision of an outdoor lap pool at the Hillcrest Centre is estimated to generate up to 16 vehicle trips during the peak hour and would require 8 accessory parking spaces, which is expected to be absorbed by the existing surrounding surface parking lots. On-street parking is also available along portions of the park perimeter. The proposed outdoor lap pool at this location would complement the existing multi-purpose recreational facilities, which includes a leisure pool, a 50-meter lap pool, and an outdoor aquatic area.

4.1.2 Mount Pleasant Park

Mount Pleasant Park is a local park with a nearby bikeshare station where a relatively higher proportion of visitors is assumed to walk or bike to the park from the surrounding neighborhoods. The provision of an outdoor lap pool at Mount Pleasant Park is estimated to generate up to 29 vehicle trips during the peak hour and would require 14 accessory parking spaces. Given that the existing accessory parking lot is relatively small, it is anticipated that the additional parking spaces required will need to be absorbed by on-street parking along portions of the park perimeter. In addition, some of the existing on-site parking could be converted to passenger loading spaces to help with drop-off and pick-up activities during the summer season.