City of Richmond

Agenda

Public Works and Transportation Committee

Anderson Room, City Hall
6911 No. 3 Road

Wednesday, April 18, 2018
4:00 p.m.

Pg. # ITEM

MINUTES

PWT-5 ***Motion to adopt the minutes of the meeting of the Public Works and Transportation Committee held on March 21, 2018.***

NEXT COMMITTEE MEETING DATE

Thursday, May 24, 2018, (tentative date) at 4:00 p.m. in the Anderson Room

DELEGATION

1. Henrik Laursen, to speak on (1) a hop-on / hop-off bus, (2) a tram system in Steveston, and (3) speeding along Steveston Highway.

PLANNING AND DEVELOPMENT DIVISION

2. **TRAFFIC SAFETY ADVISORY COMMITTEE – PROPOSED 2018 INITIATIVES**
(File Ref. No. 01-0100-30-TSAD1-01) (REDMS No. 5702321)

PWT-13 See Page **PWT-13** for full report

Designated Speaker: Victor Wei

STAFF RECOMMENDATION

(1) That the proposed 2018 initiatives for the Traffic Safety Advisory Committee, as outlined in the staff report titled "Traffic Safety Advisory Committee - Proposed 2018 Initiatives" dated March 21, 2018 from the Director, Transportation, be endorsed; and

(2) That a copy of the above staff report be forwarded to the Richmond Council-School Board Liaison Committee for information.

ENGINEERING AND PUBLIC WORKS DIVISION

3. **INTEGRATED RAINWATER RESOURCE MANAGEMENT STRATEGY**
(File Ref. No. 10-6060-03-01) (REDMS No. 5709139 v. 3)

PWT-18 See Page **PWT-18** for full report

Designated Speaker: Lloyd Bie

STAFF RECOMMENDATION

That the "Integrated Rainwater Resource Management Strategy" as attached to the staff report titled "Integrated Rainwater Resource Management Strategy," dated March 1, 2018 from the Director, Engineering be approved.

4. **DIKE MASTER PLAN - PHASE 2 REPORT**
(File Ref. No. 10-6045-09-01) (REDMS No. 5733629 v.2)

PWT-39 See Page **PWT-39** for full report

Designated Speaker: Lloyd Bie

STAFF RECOMMENDATION

(1) That the existing dike alignment in the Dike Master Plan Phase 2 study area (West Dike from Williams Road to Terra Nova and North Dike from Terra Nova to No. 6 Road) continue to be the primary flood protection dike alignment; and

(2) That the work plan identified in the staff report titled Dike Master Plan – Phase 2 Report from the Director of Engineering, dated March 21, 2018, be endorsed.

5. **BRAZILIAN ELODEA MANAGEMENT UPDATE: MARINER'S VILLAGE (11291 - 11491 7TH AVE)**
(File Ref. No. 10-6160-07-07) (REDMS No. 5777004 v.2)

PWT-103 See Page **PWT-103** for full report

Designated Speaker: Chad Paulin

STAFF RECOMMENDATION

That the staff report titled "Brazilian Elodea Management Update: Mariners Village (11291 – 11491 7th Ave)" from Director, Engineering dated March 21, 2018 be received for information.

6. **ANNUAL REPORT 2017: RECYCLING AND SOLID WASTE MANAGEMENT**
(File Ref. No. 10-6370-01) (REDMS No. 5773340 v.3)

PWT-107 See Page **PWT-107** for full report

Designated Speaker: Suzanne Bycraft

STAFF RECOMMENDATION

That the annual report titled, "Report 2017: Recycling and Solid Waste Management – Improving Recycling Quality" be endorsed and Attachment 1 be made available to the community through the City's website and through various communication tools including social media channels and as part of community outreach initiatives.

7. **2018 NATIONAL PUBLIC WORKS WEEK**
(File Ref. No. 10-6000-01) (REDMS No. 5782043)

PWT-169 See Page **PWT-169** for full report

Designated Speaker: Jatinder Johal

STAFF RECOMMENDATION

That the staff report titled "2018 National Public Works Week", dated April 18, 2018 from the Director, Public Works Operations, be received for information.

8. **MANAGER'S REPORT**

ADJOURNMENT

City of Richmond

Minutes

Public Works and Transportation Committee

Date:	Wednesday, March 21, 2018
Place:	Anderson Room Richmond City Hall
Present:	Councillor Chak Au, Chair Councillor Harold Steves Councillor Carol Day Councillor Alexa Loo
Absent:	Councillor Derek Dang
Call to Order:	The Chair called the meeting to order at 4:02 p.m.

MINUTES

It was moved and seconded
That the minutes of the meeting of the Public Works and Transportation Committee held on February 21, 2018, be adopted as circulated.

CARRIED

NEXT COMMITTEE MEETING DATE

April 18, 2018, (tentative date) at 4:00 p.m. in the Anderson Room

PRESENTATION

1. With the aid of a PowerPoint presentation (copy on file, City Clerk's Office), Leo Chan, Vice President, Canadian High-Speed Rail Research Institute, and Frank Zhu, President, Canadian High-Speed Rail Research Institute, spoke on the potential for high-speed rail from Richmond to Chilliwack and provided the following information:

- the Canadian High-Speed Rail Research Institute has been doing research on various sections of the high-speed rail plan since December 2016;
- Currently the fastest train has a test speed of 605 km/h;
- the fastest high-speed train in operation has a speed of 350 km/h;
- the proposed high-speed rail (HSR) would have five stops: Richmond (YVR), Surrey, Langley Township, Abbotsford (YXX), and Chilliwack;
- the implementation of the HSR may generate 40,000 direct and indirect job opportunities;
- it is estimated that approximately 8,700 individuals per day may ride the HSR;
- there is strong public support for HSR from Vancouver to Chilliwack;
- the HSR is estimated to cost $6 billion to complete; and
- the Institute hopes to (i) obtain $1,500,000 for research funds, (ii) collaborate with the Southeast Jiaotong University, (iii) link rail transportation or engineering institutions in Asia and Europe with Vancouver, and (iv) establish an HSR industry in Richmond.

In reply to queries from Committee, Mr. Chan noted that more research is required to implement the HSR plan and that support from the City would be valuable.

Discussion took place on the various stakeholders that were consulted and manners in which the City can support the Canadian High-Speed Rail Research Institute with their research.

As result of the discussion, the following **referral motion** was introduced:

It was moved and seconded
That staff liaise with the Canadian High-Speed Rail Research Institute to (i) examine previous rail proposals, (ii) explore route options, and (iii) provide more information on high-speed rail.

CARRIED

PLANNING AND DEVELOPMENT DIVISION

2. TRANSLINK SOUTHWEST AREA TRANSPORT PLAN – FINAL PLAN

(File Ref. No. 01-0154-04) (REDMS No. 5684886 v. 2; 5688976)

Donna Chan, Manager, Transportation Planning, introduced Geoff Cross, Vice-President, Planning and Policy, TransLink, and Rex Hodgson, Senior Transit Planner, TransLink.

Mr. Cross advised that (i) this is the first time TransLink is initiating a multi-modal plan that takes into account transit, roads, cycling and walking and how they fit together, (ii) this plan looks at the long term needs, (iii) citizens and staff were involved and feedback was important in creating this plan, and (iv) the plan will be implemented following Council consideration.

In reply to queries from Committee, Mr. Cross advised that the Canada Line has exceeded TransLink's projections and despite some inconveniences, the change in bus patterns from Delta to downtown Vancouver has been beneficial.

Mr. Hodgson advised that since the Canada Line as exceeded projections, TransLink has purchased new rail cars and examining increasing its capacity during peak hours.

In reply to queries from Committee, Victor Wei, Director, Transportation, advised that it is recommended that the speed limit between No. 4 Road and Garden City Road be reduced from 60 km/h to 50 km/h to eliminate the need for a pull-out bus bay at Alderbridge Way west of No. 4 Road. He advised that staff and TransLink are actively examining different concepts and exploring opportunities to potentially incorporate a bus exchange in Steveston.

In reply to a query from Committee, Ms. Chan advised that Steveston Highway does not currently have a cycling path, however she noted that staff are examining the potential to update the cycling network plan next year.

It was moved and seconded

(1) That TransLink's Southwest Area Transport Plan, as attached to the report titled "TransLink Southwest Area Plan – Final Plan," be endorsed for implementation;

(2) That a copy of the report titled "TransLink Southwest Area Plan – Final Plan" be forwarded to the Richmond Council-School Board Liaison Committee for information; and

(3) That Traffic Bylaw No. 5870, Amendment Bylaw No. 9816, to revise the posted speed limits on sections of Alderbridge Way and Garden City Road to support the planned transit improvements, be introduced and given first, second and third reading.

CARRIED

3. **PUBLIC BIKE SHARE - PROPOSED PILOT PROJECT**
(File Ref. No. 10-6500-01) (REDMS No. 5754120 v. 4)

Sonali Hingorani, Transportation Engineer, provided an update on staff consultation with local bike shops and noted that (i) staff sent a letter to bike shop owners for feedback with respect to the bike share program, (ii) two bike shops stated that they are optimistic that potential bike share operators would engage them, (iii) bike shops indicated that rentals are not their primary business, and (iv) bike shops wish to provide feedback and be consulted following the implementation of the pilot program as it relates to its effect on their business.

In reply to queries from Committee, Ms. Hingorani provided the following information:

- the recommendation is for a request for proposal to seek a potential bike share provider for a trial period in order for staff to further assess the programs feasibility;
- the cost to the host city is negligible as the benefit of a dockless bike share system is that there is no need for permanent fixtures to affix the bikes to;
- staff have been approached by a variety of proponents in the area to launch the program;
- if endorsed by Council, staff would develop the request for proposal, provide a report for Council's consideration;
- recent bike share pilot programs have been launched in urban centres of cities, as this area is dense with high traffic congestion;
- staff do not want to open the pilot program city-wide as they want to learn from the initial phase; and
- staff wish to see a viable program and the concentration of population, amenities and residents in the City Centre area lends itself as an appropriate trial location.

It was moved and seconded

(1) That staff be directed to issue a Request for Proposals for the development and operation of a public bike share system as a pilot project, as described in the staff report dated February 28, 2018, from the Director, Transportation; and

(2) That staff report back on the responses to the above Request for Proposals with further recommendations prior to the award of any contract(s) and implementation of the pilot program.

CARRIED

ENGINEERING AND PUBLIC WORKS DIVISION

4. **WATER USE RESTRICTION BYLAW NO. 7784, AMENDMENT BYLAW NO. 9774**
(File Ref. No. 10-6060-03-01) (REDMS No. 5523527 v. 6; 5720988)

In reply to queries from Committee, Lloyd Bie, Manager, Engineering Planning, advised that (i) once the water use restriction is in place, residents may use water as long as it is from a soaker hose or handheld hose, and (ii) there are permits for residents with regard to watering new lawns.

It was moved and seconded
That the Water Use Restriction Bylaw No. 7784, Amendment Bylaw No. 9774 be introduced and given first, second and third readings.

CARRIED

5. **2018 CLOTHES WASHER REBATE PROGRAM**
(File Ref. No. 10-6650-02) (REDMS No. 5742106)

In reply to queries from Committee, John Irving, Director, Engineering advised that to date over 700 rebates have been allocated through the program and, should the program prove to be successful, staff would bring forward a request for additional funds.

It was moved and seconded

(1) That the City of Richmond partner with BC Hydro to the end of 2018 to offer a combined rebate of $100 for the spring campaign and up to $400in the fall campaign, equally cost shared between BC Hydro and the City, for the replacement of inefficient clothes washers with new high efficiency clothes washers;

(2) That the scope of the existing Toilet Rebate Program funding be expanded to include clothes washer rebates; and

(3) That the Chief Administrative Officer and General Manager, Engineering and Public Works, be authorized to execute an agreement with BC Hydro to implement the Clothes Washer Rebate Program.

CARRIED

6. **ODOUR REGULATION IN BRITISH COLUMBIA**
(File Ref. No. 10-6175-02-01) (REDMS No. 5760322 v. 4)

In reply to queries from Committee, Peter Russell, Senior Manager, Sustainability and District Energy, advised that there are certain emission types and various technologies and techniques to determine an odour.

Mr. Irving advised that Metro Vancouver uses a 'sniff test' to detect odours, however it is a subjective technique and staff are continuously speaking with experts to determine a more reliable technique.

It was moved and seconded

(1) That a letter be sent to the BC Minister of Environment requesting that:

(a) The definition of odour as an air contaminant be included in the BC Environmental Management Act and in the BC Organic Matter Recycling Regulation;

(b) The BC Organic Matter Recycling Regulation include a specific Odour Management Regulation establishing criteria and standards related to concentration and frequency of odorant emissions from composting facilities and define performance criteria for composting facility operations; and

(c) They define a specific standard for how odours shall be measured, monitored, managed, treated, and discharged in a manner that minimizes impacts associated with odorous air contaminants;

(2) That a letter be sent to Metro Vancouver requesting that:

(a) Metro Vancouver update its bylaws and regulations related to composting facilities to establish criteria and standards with clear limits in terms of concentration and frequency for odorant emissions from composting facilities; and

(b) Metro Vancouver appropriately resource its permit procedures with criteria and standards for composting facility permits to bring facilities into compliance with industry best practices for Composting Facilities.

CARRIED

7. MANAGER'S REPORT

(i) Referral from Community Safety Committee on traffic safety enhancement measures on River Road

Mr. Wei referenced a staff memorandum dated March 15, 2018, noting that no action on traffic safety enhancements will be taken on River Road including the installation of speed humps, until after the RCMP complete their traffic enforcement activities at the end of the summer. He commented on signage installed along River Road, noting that it is consistent with national guidelines and standards and certain signage is appropriate given the narrow nature of River Road.

In reply to queries from Committee, Mr. Wei advised that a previous referral motion directed staff not to implement any safety enhancements along River Road until after the RCMP has conducted their traffic enforcement. He noted that as part of the RCMP's enforcement efforts, speed radar stations will be set up along River Road.

Discussion took place on implementation of all safety enhancements except speed humps and in reply to queries from Committee, Joe Erceg, General Manager, Planning and Development, advised that it may be appropriate to direct staff to provide a report detailing the feasibility of implementing the various safety enhancements measures, with the exception of speed humps, and report back to General Purposes Committee, at the earliest opportunity.

As a result of the discussion, the following **referral motion** was introduced:

It was moved and seconded
That staff provide a report back on the feasibility of implementing the various traffic safety enhancements on River Road, with the exception of speed humps, prior to RCMP reporting back on its enforcement efforts in Fall of this year.

Lynda Parsons, 2491 No. 8 Road, noted that the traffic radar data collection units were part of a previously passed resolution in 2015 and have yet to be installed along River Road. Ms. Parsons expressed concern with the resolutions passed in June 2017 and September 2017, and noted that the survey distributed to area residents found that 60% were against the installation of speed humps. Ms. Parsons requested that the signage currently installed be taken down and replaced with other signage and that road markers be reinstalled.

Mr. Erceg clarified that no speed humps will be installed until after the RCMP's enforcement is completed and that staff can communicate with residents and bring forward a report to General Purposes Committee. It was further noted that the next General Purposes Committee meeting was scheduled for April 3, 2018, and that it was a tight timeframe to complete the report.

Yves Trividic, 22600 River Road, expressed concern with the survey distributed to residents, noting that 60% of the survey respondents were against the installation of speed humps, and residents' opinions were not taken into account when decisions were made.

Trudy Haywood, 22610 River Road, spoke to the cement blocks on River Road that were damaged, and was of the opinion that large trucks using River Road damaged the cement blocks while turning. She spoke to the signage along River Road, noting that she believes there are too many signs along the road. Ms. Haywood expressed concern with the cyclists along River Road, remarking that residents and cyclists need to be educated on proper cycling protocol.

Arlene Trividic, 22600 River Road, expressed concern with improper cycling protocols along River Road, noting that she has documented poor cycling habits every weekend. She then spoke to the signage along River Road, and was of the opinion that they were misleading and not displaying proper information to cyclists.

The question on the referral motion was then called and it was **CARRIED**.

ADJOURNMENT

It was moved and seconded
That the meeting adjourn (5:57 p.m.).

CARRIED

Certified a true and correct copy of the Minutes of the meeting of the Public Works and Transportation Committee of the Council of the City of Richmond held on Wednesday, March 21, 2018.

Councillor Chak Au
Chair

Sarah Kurian
Legislative Services Coordinator

City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	March 21, 2018
From:	Victor Wei, P. Eng. Director, Transportation	**File:**	01-0100-30-TSAD1-01/2018-Vol 01
Re:	**Traffic Safety Advisory Committee – Proposed 2018 Initiatives**		

Staff Recommendation

1. That the proposed 2018 initiatives for the Traffic Safety Advisory Committee, as outlined in the staff report titled "Traffic Safety Advisory Committee - Proposed 2018 Initiatives" dated March 21, 2018 from the Director, Transportation, be endorsed.

2. That a copy of the above staff report be forwarded to the Richmond Council-School Board Liaison Committee for information.

Victor Wei, P. Eng.
Director, Transportation
(604-276-4131)

REPORT CONCURRENCE		
ROUTED TO:	**CONCURRENCE**	**CONCURRENCE OF GENERAL MANAGER**
Community Bylaws Fire Rescue RCMP	☑ ☑ ☑	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	**INITIALS:** CJ	**APPROVED BY CAO**

Staff Report

Origin

Council endorsed the establishment of the Traffic Safety Advisory Committee (TSAC) in 1997, in order to create a co-operative partnership between City staff, community groups and other agencies that seek to enhance traffic and pedestrian safety in Richmond. The Committee provides input and feedback on a wide range of traffic safety issues such as school zone concerns, neighbourhood traffic calming requests and traffic-related education initiatives. TSAC has representation from the following groups: Insurance Corporation of BC (ICBC), Richmond School District, Richmond RCMP, Richmond Fire-Rescue, Richmond District Parents Association, and the City's Transportation and Community Bylaws Departments. This report summarizes the Committee's activities in 2017 and identifies proposed initiatives for 2018.

This report supports Council's 2014-2018 Term Goal #1 A Safe Community:

> *Maintain emphasis on community safety to ensure Richmond continues to be a safe community.*
>
> *1.4. Effective interagency relationships and partnerships.*

This report supports Council's 2014-2018 Term Goal #3 A Well-Planned Community:

> *Adhere to effective planning and growth management practices to maintain and enhance the livability, sustainability and desirability of our City and its neighbourhoods, and to ensure the results match the intentions of our policies and bylaws.*
>
> *3.3. Effective transportation and mobility networks.*

This report supports Council's 2014-2018 Term Goal #5 Partnerships and Collaboration:

> *Continue development and utilization of collaborative approaches and partnerships with intergovernmental and other agencies to help meet the needs of the Richmond community.*
>
> *5.2. Strengthened strategic partnerships that help advance City priorities.*

Analysis

The Committee's major activities and accomplishments in 2017 are summarized below.

Road and School Zone Safety Initiatives in 2017

The Committee provided input on and/or participated in the following measures aimed at improving the safety of Richmond roads for all users, particularly in school zones.

- *Pedestrian Zone Markers in School Zones*: Given the past success of in-street mounted signage in school zones and other locations in Richmond, two signs were installed within the school zone on Smith Drive fronting Hamilton Elementary School. Similar signs were also

installed on Jack Bell Drive near Cambie Secondary School where there is a slight curve to advise approaching motorists of a crosswalk (Figure 1).

Figure 1: In-Street Pedestrian Zone Markers on Jack Bell Drive

- *School Travel Planning*: Completion of a pilot program with the Richmond School District, TravelSmart (part of TransLink) and HASTe (Hub for Active School Travel, contractor to TravelSmart) to develop a customized School Travel Plan for three elementary schools: Garden City, AB Dixon and Walter Lee. The Plans aim to create an environment that encourages healthy and active transportation to and from school, improves the journey for those who use vehicles or take school busses, and improves transportation safety for everyone.

- *No. 2 Road-Francis Road*: In response to area residents' concerns and the crash history, a traffic safety review of the Francis Road-No. 2 Road intersection was undertaken in conjunction with ICBC to identify safety issues and potential collision causes, and generate and assess potential mitigation measures. Based on the findings of the review, improvements will be made to better protect residents at the northeast corner from off-road collisions (i.e., installation of decorative crash barrels).

- *River Road (No 6 Road-Westminster Highway)*: Identification of potential road safety improvement measures on River Road to address on-going concerns related to motorist speeding and conflicts with cyclists.

Traffic and Pedestrian Safety Campaigns in 2017

Committee members participated in the following ICBC- and Richmond RCMP-led road and pedestrian safety campaigns.

- *Pedestrian Safety*: In Fall 2017, Richmond RCMP in partnership with ICBC and Richmond Fire-Rescue conducted four pedestrian safety education and enforcement campaigns that involved the distribution of over 7,000 reflectors and proactive engagement with pedestrians. Locations focused on No. 3 Road around the Richmond-Brighouse and Lansdowne Canada Line Stations including on the trains, and the Minoru Library/Cultural Centre.

- "*Project Swoop*": During this event held in May, Speed Watch volunteers set up a speed reader board at a high incident crash location and those drivers who choose to continue to speed even after being clocked by the Speed Watch volunteers will receive a speeding ticket from an RCMP officer a few blocks down the road. Nine officers and 29 volunteers were deployed at eight locations and checked nearly 7,000 motorists. Locations included the 8,000-block No. 5 Road, River Road-Nelson Road, Westminster Highway-No. 8 Road, and Alderbridge Way-May Drive. A total of 14 charges and two written warnings were issued.

- *Distracted Driving*: As part of this campaign that is conducted year-round, RCMP officers and community police volunteers conducted two "Cell Watch" blitz days in March and September that involved a total of 41 deployments (comprising 22 RCMP officers and 99 volunteers) who collectively checked over 41,000 motorists. Targeted locations in March included the Alderbridge Way corridor, Steveston Highway in the vicinity of Ironwood Plaza and streets connecting to Highway 99 in north Richmond (e.g., Great Canadian Way and Bridgeport Road). Locations in September featured No. 3 Road in the City Centre and streets in the vicinity of Ironwood Plaza (e.g., Steveston Highway, Horseshoe Way). A total of 82 charges and 41 written warnings were issued.

- *Auto Crime Awareness*: As part of this annual campaign, RCMP officers and community police volunteers conducted seven "Lock Out Auto Crime" blitz days throughout the year and issued nearly 4,000 notices. At the same, nearly 8,700 licence plates were checked as part of the Stolen Auto Recovery program, which uses up-to-date information on stolen vehicles (provided by the BC Crime Prevention Association) to search licence plates of parked and moving vehicles. If a plate number comes up as a match, the volunteers notify police. Locations focused on parking lots for shopping malls, hotels and other destinations such as Lansdowne Mall, Richmond Centre, Riverport, Richmond General Hospital, and Seafair Shopping Centre.

Proposed Traffic Safety Activities for 2018

In addition to developing and providing input on corrective measures to address identified traffic safety concerns, the Committee will undertake a number of proactive initiatives to enhance traffic safety in 2018.

- *Traffic Calming*: The assessment, implementation and monitoring of road safety and traffic calming measures where warranted in local neighbourhoods, together with consultation with Richmond RCMP and Richmond Fire-Rescue prior to the implementation of any traffic calming measures.

- *School Zone Traffic Safety*: On-going review and improvement of traffic and pedestrian safety in school zones through improving vehicle parking and circulation layout at schools, supporting the enforcement of school zone traffic violations, and introducing new walkways and crosswalks as well as upgraded crosswalks to improve pedestrian safety. The three schools involved in the School Travel Planning process noted above (i.e., Garden City, AB Dixon and Walter Lee) are anticipated to be included in the reviews for 2018.

- *Pedestrian and Traffic Safety Projects and Campaigns*: Continue to provide input on potential road safety improvement measures on River Road (No. 6 Road-Westminster

Highway) and continue to support and participate in on-going multi-agency efforts to increase the level of pedestrian and traffic safety, such as the annual campaigns held by ICBC and Richmond RCMP in various locations.

- *Discouraging Vehicle Speeding*: The member agencies of the Committee will continue to jointly work on initiatives to curb vehicle speeding in the community, such as the deployment of Speed Watch volunteers in various school zones when requested by principals and the targeted enforcement program of Richmond RCMP.

- *Special Events*: Provide comment and input from a traffic safety perspective on the development and implementation of traffic management plans to support special events (e.g., World Festival, Harvest Fest).

Costs associated with the installation of traffic control devices, walkway construction and other road and traffic safety improvements are normally accommodated in the City's annual capital budget and considered as part of the annual budget review process. Some of these projects are eligible for financial contribution from external agencies (e.g., ICBC and TransLink). If successful, staff will report back on the amount of financial contribution obtained from these external agencies through the annual staff reports on ICBC and TransLink cost-sharing programs respectively.

Financial Impact

None.

Conclusion

The Traffic Safety Advisory Committee is one of the few multi-agency forums in the region dedicated to enhancing pedestrian and traffic safety within its home municipality. Since its inception in 1997, the Committee has provided input on and support of various traffic safety improvements and programs and initiated a range of successful measures encompassing engineering, education and enforcement activities. Staff recommend that the proposed 2018 initiatives of the Committee be endorsed and this staff report forwarded to the Richmond Council-School Board Liaison Committee for information.

FOR Donna Chan, P.Eng., PTOE
Manager, Transportation Planning
(604-276-4126)
(on behalf of the Traffic Safety Advisory Committee)

pr. Joan Caravan
Transportation Planner
(604-276-4035)

City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	March 1, 2018
From:	John Irving, P.Eng. MPA Director, Engineering	**File:**	10-6060-03-01/2017-Vol 01
Re:	**Integrated Rainwater Resource Management Strategy**		

Staff Recommendation

That the "Integrated Rainwater Resource Management Strategy" as attached to the staff report titled "Integrated Rainwater Resource Management Strategy," dated March 1, 2018 from the Director, Engineering be approved.

John Irving, P.Eng. MPA
Director, Engineering
(604-276-4140)

Att. 1

REPORT CONCURRENCE		
ROUTED TO:	**CONCURRENCE**	**CONCURRENCE OF GENERAL MANAGER**
Sewerage & Drainage	☑	
Policy Planning	☑	
Parks	☑	
Corporate Communications	☑	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	**INITIALS:**	**APPROVED BY CAO**

Staff Report

Origin

Municipal Commitment 3.4.7 of Metro Vancouver's Integrated Liquid Waste Resource Management Plan dated May 2010 commits member municipalities to develop and implement integrated stormwater management plans at the watershed scale that integrate with land use to manage rainwater runoff. Richmond's integrated stormwater management plan, titled the Integrated Rainwater Resource Management Strategy (the "Strategy"), fulfils this requirement and supports Council's Term Goal #4 *Leadership in Sustainability*.

At the May 24, 2016 Regular Council Meeting, Council adopted the following motion:

> *That the "Integrated Rainwater Resource Management Strategy" as attached to the staff report titled "Integrated Rainwater Resource Management Strategy," dated April 29, 2016 from the Director, Engineering be endorsed for the purpose of public consultation.*

The Strategy was taken to public stakeholders and feedback has been incorporated. This report summarizes the outcomes of engagement activities and presents the final Integrated Rainwater Resource Management Strategy for Council's consideration.

Analysis

Richmond's Integrated Rainwater Resource Management Strategy

The City of Richmond is comprised of a series of islands in the delta of the Fraser River, with the majority of the land mass located on Lulu Island. Lulu Island forms a single watershed with carefully engineered drainage catchments that include channelized watercourses, sloughs and ditches that serve drainage, irrigation and habitat functions. As a floodplain municipality with soft soils, low gradients and a naturally high water table, the City of Richmond has unique stormwater management issues and needs compared to regional neighbours. The development of the Strategy is guided by four main goals to address these specific needs:

1. Minimize the impacts of future development and redevelopment on drainage infrastructure and ecological health;
2. Reduce potable water use;
3. Address existing and future sedimentation issues; and
4. Support the City's Ecological Network.

The Strategy identifies four key strategies to address these goals, with a series of initiatives and an implementation plan outlined for each strategy:

1. Strategic detention of water;
2. Water quality treatment and sediment control;
3. Rainwater harvesting and reuse; and
4. Protection, enhancement and building of green infrastructure.

Stakeholder Engagement and Feedback and Strategy Updates

Staff engaged the development community through presentations made to the Urban Development Institute and Small Builders Group. Staff also engaged the public through the City's community engagement website, Let'sTalkRichmond.ca, where the Strategy was made available online for public feedback. 170 people viewed this site and 66 people participated in the online survey and provided feedback. The majority of public respondents felt that the Strategy adequately addresses Richmond's stormwater management needs. Feedback received through the stakeholder presentations and public surveys are summarized below:

- Of the strategies presented, residents most favoured exploring opportunities for rainwater re-use in parks and conservation lands.

- Approximately 40% of participants who completed the online survey have not previously heard of stormwater management. Residents support hearing more about stormwater management opportunities and initiatives such as the City's rain barrel program.

- There was mixed feedback from both the public and the development community regarding daylighting initiatives and stormwater re-use on private property. While some respondents support these initiatives, others are concerned that these initiatives would become mandated requirements. The current strategy aims to identify, encourage and strategically implement these initiatives on an opportunistic basis.

- Residents expressed the desire to see the retention of tree canopies to promote stormwater retention assessed and incorporated into the strategy. The assessment of Richmond's Urban Forest is addressed through the City's Urban Forest Management Strategy and is regulated through the Tree Protection Bylaw, Zoning Bylaw, Environmentally Sensitive Areas and Public Parks and Schools Grounds Regulation Bylaw. The Urban Forest Management Strategy which addresses trees on public property is currently under review and will be updated in 2018. The Strategy has been updated to include reference to the Urban Forest Management Strategy based on feedback received.

- Residents felt that although stormwater management may be important, flood protection is of a greater concern for the City. The Strategy works in conjunction with Richmond's Flood Management Protection Strategy, which provides a guiding framework for continual upgrading and improvement of the City's flood protection.

- Residents expressed concern at building massing and the impacts of increased impermeable surface areas on stormwater management and ecological health of green infrastructure. Development applications are reviewed by staff to ensure compliance with City bylaws, policies and initiatives.

In addition to revisions to incorporate stakeholder feedback, the strategy has also been updated to include examples of stormwater re-use at a detention pond within the Garden City Lands that will be used for the irrigation of farm fields within the park.

Next Steps

The Strategy has been updated to incorporate stakeholder feedback received. If the proposed strategy is approved by Council, staff will begin execution of the implementation plan identified in the Strategy. Projects and policies that are developed according to this Strategy will be presented to Council for review prior to implementation.

Financial Impact

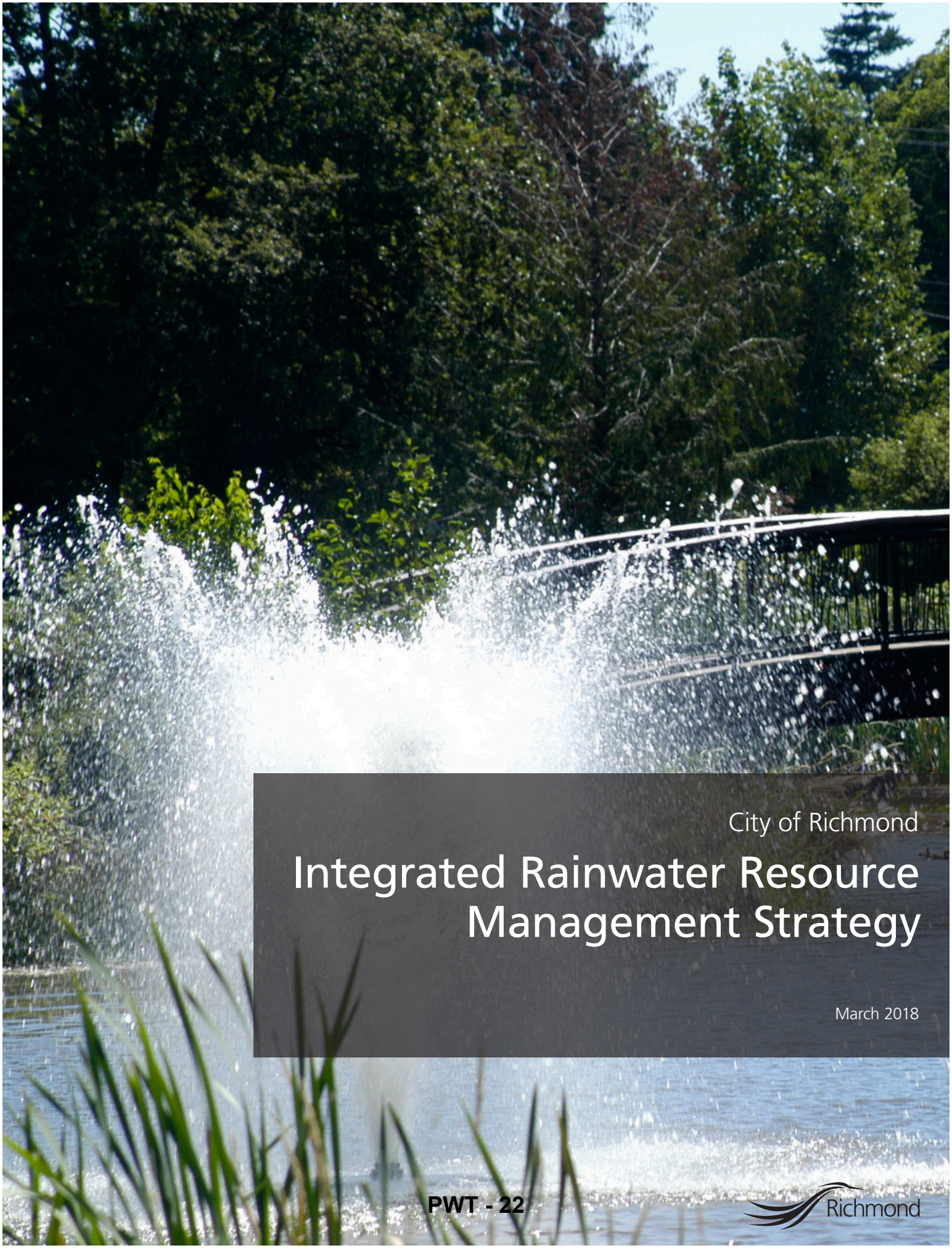
None.

Conclusion

Richmond's Integrated Rainwater Resource Strategy introduces a number of initiatives and strategies to address the City's unique stormwater management needs. The Strategy complements existing City strategies and initiatives such as the Official Community Plan, Flood Protection Management Strategy, Ecological Network Management Strategy and Urban Forest Management Strategy, and fulfils Richmond's obligations in Metro Vancouver's Integrated Liquid Waste Resource Management Plan to develop an Integrated Stormwater Management Plan.

Lloyd Bie, P.Eng.
Manager, Engineering Planning
(604-276-4075)

Att. 1: Integrated Rainwater Resource Management Strategy – March 2018



City of Richmond

Integrated Rainwater Resource Management Strategy

March 2018

Richmond

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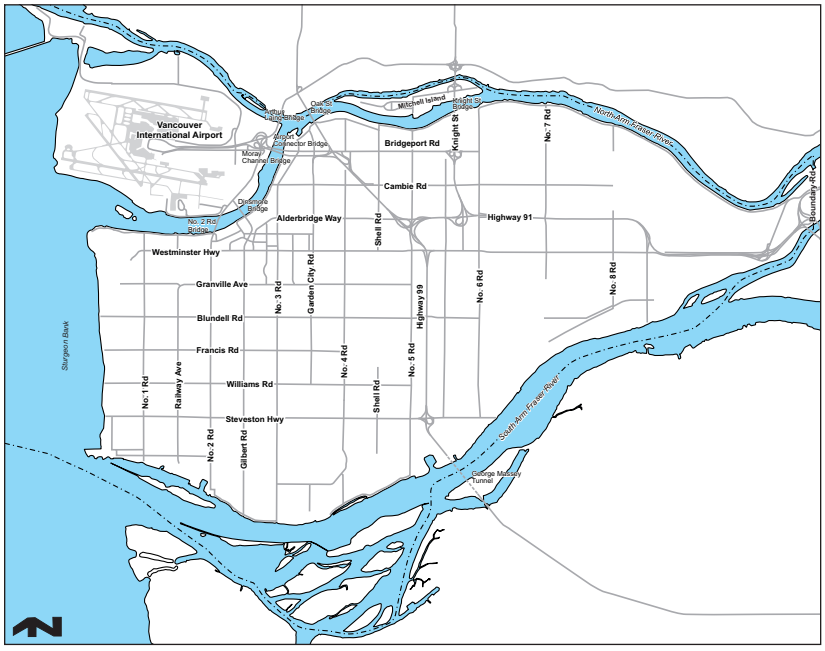
Introduction

Geographic Context

The City of is comprised of a series of islands in the delta of the Fraser River, with the majority of the land mass located on Lulu Island. Early settlers built dikes and drained the land to farm. Today, agriculture remains and important part of Richmond's economy and character. While West Richmond is predominantly urban, East Richmond is considered to be rural and agricultural.

Lulu Island is characterized by a relatively flat topography with an average elevation of one meter above sea level. Since much of the island is below the elevation of high tide, the perimeter of the island has been diked to prevent flooding. Stormwater runoff is either drained by gravity during low tides, or pumped out of the City during high tides.

The island forms a single watershed with carefully engineered drainage catchments that include channelized watercourses, sloughs and ditches that serve drainage, irrigation and habitat functions. The peat bog substrate, high water table and limited gradient typical of flood plain ecosystems result in slow flowing watershed drainage and water that has elevated temperatures, low dissolved oxygen, and high dissolved iron and other metals when compared to traditional watersheds. The City's inland watercourses are generally considered to be not hospitable to anadromous fish species, but do however, flow into and support and abundance of fish life in the receiving waters of the Fraser River Estuary.



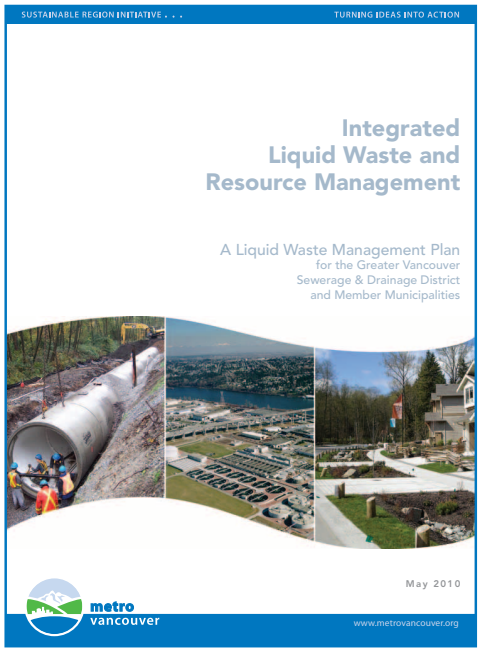
Richmond's Needs for Stormwater Management

Growth: The City of Richmond's population is projected to grow substantially in the next 30 years, as described in the City's *2041 Official Community Plan Update*. Significant development activities anticipated within Richmond result in the following consequences that are addressed through rainwater management in the City:

- Additional **demands on the City's drainage infrastructure** due to increased stormwater runoff from increases in impervious land area.
- **Reduced storage capacity** due to the replacement of roadside ditches and watercourses with pipes or culverts.
- **Increased maintenance demands** for the City's stormwater system due to increased sediment from construction sites and increased road runoff.
- **Impacts to the ecological health** of receiving water bodies due to a proportional increase in pollutant load.

Topographic and Water Quality Challenges: Richmond's distinct topography creates the following unique challenges and opportunities that guide the development of our *Integrated Rainwater Resource Management Strategy*:

- Low gradients in Richmond's gravity drainage system results in slow conveyance, increased temperatures, and lower levels of dissolved oxygen when compared to traditional watersheds.
- A naturally high water table limits the capacity to infiltrate rainwater.
- Richmond's peat bog substrates contribute to naturally occurring dissolved iron and other metals to water and the inland watercourses are generally considered to be inhospitable to anadromous fish species.



Richmond's *Integrated Rainwater Resource Management Strategy* provides a strategic approach to address Richmond's unique stormwater management issues and needs. This results in an approach that differs from many other municipalities. The strategy aims to protect and enhance the City's stormwater conveyance infrastructure and ecological assets under more frequent rainfall events, and considers rainwater as a resource to be utilized.

Regulatory Context

As a member of the Greater Vancouver Sewerage and Drainage District, the City of Richmond is committed to the stormwater management requirements set out in the *2010 Metro Vancouver Integrated Liquid Waste Resource Management Plan* and the terms of the *Minister of Environment's Letter of Acceptance (2011)*. Specifically, the plan commits member municipalities to:

- Develop and implement integrated stormwater management plans that integrate with land use to manage rainwater runoff.
- Update municipal bylaws and utility design standards to meet the criteria set out in the integrated stormwater management plan and enable and encourage on-site rainwater management.

- Develop a program to monitor stormwater, assess and report the implementation and the effectiveness of the integrated stormwater management plan.

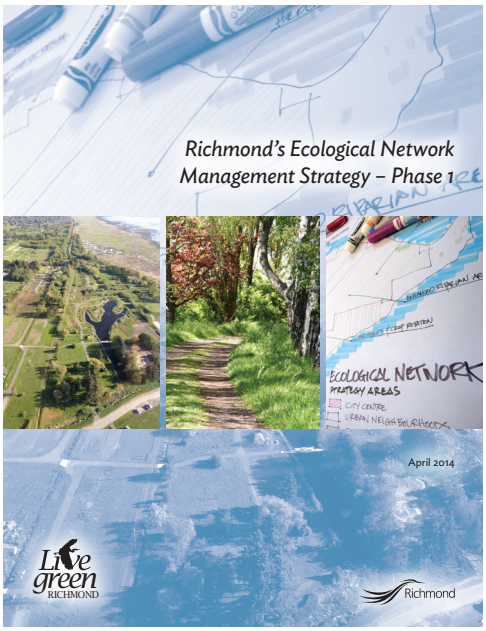
Richmond's *Integrated Rainwater Resource Management Strategy* aims to fulfill requirements of the *Integrated Liquid Waste Resource Management Plan* for stormwater management.

In addition, 119 km of Richmond's 223 km of open waterways are designated Riparian Management Area protected under the provincial *Riparian Area Regulation* and the *Federal Fisheries Act* as they flow into and support fish life in the Fraser River. The new provincial *Water Sustainability Act* also applies to the City's drainage infrastructure. This *Integrated Rainwater Resource Management Strategy* will work to address requirements of these provincial regulations.

Municipal Strategic Context

The *Integrated Rainwater Resource Management Strategy* supports and is congruent with the mandates of several Richmond policies, plans and objectives, including the:

- **2041 Official Community Plan (OCP)**, updated in 2012 forms the City's framework in establishing the City's social, economic, land use, urban design, servicing, transportation and environmental future. The Plan anticipates the City's population to grow by 80,000 people by 2041 and mandates that the City's infrastructure be maintained and improved upon to meet growing needs. The *Integrated Rainwater Resource Management Strategy* aims to address these needs.
- **Flood Protection Management Strategy**, originally adopted by Council in 2008, provides an integrated flood protection framework to minimize flooding and its impacts. While the objectives of the strategies differ, recommendations in the Flood Protection Strategy overlap with those of the *Integrated Rainwater Resource Management Strategy*. Overlapping strategies include the utilization of stormwater retention and detention, strategic raising of land levels through development, and establishment of a Floodplain Bylaw.
- **East Richmond Agricultural Water Supply Study (2006)** and **East Richmond Agricultural Water Supply Update (2013)**, provides a strategy for improving the drainage system in East Richmond to address flood protection and irrigation needs for agricultural lands. As rainwater management strategies within East Richmond's agricultural lands are addressed in the *East Richmond Agricultural Water Supply Study* and its update, the *Integrated Rainwater Resource Management Strategy* will aim to complement that, with a greater focus placed on land uses within West Richmond.
- **Ecological Network Management Strategy (ENMS)**, adopted by Council in 2015, identifies and describes Richmond's Ecological Network and recommends goals, strategies, and actions for protecting, enhancing and connecting natural lands within the City. The strategy addresses similar issues to the *Integrated Rainwater Resource Strategy* including water and habitat quality, impervious surfaces, riparian habitat issues such as bank erosion and green infrastructure enhancement opportunities to increase ecosystem services.



- **Riparian Response Strategy (RRS)** protects Riparian Management Areas that form part of the City's Ecological Network. The strategy, adopted by Council in 2006 identifies 5 m and 15 m riparian setbacks on minor and major watercourses that flow into and support fish life in the Fraser River. The RRS is the City's response to the *Provincial Riparian Area Regulation* (RAR) to protect habitat from industrial, commercial and residential development. Following a Provincial Ombudsperson review of local government's RAR implementation methods in 2012, the City is working with the Province to implement new legislated protection and enhancement measures that is compliant with the directive. The Provincial RAR applies to the City's inland watercourses, but not the foreshore of the Fraser River. The Fraser River foreshore is also part of the City's Ecological Network and is designated Environmentally Sensitive Area in the City's OCP protected under development permit.
- **Urban Forest Management Strategy**, originally adopted by Council in 2001, guides the management and protection of the City's urban forest on public property, which includes trees in City Parks, right-of-ways and boulevards. The strategy is supported by the Tree Protection Bylaw, adopted by Council in 2006. The urban forest supports stormwater management by providing rainwater detention and treatment. The Integrated Rainwater Resource Management Strategy compliments the Urban Forest Management Strategy in supporting initiatives for the protection and maintenance of tree canopies.

Goals

The development of Richmond's *Integrated Rainwater Resource Management Strategy* is guided by four primary goals:

1. To **minimize impacts of future development and redevelopment** on drainage infrastructure and ecological health of receiving water bodies;
2. To **reduce potable water use** consistent with Richmond's sustainability goals;
3. To **address existing and future sedimentation issues** and the associated impacts on the conveyance system; and
4. To **support the City's Ecological Network** through enhancement of green infrastructure.

Strategies

A series of key strategies have been developed to address Richmond's stormwater management needs:

1. Strategic detention of stormwater.
2. Water quality treatment and sediment control.
3. Rainwater harvesting and re-use.
4. Protect, enhance and build green infrastructure.

Management Strategies

Strategy #1: Strategic Detention of Stormwater

IRRMS Goal:

#1: Minimize impacts of future development and redevelopment

As a result of Richmond's growth and ongoing development activities, impervious area in West Richmond is projected to increase. This leads to an escalation in water runoff volumes during major storm events and capacity demands on the City's drainage infrastructure.

The strategy proposes to utilize stormwater detention as a means to reduce excess runoff and consequently minimize or eliminate the need for potential drainage capacity upgrades.

Select Initiatives and Outcomes:

- **Strategic implementation of water detention measures.** Because of the City's low hydraulic grade line, stormwater detention is most effective for developments located near the central areas of the island. The City will pursue opportunities for detention in conjunction with other strategic benefits such as rainwater re-use and ecological and aesthetic enhancements. Applications of detention facilities in The Gardens Agricultural Park and Garden City Community Park set precedence for ongoing collaboration between the City, developers and community groups to incorporate rainwater detention to create innovative and mutually beneficial rainwater management schemes.
- **Increase storage capacity in the City's drainage conveyance system.** Open watercourse and ditches provide greater storage capacity than an enclosed pipe system. The City will continue to preserve open watercourses and is considering daylighting strategies to convert existing drainage pipes to open watercourses as a means to provide detention as well as ecological values.
- **Encourage stormwater detention on private properties** through development and provide guidance and support for voluntary implementation. Examples of potential detention measures include green roofs and rain gardens.

Implementation of rain gardens and rock trenches for detention on private properties.

Application Examples

The Gardens Agricultural Park: The multi-family development located at the corner of Steveston Highway and No. 5 Road utilizes a pond located within the City's The Gardens Agricultural Park to serve as stormwater detention for the development. The City worked with private development to identify opportunities to reduce stormwater run-off and improve water quality while providing aesthetic enhancements for the park.

Garden City Community Park: The Garden City Community Park incorporates a central pond, wetland and swale network that serves as a stormwater detention area during heavy rainfall events. The central pond, together with surrounding trails and a pedestrian bridge, forms a main feature in the park and provides users with a highly liveable and beautiful environment.

Strategy #2: Water Quality Treatment and Sediment Control

IRRMS Goals:

#1: Minimize impacts of future development and redevelopment

#3: Address existing and future sedimentation issues

Sediment Control

Ongoing development activities place additional sediment demands on the City's stormwater infrastructure. Primary sources of sediment demands include construction activities such as sand preloading, the filling of sites to meet flood protection levels and vehicular runoff from additional impervious areas introduced through development.

Sediments are introduced to watercourse and storm sewers during significant rain events, leading to increased maintenance demands for Richmond's watercourses and sewers, and impacts downstream ecology, including the Fraser River.

Sediment and erosion management is important as it allows for future development and redevelopment while protecting environmental values and existing infrastructure.

Additional sediment demands are introduced construction activities and increasing impervious areas.

Select Initiatives and Outcomes:

- **Strengthen and enforce erosion and sediment control requirements** for construction activities. Consider the development of a specific Erosion and Sediment Control Program that includes a bylaw with regulatory requirements. The program should address erosion and sediment control expectations, acceptable Best Management Practices, sampling and reporting requirements for construction sites and specific controls for preload activities.
- **Enhance riparian vegetation and implement bank protection works** for areas of watercourses vulnerable to sloughing.
- **Encourage water quality improvement** for runoff from impervious areas to mitigate the migration of pollutants into the drainage network. Strategies for improving water quality for specific land uses include:
  - Single-family residential: Pollutant removal through absorbent landscaping or rain gardens.
  - Multi-family residential, Industrial, Commercial and Institutional: Pollutant removal through absorbent landscaping, rain gardens or manufactured oil-grit separators.
  - Parks and Conservation Lands: Pollutant removal through absorbent landscaping or rain gardens.

Water Quality Treatment and Monitoring

The BC Minister of Environment's approval of Metro Vancouver's *Integrated Liquid Waste Resource Management Plan* requires that municipalities monitor stormwater to assess and report on the effectiveness of the stormwater management plan implementation. To fulfill this provincial requirement, Metro Vancouver developed a *Monitoring and Adaptive Management Framework* (MAMF) with recommended parameters to monitor watershed health and assess the effectiveness of stormwater management throughout the region.

Due to Richmond's unique water quality conditions, the recommended MAMF parameters do not adequately reflect the effectiveness of Richmond's stormwater management plan. Under pre-development conditions, naturally occurring water quality parameters may exceed the water quality guidelines due to slow conveyance and natural soil conditions, and it is not the intent of the *Integrated Rainwater Resource Management Strategy* to alter naturally occurring conditions. As such, Richmond **will pursue a modified MAMF to guide water quality monitoring** for development activities within Richmond. Monitoring and reporting may include the following parameters:

- Physical: pH.
- Sediment: Total suspended sediment, turbidity.
- Nutrients: Nitrate.
- Microbiological indicators: E. coli, fecal coliforms.
- Metals: Total copper, total lead, total zinc, total cadmium.
- Flow monitoring: MAD, TQ Mean, Low Pulse Count, Low Pulse Duration, Summer Baseflow, Winter Baseflow, High Pulse Count, and High Pulse Duration.

Monitoring should be undertaken on Richmond's larger watercourses, near pump station or other locations that capture the majority of catchment flow.

Strategy #3: Rainwater Harvesting and Re-use

IRRMS Goals:

#1: Minimize impacts of future development and redevelopment

#2: Reduce potable water use

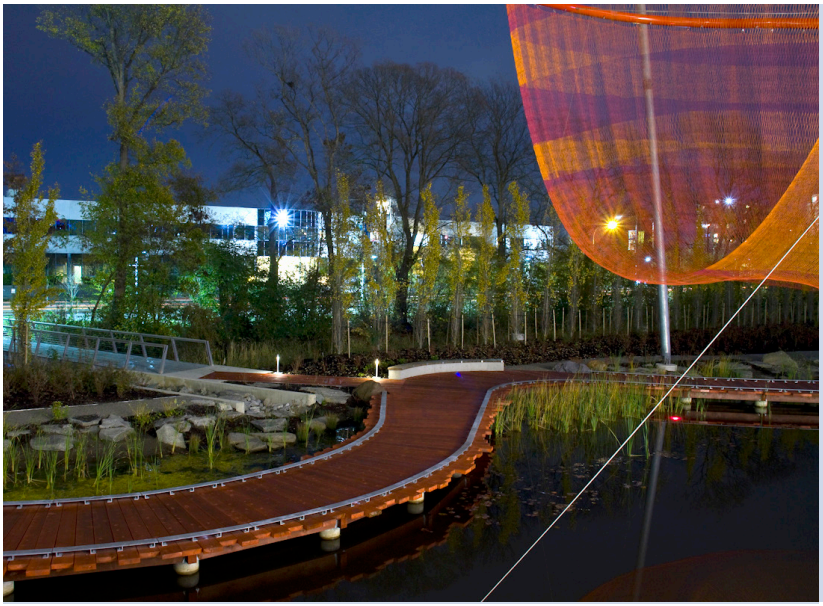
Rainwater harvesting and re-use strategies utilizes water as a resource and offer the two-fold benefit of reducing stormwater runoff volumes as well as potable water consumption. It is a key aspect in addressing the "resource" component of the *Integrated Rainwater Resource Management Strategy*.

Rainwater, primarily from building roofs, can be collected, stored, and treated as required depending on its intended application. Primary applications for rainwater re-use include indoor use for toilet flushing and outdoor use for irrigation and vehicle washing. Richmond currently utilizes potable water for these applications.

Select Initiatives and Outcomes:

- **Address barriers to implementation** for the utilization of harvested rainwater for indoor, non-potable uses such as toilet flushing. The City will review internal and external guidelines and work to enable rainwater re-use for a wider range of applications.
- **Explore further opportunities to incorporate rainwater re-use strategies in parks and conservation lands** through continued ongoing collaborations between the City of Richmond Engineering, Parks and Sustainability departments, as well as developers and community groups.
- **Provide education and support** to improve public knowledge and acceptance of rainwater re-use practices.
- **Monitor the prevalence of re-use technologies inside and outside Richmond.** The price of potable water is currently $\$1.26/m^3$. Potable water-use thresholds for economical benefits of rainwater re-use strategy applications in residential, industrial and commercial applications are as follows:
  - Single-family residential: $\$4/m^3$
  - Multi-family residential (medium- to high-density developments): $\$3/m^3$
  - Office (medium- to high-density developments): $\$2/m^3$

Application Examples



Water Sky Garden at the Richmond Olympic Oval: The Water Sky Garden at the Richmond Olympic Oval contains a wetland treatment pond which serves as a component of a public art piece and provides runoff detention as well as stormwater re-use. Rainwater from the Olympic Oval's two-hectare roof is drained into the pond, where it is treated by vegetation and aerated through a fountain. The harvested and treated water is used for toilet flushing in the Oval and irrigation of plants in the surrounding space.

Garden City Lands: Upon completion, the Garden City Lands will host a number of water bodies that serve both as aesthetically pleasing landscape features as well as measures for stormwater detention and re-use. In 2017, a pond was constructed within the park to serve both as irrigation storage for farm fields within the park and stormwater detention. Several other water storage bodies are planned for future phases of the park. Additionally, the Bog located on the eastern half of the site serves both as a site for restoration of sensitive ecological habitat as well as a large stormwater detention measure.

Rain Barrel Program: In 2005, the City of Richmond implemented the rain barrel program aimed at encouraging residential water conservation. The program invites Richmond residents to purchase rain barrels from the City at a subsidized rate. Rain barrels are used by residents to collect and store water for outdoor usage such as watering gardens and washing vehicles. As of January 1, 2016, the City has sold 1,247 barrels to Richmond's residents.

Strategy #4: Protect, Enhance and Build Green Infrastructure

IRRMS Goal:
#4: Support the City's Ecological Network

Green infrastructure encompasses the components of the natural and built environment that provide ecosystem services such as drainage, water filtration, green space and wildlife habitat. The development of these green infrastructures for stormwater management purposes opens opportunities to enhance watercourse habitat and provide other ecosystem services.

This strategy aims to support Richmond's *Ecological Network Management Strategy* through the protection and enhancement of green infrastructure including watercourses, riparian areas and wetlands.

Typical watercourse conditions in Richmond's RMAs.

Select Initiatives and Outcomes:

- Improvement of watercourse health through restoration and enhancement of riparian areas.
- Creation of wildlife habitat values and temperature mitigation services (ecosystem services) through the creation or restoration of wetlands for the retention, detention and treatment of runoff.
- Improvement of ecosystem services through green infrastructure projects such as rain gardens and green roofs.
- Enhancement of the Ecological Network's connectivity and maximization of ecosystem services through the protection, enhancement and connectivity of natural lands including the daylighting of watercourses.

Daylighting Strategy

A key component of the strategy involves the daylighting, or exposing, of previously covered waterways or stormwater drains. Daylighting of watercourses re-introduces ecosystem services to a catchment, which serve to improve water and habitat quality, flood mitigation and conveyance, provide community amenities and connecting existing isolated ecological lands.

Daylighting opportunities will be identified through assessment of daylighting benefits and triggers.

Implementation Plan

The implementation plan outlines recommended actions and corresponding target implementation timeframes for each strategy. Timeframes for the implementation plan are defined as follows:

- Short-term: 1-2 years
- Medium-term: 3-5 years
- Long-term: 5+ years
- Ongoing: Initiatives the City is currently undertaking and will continue to undertake

The implementation plan will be subject to annual review to measure progress towards achieving the strategy's outcomes. The plan will be updated as required to address and incorporate emerging needs and priorities, new science, information, techniques and best practices.

Strategy	Action	Timeframe
Strategy #1 Strategic Detention of Stormwater	1. Update the City of Richmond's Engineering and Design Specifications Manual to include recommendations on the design of rock trenches and rain gardens.	Short-term
	2. Update policies to provide more clarity regarding requirements for rainwater management and lot coverage for landscaping.	Short-term
	3. Work with external agencies such as Metro Vancouver and other municipalities in developing and promoting the implementation of stormwater detention facilities.	Ongoing
	4. Continue to collaborate with Parks, Sustainability and other City departments in implementing stormwater detention facilities in parks and other special projects.	Ongoing
Strategy #2 Water Quality Treatment and Sediment Control	Undertake an internal review to develop an effective and comprehensive Erosion and Sediment Control program.	Short-term
	Update the City of Richmond's Pollution Prevention and Clean-up Bylaw No. 8475 and Engineering and Design Specification Manual to include the following: • Details on erosion and sediment control measures that should be implemented for construction projects, including site monitoring and reporting requirements. • Inspection and enforcement for sediment control and erosion management in non-ALR areas.	Short-term
	Collaborate with Metro Vancouver to establish a modified MAMF specific for Richmond to guide water quality monitoring.	Short-term
	Collaborate between the City of Richmond's Engineering, Sustainability and Operations departments to identify areas of watercourses vulnerable to sloughing for implementation of bank protection works.	Short-term
	Evaluate the need to establish Total Suspended Solids (TSS) removal criteria to address road runoff.	Medium-term

Strategy	Action	Timeframe
Strategy #2 Water Quality Treatment and Sediment Control (con't)	Evaluate the effectiveness of this strategy through periodic monitoring according to modified MAMF guidelines specific for Richmond.	Long-term
	Monitor annual sediment removal volumes by municipal maintenance crews. Review and evaluate the effectiveness of existing Erosion and Sediment Control policies on a 5-year basis.	Long-term
	Monitor contractor compliance with Erosion and Sediment Control requirements and consider the implementation of additional measures to improve compliance.	Long-term
Strategy #3 Rainwater Harvesting and Re-use	Monitor the implementation and success of water re-use technologies inside and outside Richmond.	Ongoing
	Education to eliminate public unfamiliarity with rainwater re-use practices, with a target towards homeowners, regulatory staff, contractors, designers and trades.	Ongoing
	Complete pilot studies to obtain information on actual costs and potable water use reductions for residential and ICI applications.	Short-term
	Implement rainwater re-use for medium- and high-density office developments for toilet fixture applications.	Medium-term
	Update the Drainage, Dyke and Sanitary Sewer System Bylaw No. 7551 to allow rainwater re-use as an alternative to collection and conveyance of all surface drainage to the municipal stormwater sewer system.	Medium-term
	Work with external agencies to: • Remove regulatory barriers that limit re-use applications. • Establish water quality treatment and local Health Authority approval requirements to address various re-use applications. • Develop regulations, guidelines and established practices for rainwater harvesting.	Medium-term
	Monitor changes in the price of water.	Long-term

Strategy	Action	Timeframe
Strategy #4 Protect, Enhance and Build Green Infrastructure	Update the City's Riparian Response Strategy to meet Provincial requirements for compliance with the Riparian Area Regulation.	Short-term
	Incorporate projects and opportunities identified through the Daylighting Strategy in the City's drainage capital planning process and through collaboration with the development community.	Short-term
	Update the criteria for the City of Richmond's Protection of Environmentally Sensitive Areas document to include best management practices for managing and enhancing habitat as part of rainwater management.	Short-term
	Identify and map opportunities for wetland creation in parks and other public land and develop guidelines for the use of parks and other public lands for rainwater management, habitat enhancement, and other green infrastructure projects to be incorporated into the Parks and Open Space Strategy.	Medium-term
	Collaborate on the development of an Erosion and Sediment Control program to address water quality in watercourses.	Medium-term
	Support invasive species management activities under the direction of the Invasive Species Action Plan to improve watercourse health and reduce long-term maintenance cost.	Ongoing

City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	March 21, 2018
From:	John Irving, P.Eng. MPA Director, Engineering	**File:**	10-6045-09-01/2018- Vol 01
Re:	**Dike Master Plan - Phase 2 Report**		

Staff Recommendation

1. That the existing dike alignment in the Dike Master Plan Phase 2 study area (West Dike from Williams Road to Terra Nova and North Dike from Terra Nova to No. 6 Road) continue to be the primary flood protection dike alignment.

2. That the work plan identified in the staff report titled Dike Master Plan – Phase 2 Report from the Director of Engineering, dated March 21, 2018, be endorsed.

John Irving, P.Eng. MPA
Director, Engineering
(604-276-4140)

Att. 1

REPORT CONCURRENCE		
ROUTED TO:	**CONCURRENCE**	**CONCURRENCE OF GENERAL MANAGER**
Real Estate Services	☑	
Roads and Construction	☑	
Sewerage and Drainage	☑	
Parks	☑	
Development Applications	☑	
Policy Planning	☑	
Transportation	☑	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	**INITIALS:** CJ	**APPROVED BY CAO**

Staff Report

Origin

By the year 2100, climate change scientists estimate that sea level will rise approximately 1.0 meter and the City will subside 0.2 meters. To maintain Richmond's high level of flood protection, the City will need to increase the height of the City's dikes by 1.2 m over the next 25 to 75 years.

The 2008 – 2031 Richmond Flood Protection Strategy identified the need to "Prepare and implement a comprehensive dike improvement program." On February 11, 2014, Council approved $200,000 from the 2014 Capital Budget to prepare Dike Master Plan Phase 2.

The Dike Master Plan Phase 2 Draft Report was presented at the regular Council meeting on January 26, 2017, where Council resolved:

> *"That the public and key external stakeholders be consulted to provide feedback on the medium and long term dike improvements required for part of Richmond's West Dike (between Williams Road and Terra Nova Rural Park) and part of the North Dike (between Terra Nova Rural Park to No. 6 Road) as identified in the staff report titled "Dike Master Plan – Phase 2" from the Director of Engineering, dated December 6, 2016."*

Staff have completed stakeholder consultation for Dike Master Plan Phase 2 and the results of that consultation are the focus of this report.

This report supports the following Council 2014-2018 Term Goals:

> #5 Partnerships and Collaboration:
>
> *Continue development and utilization of collaborative approaches and partnerships with intergovernmental and other agencies to help meet the needs of the Richmond community.*
>
> *5.2. Strengthened strategic partnerships that help advance City priorities.*
>
> #6 Quality Infrastructure Networks:
>
> *Continue diligence towards the development of infrastructure networks that are safe, sustainable, and address the challenges associated with aging systems, population growth, and environmental impact.*
>
> *6.1. Safe and sustainable infrastructure.*
>
> #9 A Well-Informed Citizenry:
>
> *Continue to develop and provide programs and services that ensure the Richmond community is well-informed and engaged on City business and decision making.*
>
> *9.2. Effective engagement strategies and tools.*

Analysis

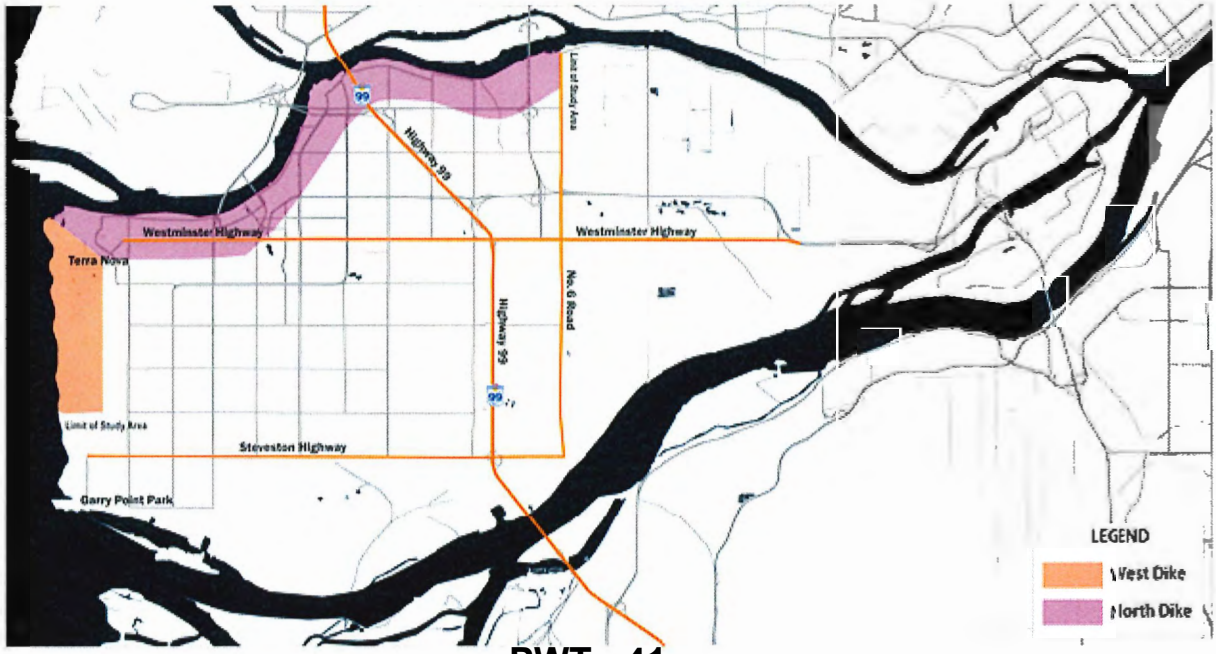
The Dike Master Plan is intended to be a comprehensive guide to upgrade the City's dikes to:

- Protect Richmond from both ocean storm surges and Fraser River freshet events;
- Adapt to sea level rise and land subsidence;
- Be seismically resilient;
- Integrate the Ecological Network Management Strategy principles and goals;
- Follow the five strategic directions of the City's 2009 Waterfront Strategy; and
- Prioritize dike improvement phasing to efficiently use resources.

The current phases of the Dike Master Plan are shown in Attachment 1. Phase 1 is complete and was endorsed by Council on April 22, 2013. Stakeholder consultation for the draft version of Phase 2 is complete and is the focus of this report. National Disaster Mitigation Program grant funding was secured for Phase 3 and work was deferred from an original March 2017 start date to November 2017 to meet the funding conditions of the grant. Work on Phase 4 of the Dike Master Plan began in October 2017. Staff anticipate that both Phase 3 and Phase 4 will be completed in 2018. Staff recently secured a $150,000 grant from the Union of BC Municipalities Community Preparedness Fund for Phase 5 of the Dike Master Plan and work will begin in 2018.

Dike Master Plan Phase 2 focusses on the north portion of Richmond's West Dike between Williams Road and Terra Nova Rural Park and part of Richmond's North Dike between Terra Nova Rural Park and No. 6 Road (Phase 2 Study Area), as shown in Figure 1. The Dike Master Plan Phase 2 Report is appended as Attachment 2.

Figure 1 – Dike Master Plan Phase 2 Study Area



Public Feedback

Dike Master Plan Phase 2 was presented to the public through two open houses and the City's Let's Talk Richmond web site. Approximately 200 people attended the open houses and 532 people visited the web page. Two people submitted written comments at the open houses and 68 people completed an online survey.

Based on feedback received, the public indicated:

- general acceptance that climate change is real;
- support for ongoing sea level monitoring;
- support for dike master planning and dike raising;
- support for coordination with development to create super dikes;
- support for the creation of barrier islands on Sturgeon Banks;
- support for flood construction levels;
- support for consideration of environmental impacts in the Dike Master Plan;
- concern regarding the uncertainty in sea level rise forecasting and support for building dikes higher than the currently proposed levels;
- that the dike trail network is an important amenity. Of those that expressed a preference, 70% preferred a more natural trail integrated with the surrounding environment and 30% preferred a paved, "Sea Wall" type trail. The 2010 Richmond Trail Strategy guides the City in trail development and will be incorporated into all of the City's dike improvement projects; and
- that they would like more information regarding the amount of capital assigned to dike improvements and the timing of dike upgrades. Council has approved the 2018 to 2022 Drainage and Diking Capital plan which includes $5 million in dike upgrade every year for the next five years. Staff will continue to inform the public on the timing and funding of the projects through capital open houses, the City's website and information in utility inserts.

Key External Stakeholder Feedback

Key external stakeholders consulted included:

- Department of Fisheries and Oceans
- Provincial Inspector of Dikes
- Ducks Unlimited Canada
- The City's Advisory Committee for the Environment

- The City's Heritage Commission
- The Urban Development Institute
- Fraser Basin Council
- Port Metro Vancouver

Stakeholders that returned comments were generally supportive of the findings in Dike Master Plan Phase 2.

The Department of Fisheries and Oceans - Small Craft Harbours indicated they are considering options that restore intertidal sediment supply to Sturgeon Banks as part of an overall sediment management plan. They expressed concerns regarding the barrier islands concept based on a possibility that tidal flood and storm currents could cause gullying of tidal flat sediments around the proposed barrier islands.

The Provincial Inspector of Dikes indicated that Dike Master Plan Phase 2 is a reasonable plan, but indicated that any "unconventional" strategies would require further consultation with the Province.

The City's Heritage Commission indicated support for Dike Master Plan Phase 2 and recommended that the City incorporate the cultural and historical aspects of the diking system into diking improvements.

The Urban Development Institute stated in writing that Dike Master Plan Phase 2 will mutually benefit the City of Richmond and UDI members as the design for specialized flood protection along the waterfront will increase the livability and value of large developments by increasing flood protection.

Next Steps

Dike Master Plan Phase 2 identifies a long term program for dike improvements from Williams Road to No. 6 Road over the next 25 to 75 years to stay ahead of climate change induced sea level rise and land subsidence. Funding for dike improvements is secured through the Drainage and Diking Utility which currently collect $11.6 million annually through utility rates for drainage and diking capital projects.

As sea level rise is realized, the rate of dike improvement will be adjusted accordingly. Staff will present annual utility funding levels for dike improvement for Council's consideration through the bi-annual Ageing Infrastructure Report. Upgrades will also occur in conjunction with the City's growth, allowing synergies between the City and the development community.
In the short and medium term, there is a significant amount of work that can be carried out in preparation for these upgrades. Should Council endorse this work plan, staff will:

- Investigate the application of barrier islands and the impacts to habitat for the Sturgeon Bank area. Coordinate these actions with other jurisdictions that have interests in Sturgeon Bank;
- Encourage the construction of superdikes through development;

- Re-evaluate current and future flood construction levels and development bylaws to reduce flood risk;
- Strategically acquire property in support of future dike upgrading;
- Monitor sea level rise using water level sensors; and
- Investigate creation of a habitat banking program to support dike improvement projects based on environmental assessment.

Financial Impact

Capital projects will be brought forward for Council's consideration as part of the Council budget process.

Conclusion

Consistent with the City's 2008 – 2031 Richmond Flood Protection Strategy, Dike Master Plan Phase 2 identifies medium and long term dike improvements along part of the West Dike (Williams Road to Terra Nova Rural Park) and part of the North Dike (Terra Nova Rural Park to No. 6 Road) that will be required to address climate change induced sea level rise. Dike Master Plan Phase 2 generally recommends that the City maintain the existing dike alignments in the study area, pursue superdikes through development, and investigate wave mitigating barrier islands on Sturgeon Banks.

Public and key stakeholder feedback on Dike Master Plan Phase 2 is positive and will be incorporated into capital dike improvement projects identified in this plan.

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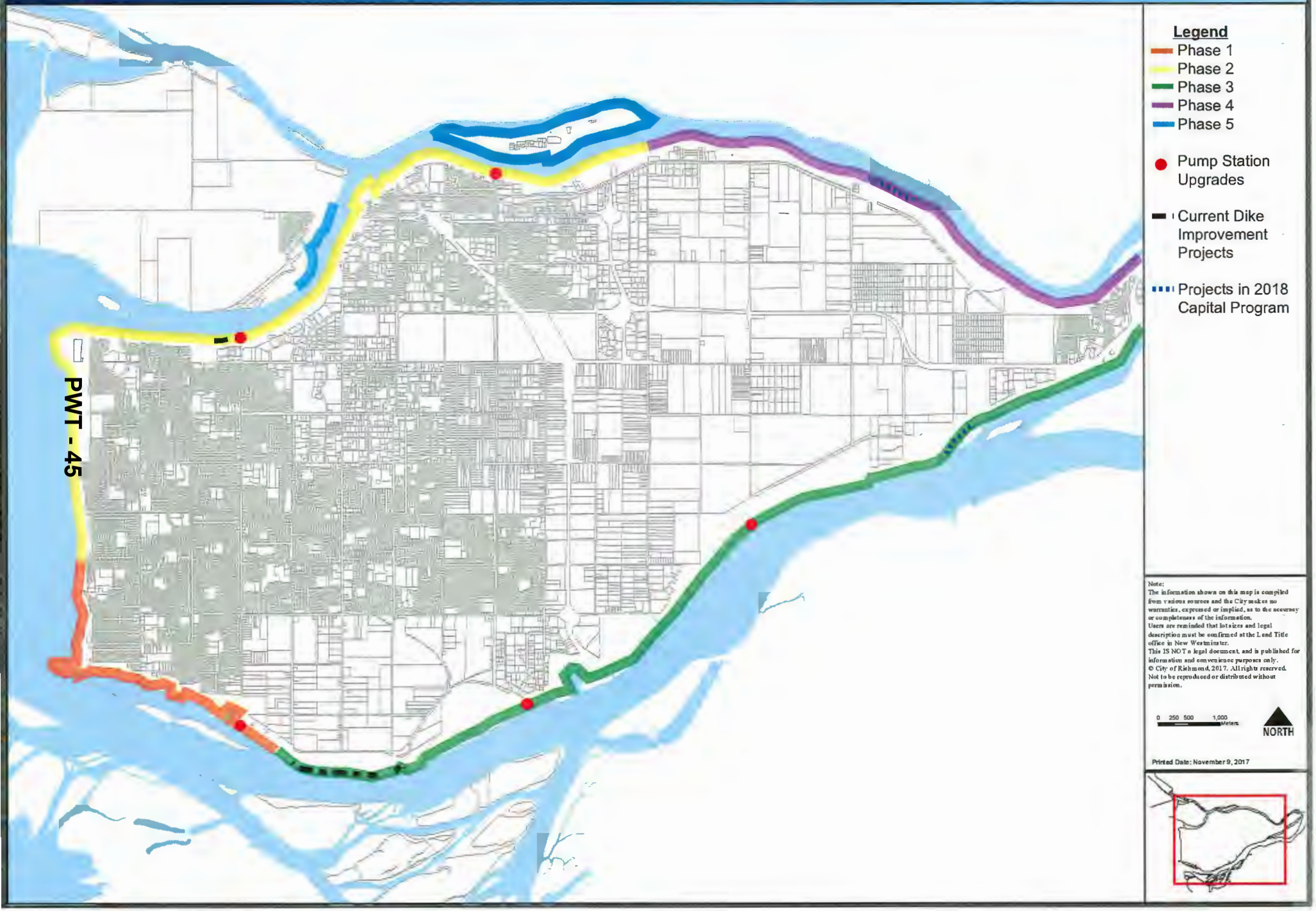
LB:pm

Att. 1: Dike Master Plan Phasing Map
Att. 2: Dike Master Plan Phase 2 Final Report 2018

Dike Master Plan Phasing Map



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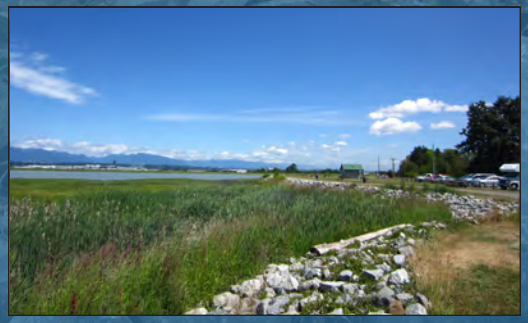
Attachment 1

Attachment 2

Richmond



LULU ISLAND DIKE MASTER PLAN
PHASE 2
FINAL REPORT

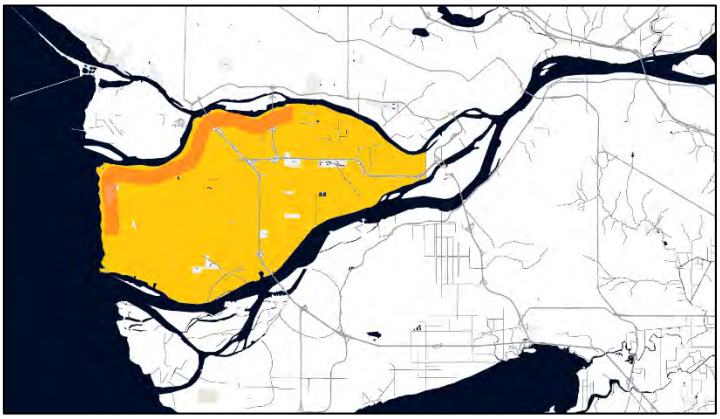
PWT - 46

PARSONS

475287 - FEBRUARY 2018

Executive Summary

The purpose of the Lulu Island Dike Master Plan (LIDMP) is to identify preferred methods for implementing the objectives of the City of Richmond's 2008 – 2031 Flood Protection Strategy. The Lulu Island Dike Master Plan is being prepared in phases. Parsons (as Delcan) prepared Phase 1 of the plan for the Steveston and southern West Dike areas[1] (Phase 1 LIDMP). The Study Area for Phase 2 has been defined from Williams Road on the West Dike to No. 6 Road on the North Dike. The Study Area is highlighted orange within Lulu Island in the figure below. Lulu Island lies in the Fraser River Delta, and is surrounded by the Fraser River Estuary. The estuary provides critical habitat for many species of fish and wildlife, and important ecosystems services such as erosion control, shoreline stabilization and storm surge protection.



Phase 2 LIDMP Study Area on the West Dike and North Dike within Lulu Island

The Phase 1 LIDMP focused largely on technical issues of assessing significant changes in dike alignment. Instead of adapting upgrades to the existing shoreline alignment which may have impacted heritage structures in Steveston, the engineering feasibility of a future dike and flood-gate along Steveston Island was presented.

In the Phase 2 Study Area, the existing dike alignment along the waterfront is established and well defined. There is limited basis to support any major changes to the alignment of the existing dike, thus the recommendations are generally in keeping with traditional dike crest increases, with consideration for localized constraints and opportunities. The Study Area has been segmented into thirteen design areas to make these recommendations on an area specific basis. There are also opportunities to consider flood protection strategies that are applicable throughout the entire Study Area. These area wide strategies may be implemented to fortify the area specific adaptations.

The City has identified a target dike crest elevation of 4.7 m, with consideration for raising the dike to 5.5 m in the long term future. Dike adaptations that achieve the target crest elevation are considered by area, forming the area specific adaptations. These include dikes and floodwalls in any conformation. Area wide adaptations are those which may not achieve the target dike crest elevation on their own, but contribute to overall flood protection. For example, barrier islands that reduce wave run-up to eliminate the need for additional target crest increases, or policy changes that facilitate the implementation of dike adaptations are both categorized as area wide adaptations. Both area wide and area specific strategies will be presented in the LIDMP, forming a comprehensive plan to achieve the objectives of the Flood Protection Strategy. Area wide and area specific strategies will be considered within the context of the City's Ecological Network Management Strategy (ENMS) such that the recommendations presented in the LIDMP are consistent with strengthening the City's green infrastructure, while managing and enhancing ecological assets.

Area Wide Protection Strategies

A number of area wide approaches can be considered to enhance long term flood protection in the City and create resiliency in addressing climate change and sea level rise. Preferred strategies are summarized below.

Plan for the long-term raising of lands adjacent to and inland of the existing dikes: Long term raising of land levels has previously been recommended (2008-2031 Flood Protection Strategy). Maximizing the width of raised land adjacent to the river decreases flood and seismic risks by increasing the integrity of the dike. Plan to raise the ground elevation of waterfront development sites to the prescribed dike crest elevation.

[1] Lulu Island Dike Master Plan Phase 1, Delcan, March 2013

Enhance floodproofing through amendments to the FCL By-law: The City's Flood Construction Level (FCL) Bylaw establishes minimum levels to which land needs to be raised. Amending the FCL bylaw is the recommended area wide strategy to regulate raising ground elevations with redevelopment to improve flood protection throughout the Study Area.

Support site assemblies along the waterfront that promote cohesive adaptations for flood protection: Large developments along the waterfront allow for major improvements to flood protection infrastructure and often result in robust superdike conditions.

Plan for implementation of offshore protection on Sturgeon Banks: If climate change and sea level rise predictions materialize, increased depths offshore could simultaneously increase wave heights, particularly in the Georgia Strait. Upland limitations to natural accretion within the Sturgeon Bank Wildlife Management Area may also contribute to increased offshore depths beyond the West Dike. Offshore barrier islands are one option to consider to dissipate wave energy prior to waves reaching the West Dike and stabilize shorelines, thereby minimizing future dike crest increases. Enhancement of intertidal habitat alongside the creation of offshore barrier islands may provide natural ecosystem mechanisms to further dissipate wave energy. The City may consider offshore protection in its long-term plans for flood protection along the West Dike.

Area Specific Flood Protection Strategies

In practice, when dike upgrades have been made, they have been made along the existing alignment. Apart from select site specific constraints and opportunities, the recommended future dike alignment for the Phase 2 Study Area matches the existing dike alignment. Area specific strategies were selected with consideration for: flood protection, environmental, geotechnical, infrastructure, site-specific constraints, social, property, economic, operational and cost considerations. The City is committed to avoid, mitigate or compensate for any environmental impacts that may result from dike adaptation projects. Completely avoiding any impact on an environmental area may not be feasible in some cases, for example where dikes are highly constrained. In these instances, mitigation or compensation that follows a net gain approach may be pursued.

Area specific strategies for the Phase 2 study are summarized below:

West Dike: Raise the dike on the existing alignment. Additional studies required to quantify drainage impacts of land side expansion, habitat impacts and costs associated with water side or land side expansion, and long term resiliency of a constrained dike solution. Consider routing the dike inland through Terra Nova Rural Park.

North Dike: Terra Nova to No. 2 Road Bridge: Raise the dike on the existing alignment with land side expansion. Plan for the raising of River Road.

North Dike: No. 2 Road Bridge to Dinsmore Bridge: Existing and proposed developments are raising elevations to 4.0 m to 4.7 m. Future raisings to 5.5 m can take place on the existing alignments and integrate into the adjacent landscaping.

North Dike: Dinsmore Bridge to Moray Bridge: Raise the dike with land side expansion. Consider creation of a set-back dike and inland raising (superdike) in conjunction with the future Middle Arm Waterfront Park construction. Ensure any interim dike upgrades are compatible with the long term strategy of constructing superdikes.

North Dike: Moray Bridge to Oak Street Bridge: Implement flood protection with approved development plans for Duck Island and the River Rock Casino when available. If required to address sea level rise and climate change prior to implementation of the approved strategy at the Duck Island or River Rock Casino sites, plan for a temporary adaptation, such as a demountable floodwall, to protect City assets

North Dike: Oak Street Bridge to No. 4 Road: Raise the dike on the existing alignment. Site specific solutions may be required at the Fraser River Terminal site. Plan for temporary dike along the alternate alignment if required to address sea level rise and climate change prior to implementation of a strategy at the Fraser River Terminal site.

North Dike: No. 4 Road to Shell Road: Existing and proposed developments will raise the area generally to an elevation of 4.7 m. Future raisings to 5.5 m can take place on the existing alignments and integrate into the adjacent landscaping.

North Dike: Shell Road to No. 6 Road: Raise the dike on the existing alignment. Land acquisition may be required to facilitate construction of a trapezoidal dike (through redevelopment or otherwise). Implementation of a temporary floodwall

adjacent to the waterfront lots may be required in advance of a permanent adaptation to address sea level rise and climate change. Consider Bath Slough Revitalization Initiative for future designs. Additional studies are required to quantify drainage, habitat impacts, and costs associated with land side expansion of a trapezoidal dike. A constrained land side slope may be required to integrate with the existing drainage infrastructure.

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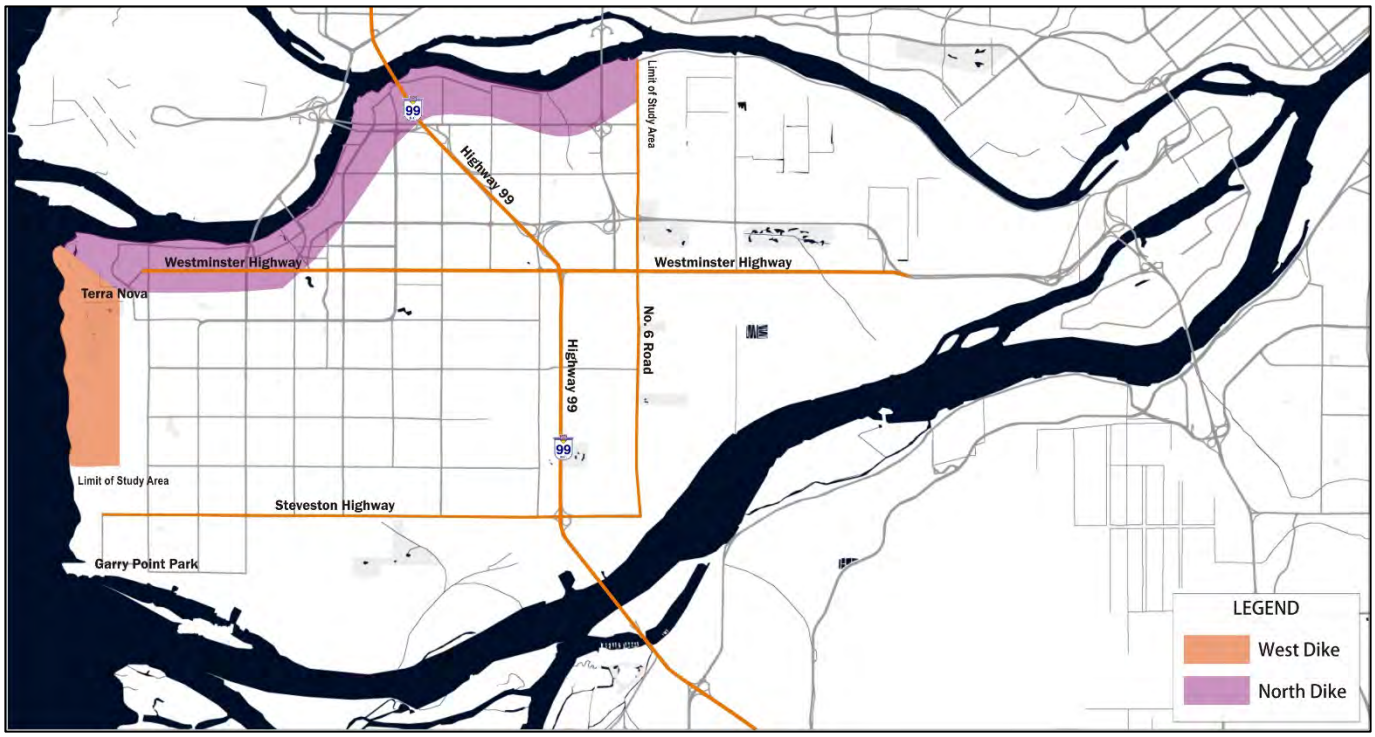
1 Introduction

Richmond is a city of over 200,000 people in 130 square kilometres with considerable assets to be protected from flood damage. The City has endeavoured to adapt its flood protection systems to changing flood risks, including anticipated increases to flood levels resulting from climate change and sea level rise. With the establishment of the 2008 – 2031 Flood Protection Strategy, the City committed to prepare and implement a perimeter dike improvement program. The purpose of the Lulu Island Dike Master Plan (LIDMP) is to identify preferred methods for implementing the objectives of the City of Richmond's 2008 – 2031 Flood Protection Strategy.

With Richmond located at the mouth of the Fraser River, and the flood protection infrastructure interfacing with the high ecological value of the Fraser River Estuary, the LIDMP also works to integrate the objectives of key City documents such as the City's Ecological Network Management Strategy (ENMS), and put forward recommendations that will strengthen the City's green infrastructure network.

The LIDMP is being prepared in phases. Parsons (as Delcan) prepared Phase 1 of the LIDMP for the Steveston and southern West Dike areas[2] (Phase 1 LIDMP). The Study Area for the second phase of the LIDMP (Phase 2 LIDMP) includes the West Dike from Willams Road to Terra Nova Rural Park, and the North Dike from Terra Nova Rural Park to No. 6 Road as shown in ***Figure 1***.

Figure 1: Study Area



The Phase 2 LIDMP provides the framework to direct future dike improvement projects and ensure that diking requirements are considered as waterfront lands are redeveloped. It establishes a well-planned strategy to identify future flood protection infrastructure requirements along the waterfront. The Phase 2 LIDMP presents recommended adaptations for flood protection, including guidelines for incorporating flood protection into future waterfront developments. It also presents considerations for any dike adaptation project in the Study Area to minimize impacts and to integrate adaptations within the public and natural realms.

[2] Lulu Island Dike Master Plan Phase 1, Delcan, March 2013

1.1 SCOPE

The recommended flood protection adaptations forming the Phase 2 LIDMP are assessed for their ability to achieve a minimum crest elevation of 4.7 m, and accommodate a future increase to 5.5 m as prescribed by the City. No independent evaluation of these crest elevations has been conducted by Parsons. These target elevations have been accepted as the basis for the Phase 2 LIDMP.

Recommendations have been categorized as either area wide or area specific adaptations. Area wide strategies encompass adaptations that are applicable for the entire Study Area, or a substantial part of it. These include policy adaptations, as well as structural adaptations that would fortify the primary dike, but would not achieve the City's target crest elevation on its own. The Phase 2 LIDMP recommends adaptations in both categories to produce a comprehensive strategy for improving flood protection in the Study Area.

Area specific strategies are structural adaptations that modify the existing dike or replace it to achieve the City's target dike crest elevation of 4.7 m. The Study Area has been broken into thirteen design areas to recommend area specific adaptations. The design areas have been delineated according to the boundaries for planning areas in the City's Official Community Plan (OCP). The design areas are described further in ***Section 2*** and ***Section 4.2***.

The Phase 2 LIDMP is a guidance document for future dike adaptation design and construction projects. No detailed design, nor any construction will be undertaken as part of the Phase 2 LIDMP. Design and construction projects are beyond the scope of the current planning exercise. Proponents of diking design and construction projects will need to confirm their projects are in compliance with all regulatory requirements, in addition to adhering to the Master Plan, when projects move forward.

1.2 APPROACH

In preparation of the Phase 2 LIDMP, Parsons previously prepared and submitted two technical memos to the City. Technical Memo #1[3] (TM #1) presented potential flood protection options that may be appropriate for implementation in the Study Area, based on a detailed review of current and future land uses, environmental and geotechnical conditions, and other City guidance documents. Technical Memo #2[4] (TM #2) outlined the evaluation of potential flood protection adaptations within the Phase 2 Study Area, and presented the preliminary concept for the Phase 2 LIDMP. Both technical memos have been attached to the Phase 2 LIDMP as ***Attachment 1*** and ***Attachment 2*** for reference.

Both technical memos were circulated internally to relevant City departments for review. The feedback received from these stakeholders was integrated into the technical memos before each was finalized. The final Phase 2 LIDMP is derived from these previous studies and as such, City feedback has been incorporated into the Phase 2 LIDMP.

1.3 ADDITIONAL GUIDANCE DOCUMENTS

The recommendations in the Phase 2 LIDMP have been prepared in keeping with other City strategies and plans. Any proposed diking projects should be designed and constructed with consideration for the Phase 2 LIDMP, as well as any other City guidance documents in effect at the time an adaptation project proceeds to design and construction. Policy adaptations should also be implemented with consideration for compatibility with other City strategies and guidelines. City guidance documents considered in the development of the Phase 2 LIDMP included:

2009 Waterfront Strategy: The five Strategic Directions of the 2009 Waterfront Strategy were considered in the development of the Phase 2 LIDMP. The Strategic Directions include: 1) Working Together; 2) Amenities and Legacy; 3) Thriving Ecosystems; 4) Economic Vitality; and 5) Responding to Climate Change and Natural Hazards.

[3] Lulu Island Dike Master Plan Phase 2 – Technical Memo No. 1: Review of Existing Conditions, Parsons, Oct 5, 2016
[4] Lulu Island Dike Master Plan Phase 2 – Technical Memo No. 2: Analysis of Flood Protection Alternatives, Parsons, Oct 5, 2016

Flood Plain Designation and Protection By-Law 8204:	The Phase 2 LIDMP considers the existing Flood Plain Designation and Protection By-Law, and will consider outlines potential options to amend or accelerate increasing flood construction levels adjacent to the foreshore.
2008 – 2031 Richmond Flood Protection Strategy:	The Phase 2 LIDMP has been developed to address the goals of the Flood Protection Strategy.
2015 Ecological Network Management Strategy:	The Phase 2 LIDMP is informed by the strategic goals outlined in the 2015 Ecological Network Management Strategy (ENMS) to promote the Ecological Network. The City's ENMS is an ecological blueprint for the preservation of natural land City-wide. Through the ENMS the City will protect, restore and connect natural lands to avoid habitat fragmentation. The strategic goals outlined in the ENMS are: 1) Manage and Enhance Ecological Assets; 2) Strengthen City Green Infrastructure; 3) Create, Connect, and Protect Diverse and Healthy Spaces; 4) Engage through Stewardship and Collaboration. The objective of developing an Ecological Network was initially outlined in the OCP under Chapter 9: Island Natural Environment (and Ecological Network Approach).
2006 Riparian Response Strategy:	The Phase 2 LIDMP is consistent with the Riparian Response Strategy (RRS), which protects Riparian Management Areas that form part of the City's Ecological Network. The RRS identifies 5 m and 15 m Riparian Management Area (RMA) setbacks on minor and major watercourses that flow into and support fish life in the Fraser River, and are to remain free from development in accordance with requirements under the provincial Riparian Area Regulation. The RRS applies to riparian habitat on the City's inland watercourses but does not apply to the Fraser River, which is protected through designation as Environmentally Sensitive Area (ESA) in the OCP.
2008 Climate Change Response Agenda:	The recommendations from the Phase 2 LIDMP are made with consideration of the 3rd pillar of the City's Climate Change Response Agenda – implement strategies for adapting to unavoidable changes. Strategies have been considered that can meet the short and long term goals with respect to crest elevations; however, they must also be adaptable to change.
2010 Richmond Trail Strategy:	The Phase 2 LIDMP is developed with regard for the goal of maximizing access to the waterfront, as identified in the Richmond Trail Strategy.

2 Study Area

The Phase 2 Study Area includes parts of the West Dike and the North Dike. The West Dike section of the Study Area spans from Williams Road to Terra Nova Rural Park at the Middle Arm of the Fraser River. The North Dike section of the Study Area spans from Terra Nova Rural Park to No. 6 Road.

On the water side of the West Dike is Sturgeon Bank, a provincially designated Wildlife Management Area (WMA) within the Fraser River Estuary. It is comprised primarily of near shore and intertidal brackish marsh, sandflats, mudflats, and open water. It is a protected area for the conservation of critical, internationally significant habitat for year-round migration and wintering waterfowl populations and important fish habitat. The water side of the North Dike includes pockets of mud flat, salt marsh, and eelgrass habitat.

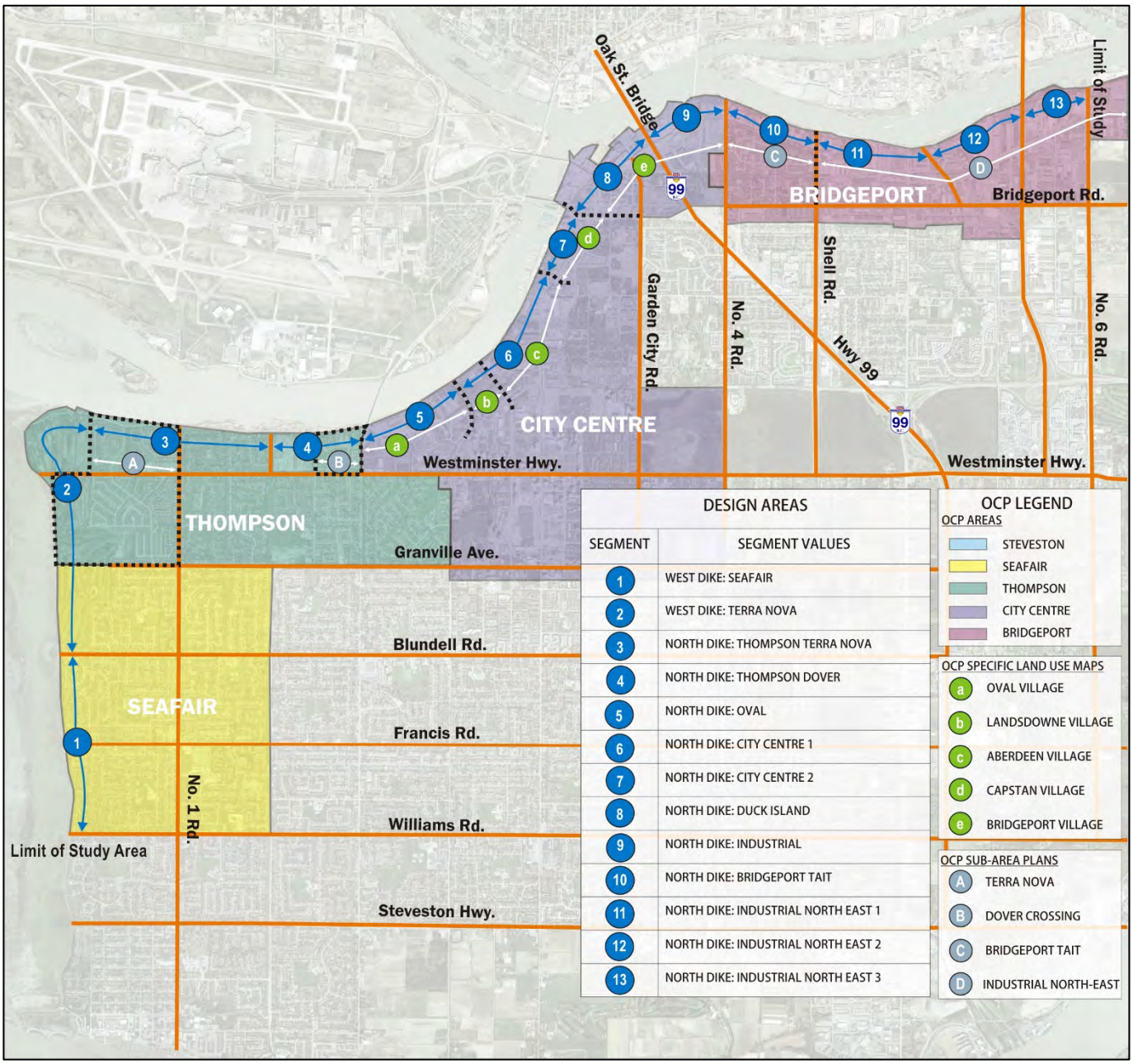
On the land side of the West and North Dikes, Riparian Management Areas (RMA's) are interspersed throughout the Study Area. RMA designated watercourses are wetted the majority of the year and flow into and support fish life in the Fraser River. The City's RMA's have predetermined setbacks of 5 m or 15 m from top of bank to delineate areas that support the form and function of the watercourses. These areas are protected under the provincial Riparian Area Regulation and form

a key component of the City's ENMS. The entire Study Area is also designated Environmentally Sensitive Area (ESA) within the OCP.

For the purposes of evaluating current and future land conditions and recommending appropriate structural adaptations, the Study Area has been broken into thirteen design areas. These areas are based on the planning boundaries established in the OCP for OCP Areas, OCP Sub-Area Plans, and OCP Specific Land Use Maps. The relevant OCP figures showing these areas are provided for reference in ***Appendix A***.

The design areas have been delineated using the OCP boundaries to ensure that the recommendations in this Master Plan can be readily integrated with other City guidelines and City planning initiatives. Area specific adaptations are recommended by area, with consideration for special sites within the thirteen design areas. Existing conditions for each design area, as well as future conditions as provided for in the OCP, are described in ***Section 2.1***. The design areas within the Study Area are illustrated in ***Figure 2***.

Figure 2: Design Areas and OCP Boundaries



2.1 PRESENT AND FUTURE LAND USE

A brief summary of existing conditions and planned future uses (as outlined in the OCP) for each of the thirteen design areas is provided in ***Table 1***. Site conditions or future uses having an anticipated impact on dike planning are discussed in more detail in the discussion of each design area in ***Section 4.2***, where the recommended adaptation is presented for each design area.

Table 1: Summary of Existing and Future Conditions

DESIGN AREA	BOUNDARIES		DESCRIPTION OF EXISTING AND FUTURE CONDITIONS PER OCP
SEAFAIR	Williams Rd to Granville Ave	Existing	Primarily established single family and low-rise residential. Sturgeon Bank is west of the dike. The West Dike Trail is over the dike, with natural areas on either side. The northern third of the plan is the Quilchena Golf & Country Club, situated on Agricultural Land Reserve (ALR) lands. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	No major changes anticipated.
TERRA NOVA	Granville Ave to Terra Nova Rural Park	Existing	Situated entirely on ALR lands. Primarily open space, with few buildings. Includes Quilchena Golf & Country Club, Terra Nova Rural Park, and agricultural areas. Sturgeon Bank is west of the dike; includes the Grauer Lands, an enhanced habitat site. West Dike Trail continues north. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	No major changes anticipated.
THOMPSON TERRA NOVA	Terra Nova Rural Park to McCallan Road	Existing	Established residential neighbourhood of single family homes. River Road is substantially offset from the waterfront, with a wide open space from the road to the dike, which includes a trail. Typical park amenities are in the open space, including benches, sign posts and washroom facilities. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	No major changes anticipated.
THOMPSON DOVER	McCallan Road to No. 2 Rd Bridge	Existing	Half industrial, a City works yard and recycling depot. Half residential neighbourhood of townhouses and medium-density apartment complexes. Buildings are set back from River Road, and built on higher land than the road elevation. No driveway access from River Road to the condo complexes. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	No major changes anticipated.
OVAL	No. 2 Rd Bridge to Dinsmore Bridge	Existing	Mostly redeveloped in the past fifteen years, with the Olympic Oval, high-rise condos and offices. River Road is realigned behind waterfront development. A waterfront trail and recreational areas are along the waterfront, including intertidal zones and park amenities, such as benches. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	Development is currently underway for the remaining sites, and nearly complete. These areas are designated for mixed use in the OCP. Retail and other commercial uses will be at the main levels of new developments.
CITY CENTRE 1	Dinsmore Bridge to Cambie Rd	Existing	Low-rise office industrial lands and parking lots. Office sites have substantial footprints. River Road is adjacent to the waterfront. The UBC Boathouse and other marinas are on the water. Along the waterfront there is a thin linear park including a dike trail with park amenities and public art. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	The area from the waterfront to the former rail corridor is planned to be the proposed Middle Arm Park, a large park surrounded by high density mixed use and commercial uses of the planned Pedestrian-Oriented Retail Precincts. A museum and arts centre are proposed for this area.
CITY CENTRE 2	Cambie Rd to Moray Bridge	Existing	Low-rise office industrial lands and parking lots. Office sites have smaller footprints with narrow frontages on the water. River Road is adjacent to the waterfront, with parking lots along the dike. Marinas are present along this entire area. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	Intensification of the urban area with high density mixed use and commercial zones in planned Pedestrian-Oriented Retail Precincts. Expansion of marinas for residential and non-residential boats. The proposed Capstan Canada Line Station .

DESIGN AREA	BOUNDARIES		DESCRIPTION OF EXISTING AND FUTURE CONDITIONS PER OCP
DUCK ISLAND	Moray Bridge to Oak St Bridge	Existing	Former industrial lands, currently vacant lots that host the Richmond Night Market during the summer. River Rock Casino & Marina, and large parking lots. A constructed wetland between the parking lot and the marina. Smaller industrial sites west of the Oak Street Bridge. Disused CP Rail bridge. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	Parklands and marinas along the waterfront. Development of urban commercial and residential uses. A bridge for the Canada Line and a new Skytrain station. NOTE: Private developers are currently submitting development plans to the City for approval.
INDUSTRIAL	Oak St Bridge to No. 4 Rd	Existing	Industrial facilities and parking lots. Fraser River Terminal, BC Hydro power station. Canada Line and Bikeway bridge. River Drive in aligned inland. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	No major changes anticipated. Industrial lands for the foreseeable future. Residential uses are prohibited.
BRIDGEPORT TAIT	No. 4 Rd to Shell Rd	Existing	Formerly industrial, presently existing high-rise condos; approved condo and townhouses currently under development. River Road at the waterfront was decommissioned on this section. Small light industrial site remains. Single family residential south of the waterfront area. Log booms on the water. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	Ongoing redevelopment to be completed in the near future. No major changes anticipated once redevelopment is complete.
INDUSTRIAL NORTH EAST 1	Shell Rd to Bath Slough	Existing	Industrial area. Businesses and associated parking lots on the narrow strip of land between River Road and the waterfront. Log booms on the water. ESA type is Shoreline, Intertidal or Freshwater Wetland.
		Future	No major changes anticipated.
INDUSTRIAL NORTH EAST 2	Bath Slough to Knight St Bridge	Existing	Industrial area. Offices and parking lots. River Road is against the waterfront. Large trees and established vegetation on the waterfront area north of River Road. A small vacant lot under Port Metro Vancouver ownership is west of the Knight Street Bridge. Drainage ditches south of River Road. ESA type is Shoreline, Intertidal or Freshwater Wetland.
		Future	No major changes anticipated.
INDUSTRIAL NORTH EAST 3	Knight St Bridge to No. 6 Rd	Existing	Industrial area. Large lumber processing yard and waterfront log transport facilities. Large trees and established vegetation on the waterfront. Public access to River Road is blocked by gates however the City has a ROW. ESA type is Shoreline on the land side and Intertidal on the water side.
		Future	No major changes anticipated.

2.2 GEOTECHNICAL CONDITIONS

Thurber Engineering Ltd (Thurber) conducted a review of the Study Area to assess the anticipated geotechnical conditions. Based on their review, the anticipated subsurface conditions within the Study Area are primarily fill and silt overlying alluvial Fraser River deposits. The silt is clayey near the surface and becomes sandier with depth. This layer is generally about 2 to 4 m thick, although it ranges from about 1 m to 6 m thick. Below the silt, there is a zone that transitions from silt to sand at about 7 m depth. The sand layer below about 7 m depth becomes cleaner and coarser with depth and is typically 8 to 25 m thick. This sand layer is susceptible to seismically induced liquefaction. Below the sand there is a sequence of silt and sand layers. Underlying the silt and sand sequence, there is a thick deposit of silt, which is underlain by dense till-like soil at depths of 50 m or more. Geotechnical investigations and modelling may be required at the design stage of a dike adaptation project to establish site-specific subsurface conditions, and any associated geotechnical requirements.

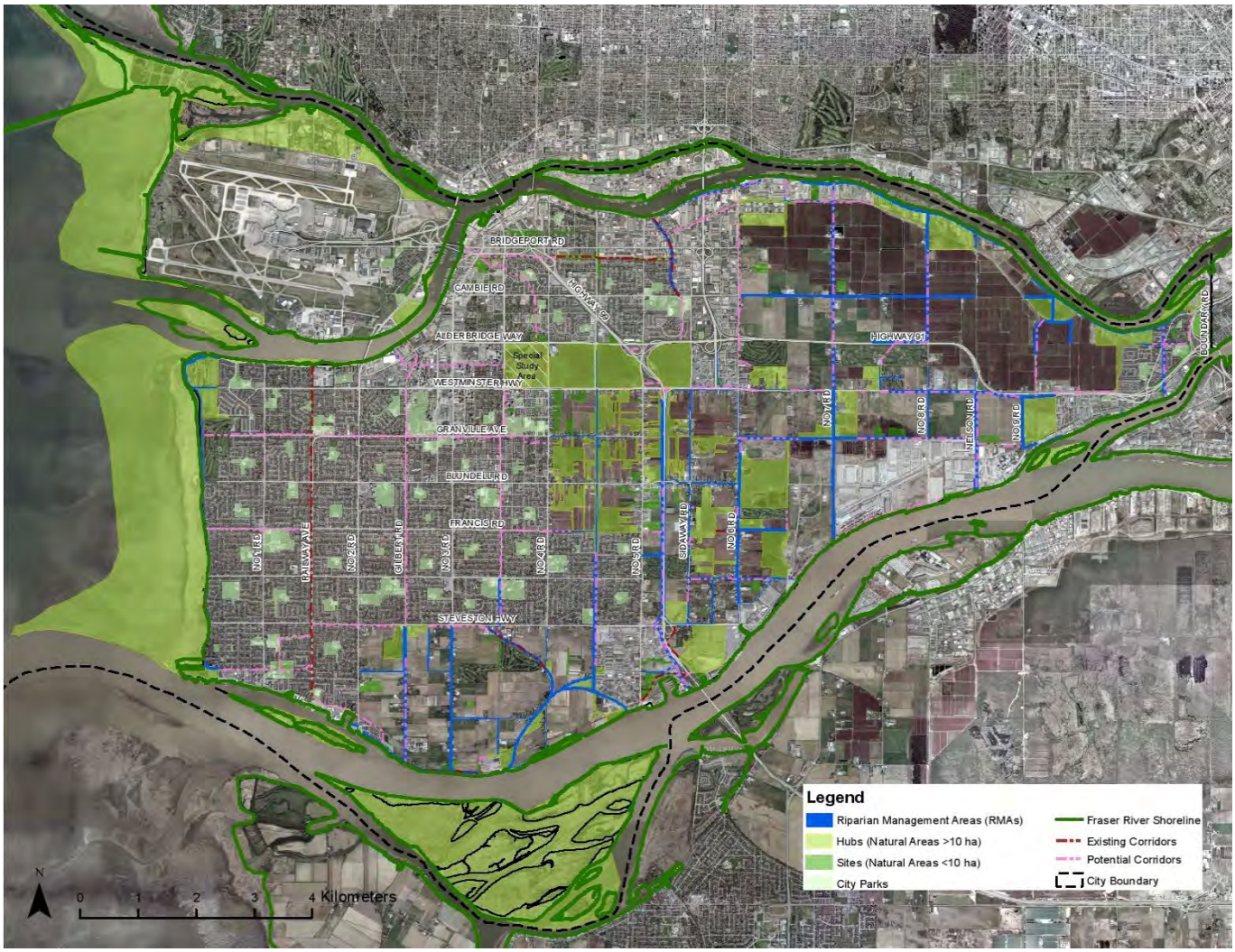
The report[5] prepared by Thurber in support of the Phase 2 LIDMP is included as ***Attachment 3*** for reference.

[5] Lulu Island Dike Master Plan - Phase 2: Geotechnical Input, Thurber Engineering Ltd., October 6, 2016

2.3 ENVIRONMENTAL CONDITIONS

Richmond is located at the mouth of the Fraser River, an urban and agricultural City juxtaposed within the high ecological values of the Fraser River Estuary. The City's Ecological Network Management Strategy (ENMS) provides context for the protection, enhancement and connectivity of an interconnected system of natural areas that make up Richmond's distinctive landscape. The ENMS recognizes the essential ecosystem services integral to the subtidal, intertidal and upland riparian areas within the Study Area, such as water storage and filtration, wave energy attenuation, temperature mitigation and prevention of soil erosion. Green infrastructure, which refers to components of the natural and built environment that provide ecosystem services, are also promoted within the ENMS. A map of Riparian Management Areas (RMA's) of Lulu Island is shown below in ***Figure 3*** and provided in full size in ***Appendix B***.

Figure 3: Riparian Management Areas (RMA's)



Ecological lands within the LIDMP Study Area include City parks, RMA's and ESA's designated in the OCP, as well as other ecologically valuable lands such as the provincially designated Sturgeon Bank WMA. The LIDMP Study Area includes six of the ten geographic strategy areas identified within the ENMS: Traditional Neighbourhoods, City Centre, West Dike, WMA's, Industrial Area and the Fraser River. The ENMS and associated Strategy Areas inform the LIDMP.

The ENMS encompasses all ecological lands in the City, regardless of tenure. Priorities to reduce the fragmentation of natural habitats is central to the ENMS principles. The LIDMP Study Area includes some of the City's highest ecological values within the Fraser River delta. An overview of the City and non-City designated ecological attributes within the Study

Area is provided below. Further detail is provided in the Envirowest Technical Brief[6] included as ***Attachment 4*** for reference. The following discussion presents environmental factors, regulations and guidance documents in place at the time of this writing. Any additional regulations that may be in place in future at the time that any diking project moves forward should also be reviewed and considered in the preparation of dike design and construction plans.

Riparian Management Areas (RMA's) and Channelized Watercourses

Richmond has interconnected drainage catchments that are delineated by the operation of pump stations that discharge into the Fraser River. The inland watercourses are slow moving and wetted the majority of the time. The high groundwater table that feeds local watercourses and sloughs contains naturally-occurring dissolved iron and other metals, and low levels of dissolved oxygen. These water quality conditions are generally inhospitable to salmon and trout; however, other species of fish, reptiles and amphibians may utilize the inland aquatic areas.

The City's watercourses flow into and contribute to fish and wildlife resources sustained by the Fraser River. As such the watercourses are designated fish habitat under the federal Fisheries Act, the provincial Water Sustainability Act, and the provincial Riparian Areas Protection Act. While the majority of these watercourses have been historically realigned into road grid to support agricultural development, they are identified by the City as channelized watercourses and not stormwater ditches. To support the form and function of these channelized watercourses, pre-designated riparian setbacks of 5 m and 15 m are designated by the City on minor and major watercourses, respectively. These setbacks, developed in consultation with the Department of Fisheries and Oceans (DFO), are identified by the City as Riparian Management Areas (RMA's) and protected from development. Channelized watercourses, and their associated RMA's, are interspersed on the landside of the West and North dikes within the LIDMP Study Area. Locations of RMA's are shown on the map included in ***Appendix B***.

Environmentally Sensitive Areas

The City has designated Environmentally Sensitive Areas (ESA's) throughout the City. As identified in Chapter 9 of the OCP, intertidal and shoreline ESA Development Permit (DP) areas are in place around the Lulu Island perimeter. The intertidal DP area is defined as 30 m out into the intertidal or subtidal area measured from the High Water Mark as defined in the Riparian Area Regulations. The shoreline DP area is defined as 30 m inland of the shoreline into upland riparian habitat. This ESA recognizes the estuarine values surrounding Lulu Island and provide direction for application of the DP through DP permit guidelines. Along the West Dike section of the Study Area, ESA DP areas contain upland riparian, brackish marsh, sandflats, mudflats, and open water habitat. Along the North Dike section of the Study Area, ESA DP areas contain pockets of mud flat, salt marsh, eelgrass and upland riparian habitat. This ESA recognizes the estuarine values surrounding Richmond and provides direction for application of the DP through DP permit guidelines. Along the West Dike section of the LIDMP Study Area, the ESA Development Permit Area contains upland riparian, brackish marsh, sandflats, mudflats, and open water habitat. Along the North Dike section of the LIDMP Study Area, the ESA Development Permit Area contains pockets of mud flats, salt marsh, eelgrass and upland riparian habitat. Locations of ESA's are shown on the map included in ***Appendix C***.

City Parks

The West Dyke Trail and Terra Nova Rural Park are both City park attributes contained within the Study Area. There is habitat functionality and ecological value comprised within these lands.

Bath Slough

The Study Area includes Bath Slough at the boundary between the Industrial North East 1 and Industrial North East 2 design areas. Bath Slough forms part of the historical watercourse complex that stretched across Lulu Island, and receives run-off from industrial and residential lands in the Bridgeport area. Through the 2014 Bath Slough Revitalization Initiative, the City has conducted a number of innovative ecological initiatives along Bath Slough including water quality improvements, riparian enhancements and native pollinator pasture initiatives. The Bath Slough Revitalization Initiative should be considered in the design and construction phase of proposed dike upgrade projects in this area.

[6] Lulu Island Dike Master Plan Phase 2: Technical Brief, Envirowest Consultants, November 2, 2016.

Ecological Network Management Strategy (ENMS) Strategy Areas

Both inland and foreshore ecological values are embedded within the six ENMS Strategy Areas. The ENMS and associated Strategy Areas provide key ecological context within the Study Area. ENMS Strategy Areas as shown on the map included in ***Appendix D***.

Wildlife Management Area (WMA) – Sturgeon Bank

Sturgeon Bank is a provincially designated Wildlife Management Area (WMA) established in 1998 and is located on the water side of the West Dike. It is protected for the conservation of critical, internationally-significant habitat for year-round bird migration and wintering waterfowl populations. It is also important fish habitat. It is comprised primarily of near shore and intertidal brackish marsh, sandflats, mudflats, and open water. The WMA foreshore marsh and mudflat habitats provide critical ecological values as well as ecosystem services for wave energy attenuation and shoreline erosion and stabilization. Consideration for these key climate change adaptation and resiliency attributes along Sturgeon Bank should be considered in the design and construction phase of proposed dike upgrade projects in this area.

Fraser River Estuary Management Program (FREMP) Mapping

Since the mid-1980's habitat productivity mapping has been undertaken along the Fraser River shoreline from the mouth of the Fraser River Delta upstream to the Pitt River/Maple Ridge area. This mapping was undertaken by the former Fraser River Estuary Management Program (FREMP). FREMP was a cooperative agreement amongst member agencies, including Environment Canada, Fisheries and Oceans Canada, Transport Canada, Fraser River Port Authority, North Fraser Port Authority, BC Ministry of Environment, and the Greater Vancouver Regional District. Though FREMP ceased to exist in 2013, the City continues to utilize this data resource to inform activities in and along the City's Fraser River foreshore. The FREMP classification system comprises a three tiered colour-coded system: habitats are colour-coded red, yellow or green. Red-coded shorelines sustain highly productive fish and wildlife habitats. Yellow-coded shorelines sustained moderately productive habitats, while green-coded shorelines were characterized by habitats of low productivity. Generally development constraints are greatest within red-coded habitats, while development within green-coded habitats are constrained the least. Habitat productivity within the LIDMP Study Area includes a majority of red-coded reaches along the West Dike and North Arm.

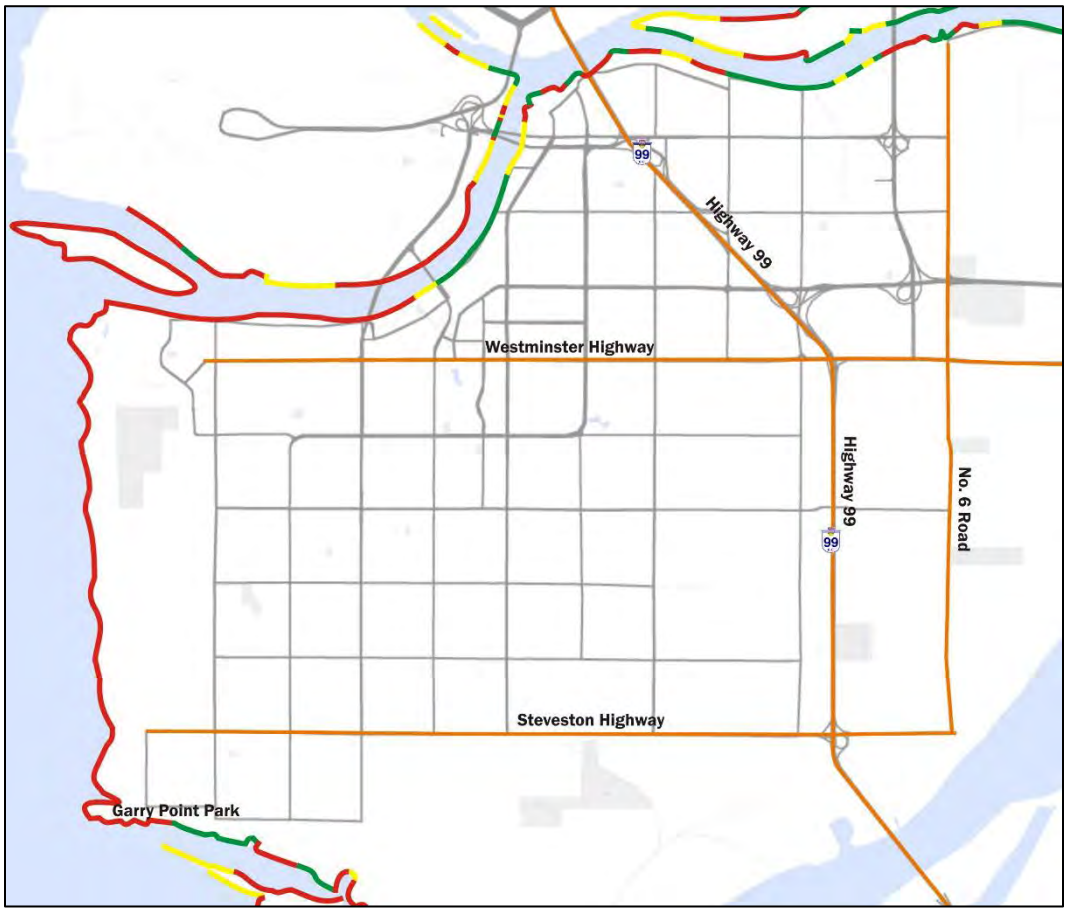
Detailed maps showing habitat coding throughout the Study Area are presented in ***Appendix E***. An overview of the foreshore habitat coding in the Study Area is shown in ***Figure 4***. High productivity habitat is depicted to extend along the north dike generally from No. 6 Road to the Knight Street bridge, along the Tait Waterfront Park, from No.4 Road to the Canada Line bridge, under the Oak Street Bridge, immediately west of the River Rock casino, south of the Canada Line YVR line, and west of Hollybridge Way to the Terra Nova Rural Park. Moderate and low productive habitat are interspersed along this shoreline between Hollybridge Way and Knight Street bridge. High productivity habitat is depicted to extend along the entire sea-ward edge of the west dike fronting Sturgeon Bank and Terra Nova Rural Park.

Fraser River Fish and Species at Risk Values

The Fraser River Estuary contains rich habitat for many species of fish and wildlife. Estuary marshes support a significant portion of the regions migrating salmon. While the inland watercourses are generally considered to not be hospitable to salmon and trout species, they do flow into and support fish life in the Fraser River and are therefore considered to be nutrient providing fish habitat.

A desktop review for species of management concern (i.e. included in Schedule 1 of the Federal Species at Risk Act, and Provincial Conservation Data Centre red- and blue-listed species) was undertaken on the Provincial Conservation Data Centre web map. The search provided a single result, specifically utilization of the Fraser River by white sturgeon. The search did not provide any results along the seaward extent of the west dike, or along inland channelized watercourses . The absence of search results does not indicate that species at risk or of management concern are absent, but that they have either not been observed and /or recorded within these areas. A detailed species at risk assessment will need to be undertaken at the time of design construction as the potential for listed species such as white sturgeon, Vancouver Island beggertick, streambank lupin etc. within the Study Area is high.

Figure 4: Foreshore Habitat Coding in the Study Area



2.4 EXISTING FLOOD PROTECTION INFRASTRUCTURE

At present, Lulu Island is protected from flood hazards by a perimenter ring dike consisting of the West Dike, the North Dike, and the South Dike. The Study Area comprises the waterfront and lands protected by the West Dike, and part of the North Dike from Terra Nova Rural Park to No. 6 Road. These dikes provide flood protection from storm surges and Fraser River freshet events. Generally the dike is a standard trapezoidal earth dike in most locations, with a trail or a road over the dike crest.

The existing dike crest elevations in the Study Area vary from 3.0 m to 4.7 m depending on when the dike was last upgraded, or when surrounding lands were last redeveloped. Drainage ditches and storm sewers behind the dikes convey storm flows and flood waters to pump stations discharging to the Fraser River and the Georgia Strait. Public dikes and all drainage infrastructure are now owned solely by the City of Richmond.

The West Dike protects the City from high tides and storm surges originating in the Strait of Georgia. Sturgeon Bank, a mudflat and marshland, extends up to 6 km into the Strait of Georgia from the toe of the dike. These lands consist of a relatively flat face with grass cover next to the dike, then marsh and mudflats further out towards the sea. Sturgeon Bank currently provides some protection from wave run-up to the West Dike.

The North Dike protects the City from high tides and storm surge impacts originating in the Strait of Georgia and migrating up the North and Middle Arms of the Fraser River. To a lesser extent, these dikes protect from high Fraser River freshet events. Generally the North Dike is bounded by the Fraser River foreshore and River Road. Through the City Center OCP Area, the dike is primarily a linear park on the waterfront bounded on the land side by River Road or development. Waterfront developments that have been constructed in the past ten years have often elected to raise their lands to the

dike crest elevation, forming a superdike. A superdike is formed whenever the lands behind the dike are filled to the same elevation as the dike crest, and development is built on a ground elevation equal to the dike crest. Superdikes are discussed in greater detail in ***Section 4.1.2***. Through the industrial areas north of the City Center, the dike remains generally earthfill with sections of sheet pile and floodwalls associated with specific sites.

2.5 EXISTING FLOOD PROTECTION POLICY

The City of Richmond has two primary policies in place that guide flood protection initiatives. The OCP establishes flood protection as a priority in the context of land use planning. Flood proofing objectives are enforced through Bylaw No. 8204.

At present, the OCP states that ESA's serve the dual purpose of planning for environmental and flood protection needs. Flood protection has been established as a priority alongside environmental priorities within the OCP, especially in areas that are designated ESA's. This includes the entire waterfront of the Study Area. The OCP also establishes a priority for a green infrastructure network throughout the City's ecological network, including the intertidal, shoreline and upland riparian areas. A green infrastructure network integrates the built and natural environment to realize associated ecosystem services such as flood mitigation, and stormwater management.

The City currently enforces flood proofing through the Flood Plain Designation and Protection Bylaw No. 8204, established in 2008 to set minimum Flood Construction Levels (FCL's) throughout the City. The FCL prescribes the minimum elevation where the underside of a floor system can be constructed. The By-law also provides for diking needs such as ROWs by specifying that lands at a certain distance from the dike or waterfront must be dedicated to dike works.

Proposed developments at the waterfront must commit to implementing flood protection measures in order to secure approval for development plans. These are typically negotiated with the City on a site-by-site basis. In recent years, residential developers have voluntarily raised the elevation of development lands to the same elevation as the dike crest (creating a superdike) to ensure that the units on the ground floor will have a view of the water.

3 Considerations

The considerations in this section were used to evaluate potential flood protection adaptations to make the recommendations that comprise the Phase 2 LIDMP. Any flood protection adaptation, whether in compliance with or deviating from the Phase 2 LIDMP, should use the following considerations in evaluating the suitability of a proposed flood protection project for implementation. It is important that any proposed project avoid or mitigate negative impacts, while maximizing the benefits, as a balance of the following considerations. In the event that a dike adaptation project differs from the recommended adaptation for that design area, the project should still take these considerations into account. These considerations outline important factors that should be incorporated into the implementation plans for both structural adaptations that will alter the existing landscape, or policy adaptations that have indirect impacts on the landscape.

3.1 FLOOD PROTECTION CONSIDERATIONS

The City has established a design crest elevation of 4.7 m with consideration to be further raised to 5.5 m in response to climate change and sea level rise predictions. These design crest elevations have been adopted by the City in response to a combination of sea level rise predictions (1.0 m) and land subsidence (0.2 m)[7], anticipated to materialize by the year 2100.

Increases in dike crest levels (up to 4.7 or future 5.5 m) to address sea level rise and climate change are anticipated to be staged and implemented over the next few decades to respond to rising sea levels. The City will continue to monitor sea level rise and adjust the target dike crest elevations as required. Any flood protection project in the Study Area should, at

[7] Sea Level Rise Adaptation Primer, Arlington Group et. al, January 2013

a minimum, adhere to these elevations. Additional regional guidelines should also be considered at the design stage of dike improvements.

Adaptations should be compatible with existing dikes and other flood protection measures adjoining the site of proposed works. Connections to existing flood protection works should be designed to ensure there will not be inconsistencies or weak points where an adaptation meets a pre-existing dike.

3.2 ENVIRONMENTAL CONSIDERATIONS

The Study Area is situation along the Georgia Strait and the Fraser River, two important fish and wildlife habitats. There are also riparian areas and intertidal zones that have ecological value. Any diking projects should be well-integrated with the surrounding natural realm, and should be designed to mitigate alterations that compromise the local environment, either aesthetically or ecologically. The Study Area includes substantial open space and parklands, including wetlands and natural areas on the waterfront. The City has an interest in preserving the environment at the waterfront for public uses, in particular the dike trail for cyclists and pedestrians. The aesthetic value of the natural environment along the trails should be considered as well as ecological significance.

The breadth of ecological values comprised within the study area is reflective of estuary habitats as described in ***Section 2.3***. The perimeter ring dike in the Study Area is flanked by either ripariam or upland ESA habitat to the landside, and high value shoreline & intertidal ESA or WMA habitats on the foreshore. Any proposed dike design and construction projects should undertake an assessment of the adjacent ecological values to determine the most appropriate dike design and footprint using an approach to avoid alterations in high value habitats, and if that is not feasible, then mitigate or compensate with a net gain approach. The Study Area is comprised of large tracts of open space and park lands that contribute significant aesthetic values within the estuary which must be considered in concert with the ecological values.

An overview of the federal and provincial regulatory context is provided above in ***Section 2.3***. Detrimental impacts to the environment are to be avoided wherever possible, in accordance with the City's environmental regulations. In addition, sea level rise should be monitored and reviewed in order to determine the impact on existing foreshore wetlands within the Study Area. Additional guidance documents outlining the City's environmental protection and enhancement strategies are listed in ***Section 1.3***. Any flood protection project should be prepared by qualified persons having reviewed and understood these documents, as well as any environmental guidance documents or regulations in effect at the time a project is proposed. The design of proposed diking projects should follow the City's approach regarding the priority to avoid habitat impact first. Where that is not feasible, enhancement and mitigation may be pursued with a net gain approach.

3.3 GEOTECHNICAL CONSIDERATIONS

Geotechnical design considerations for dike adaptations include seepage control both under and through the dike, dike slope stability, dike crest settlement, and seismic performance. Furthermore, additional loading from increased dike size over any existing structures, such as building footings or bridge abutments, will need to be verified for confirmation that existing infrastructure will not be negatively impacted. Other types of structural flood protection measures will also need to be verified for impacts to existing infrastructure.

Thurber has reviewed the existing geotechnical conditions in the Study Area. Their comments on the key design considerations are outlined on the following pages.

Seepage

Seepage risk should be assessed and mitigated for any dike adaptation project, whether for dikes or floodwall systems. Seepage becomes problematic where water flow through or under the dike dislocate the fill materials forming the dike, which may weaken the integrity of the dike and increase the risk of failure during high water events. Adaptations should be designed with proper drainage to mitigate seepage risks.

Increasing the height of an existing dike to 4.7 m or 5.5 m may increase the design flood height, defined as the height from the ground at the land side toe of the dike to the height of water against the dike during a high water event. Existing dikes

are between 3.0 m and 4.7 m, and the ground elevation on the landside of the dikes is generally at about 2.0 m. Raising an existing dike may also increase the flood height, unless the lands adjacent to the dike are also raised in conjunction with crest height increases, forming a superdike. Increasing the flood height may increase risks of landside heave of the less permeable surficial silt layer, and piping through the dike or its foundation.

Piping occurs when excessive seepage forces cause the migration of soil particles through the soil matrix resulting in internal erosion and eventually retrogressive failure. Heave can occur when there are excessive hydraulic pressures on the landside of the dike caused by a lower permeability soil layer forming a cap over a more permeable layer near the ground surface. Heave can lift and fracture the cap, causing large localised seepage volumes and internal erosion, which could cause a dike breach.

To provide reliable protection from higher design flood heights, a system of seepage control measures will likely be required for any dike adaptation project. The potential for heave and piping may be mitigated using relief wells, drainage blankets or trenches to drain water from behind the dike face to an outlet such as a sewer or ditch. The receiving system's capacity should be verified to ensure drainage can be accommodated in the system. Relief wells and trenches should be designed with filters, such as a geotextile, to prevent piping and internal erosion. Seepage exits should be similarly protected with filters to minimize risk of fill materials migrating out of the dike.

Where there are ditches at the toe of an existing dike, filling the ditches may be considered within the scope of a proposed dike adaptation project. Ditches at the toe of a dike increase the risk of piping, since these ditches shorten the seepage path length and increase the hydraulic gradient. Filling the ditches may contribute to a comprehensive plan to reduce the risk of seepage.

Seepage potential should be evaluated and mitigated for any structural adaptation, as seepage may cause build-up of pressures behind the structure that may increases risks of failure. Constrained dikes, designed with a retaining wall on one or both sides, may be less susceptible to seepage risk if the dike face is a uniform material, such as a concrete cut-off wall or a floodwall. A dike face constructed with a segmental wall system, such as lock blocks or armour stone, may need to have the joints between segments grouted to prevent seepage at the joints.

Stability

Any dike adaptation project should be designed and constructed to withstand pressures and forces it may be subjected to during a high water event. For dike adaptations, high quality dike fill materials should be used and placed in accordance with accepted engineering practice to maximize stability. The standard dike section is anticipated to be generally stable with increased flood heights, although it will be less stable than the lower height configuration. In areas where stability is a concern, minor modifications to the standard dike section may be required, such as flattening the landside slope, constructing a toe berm or providing a seepage cut-off and filter within the dike. The stability of dikes may be further improved where ditches at the landside toe are infilled.

Settlement

Any dike adaptation project should be designed and constructed with consideration for settlement. Designs that minimize settlement are preferred, though some measure of settlement is anticipated in the long-term in all cases.

Raising existing dikes may induce consolidation settlement of the surficial silt layers. This settlement could be up to about 5% of the increase of the thickness of new dike fill placed. Dikes and surrounding areas may also experience compression settlement due to on-going long-term compression of deeper silt layers. This ongoing settlement is typically in the range of 1 to 2 mm per year for dikes built on soil conditions in Richmond. Settlement could potentially be compensated for by overbuilding the dike to a higher initial crest elevation, anticipating that it will settle to the target dike crest.

Local soil properties should be investigated prior to finalizing the design of any adaptations. Where construction is over peat or highly organic soils, settlement may be higher.

Seismic Performance

The Provincial Seismic Design Guidelines for Dikes[8] (Seismic Guidelines) published in June 2014 recommends designing high consequence dikes to control seismic deformations within prescribed limits. For a trapezoidal dike to achieve the objectives of the Seismic Guidelines, ground improvement may be required. Ground improvement reduces seismic vulnerability by densifying the foundation of the dike. Compaction of the ground underlying the dike may achieve the targets in the Seismic Guidelines. However, more intensive methods such as deep soil mixing or vibro-replacement to a specified depth may be pursued if compaction alone is found to be insufficient. These ground improvements may be very costly. Dikes that are set back from the waterfront are more resistant to seismic events due to being restrained by earth at both dike toes, as compared to a waterfront dike where the waterside toe is much deeper and may provide less force anchoring the dike in place. Therefore, setback dikes require less intensive methods to meet the Seismic Guidelines. Likewise, widening the dike crest to create a superdike increases resilience to seismic events without typically requiring ground improvements. Superdikes are discussed in greater detail in ***Section 4.1.2***.

To further understand the potential seismic risks to dikes within the Study Area, Thurber conducted seismic deformation analyses at three select locations (No. 1 Road Pump Station, No. 4 Road Pump Station, and Bath Slough Pump Station). Results are included in their Seismic Deformation Analysis report[9] included in ***Attachment 5***. Results from the assessment identified that at the three sites selected, horizontal deformations were within the allowances prescribed for the 1:2,475 year event by the Seismic Guidelines. Vertical deformations exceeded the tolerances; however, overbuilding the dike to provide post-earthquakle freeboard may be an acceptable alternate to meet the Seismic Guidelines instead of costly ground improvements. The results are largely depended on the underlying soil conditions, slope of the riverbank, and depth of the river bottom. Larger deformations could be expected where the river channel is deeper and steeper. The results discussed in the Seismic Deformation Analysis pertain only to the three sections analyzed; these are generally representative of Lulu Island however the results cannot be assumed to be consistent for any other locations. At the design stage of a proposed dike adaptation project, a site-specific seismic deformation analysis should be conducted to confirm seismic risks, and possible mitigation requirements. A seismic deformation analysis, for example a Plaxis model, may inform whether ground improvements may be required, and what level of ground improvements may be required to meet the Seismic Guidelines.

3.4 INFRASTRUCTURE CONSIDERATIONS

It is advantageous to pursue dike works alongside other infrastructure upgrades in the vicinity of the dike. Where infrastructure works are proposed on the waterfront, local diking needs should be evaluated and included in the scope of proposed work wherever possible. For example, when a road is being raised or resurfaced, the adjacent dike could be upgraded concurrently. Including dike adaptations within the scope of other municipal works may also present a cost savings as compared to pursuing projects independently. The resulting dikes may also be better integrated with the local landscape if they proceed concurrently with neighbouring infrastructure upgrades.

Any impacts to local stormwater drainage patterns should be evaluated to ensure compatibility with the local infrastructure, such as pump stations or roads. Where adaptations will interfere with existing drainage patterns, the capacity of the receiving pump station must be confirmed. If ditches at the toe of the dike are to be filled, the associated loss of stormwater storage and conveyance functions may need to be compensated with underground pipes or alternative systems.

Above ground utilities may be impacted by diking projects. Utility poles may need to be temporarily relocated while dike works are underway, and relocated to a permanent position when works are complete. There may be an opportunity to relocate cables underground when dike works proceed, particularly if roadworks are included. The dike trail and associate park infrastructure, such as park benches and lookouts, may need to be relocated to accommodate dike adaptations.

[8] Seismic Design Guidelines for Dikes, 2nd ed., Golder, Ministry of Forests Lands and Natural Resources (MFLNRO) Flood Safety Section, Jun 2014
[9] Lulu Island Dike Master Plan - Phase 2: Seismic Deformation Analysis, Thurber Engineering Ltd., Sep 12, 2016

3.5 SITES WITH UNIQUE CONSTRAINTS

There may be sites with unique features that must be accommodated when adaptations proceed. Dike adaptations may be realigned to avoid special sites, however this may not always be feasible. Where development and infrastructure exists along the waterfront where a dike adaptation project would ideally proceed, a custom design to accommodate that site may be required. Examples include pump stations, bridges, or industrial sites located immediately on the water. There are a number of bridges in the Study Area. Adaptations at bridge sites are discussed further under ***Section 4.3***.

The adjoining adaptations on either side of the special site should be well-integrated with that site's custom adaptation design, to ensure there are no vulnerabilities in the flood protection strategy at the boundaries between adaptation types. For example, a section of floodwall within a dike should be protected at the joints to ensure the joints are as robust as both the dike and floodwall. The joints should be as capable of withstandard high water levels as the adaptations on either side.

3.6 SOCIAL CONSIDERATIONS

Dike adaptations should be designed with consideration of the public realm. The City's 2009 Waterfront Strategy presents a vision that promotes community wellness, economic vitality and a healthy environment through initiatives that integrate the waterfront with the urban landscape. The Study Area contains recreation, culture and heritage resources to be preserved wherever feasible, according to the regulatory protections in place for heritage resources. Recreational uses may include walking and cycling on the trail, as well as offshore activities such as sport fishing and boating.

Heritage sites may be treated as sites with unique constraints, as described in ***Section 3.5***, that require special accommodations within a diking project. Heritage sites that have been identified as culturally significant should be preserved per the Heritage Procedures Bylaw 8400 as applicable.

Any impacts that restrict use and enjoyment of the waterfront, as well as views of the waterfront, should be mitigated. Impacts on cultural and heritage resources limiting the accessibility of these sites should be mitigated. Sites should remain accessible to all people including those using mobility aids, such as wheelchairs or crutches.

Public access to the waterfront is provided by the perimeter dike trail system. Where waterfront access is constrained, the City's Parks Planning and Design (Parks) department has identified connectivity at the waterfront as preferable to inland trail detours. For example, where the existing dike trail alignment crosses under low bridges, raising the dike may not provide adequate clearance to maintain the trail over the dike. The preference is to keep the trail at the waterfront. A boardwalk at the waterside toe of the dike would be a preferred approach as opposed to directing pedestrians up to the road to circumvent a barrier.

Adaptations should be aesthetically integrated with the surrounding area. For example, in recreational areas or ecological landscapes, adaptations that do not detract from the natural beauty of the local environment are preferable to those adaptations requiring severe hardscaping, such as concrete or retaining walls. The local character of industrial areas is amenable to man-made structures thus floodwalls may be in keeping with the landscape themes in industrial areas.

Adaptations should support, and be integrated with, the habitat functionality and aesthetics of the surrounding environment.

3.7 PROPERTY CONSIDERATIONS

The City must have permanent access to the dike adaptations in the long-term, for both construction and ongoing maintenance operations. Acquiring property may add considerable costs to a diking project. Wherever feasible, adaptations should proceed within the lands that are already under City ownership, or that the City may access through easements or right-of-ways (ROW's).

Much of the City's waterfront was developed prior to the establishment of robust policies for dedicating lands to diking. As a result, older buildings remain directly on the waterfront, or within 30 m from the natural boundary. In cases where no alternative alignment can be implemented, it may be necessary for the City to acquire waterfront lands or obtain easements or ROWs to construct or maintain adaptations.

3.8 ECONOMIC CONSIDERATIONS

For the purposes of the Phase 2 LIDMP, economic considerations encompass impacts to local businesses operating in the vicinity of existing or proposed dikes. The cost of adaptation projects is also an economic consideration, however for the purposes of the Phase 2 LIDMP these will be referred to as "cost considerations," discussed further under ***Section 3.10***.

Flood protection projects provide an overall economic good by preventing damage to assets. However, any changes to existing conditions may trigger negative impacts to the local economy. For example, diking may damage views to the waterfront, or challenge industrial activities by limiting water access.

Where economic impacts cannot be completely avoided, they should be mitigated to the extent feasible. Dike adaptations should consider local economic factors in the overall decision making context.

Lands that were formerly used for economic purposes, such as waterfront shipping facilities, but are no longer being used for economic activities may be suitable lands for dike adaptations. If alternative lands are available that do not have any associated economic uses, those lands should be used rather than compromising lands of economic interest.

3.9 OPERATIONAL CONSIDERATIONS

Dikes in the Study Area provide access to City assets that must be maintained, such as drainage ditches and trails. Adequate clearance must be retained for maintenance vehicles to navigate the dikes where required, and carry out maintenance activities. For example, if a dike is raised in an area where there are drainage ditches at the dike toe, the boom of an excavator on the dike must be able to reach the ditches for cleaning and maintenance.

Raising a dike may complicate access as the slopes must remain suitable for maintenance and emergency access. Additional lands may be required to improve access to the dike.

3.10 COST CONSIDERATIONS

The overall cost of implementing adaptations is driven by a number of factors that include habitat consideration, land acquisition and ground improvements. When evaluating the cost of an adaptation, the costs of all associated works and mitigation plans should be included. A project with relatively higher construction costs may still be the least expensive option if it does not require any habitat compensation, for example.

3.11 STAKEHOLDER FEEDBACK

The diking solutions were presented to key stakholders and the general public. The public and key stakeholder groups were pleased with the City's proactive approach to addressing climate change and sea level rise in the community. Comments with the West Dike and North Dike (from Terra Nova to No. 6 Road) related to the height in which the dikes would be raised, possible increased dredging needs, and the disruption it may cause to the environment, wildlife and their habitats were raised.

Two public open houses were held to present the flood protection concepts for the Phase 2 area. The first session was held at City Hall on April 20th, 2017 and the second session was held at the City Centre Community Centre on June 21st, 2017. All materials provided at the Open Houses were made available on the City's community engagement website address, Letstalkrichmond.ca. There were 532 individuals that viewed the project on this website, 68 of which provided feedback.

A summary of the open house and website feedback is presented in ***Table 2***.

Table 2 – Public Consultation Feedback

TOPIC	SUMMARY OF COMMENTS
Dike Raising / Construction Time	Most of the comments expressed that the dikes are not being raised high enough. Some additional comments noted that the timeline for raising the dikes may also be too slow. The majority of the commentary referenced media and scientific reports that suggest the rate and amount of sea level rise could be more accelerated and higher than previously estimated.
Dike Esthetics / Recreational use	There was a strong desire to maintain walkways and recreational access on and along the dikes, with some individuals preferring not to have a paved path to maintain a more natural aesthetic in and around key wildlife areas and others preferring a paved path to increase convenient access for pedestrians and cyclists.
Seismic	Some individuals raised the issue of seismic stability and the desire to have an increased level of safety in the event of an earthquake or tsunami.
Superdikes	Individuals who commented on superdikes were generally in support of this option.
Development	Comments were received from several residents that the flood control level for new developments should be raised for further protection. One resident expressed concern about the raising the flood control levels for new developments could also be detrimental to the character of the neighbourhoods.
Flood Protection	Concerns were raised about what additional flood protection measures are in place in the event of the dike breach, such as increased pump station capacity to reduce flooding. One resident also suggested installing new data recording instruments to monitor flood levels and settlement of the dikes more regularly.
The Environment	Two residents commented that the City should consider all of the environmental impacts of the dike and flood protection upgrades, emphasizing that preservation of the natural environment be considered during all phases of the dike master planning and upgrades.
Barrier Island	Several residents commented on their interest in a barrier island, but wanted more information on the cost of these features and if they might impact the water quality or natural ocean processes.
Property Value	One resident expressed that the dike upgrades would help keep property values high.
Funding	Several residents questioned what the cost of the dike upgrades would be for taxpayers and where there were opportunities for residential developers to pay for upgrades.
General	Several comments were received that indicated a desire for more information on the key solutions being considered as well as access to the consultation and feedback from environmental agencies.

In addition to the two public open houses, all materials were provided to key stakeholders. The City also hosted a number of individual key stakeholder meetings to solicit feedback. Comments received in the meetings and through email correspondence are summarized in **Table 3**.

Table 3 – Other Key Stakeholder Feedback

STAKEHOLDER	SUMMARY OF COMMENTS
Provincial Inspector of Dikes	The Deputy Inspector of Dikes did not foresee any major issues in moving forward with the master plan, but noted that additional discussion and correspondence would be required where alternative strategies that deviate from the existing flood protection (e.g. superdikes) are proposed.
City of Richmond Advisory Committee for the Environment	The Advisory Committee for the Environment (ACE) did not have any comments after the City presented the Phase 2 LIDMP to them in April 2017.
Urban Development Institute	The Urban Development Institute (UDI) noted that the Phase 2 LIDMP will mutually benefit the City of Richmond and UDI as the flood protection solutions will increase the livability and value of development within the City. UDI has acknowledged support of the presented flood protection strategies with the awareness that there could be increased costs incurred by the development industry.
Port of Metro Vancouver	Port Metro Vancouver (PMV) had the following comments: • The Vancouver Fraser Port Authority (VFPA) does not have any infrastructure in the area and the report recommendations do not affect the two Port Sites within the study areas. • The report refers to secondary dikes that work in conjuction with primary dikes. Has consideration been given to extending the secondary sike concept to inlands (perhaps through improving performance/raising elevations of existing roads) to provide redundancy and limit extent of area being flooded in the event a section of dyke is breached?
City of Richmond Heritage Commission	The Heritage Commission supports the “Dike Master Plan – Phase 2” initiative and recommends that staff/Council take into account the cultural and historical aspect of the diking system as imporvements are designed and implemented.
Department of Fisheries and Oceans – Small Craft Harbours Branch (SCH)	The Small Craft Harbours (SCH) Branch of the Department of Fisheries and Oceans provided the following comments: • The longer the distance incoming storm waves travel over shallow tidal flats the less vulnerability and the need for dike wave run-up freeboard and armouring. The concept is to provide replacement for lost sediment nourishment to and allow natural wave action to distribute the sediment pile gradually over the flats over time (as used to be the case prior to manmade deflection and interception of river supplied Sturgeon Bank sediment accretion). This would go hand in hand with investigating the details of the more intrusive and expensive approach of constructing offshore barrier islands as mentioned in the report. • The offshore berms could be a challenging geotechnical and coastal design with considerable expense and risk. • A side observation is the likely contributing effects of dredging of the legacy Fisherman' slough harbour cut into the southern area of the flats. This probably confounds the above situation in that it provides a sediment "sink" for any mobile sediments that fined their way into the harbour "hole" which is then removed from time to time by dredging and removed from the system by disposal at sea. Either the slough harbour should be isolated in such a way so as not to be a sediment sink or it should be eliminated. In any situation, material removed from the slough belongs on the tidal flats and not removed and dumped in deep water. • Considering the above, there are a couple of primary observations that map directly to the Phase 2 report. Firstly, making it clear that the erosional loss of elevation and width of the tidal flats of Sturgeon Bank due to a century of indiscriminate messing about with the natural sediment regimes needs to be highlighted. It is inferred in the report but does not stand out. This is the core of the seaward vulnerabilities both present and future with SLR. I am aware for instance that Golder has produced a DRAFT (2015) report on the erosion of Point Grey which has similar issues regarding loss of sediment supply and erosion of tidal flats and perhaps should be appended to the Sturgeon Bank Report. • The proposals for the barrier islands are a conceptual means to address the problems of protecting the dikes from increased wave attack and a "squeeze" on the upper shore, including wave run up on dikes. This squeeze will be aggravated by SLR as the deeper water allows for both larger storm waves penetrating to the dike as well as increased erosion of the highly mobile tidal flat due to both the intensity of wave induced particle movements, increased transport by tide induced flows and the net amount of time of these conditions occurs. To aggravate the situation, storm waves will be partially reflecting from a rock armoured dike. Tidal flood and ebb and storm setup currents behind and around the barrier islands would be likely to cause gullying of the fine tidal flat sediments. Anything that puts sediment back to accrete and be wave sorted naturally and gently on the tidal flats and upper marsh zones, whether deflected from the river freshens or enhanced artificially with placement (i.e. dredgeate) should have net positive outcomes provided the material is "clean" biologically speaking, and is representative in the mix of sand and silt particle sizes of what had been deposited naturally in the past. • We would have reservations about the more intrusive barrier island concept. It is complicated and it would lead to significant wave concentration at the hardened boundaries of the armoured islands. They would also create concentrated tidal flow and wave induced currents. The fine particle size silty sands of the outer flats would be extremely sensitive to those flows and also to compression and settlement under the weight and cyclical tidal buoyancy fluxes of

STAKEHOLDER	SUMMARY OF COMMENTS
	the placed islands. Being well out into the deep water, exposed to higher wave regimes, the islands would need to be Rock armoured and constructed to very rigorous standards to stay put. Indeed they would have to be constructed very expensively as rock breakwaters. As such, they would also load the delta slopes and under earthquake shakes would likely increased the risk of major deltaic slumps or slides into deep water. The SCH Branch provided the following conculsions: • A serious study of the history, evolution and current status of the flats including updated data on the hydrographic changes, the sediment size characteristics today and yesterday, the baseline sediment chemical conditions (I.e. Pah's) and of course the biological values both current and historic with the trends indicated. • A serious pilot program to place clean Fraser River silty sands into the tidal flats regime, probably as before, placed in one corner and allowed to spread by wave action over time. This would be monitored for effects and quality, and then linked to the potential for being part of a larger long term sediment management plan, encompassing Sturgeon Bank flats, and both Cannery Channel and the Ports shipping channel. The SCH Branch provided the following additional comments on the report document: *Executive Summary* • "For example, barrier islands that reduce wave run-up to eliminate the need for additional target crest increases,"... SCH Comment: And/or barrier islands in concert with restoring intertidal sediment supply and elevations as part of overall sediment management plan including redirection of dredgeate and in river sediment bypassing. • FCL should be incorporated in planning for small craft harbours harbour buildings and infrastructure as well as potential increased use of floating structures for enhanced adaptation long term. • SCH Comment: Restoring sediment input to intertidal areas may be an environmental net gain if done in an integrated manner. *Additional Guidance Documents* • With respect to the Phase 2 LIDMP reference to the existing Floodplain Designation and Protection By-Law 8204, it should be linked with overall Fraser River sediment management plan. Past practices and jurisdictional stovepipes have increased flood risk to West Dike area due to reductions of previous natural rates of sediment accretion and intertidal elevation. • The 2015 Ecological Network Management Strategy items are a potential fit with in river sediment bypass as well as sediment nourishment to sturgeon bank tidal flats. *Environmental Conditions* • What has been and will be the impacts to the environmental sensitive areas due to the combination of lowered intertidal elevations combined with SLR and what might be done to reverse impacts over time? • High productivity habitat is depicted to extend along the entire sea-ward edge of the west dike fronting Sturgeon Bank and Terra Nova Rural Park, but could be negatively impacted if tidal flat elevations do not keep pace with SLR armouring of west dikes would aggravate erosion of tidal flats. • There is an overall lack of comprehensive data on the species risk within the study area. This should be a top priority. *Flood Risk Management Adaptations* • Small craft harbours could continue science examination of nourishment to intertidal areas as part of overall sediment management plan. • With respect to breakwaters and barrier islands, there is an opportunity for SCH to provide resources and guidance in the planning process. • With respect to enhancement of intertidal habitat, the City could restore wide flat and elevated tidal flats uniformly with or without barrier islands. • With respect to barrier islands, raised islands may be more problematic than simply restoring sediment nourishment to raise overall tidal flats. • There is an overall lack of comprehensive data on the species risk within the study area. This should be a top priority. • With respect to slough dredging, any repeated dredging of the slough may be contributing to impacts on tidal flats especially if mandated to be disposed out of the sturgeon bank sediment regime by ocean disposal regulations. • With respect to discussion of breakwaters, expand to encompass raising of tidal flats with restored sediment supply.

4 Flood Risk Management Adaptations

Flood Risk Management adaptations have been categorized as either area wide or area specific.

Ultimately the City's goal is to fortify the perimeter ring dike to a design crest elevation of 4.7 m, with consideration to be further raised to 5.5 m in response to climate change and sea level rise predictions. Area wide adaptations are those that facilitate the City's flood protection objectives in tandem with the dikes or alternative protection measures in place at the waterfront. These could be policy adaptations, structural measures, or enhancement of green infrastructure to secure additional benefits to an adaptation that will achieve the 4.7 m crest elevation. Area wide adaptations may not be sufficient to meet the City's target dike crest elevation if implemented in isolation, however they may facilitate achieving the City's flood protection goals. For example, revising City policies to include specific diking requirements would be an area wide adaptation, as this is applicable across the entire Study Area, however, on its own, a revision to City policy would not achieve the target dike crest elevation. Area wide adaptations encompass strategies to facilitate implementing flood protection projects, and seizing opportunities presented by waterfront development to implement flood protection works concurrently. Area wide adaptations are defined and described in further detail in ***Section 4.1***.

Area specific adaptations are recommended for each of the thirteen specified design areas. These include all dike and floodwall adaptations that may achieve the 4.7 m design crest, and may be further raised to 5.5 m in future when required. As noted in ***Section 2***, the design areas have been delineated using the City's Official Community Plan (OCP) boundaries as identified in the OCP Areas, OCP Land Use Maps and OCP Sub-Area Plans. OCP Areas have been subdivided where similar waterfront conditions exist for a clearly defined part of an area. Area specific adaptations are defined and described in further detail in ***Section 4.2***.

Recommendations from both area wide and area specific categories have been made to create a comprehensive flood protection strategy for the Study Area. A summary of the recommended Flood Risk Management Stragies that apply to either specific design areas, or all of the Study Area is provided in ***Table 4***. The contexts for the recommended application of each adaptation are detailed in ***Section 4.1*** and ***Section 4.2***.

Table 4: Recommended Flood Risk Management Strategies

AREA SPECIFIC				AREA WIDE				
DIKES		FLOODWALLS						
Widen Footprint to Land or Water Side	Raise in Place / Constrained Dike	Permanent	Demountable	Superdikes	Flood Proofing	Planning and Development Controls	Breakwaters and Barrier Islands	Secondary Dikes

Note that other adaptations were reviewed and evaluated for implementation in the Study Area, though only the recommended adaptations are presented in the Phase 2 LIDMP. Adaptations that were eliminated at the evaluation phase include coastal wetlands, emergency preparedness and response, and managed retreated.

Coastal Wetlands: Coastal wetlands, including intertidal habitat such as brackish wetlands, eelgrass beds, mud flats, and sandflats, temper the extremity of storm impacts by attenuating wave energy, similar to breakwaters. There are no candidate sites within the Study Area to create new coastal wetlands for the purposes of flood protection; however, existing coastal wetlands can be maintained and enhanced to improve their flood protection characteristics.

The West Dike runs adjacent to the Sturgeon Bank WMA which is comprised of intertidal brackish marsh, sandflats, mudflats, and open water. The North Dike runs adjacent to pockets of mud flat, salt marsh, and eelgrass habitat. This intertidal habitat currently provides ecosystem services such as erosion and wave attenuation. Where feasible through dike upgrades this intertidal habitat could be enhanced. As part of the LIDMP the City will need to continue to work with inter-jurisdictional partners to monitor the complexity of the surrounding intertidal habitat, evaluate the existing ecosystems services that this habitat provides, and based on monitoring collaborate of efforts and initiatives to maintain and enhance this area.

Emergency Preparedness and Response: This strategy accommodates flood risks by preparing robust mitigation plans, to be carried out in the event of flood emergencies. The City has an existing emergency response plan: the Emergency Operations Centre coordinates with various departments to execute the Emergency Preparedness Flood Management Plan. The plans in place have not been reviewed as part of the Phase 2 LIDMP as this is beyond the scope of this study.

Managed Retreat: Managed retreat involves decommissioning or demolishing existing assets within a specified hazard zone, thereby eliminating flood risk by removing any development where flooding may occur. This strategy is not appropriate for the Study Area. The economic value of retaining existing assets exceeds the cost of reducing the risk of flood damage by relocating assets. The existence of development on Lulu Island that must be protected from flooding is considered a permanent condition for the purposes of the LIDMP.

4.1 AREA WIDE ADAPTATIONS

In the context of the Phase 2 LIDMP, area wide adaptations are those that facilitate the City's flood protection objectives in tandem with the dikes or alternative protection measures in place at the waterfront, but may not be sufficient to meet the City's target dike crest elevation in isolation. The target dike crest elevation is addressed through the area specific adaptations described in ***Section 4.2***.

The recommended area wide adaptations are: superdikes; floodproofing; planning and development controls; breakwaters and barrier islands; and, secondary dikes,. Each recommended adaptation is discussed in the following sections.

4.1.1 SUPERDIKES

As noted in ***Section 2.4***, a superdike is formed where the lands behind the dike are filled to the same elevation as the dike crest. Development is then built on a ground elevation equal to the dike crest.

Maximizing the width of raised land adjacent to the river decreases flood and seismic risks by increasing the integrity of the dike. The existing dikes of Lulu Island are built on soft soils that are subject to liquefaction during seismic events. These dikes may require ground improvements to meet the 2014 Seismic Design Guidelines (Seismic Guidelines). Superdikes are an approach to achieve the dual objectives of reducing vulnerability to both high water levels and seismic events. A superdike is more likely to withstand lateral movement and sloughing of the dike face without resulting in a dike breach, as compared to a standard trapezoidal dike alone. By raising lands to a superdike condition, costly ground improvements may not be required, even if they may have been required for a standard trapezoidal dike in the same area.

Any proposed dike adaptation project should comply with the Seismic Guidelines. If a proposed dike adaptation project will not meet the requirements in the Seismic Guidelines, superdikes may be considered as an alternative to ground improvements. At the design stage, a number of strategies should be investigated to determine which will meet the Seismic Guidelines at the lowest cost, on the overall balance of the considerations listed in ***Section 3***.

Any redevelopment of waterfront sites presents an opportunity to fortify existing flood protection measures. Although the Study Area is already fully built out, lands will continue to be redeveloped over the long-term future. Opportunities for implementing superdikes are most attainable where existing commercial and industrial sites are leveled in support of

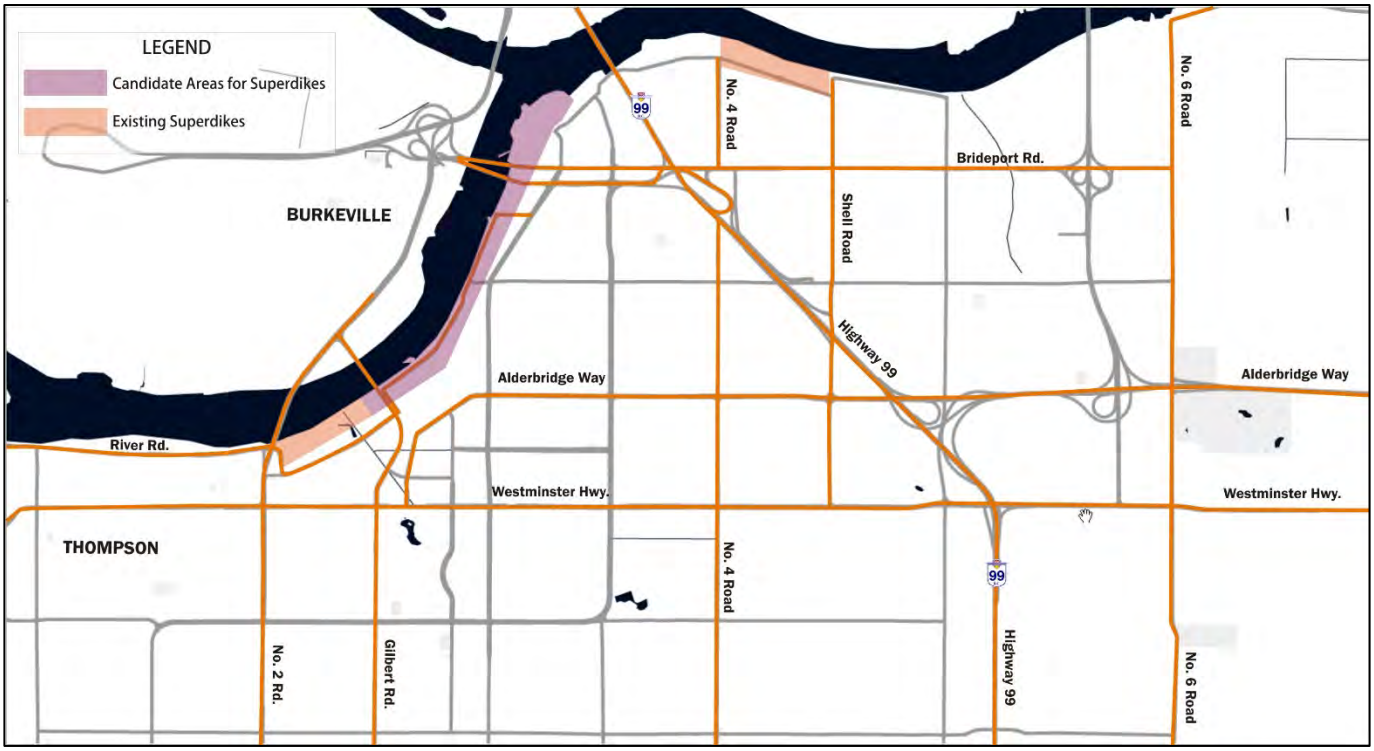
developing residential uses. Generally, industrial sites have different waterfront access and aesthetic needs than residential sites, which benefit most from a superdike condition. In recent years, residential developers have voluntarily raised the ground elevation of development sites to the same elevation as the dike crest to ensure that the units on the ground floor will have a view of the water. Within the Study Area, this has been the case at the multi-family residential developments next to the Olympic Oval, and the multi-family residential development under construction on the formerly industrial waterfront sites between No. 4 Road and Shell Road.

Application: Commercial & Residential Lands on the North Dike

The lands of the City Centre area are anticipated to experience extensive intensification and redevelopment in the coming years, further detailed in ***Section 4.2.7*** and ***Section 4.2.8***. This area has been identified as a candidate for superdikes, as shown in ***Figure 5***.

Redevelopment of waterfront sites presents opportunities to implement flood protection works concurrently with development. The optimal time for implementing superdikes is when existing assets are demolished and the site is leveled to accommodate new development.

Figure 5: Superdikes in the Study Area



4.1.2 FLOOD PROOFING

Flood proofing is a strategy to minimizing the damage to critical infrastructure in the event of a dike breach. Buildings can be constructed as flood proofed by ensuring habitable space is set at an elevation above the flood risk zone. Damage and losses incurred during flooding are minimal as any valuable or vulnerable assets are located above the possible flood elevation. In these buildings, habitable space and sensitive assets are located above a prescribed ground floor elevation, and lower floors are used only for storage of flood-resistant or low value assets. Another flood proofing strategy is using only impermeable building materials and watertight building equipment below the prescribed flood risk elevation.

The City's influence on where private building operators locate their assets within their buildings is limited, however construction of buildings with habitable space or vital assets below a specified elevation may be prohibited through legislation. By flood proofing buildings located in a specified waterfront or low elevation area, vital assets are prohibited from being located in high risk zones so that flooding will only affect non-vital infrastructure. Generally, flood proofing

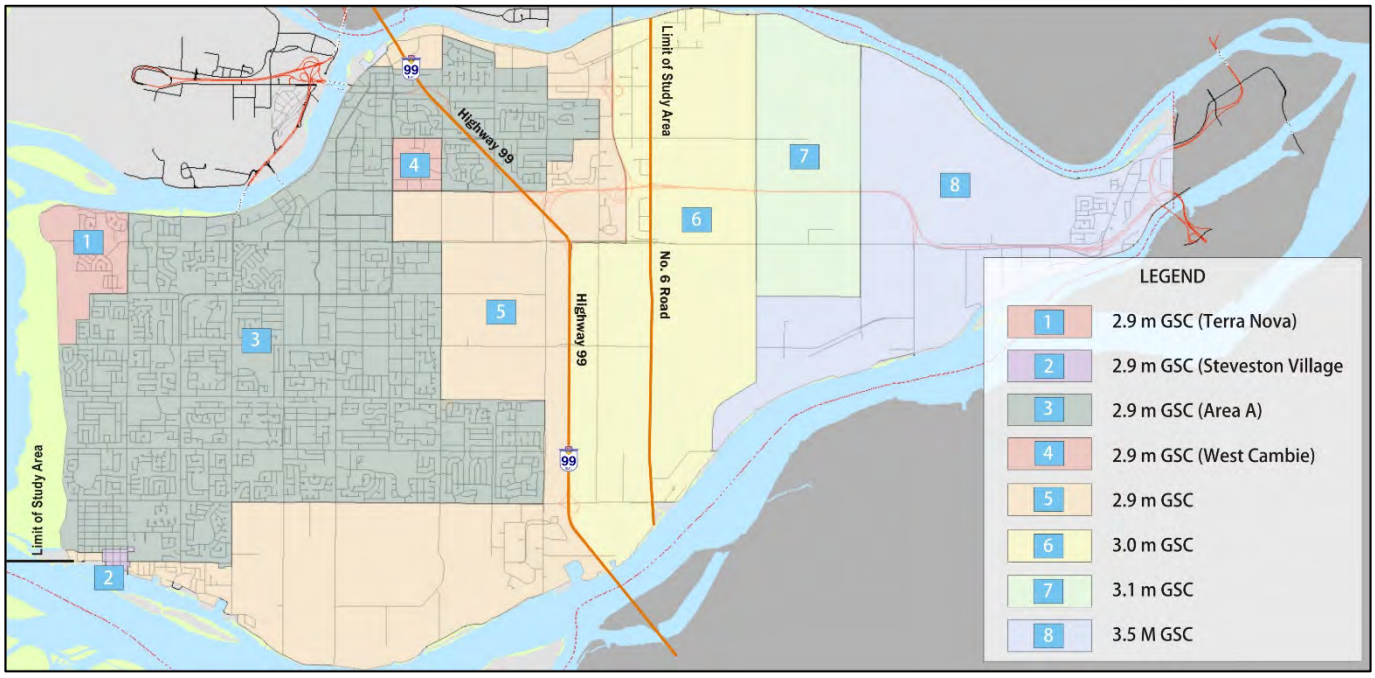
legislation impacts only the construction of new buildings; existing buildings constructed prior to the legislation's implementation are typically not impacted except through building permit applications for renovations or additions.

As noted in ***Section 2.5***, the City currently enforces flood proofing through the Flood Plain Designation and Protection Bylaw No. 8204. The Bylaw sets minimum Flood Construction Levels (FCL's) throughout the City. The FCL prescribes the minimum elevation where the underside of a floor system can be constructed. Long term raising of land levels has previously been recommended (2008-2031 Flood Protection Strategy); however, is challenging to implement in already built up areas. The bylaw also specifies setbacks from a dike ROW to make land available for diking.

Application: Flood Construction By-law Amendments

Every part of Lulu Island has a designated FCL, not only the waterfront area. The bylaw organizes FCL's by area, as shown in ***Figure 6***. Presently, the majority of the Study Area fronting the existing dikes is within 'Area A' of the bylaw. The requirements for 'Area A' are to construct to 2.9 m or at least 0.3 m above the highest elevation of the crown of any road that is adjacent to the parcel. Commercial and industrial buildings are fully exempt if the main entrance is within 3 m of a road. Developments within the Terra Nova Area are further exempt only requiring the underside of the floor slab to be greater than 2.6 m. There are no exemptions in the north-east portion of the Study Area, where a 2.9 m FCL is required.

Figure 6: Flood Construction Levels (FCL's)



Amendments to Bylaw No. 8204 may be appropriate given the current predictions for sea-level rise. These amendments could include creation of an additional FCL Area adjacent to or within a stipulated distance from the existing dike or waterfront. The area could require an FCL of 4.7 m with exemptions based development size or parcel size. The FCL's would also have to consider overall lot raising and not just habitable space.

Examples of alternate concepts for consideration are provided below:

> ***Single Family Dwellings and Small Lots***: The bylaw could be amended to increase the rate at which land is raised concurrently with redevelopment. Presently, this rate is 0.3 m above the road centreline. For smaller lots, this strategy may then present challenges to local grading, producing inconsistent grades across lots and possibly introducing complex drainage patterns. Smaller lots are more likely to be highly constrained by existing grades on neighbouring lots and the road. Where grading is highly constrained, retaining walls may be required to accommodate substantial changes in elevation. Aesthetically, abrupt grade changes are undesirable, especially in neighbourhoods of single family homes. Varied grading between lots can also create issues with differential settlement. Grading designs that are consistent with the surrounding lot fabric and do not use retaining walls are

preferred. The sidewalks and road network must also be carefully graded to maintain minimal slopes and safe connections at intersections. Any FCL increase must be implemented strategically to mitigate the potential grading challenges it may introduce.

Zoning bylaws could potentially be modified to provide additional guidance and requirements for lot coverage, setback, building heights, and others to help plan how the greater staggered lot elevations may integrate with each other. This will be challenging to implement but would increase the rate of increasing the land height in residential areas.

Mid-Size Development Lots or Building Permit Value Criteria: The bylaw could be amended to require raising to 4.7 m or 1 m (or alternate) above the road. Challenges may still exist with incorporating grading to adjacent parcels and roads.

Large Development Lots or Building Permit Value Criteria: The bylaw could be amended to require raising to 4.7 m and upgrading the local road network to accommodate access. This is currently done in practice, however, it is not specifically required under the current bylaw.

Additional studies on implementation of modified FCL bylaws should be conducted prior to proceeding with any changes. Input should be provided from architects, planners, engineers, environmental consultants and key stakeholders to obtain a comprehensive understanding of opportunities and factors to be mitigated while achieving flood protection goals.

Flood risk should be evaluated by the City periodically to determine whether increased risk warrants raising the target dike crest elevation. The bylaw can be amended as required to meet evolving City guidelines as they are adjusted per changes to flood risk conditions. For example, if the design crest elevation is raised from 4.7 m to 5.5 m, the FCL bylaw can be amended to reflect the new minimum elevation. In this way, flood proofing can progress over time as required.

4.1.3 PLANNING AND DEVELOPMENT CONTROLS

Planning and development controls may be implemented by enacting legislation to prohibit or restrict development in a defined hazard zone, such as a floodplain. More flexible policies can also be enacted to include conditional development approvals, where projects may be approved on condition that developers commit to implementing flood protection measures such as raising the abutting dike or raising the land elevation to a superdike.

Application: Site Assembly Size in the City Centre

In the Study Area, there are opportunities to pursue flood protection improvements in conjunction with new development, especially in areas expected to be intensified in the coming years. In Richmond, planning and development controls can be implemented through bylaws or amendments to the OCP.

Increasing the ground elevation of a single waterfront site is restricted by the existing elevations of adjacent lands. Where adjacent sites remain low, a redevelopment site can only be minimally raised without introducing challenges to the local road network and drainage patterns. To avoid complications arising from steep grades or retaining walls, the City can encourage developers to assemble multiple adjacent sites until a specified minimum waterfront frontage can be developed concurrently. This strategy permits increasing the dike crest level fully to the current standard elevation, and eases the transition of the waterfront to a superdike.

4.1.4 BREAKWATERS AND BARRIER ISLANDS

Breakwaters may be constructed to dissipate wave energy before waves reach the shore. This reduces the burden on the flood control structures at the waterfront. In combination with a foreshore structure, flood control structures with lower crest elevations may remain adequate to withstand increased wave run-up associated with increased water depths due to climate change and sea level rise.

With appropriate environmental consideration during design and construction, breakwaters and barrier islands can create intertidal habitat, such as sand flats, mud flats, salt marsh and eelgrass beds. These features can assist with erosion and

wave attenuation. The intertidal habitat can work in combination with a constructed flood control structures like dikes and floodwalls, to mitigate flood risk.

Sea level rise and upland limitations to natural accretion within the Sturgeon Bank WMA could result in increased offshore depths beyond the West Dike, which could simultaneously increase wave heights reaching the West Dike.

Increased water depths off-shore reduce the wave attenuating properties of Sturgeon Bank. The current predictions and assumptions used in the BC Sea Dike Guidelines[10] for the year 2100 suggest wave run-up may account for up to 2.7 m of the future dike crest elevation. The full extent of future crest height increases will require detailed observation and study of observed sea level rise.

Application: The West Dike Foreshore - Sturgeon Bank

The West Dike runs adjacent to Sturgeon Bank WMA comprised of intertidal brackish marsh, sandflats, mudflats, and open water. Maintenance and enhancement of these areas could provide wave dissipation and erosion protection.

Photograph: Sturgeon Bank Management Area

The West Dike is a candidate for barrier islands, as presented in the Phase 1 LIDMP. Presently, the features of Sturgeon Bank dissipate wave energy. With future increased water depths on the Sturgeon Bank, wave heights are expected to increase, reducing the wave dissipate benefits of Sturgeon Bank, putting the West Dike at higher future risk of overtopping. Construction of breakwaters or barrier islands, including the maintenance and enhancement of intertidal habitat, is one approach to offset the potential future loss the existing wave dissipation benefits of Sturgeon Banks.

While breakwaters and barrier islands will not address the immediate crest elevation requirements of 4.7 m, construction of barrier islands may allow for future deferrals of crest height increases. A general concept plan showing possible locations for barrier islands is presented in ***Figure 7***.

[10] Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use Draft Policy Discussion Paper, Ausenco Sandwell, Jan 27 2011

Figure 7: Artistic Rendering of Barrier Island Concept for Sturgeon Bank

Breakwaters are most effective when constructed close to the shore, as broken waves grow again behind the breakwater under the influence of wind. The effectiveness depends also on the crest height of the breakwater, with a higher breakwater giving more wave reduction. Preliminary calculations from the Phase 1 LIDMP indicated that wave reduction with a breakwater or barrier islands constructed to +3.0 m geodetic would reduce wave height by 70% if constructed 200 m offshore, 60% at 500 m offshore, and 45% at 2000 m offshore.

Intertidal ecosystems are driven by interdependent components including rates of accretion, stream velocity, salinity, water quality, sea level, temperature, vegetation productivity, adjacent land use etc. that are complex to measure and model. Understanding the complexity of current conditions to better prepare for predictable increases in sea level rise will help direct strategies to maintain and enhance intertidal ecosystems. To this end, the City continues to work on inter-jurisdictional efforts to better understand the influencing factors that affect the Sturgeon Bank WMA, and intertidal habitat throughout the Fraser River Estuary.

4.1.5 SECONDARY DIKES

Secondary dikes work in conjunction with primary dikes to reduce the impact of a flood in the event that a primary dike is breached or overtopped. A secondary dike protects assets behind the secondary dike alignment while the lands between the primary and secondary dikes may flood intermittently. Secondary dikes are appropriate for implementation where the lands between the primary and secondary dike require a different measure of protection than lands behind the secondary dike. Eligible areas may include parking lots, parks or natural areas that can withstand intermittent flooding with minimal damage or losses incurred.

As secondary dikes are built inland, they can be less costly to build and less susceptible to damage during seismic events as compared to adaptations directly on the waterfront. The advantage is that an equivalent measure of protection can be

extended to important inland assets, at a lower cost and lower seismic risk, than raising the primary dike at the waterfront. In the Study Area, secondary dikes are recommended for consideration where no critical assets are located on waterfront lands and there are assets further inland that require protection.

Application: Terra Nova

In future, the City may consider exploring establishing an alternative dike alignment for a part of the Terra Nova area through the park lands, as shown in ***Figure 8***.

By setting the alignment inland, the City may avoid costly ground improvement measures that may be required for upgrading the existing alignment on the waterfront. Assets sensitive to flooding, such as private homes and heritage sites, would be protected by the secondary dike. Less sensitive assets, such as the park, trails and open space lands, can withstand occasional flooding with minimal losses incurred and therefore may be adequately protected by a dike with a relatively lower crest elevation.

A proposed breach in the primary dike to connect the Terra Nova Slough to the Fraser River for the purpose of creating a Chum Salmon spawning slough will increase flood risk to the City. A secondary dike will mitigate the risk.

Figure 8: Secondary Dike Alignment through Terra Nova

4.2 AREA SPECIFIC ADAPTATIONS

For the purposes of the master plan, an area specific adaptation is a structural adaptation that can achieve the target 4.7 m crest height, with consideration for a future increase to 5.5 m. This section outlines the preferred area specific adaptation measures for each of the thirteen design areas.

The recommended approaches to area specific adaptations includes: widen footprint to land or water side; raise in place / constrained dike; permanent floodwall; demountable floodwall.

Widen Footprint to Land or Water Side

Dikes are the most common form of structural flood protection. Lulu Island is currently protected by a perimeter ring dike, with floodwalls or alternative protections at some sites. In the Study Area, improvements to the existing dike should be pursued wherever possible.

As per the typical dike sections presented in ***Appendix F***, the typical City dike upgrade cross-section consists of a 2:1 slope on the water side, and a 3:1 slope on the land side[11]. Raising a dike by 1 m then triggers a 5 m horizontal space requirement (assuming the standard slopes are applied). Land side dike expansions can be challenging where the footprint is constrained by existing buildings, infrastructure, drainage ditches, or RMA's at the toe. Where a dike's land side toe is heavily constrained, a standard dike can be raised by widening its footprint onto the water side.

While shoreline habitat within the Fraser River Estuary will generally have a higher habitat value, and expansion into this area should be avoided, this may not always be the case. Implementation of area specific flood protection strategies will have an environmental impact regardless of the strategy put forth for a given area. Environmental assessments and valuation will be undertaken in the design construction phase, where possible habitat impact will be avoided. Where impact cannot be avoided, efforts will be made to mitigate, and if necessary compensate for impact following a net gain approach.

Raise in Place / Constrained Dike

Where dike expansion is constrained on both the land and water sides, it may be possible to raise a dike within its existing footprint, creating a constrained dike. This may be achieved by introducing a retaining wall on one or both sides. In Richmond, RMA's, development and infrastructure may abrupt to the landside of the dike, and intertidal habitat or marine infrastructure may be on the water side of the dike, meaning the dike may have constraints on both sides. In the Study Area, raising the dike in place can be pursued to minimize impacts on adjacent lands.

Permanent Floodwall

A floodwall is a constructed barrier designed to hold back flood waters. In the Study Area, floodwalls can be implemented where space is limited and a dike would interfere with other land uses or infrastructure, such as existing buildings. Floodwalls may also be preferable to a dike where access to the water is required for economic activity, such as fishing or shipping. Generally, where feasible, earth fill trapezoidal dikes are preferable as they generally have lower costs, they are easier to maintenance, they are more reliable and easier to repair in emergency situations.

Demountable Floodwall

In areas where waterfront access is desired, demountable flood barriers can be constructed so that the barrier is erected only when required, during storm events. Regular access to the waterfront is maintained otherwise. This adaptation may be applied in the Study Area at industrial sites or marinas, where activities require amenities directly on the waterfront that cannot be set back behind a floodwall or dike. Where possible, this form of dike is avoided due to their higher costs, mobilization requirements, and reliability concerns.

Parsons assessed each potential dike adaptation strategy based on the considerations outlined in ***Section 3***. A summary of the recommendations for each design area is provided in ***Table 5***. Key issues and opportunities to be considered when implementing the recommended adaptations are presented for each design area in ***Section 4.2.1*** through ***Section 4.2.13***.

[11] Typical Cross Section River Dike Upgrade, City Drawing Mb-98, Golder Associates, 2008

Table 5: Recommended Area Specific Adaptations

FLOOD PROTECTION SEGMENT	RECOMMENDATION
WEST DIKE	
Seafair	Raise the dike on the existing alignment. Additional studies required to quantify drainage impacts of land side expansion, habitat impacts and costs associated with water side or land side expansion, and long term resiliency of a constrained dike solution.
Terra Nova	Raise the dike on the existing alignment. Additional studies required to quantify drainage impacts of land side expansion, habitat impacts and costs associated with water side or land side expansion, and long term resiliency of a constrained dike solution. Alternatively, consider routing a secondary dike inland through Terra Nova Rural Park, in lieu of raising the primary dike at the waterfront.
NORTH DIKE	
Thompson Terra Nova	Raise the dike on the existing alignment with land side expansion. Plan for the long-term raising of River Road.
Thompson Dover	Raise the dike on the existing alignment with land side expansion. Plan to raise River Road.
Oval	Existing area generally redeveloped as a superdike scenario (elevations from 4.0 to 4.5m). Future raisings to 5.5 m can take place on the existing alignments and integrate into the adjacent landscaping.
City Centre 1	Raise a dike with land side expansion. Consider creation of a set-back dike and inland raising (superdike) in conjunction with the future Middle Arm Waterfront Park construction.
City Centre 2	Raise the dike on the existing alignment with land side expansion in conjunction with redevelopment. Ensure any interim dike upgrades are compatible with the long term strategy of constructing superdikes.
Duck Island River Rock	Implement approved development plans. Plan for temporary dike to protect City assets if required to address sea level rise and climate change prior to implementation of the approved strategy at the Duck Island or River Rock Casino sites.
Industrial	Raise the dike on the existing alignment. Site specific solutions may be required at the Fraser River Terminal site. Plan for temporary dike along the alternate alignment if required to address sea level rise and climate change prior to implementation of a strategy at the Fraser River Terminal site.
Bridgeport Tait	Existing area generally redeveloped as a superdike scenario (elevation 4.7m). Future raisings to 5.5 m can take place on the existing alignments and integrate into the adjacent landscaping.
Industrial North East 1	Raise the dike on the existing alignment. Land acquisition may be required to facilitate construction of a trapezoidal dike (through redevelopment or otherwise). Implementation of a temporary floodwall adjacent to the waterfront lots may be required in advance of a permanent adaptation to address sea level rise and climate change. Consider Bath Slough Revitalization Initiative for future designs.
Industrial North East 2	Raise the dike on the existing alignment. Additional studies required to quantify drainage, habitat impacts, and costs associated with land side expansion of a trapezoidal dike. A constrained land side slope may be required to integrate with the existing drainage infrastructure. Consider Bath Slough Revitalization Initiative for future designs.
Industrial North East 3	Raise the dike on the existing alignment. Additional studies required to quantify drainage, habitat impacts, and costs associated with land side expansion of a trapezoidal dike. A constrained land side slope may be required to integrate with the existing drainage infrastructure.

4.2.1 SEAFAIR

The Seafair design area consists of established residential neighbourhoods of single family homes and townhouse complexes. On the foreshore, lands are undeveloped as is the case for the entirety of Sturgeon Bank. The Quilchena Golf & Country Club makes up the northern third of the plan; it sits entirely on Agricultural Land Reserve (ALR) lands. No major changes to the Seafair waterfront are identified in the OCP.

The preferred adaptation is to raise the dike on its existing alignment. Expansions to either side are constrained by environmental and infrastructure factors. These should be evaluated at the time an adaptation project is proposed to inform a detailed design that will best balance the considerations outlined in ***Section 3***.

Barrier islands may be considered to reduce wave run-up and mitigate the need for future dike crest increases, as discussed in ***Section 4.1.4***.

If ditches at the toe of the dike are to be filled, the associated loss of stormwater storage and conveyance may need to be compensated with underground pipes or alternative systems. Ditches may be designated as RMA's. Associated restrictions to alterantions should be investigated when dike adaptations proceed to design and construction. Revised drainage plans must be compatible with local pump stations.

The Williams Road pump station was upgraded in 2013. The dike crest in the vicinity of the pump station is higher than adjacent lands. The pump station is not anticipated to pose special requirements for raising the dike on adjacent lands, however raising the dike crest over the pump station may increase the loading on this infrastructure. Dike adaptation projects that include raising the dike crest over the pump station should consider the pump station's structural and operational needs, including access.

LOCATION:

Williams Road to Granville Avenue

RECOMMENDATION:

Raise the dike on the existing alignment. Additional studies required to quantify drainage impacts of land side expansion, habitat impacts and costs associated with water side or land side expansion, and long term resiliency of a constrained dike solution.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- West Dike
- Traditional Neighbourhood

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Red-coded

RMA Presence

- 5m RMA Presence

PHOTOGRAPH:

West Dike, facing north at Williams Road Pump Station

4.2.2 TERRA NOVA

The Terra Nova area is primarily recreational and agricultural including small, low density areas of single family homes. Recreational and natural areas include the Quilchena Golf & Country Club and Terra Nova Rural Park. The park has extensive natural areas with trails and observation decks at the slough and wetland areas. A large children's play structure, the Adventure Play Environment, opened in 2014 at the northwest corner of the park. No major changes to the waterfront or parklands are identified in the OCP for this design area. The entire park is identified as conservation lands within the OCP.

The open space provides a unique setting within the Study Area to consider both waterfront adaptations at the existing primary dike, or a secondary dike alignment through the park. For more information on the secondary dike option, refer to ***Section 4.1.5***. Barrier islands may be considered for implementation on Sturgeon Bank to reduce wave run-up and avoid the need for future dike crest increases, as discussed in ***Section 4.1.4***. Opportunities to create intertidal habitat areas in the park may be pursued when dike adaptations proceed.

The historic Terra Nova Cannery site is present on the north side of the park, in front of the private homes on River Road within the park. There are no visible remains of the cannery, except the shoreline recedes inwards around the former cannery's boundaries. Heritage status and associated restrictions to local alterations should be investigated when dike upgrades at the waterfront are proposed. Sheet pile may need to be considered for the segment adjacent to the Cannery site to minimize impacts.

LOCATION:

Granville Avenue to Terra Nova Rural Park

RECOMMENDATION:

Raise the dike on the existing alignment. Additional studies required to quantify drainage impacts of land side expansion, habitat impacts and costs associated with water side or land side expansion, and long term resiliency of a constrained dike solution.

Alternatively, consider routing a secondary dike inland through Terra Nova Rural Park, in lieu of raising the primary dike at the waterfront.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- West Dike

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Red-coded

RMA Presence

- 5 m & 15m RMA Presence

PHOTOGRAPH:

West Dike, facing north at Terra Nova Rural Park

4.2.3 THOMPSON TERRA NOVA

The Thompson Terra Nova design area is residential, with recreational uses between River Road and the waterfront in the form of the dike trail and surrounding open space. The residential areas consist primarily of single family homes. No major changes to the Thompson Terra Nova design area are identified in the OCP.

The existing dike is situated between the Middle Arm of the Fraser River and River Road. Future expansions in some areas will be challenging due to the lack of space. Raising River Road will help with future dike crest elevation increases; however, will be challenging to implement.

Single family homes have driveway access from River Road throughout the design area. Individual lots are anticipated to be incrementally raised as they are redeveloped, however, this will take numerous decades to occur.

LOCATION:

Terra Nova Rural Park to McCallan Road

RECOMMENDATION:

Raise the dike on the existing alignment with land side expansion. Plan for the long-term raising of River Road.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- Traditional Neighbourhood

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Red-coded

RMA Presence

- None

PHOTOGRAPH:

North Dike, facing east near Terra Nova Rural Park entrance

4.2.4 THOMPSON DOVER

The Thompson Dover design area includes a City works yard and recycling facility, as well as mid-rise multi-family residential complexes. Recreational uses exist between River Road and the waterfront in the form of the dike trail and surrounding open space. Within the Thompson Dover design area, only the City works yard has driveway access to River Road. No major changes to the Thompson Dover design area are identified in the OCP. It is anticipated that the City works yard will be redeveloped to residential uses consistent with the surrounding neighbourhood at some point in the future.

It would be advantageous to raise River Road and assist in future land and dike crest increases in the long term. The multi-family residential lands were raised much higher than River Road when these sites were developed. Raising River Road at this location would not have the same access challenges as the Thompson Terra Nova area as there is no driveway access and the buildings are already on high land. River Road may be raised to the dike crest elevation on this section at any time. It would be advantageous to do a longer segment of River Road together, thus raising the road here should proceed concurrently with raising River Road in the Thompson Terra Nova design area to the west. Raising River Road along the City works yard may be considered concurrently with redevelopment of the site in the event that this site is redeveloped.

Issues and opportunities with raising River Road are further discussed in *Section 4.3.2*.

LOCATION:

McCallan Road to No. 2 Road Bridge

RECOMMENDATION:

Raise the dike on the existing alignment with land side expansion. Plan for the long-term raising of River Road.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- City Centre

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Red-coded

RMA Presence

- None

PHOTOGRAPH:

North Dike, facing east at Lynas Lane

4.2.5 OVAL

Within the Oval design area, the River Road alignment has been relocated south of development to the former rail corridor. The dike trail is part of a wide landscaped area abutting high rise condos. Redevelopment of the Oval design area began in advance of the 2010 Vancouver Winter Olympics, for which the Richmond Olympic Oval skating and fitness centre was built. The adjacent sites have since been redeveloped as well. The majority of these lands were filled to the dike crest elevation when the dike was raised in conjunction with site redevelopment. This design area is considered complete for the time being as the dike crest elevations vary from 4.0 m to 4.5 m, which is within range of the current 4.7 m target dike crest elevation.

There is one existing building directly west of the Dinsmore Bridge, forming the one remaining section of this design area to be raised. As this building has been set back from the waterfront, there is land available to raise the dike by widening the footprint to the land side at this site. This option may be pursued when this segment of River Road is decommissioned and relocated to the former rail corridor inland.

LOCATION:

No. 2 Road Bridge to Dinsmore Bridge

RECOMMENDATION:

Existing area generally redeveloped as a superdike scenario (elevations from 4.0 to 4.5m). Future raisings to 5.5m can take place on the existing alignments and integrate into the adjacent landscaping.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- City Centre

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Red-coded

RMA Presence

- 5 m & 15 m RMA Presence

PHOTOGRAPH:

North Dike, facing east at the Richmond Oval

4.2.6 CITY CENTRE 1

The City Centre 1 design area is is presently long-established office industrial sites with sizeable parking lots. All sites have access from River Road, which runs along the waterfront in this design area. Marinas exist along the waterfront. The existing Middle Arm Waterfront Park is a linear park along the waterfront constructed concurrently with the Olympic Oval in 2009. The park's amenities include the dike trail, playgrounds, and piers. Outdoor seating and stages for public events have been inset on the water side dike face. The OCP identifies major changes, including commercial intensification and creation of a large park.

A new park, Middle Arm Park, is proposed in the OCP adjacent to the existing Middle Arm Waterfront Park, as shown on the City Centre Area Plan presented in ***Appendix A***. The existing River Road is planned to be realigned to the former rail corridor, and all lands between the rail corridor (the future River Road) and the waterfront are proposed to become the parklands forming Middle Arm Park. A concept sketch[12] is presented in ***Figure 9***.

LOCATION:

Dinsmore Bridge to Cambie Road

RECOMMENDATION:

Raise dike with land side expansion. Consider creation of a set-back dike and inland raising (superdike) in conjunction with the future Middle Arm Waterfront Park construction.

Plans for the new park have not yet been formalized; however, based on consultation with City staff, there is support for establishing the future dike alignment inland to improve public connectivity with the waterfront, and facilitate creation of intertidal habitat within the park. A set-back dike combined with inland raising to create a superdike would provide the most resilient solution for this area. Dike plans should be prepared concurrently with plans for the proposed park.

In the event that the City wishes to fortify the existing dike in advance of the development of Middle Arm Park, the City may consider raising a temporary flood protection adaptation in the interim until the proposed park's plans are finalized and implemented.

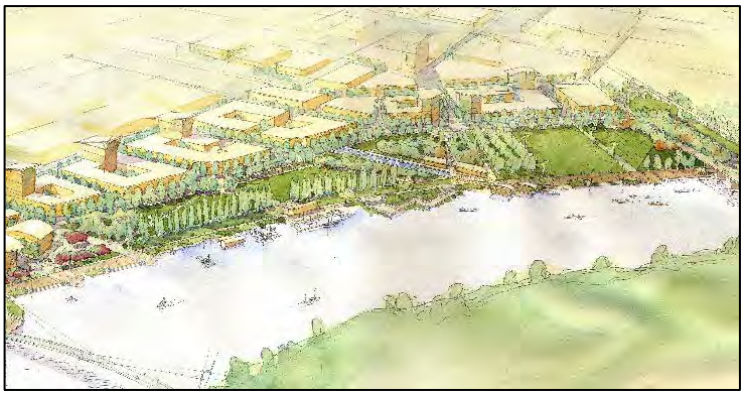


Figure 9: 2006 Concept Plan for the Proposed Middle Arm Park

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- City Centre

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Yellow-coded
- Green-coded

RMA Presence

- None

PHOTOGRAPH:

North Dike at Gilbert Road, facing east

[12] Middle Arm Open Space Master Plan Concept, PFS Studio, December 2006

4.2.7 CITY CENTRE 2

Marinas are present throughout the City Centre 2 design area. The dike trail ends approximately 200 m north of Cambie Road, where the dike becomes marina parking lots. The proposed Middle Arm Park ends where the dike trail becomes parking lots. These parking lots are directly adjacent to the trafficable road; there is no shoulder between the road and the parking lots. Parking lots are raised from River Road with either steep slopes or retaining walls. This section of River Road will ultimately be realigned to the former rail corridor. Lands are planned to be redeveloped into high density commercial and mixed use buildings. Redevelopment of this area has begun.

While the optimal time to implement flood protection adaptations is concurrently with redevelopment of adjacent sites, the parcels of land in this area have narrow frontages, and smaller lot depths. This lot geometry can create challenges in implementing flood protection upgrades alongside redevelopment. These issues can be addressed through site assemblies, as detailed above in ***Section 4.1.3***. The approach to flood protection in this area should generally mimic the recent improvements in the Oval area, with redevelopment raising the waterfront and the development site to establish a superdike.

The adaptations along this design area may include sites with floodwalls in order to maintain access and usage of the existing marinas. Any interim dike upgrades planned in this area should be designed with consideration for future adaptations to establish a superdike, the long-term goal in this area.

LOCATION:

Cambie Road to Moray Bridge

RECOMMENDATION:

Raise the dike on the existing alignment with land side expansion in conjunction with redevelopment. Ensure any interim dike upgrades are compatible with the long term strategy of constructing superdikes.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- City Centre

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Yellow-coded
- Green-coded

RMA Presence

- None

PHOTOGRAPH

Float homes off North Dike at Capstan Way

4.2.8 DUCK ISLAND

The Duck Island design area consists of former industrial lands, substantial parking lots and the River Rock Casino, which includes a marina and a wetland. The River Road alignment is inland from Duck Island. The former industrial area, now vacant, hosts the Richmond Night Market in the summer. The landowners of this area are currently seeking development approval to develop the site for commercial uses, consistent with the land uses identified in the OCP.

The existing waterfront lands in the Duck Island design area are entirely privately-owned. The landowners are currently developing private flood protection plans, to be reviewed and approved by the City. The plans are expected to be implemented in the near future, upon approval by the City.

In the event that a suitable strategy is not developed for the private waterfront lands in this area, or if an interim adaptation measure is required, there are inland alternative alignments available to the City to maintain protection for Lulu Island. The alternate alignment would follow River Road or the CN Rail Corridor through this design area. This approach is not preferred; however, details on the alignment and approach are outlined in TM#2 (*Attachment 2*).

LOCATION:

Moray Bridge to Oak Street

RECOMMENDATION:

As per approved development plans. Plan for temporary dike to protect City assets if required to address sea level rise and climate change prior to implementation of the approved strategy at the Duck Island or River Rock Casino sites.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- City Centre

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Red-coded
- Yellow-coded
- Green-coded

RMA Presence

- None

PHOTOGRAPH:

Marina at River Rock Casino

4.2.9 INDUSTRIAL

The Industrial design area includes industrial areas and parking lots. The Fraser River Terminal and a BC Hydro power station are located here. River Drive is aligned south of these sites, set back from the waterfront. These lands are anticipated to be industrial uses for the foreseeable future, as noted in the OCP.

The North Arm Bridge carrying the Canada Line and a bikeway was constructed in this design area in 2009 with ample clearance for dike works beneath the bridge deck. At the detailed design stage, dike works would need to be verified for confirmation that the footings can withstand additional loading without risk of settling, or any other risks that may compromise the bridge structure.

Adaptations in this area are constrained by existing waterfront development and uses. This industrial area includes the Fraser River Terminal - a shipping port and ship repair centre – as well as the BC Hydro Kidd #2 Substation. This area is anticipated to be industrial for the foreseeable future. Because waterfront lands are constrained by private industrial uses, the City may consider pursuing a temporary adaptation in the interim until the industrial sites are redeveloped. A temporary structure along the River Drive alignment may be considered. This approach is not preferred; however, details on the alignment and approach are outlined in TM#2 (***Attachment 2***).

LOCATION:

Oak Street Bridge to No. 4 Road

RECOMMENDATION:

Raise the dike on the existing alignment. Site specific solutions may be required at the Fraser River Terminal site. Plan for temporary dike along the alternate alignment if required to address sea level rise and climate change prior to implementation of a strategy at the Fraser River Terminal site.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- City Centre

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Red-coded
- Green-coded

RMA Presence

- None

PHOTOGRAPH:

North Dike, west of Fraser River Terminal

4.2.10 BRIDGEPORT TAIT

The Bridgeport Tait design area was formerly entirely industrial. An auto repair facility remains at its eastern edge. The remainder of these lands were recently developed to high-rise multi-family residential, with ongoing development of associated residential and commercial uses.

During site devepment, the dike crest elevation was raised to 4.7 m and the development lands were filled to a superdike condition. This area is considered complete for the time being. A wide landscaped area exists between the waterfront and the buildings, providing a trail through the neighbourhood at the waterfront. Future dike crest height increases can be accommodated in this area, and integrated with the local landscaping and waterfront trail.

LOCATION:

No. 4 Road to Shell Road

RECOMMENDATION:

Existing area generally redeveloped as a superdike scenario (elevation 4.7m). Future raisings to 5.5 m can take place on the existing alignments and integrate into the adjacent landscaping.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- City Centre

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Red-coded
- Yellow-coded

RMA Presence

- None

PHOTOGRAPH:

North Dike, facing west at the Park Riviera Development

4.2.11 INDUSTRIAL NORTH EAST 1

The Industrial NE 1 design area is entirely industrial, and no major changes are outlined in the OCP. Limited space is available in this design area as River Road is either directly on the waterfront or confined by developed lots. Where River Road is adjacent to the waterfront, it will need to be raised concurrently with dike works to meet the target dike crest elevation with a standard trapezoidal cross-section. This may impact driveway access to the lots south of River Road. An interim constrained land side dike toe may be required to mitigate impacts to adjacent lots in the interim until redevelopement and land raising occurs.

A number of small businesses operate on a narrow strip of land between River Road and the waterfront. These lands, approximately 2 ha, are privately owned. The City may consider acquiring these lands to implement diking in this area. The acquisition of approximately 2 ha of private lands north of Simpson Road may add significant costs to diking in this area.

A floodwall may be considered for this section of the design area as an interim solution in advance of the City implementing a permanent trapezoidal dike adaptation. Any interim solutions will require cooperation with the existing landowners. Outside this section, there are lands available from the River Road ROW to the shore to raise the existing dike. At the detailed design stage, if lands are too highly constrained to expand the dike footprint, the City may also consider acquiring additional lands from the parking lots on the south side of River Road.

The Industrial North East 1 LIDMP Study Area is bounded by Bath Slough. Through the Bath Slough Revitalization Initiative, adopted in 2014, the City has conducted a number of innovative ecological initiatives along Bath Slough including water quality improvements, riparian enhancement and native pollinator pasture initiatives. The Bath Slough Revitalization Initiative should be considered in the design and construction phase of diking in this area.

LOCATION:

Shell Road to Bath Slough

RECOMMENDATION:

Raise the dike on the existing alignment. Land acquisition may be required to facilitate construction of a trapezoidal dike (through redevelopment or otherwise). Implementation of a temporary floodwall adjacent to the waterfront lots may be required in advance of a permanent adaptation to address sea level rise and climate change. Consider Bath Slough Revitalization Initiative for future designs.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- Industrial

ESA Habitat Type

- Intertidal
- Shoreline
- Freshwater Wetland

FREMP Data

- Yellow-coded
- Green-coded

RMA Presence

- 15m RMA Presence

PHOTOGRAPH:

North Dike, facing west at No. 5 Road

4.2.12 INDUSTRIAL NORTH EAST 2

The Industrial NE 2 design area is entirely industrial. River Road abuts the waterfront. Port Metro Vancouver owns a vacant lot west of the Knight Street Bridge. There are large ditches along the south side of River Road. No major changes to this area are presented in the OCP.

River Road is currently the dike in this design area. There are insufficient lands available north of the road to raise the dike, although the elevation of the entire River Road may be raised. No businesses within this area access the waterfront directly from their lots, therefore maintaining waterfront access for these businesses is not required. Existing drainage on the land side may need to be modified as large ditches are present along River Road.

Public access to the waterfront may be improved by the addition of a trail adjacent to the raised River Road, in compliance with the City's long term vision of a connected trail system at the waterfront of the entire island.

The Industrial North East 2 LIDMP Study Area is bounded by the Bath Slough. Through the Bath Slough Revitalization Initiative, adopted in 2014 the City has conducted a number of innovative ecological initiatives along Bath Slough including water quality improvements; riparian enhancement and native pollinator pasture initiatives. The Bath Slough Revitalization Initiative should be considered in the design construction phase of dike upgrades in this area.

LOCATION:

Bath Slough to Knight Street Bridge

RECOMMENDATION:

Raise the dike on the existing alignment. Additional studies required to quantify drainage, habitat impacts, and costs associated with land side expansion of a trapezoidal dike. A constrained land side slope may be required to integrate with the existing drainage infrastructure. Consider Bath Slough Revitalization Initiative for future designs.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- Industrial

ESA Habitat Type

- Intertidal
- Shoreline
- Freshwater Wetland

FREMP Data

- Red-coded
- Yellow-coded
- Green-coded

RMA Presence

- 15m RMA Presence

PHOTOGRAPH:

North Dike, facing east at Bath Slough Pump Station

4.2.13 INDUSTRIAL NORTH EAST 3

The Industrial NE 3 design area is entirely industrial. River Road abuts the waterfront and provides access to substantial parking lots for associated industrial sites and businesses. There are large ditches along the south side of River Road. No major changes to this area are presented in the OCP.

River Road is currently the dike in this design area. Large natural areas along the waterfront host mature trees, primarily on the north side of the dike. There is also smaller, less established vegetation along the south side of River Road. It is anticipated that the entire road must be raised to implement dike crest increases.

A lumber yard occupies a substantial part of this design area. The City has a ROW through the site over the River Road alignment, however access is blocked off with gates at either end of the lumber yard site. The waterfront trail is also currently blocked off through this area. If ever this site is redeveloped, dike adaptations may be pursued concurrently. However, no major changes to this industrial area are anticipated in the near future.

LOCATION:

Knight Street Bridge to No. 6 Road

RECOMMENDATION:

Raise the dike on the existing alignment. Additional studies required to quantify drainage, habitat impacts, and costs associated with land side expansion of a trapezoidal dike. A constrained land side slope may be required to integrate with the existing drainage infrastructure.

ENVIRONMENTAL CONSIDERATIONS:

ENMS Strategy Area

- Fraser River
- Industrial

ESA Habitat Type

- Intertidal
- Shoreline

FREMP Data

- Red-coded
- Green-coded

RMA Presence

- 15m RMA Presence

PHOTOGRAPH:

Conveyor belt over North Dike at No. 6 Road.

4.3 SITE SPECIFIC ADAPTATIONS

Where existing infrastructure conflicts with the recommended flood protection adaptation, a custom design for that site may be required, or the existing infrastructure may be retrofitted to accommodate diking. Infrastructure including but not limited to pump stations, road or railways, bridges or industrial infrastructure may present site-specific constraints that preclude the implementation of the recommended adaptation for the rest of that design area.

Ideally, dike adaptations are pursued when the adjacent lands are redeveloped. Flood protection measures can then be included in the scope of the proposed works. However, existing infrastructure may be suitable for a design life extending far into the future, farther than the City wishes to defer dike adaptations. In these cases, interim adaptations may be pursued.

Site-specific adaptation designs, whether permanent or temporary, should take into account all the considerations listed in *Section 3*.

4.3.1 BRIDGES

Bridges have unique constraints within a design area. The recommended adaptation for a design area may not be feasible at a bridge site, in which case a site-specific adaptation may be designed to be integrated with the standard adaptation on either side of the bridge.

A list of bridges and the particular constraints that may guide a site-specific adaptation is presented in *Table 6* below. Note that the recommended adaptation strategies in the table are recommended based on adaptations proceeding in advance of any bridge upgrades or replacement. If any bridges are to be upgraded or replaced, flood protection measures at the bridge site should be included within the scope of work.

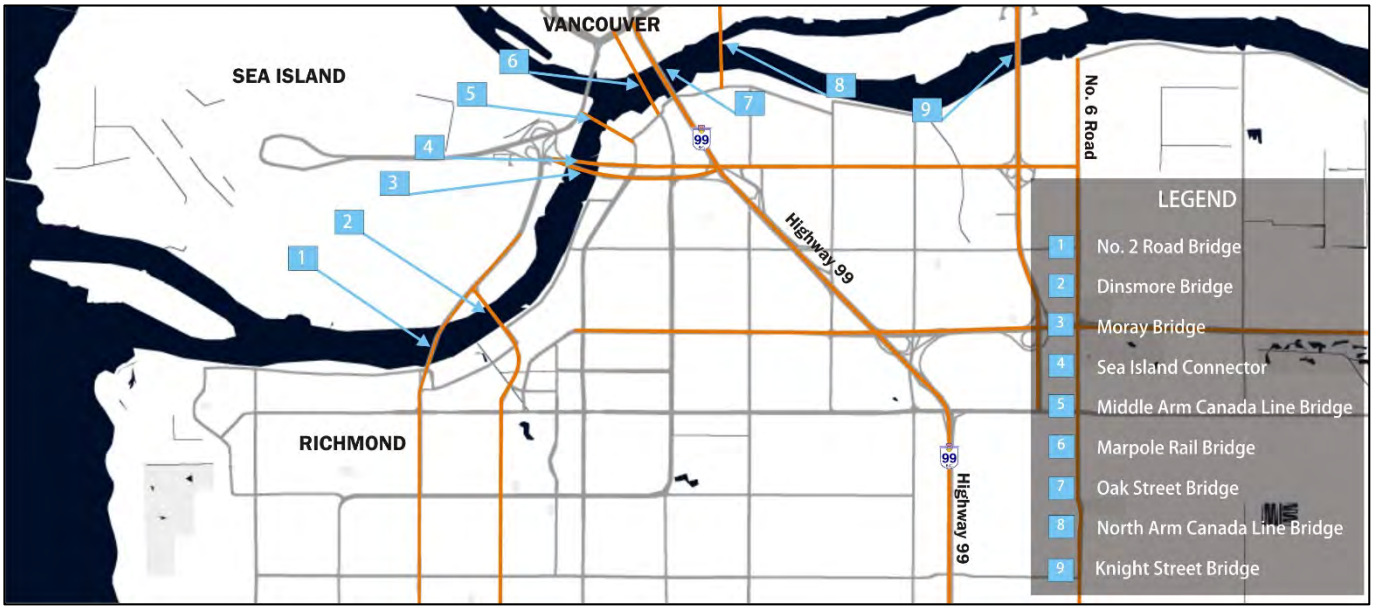
Table 6: Bridge Constraints and Recommended Adaptations

BRIDGE NAME (OWNERSHIP, BRIDGE TYPE)		
AREA	**CONSTRAINTS AND CONDITIONS**	**RECOMMENDED ADAPTATION STRATEGY**
1) NO. 2 ROAD BRIDGE (CITY OF RICHMOND, ROAD)		
Oval	• Bridge deck is low. • Footings are under the existing dike. • Bridge crosses over River Road. • Bridge crosses over dike trail. • Bike ramp to bridge from dike trail sensitive to grade changes.	Tied to abutments
2) DINSMORE BRIDGE (CITY OF RICHMOND, ROAD)		
Oval	• Bridge deck is low. • Footings are under the existing dike. • Bridge crosses over River Road with 4.3m clearance. • Bridge crosses over dike trail.	Tied to abutments
3) MORAY BRIDGE (CITY OF RICHMOND, ROAD)		
City Centre 1	• Bridge deck is very low. • Existing dike is inland, not under the bridge. • Bridge does not cross any road or trail. • No waterfront trail currently exists under the bridge. • Existing dike is aligned over the bridge.	Tied to abutments
4) SEA ISLAND CONNECTOR (CITY OF RICHMOND, ROAD)		
City Centre 1	• Bridge deck is very low. • Existing dike is inland, not under a bridge. • Bridge does not cross any road or trail. • No waterfront trail currently exists under the bridge. • Existing dike is aligned over the bridge.	Tied to abutments

BRIDGE NAME (OWNERSHIP, BRIDGE TYPE)		
AREA	**CONSTRAINTS AND CONDITIONS**	**RECOMMENDED ADAPTATION STRATEGY**
5) MIDDLE ARM CANADA LINE BRIDGE (TRANSLINK, RAIL)		
Duck Island	• None	Under span
6) MARPOLE RAIL BRIDGE (CP RAIL, RAIL)		
Duck Island	• Bridge deck is low. • Timber trestle bridge; minimal space between footings. • Not currently operational. • Repairs required to return bridge to operational conditions. • CP Rail's intentions for future use are unknown.	Tied to abutments
7) OAK STREET BRIDGE (BC MINISTRY OF TRANSPORTATION, ROAD)		
Duck Island	• None	Under span
8) NORTH ARM CANADA LINE BRIDGE (TRANSLINK, RAIL)		
Industrial	• None	Under span
9) KNIGHT STREET BRIDGE (TRANSLINK, ROAD)		
Industrial NE2	• None	Under span
10) PROPOSED BURKEVILLE PEDESTRIAN BRIDGE (CITY OF RICHMOND, PEDESTRIAN)		
City Centre 1	• Proposed bridge design has not yet been prepared. • Diking to be incorporated when design proceeds.	N/A

The locations of all bridges listed in *Table 6* are shown in *Figure 10.*

Figure 10: Bridges in the Study Area



4.3.2 RAISE RIVER ROAD

In the Thompson Terra Nova and Thompson Dover areas, River Road is immediately adjacent to the existing dyke; however, is constructed at a lower elevation to match the existing developed area. It is anticipated that land-side expansion of the existing dike will encroach on River Road. As such, the City should consider raising the grade of River Road from Cornwall Drive to No. 2 Road. The area identified for this strategy is show in *Figure 11*.

Figure 11: Raising River Road in the Thompson Neighbourhood

The benefits to long-term flood protection assocated with raising River Road include:

- Improves dike stability and seepage performance;
- Reduce requirement for water-side expansion and impacts to environmental habitat;
- Promotes the long-term increase in site grades for redevelopment of the Thompson Residential Area; and,
- Facilitates future dike crest increases or overbuilding of the existing dike height to accommodate settlement during a seismic event.

Challenges to raising River Road will include:

- Maintaining driveway access and for the single family residential developments;
- Tieing the raised River Road into adjacent streets;
- Addressing settlement concerns with underground utilities;
- Planning to cost-effectively stage incrementally raising of River Road; and,
- Addressing potential impacts to RMA's and ESA's.

Raising River Road is then a very long-term strategy to assist with achieving higher waterfront land elevations, and minimize future waterside works to achieve higher crest elevations.

5 Timing of Adaptation Projects

Implementation of adaptations is best pursued alongside adjacent works. For example, when adjacent lands are being developed, dike adaptations can be included in the scope of site redevelopment. If there are substantial works to an area that are upcoming, the City may choose to implement an interim adaptation until those adjoining works proceed.

5.1 REDEVELOPMENT OF SMALL LOTS

Small lots with narrow frontages are highly constrained by grading. There must be adequate lands available to raise a dike immediately to the target crest elevation. In areas where lot sizes are too small to implement adaptations that may immediately achieve the dike crest elevation, lands can be incrementally raised by raising the lots in small intervals each time it is redeveloped. Similarly, the frontage road can be raised by a practical interval whenever substantial road rehabilitation works proceed. This is a very long-term strategy.

The ground elevation of individual lots may be raised as they are redeveloped, however the grading will be constrained by matching neighbouring ground elevations, as well maintaining driveway access to the road. If the road is also raised, then individual lots can be raised higher, however existing lots at relatively low elevations must still have driveway access to the road. This limits the overall height that the frontage road can be raised. Over time, the frontage road and adjoining lots are raised at different times. In this way, the road and surrounding lots are raised in steps. In the very long term, the overall land elevation can be raised to the target dike crest elevation using this strategy. The City may pursue interim adaptations if a greater level of flood protection is deemed to be required before the lands can be raised to the specified elevation.

Where flood protection will be integrated with redevelopment, lot consolidation is preferred to minimize impacts associated with tying in to neighbuoring properties.

5.2 LAND ACQUISITIONS & LEGAL ACCESS

The City may need to acquire property where development is immediately adjacent to the waterfront, and bound on the land side by roads, buildings or other assets. Obtaining a sufficient ROW from some properties for diking may effectively sterilize the lot, leaving insufficient space available for development. In those instances, the City may need to acquire the entire property in order to implement dike adaptations. The riverfront lots between Shell Road and No. 5 Road may be candidates for acquisition when dike upgrades proceed in that area, depending on land requirements to implement dike upgrades.

The City should acquire easements where dikes are being constructed on private property. All adaptations on private lands depend on the City being able to secure legal access to the property in order to maintain them.

5.3 RAISING THE TARGET DIKE CREST ELEVATION

The City should monitor sea level rise to pursue flood protection adaptations when higher dike crest elevations become necessary. Presently, all adaptations will be designed to meet the 4.7 m target crest elevation, with consideration for an increase to 5.5 m. Depending on whether sea level rise predictions materialize, the City may wish to raise the target dike crest elevation.

5.4 INTERIM ADAPTATIONS

Temporary adaptations, such as a demountable floodwall, may be necessary where existing conditions are constrained by existing infrastructure (such as bridges, roads, ditches, or buildings) that cannot be impacted or modified to make way for diking. Temporary adaptations may also be pursued in instances where the City cannot yet secure adequate lands or capital to implement the ultimate adaptation.

The timeline until the ultimate adaptation can be implemented should be considered when allocating resources to temporary works. For example, if the interim adaptation will only be in place for a period of a few months, it it likely not worth investing substantial resources into it. Interim adaptations may be considered if necessitated by sea level rise or any other increase in flood risk.

Compatibility with the ultimate adaptation should be considered in the design of any interim adaptation. An interim adaptation should be easily decommissioned, or able to remain in place indefinitely without interfering with the ultimate

adaptation or any other land use. The ultimate adaptations are anticipated to be implemented alongside concurrent waterfront works, as noted in *Table 7*.

Table 7: Triggers to Implementation of Adaptations

AREA	EXISTING	SUMMARY OF RECOMMENDED ADAPTATION	TRIGGER TO IMPLEMENTATION OF RECOMMENDED ADAPTATION
Steveston	Earthfill Dike	Raise Dike on Existing Alignment & Consider Construction of Barrier Islands	City Initiative
Seafair	Earthfill Dike	Raise Dike on Existing Alignment & Consider Construction of Barrier Islands	City Initiative
Terra Nova	Earthfill Dike	Raise Dike on Existing Alignment & Consider Construction of Barrier Islands	City Initiative
Thompson Terra Nova	Earthfill Dike	Raise Dike on Existing Alignment & Plan for Long-term Raising of River Road	River Road is Reconstructed
Thompson Dover	Earthfill Dike	Raise Dike on Existing Alignment & Plan for Long-term Raising of River Road	River Road is Reconstructed
Oval	Superdike	Complete	N/A
City Centre 1	Earthfill Dike	Raise Dike at Waterfront or Set Back & Fill Adjoining Lots to Superdikes	Development of Middle Arm Park
City Centre 2	Earthfill Dike	Raise Dike on Existing Alignment & Fill Adjoining Lots to Superdikes	Redevelopment
Duck Island	Varies	Implement Recommendations of Approved Developer's Plan	Approval of Developer's Plan
Industrial	Varies	Raise Dike on Existing Alignment	Redevelopment of Fraser River Terminal
Bridgeport Tait	Superdike	Complete	N/A
Industrial North East 1	Earthfill Dike	Raise Dike on Existing Alignment	Assembly of Sufficient Lands to Implement Dike Upgrades
Industrial North East 2	Earthfill Dike	Raise Dike on Existing Alignment	Rehabilitation of River Road or Redevelopment of Industrial Sites
Industrial North East 3	Earthfill Dike	Raise Dike on Existing Alignment	Rehabilitation of River Road or Redevelopment of Industrial Sites

6 Implementation Opportunities

Dike upgrades are best undertaken alongside alterations to adjacent lands and infrastructure. In addition to the examples of concurrent infrastructure development noted in the sections above, dike adaptations may present opportunities to implement projects strategically to accomplish other City goals.

6.1 WATERFRONT TRAIL SYSTEM

The City's Parks Planning and Design (Parks) department has identified a goal to improve public access to the waterfront. Recreational trails and linear parks should be considered wherever dikes are modified. Even where waterfront trails are

already present, there may be an opportunity to increase waterfront access by improving trails with ramps or paved surfaces. Dike trails should remain accessible to people using mobility aids, such as wheelchairs or strollers.

The Parks department's preference is to have a trail directly adjacent to the water, without any rerouting inland, even if this means trails are sometimes flooded.

6.2 INTERTIDAL ZONES

Dike adaptations that proceed alongside the development of waterfront parks may be suited to the concurrent development of intertidal zones, to create additional habitat. The local ecosystem's productivity may be increased by providing a rich riparian environment. These intertidal zones may be integrated with the typical foreshore rip rap or other erosion protection by insetting habitat at lower elevations to be closer to the daily water level, and flooded during high water events. Projects incorporating the development of intertidal habitat may be designated as compensation sites for alterations required in environmentally sensitive areas.

6.3 HABITAT BANKING

As the Study Area lies within intertidal, shoreline and upland riparian habitat, environmental impact may be unavoidable. Environmental assessments and valuation will be undertaken in the design construction phase, where possible habitat impact will be avoided. Where impact cannot be avoided, efforts will be made to mitigate, and if necessary compensate for impact following a net gain approach. To achieve a net gain approach to compensation the City may consider establishing a formal habitat banking program. Habitat banking guidelines should articulate appropriate compensation ratios by habitat type, monitoring periods and success measures for created or enhanced habitat. Additionally a hierarchy of compensation options may be considered that replaces habitat types in order of priority as follows:

- Create or increase productive capacity of like for like habitat within the same ecological unit;
- Create or increase the productive capacity of unlike habitat in the same ecological unit; and
- Create or increase the projective capacity of habitat in a different ecological unit.

Habitat credits could be applied to multiple projects, or stored for future dike works. A formal habitat banking program may assist with the implementation of long term flood protection infrastructure upgrade programs.

7 Recommendations

Key recommendations for the Phase 2 LIDMP Study Area are outlined as follows:

1. **Plan to raise the existing dike on its existing alignment.**

   The existing dike alignment along the waterfront is established and well defined. There is limited basis to support any major changes to the alignment of the existing dike, thus the recommendations are generally in keeping with traditional dike crest increases, with consideration for area specific constraints and opportunities.

2. **Prepare conceptual level designs for the West Dike upgrades and conduct drainage and environmental studies on the alternatives.**

   Future crest height increases to the West Dike will required landside or waterside expansion. Both will have impacts to either intertidal, or upland riparian habitat. Environmental impacts should be quantified, and an approach of avoid, mitigate, and compensate following a net gain approach should be used to in evaluating the preferred strategy.

   Landside expansion will impact drainage infrastructure. Impacts should be quantified to identify potential internal drainage network upgrades required if landside expansion is the preferred alignment.

3. **Continue to monitor sea level rise.**

   Design crest height elevations are selected with consideration for climate change and sea level rise predictions. The City should continue to monitor sea level rise and adjust crest height targets and City flood protection police as required to address any changes in predicitons.

4. **Plan to establish a habitat banking program for dike improvement projects.**

   Where impact to habitat cannot be avoided, efforts will be made to mitigate, and if necessary compensate for impacts following a net gain approach. To achieve a net gain approact to compensation, the City may consider establishing a formal habitat banking program. Habitat banking guidelines should outline appropriate compensation ratios by habitat type, monitoring periods, and success measures.

5. **Plan for implementation of offshore protection along the West Dike as a response to climate change and sea level rise.**

   Sea level rise and upland limitations to natural accretion within the Sturgeon Bank WMA could result in increased offshore depths beyond the West Dike, which could simultaneously increase wave heights reaching the West Dike. Offshore barrier islands are one option to consider to dissipate wave energy prior to reaching the west dike, thereby minimizing future dike crest increases.

   With appropriate environmental consideration during design and construction, breakwaters and barrier islands can create intertidal habitat, such as sand flats, mud flats, salt marsh and eelgrass beds. These features can assist with erosion and wave attenuation. The intertidal habitat can work in combination with a constructed flood control structures like dikes and floodwalls, to mitigate flood risk.

   The City should continue to coordinate with relevant agencies including (Port of Vancouver, Fisheries and Oceans Canada, and others) to research and identify opportunities to improve flood protection and enhance interdital habitats in the Sturgeon Bank WMA and throughout the Fraser River Estuary.

6. **Plan to raise River Road in the Thompson neighborhood.**

   The existing dike in the Thompson Neighborhood is confined by the Fraser River and River Road. Increasing the grade of River Road will improve dike stability and resilence; and minimize requirement to expand the dike into the Fraser River. The City should plan to incrementally raise River Road.

7. **Consider aquiring land to accommodate future dike construction between Shell Road and No. 5 Road.**

   Land acquisition may be required to accommodate construction of a future trapezoidal dike between Shell Road and No. 5 Road. It is anticipated that acquisition will primarily be achieved through redevelopment, however, where redevelopment does not occur; the City may consider opportunistic land purchase to accommodate future dike crest height increases in the area. Plan to complete a conceptual design of the future dike through the constrained area to verify the future dike footprint.

8. **Plan for the long-term raising of lands adjacent to and inland of the existing dikes.**

   Long term raising of land levels has previously been recommended (2008-2031 Flood Protection Strategy). Maximizing the width of raised land adjacent to the river decreases flood and seismic risks by increasing the integrity of the dike. Plan to raise the ground elevation of waterfrount development sites to the prescribed dike crest elevation.

9. **Support site assemblies along the waterfront that promote cohesive adaptations for flood protection.**

   Large developments along the waterfront allow for major improvements to flood protection infrastructure and often result in robust superdike conditions.

10. Consider enhanced floodproofing through amendments to the FCL Bylaw

The City's Flood Construction Level (FCL) Bylaw establishes minimum levels to which land needs to be raised. Amending the FCL bylaw is the recommended area wide strategy to regulate raising ground elevations with redevelopment to improve flood protection throughout the Study Area. Plan to conduct an assessment on the implementation of a modified FCL bylaw.

11. Facilitate public access to the waterfront.

Integrate new trails and trail improvements with diking projects; provide trails and waterfront recreation areas that are accessible to persons using mobility aids; and, route any new trails along the waterfront instead of rerouting the trail inland.

Regards,

Alex McBride, P.E.
Project Manager

Phil Lobo, P.Eng.
Project Reviewer

PWT - 102

City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	March 21, 2018
From:	John Irving, P.Eng. MPA Director, Engineering	**File:**	10-6160-07-07/2018- Vol 01
Re:	**Brazilian Elodea Management Update: Mariner's Village (11291 - 11491 7th Ave)**		

Staff Recommendation

That the report titled "Brazilian Elodea Management Update: Mariners Village (11291 – 11491 7th Ave)" from Director, Engineering dated March 21, 2018 be received for information.

John Irving, P.Eng. MPA
Director, Engineering
(604-276-4140)

REPORT CONCURRENCE	
CONCURRENCE OF GENERAL MANAGER	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS:
APPROVED BY CAO	

Staff Report

Origin

At the General Purposes Committee on November 6, 2017, staff provided an update on the Brazilian elodea infestation with the following recommendation:

> *That a letter be sent to the BC Ministry of Forests, Lands and Natural Resource Operations, to request their immediate involvement and the allocation of appropriate funding to manage Brazilian elodea infestations in Richmond.*

This report supports Council's 2014-2018 Term Goal #6 Quality Infrastructure Networks:

> *Continue diligence towards the development of infrastructure networks that are safe, sustainable, and address that challenges associated with aging systems, population growth, and environmental impact.*
>
> *6.1 Safe and sustainable infrastructure*

Background

Mariner's Village is a private condominium development, located between 11291 and 11491 7th Ave in Richmond that consists of several single- and multi-family dwellings. A water feature is located adjacent to the development on City property, situated between the site and the west dike. The water feature is approximately 500 metres (m) long by approximately 25 m wide and is a linear water feature that forms part of the City's drainage system in the area.

In 2014, staff were notified by the Strata of Mariner's Village to the presence of Brazilian elodea (elodea) in the water feature, which likely resulted from the improper disposal of an aquarium. Since 2014, the elodea has spread throughout the entire water feature. Currently there are only two known locations of elodea in BC. As such, elodea is a candidate species for the provincial *Early Detection Rapid Response* program and is recognized as a priority species under the City's *Invasive Species Action Plan.*

As requested by Council, a letter was sent to the BC Ministry of Forests, Lands and Natural Resource Operations, to request their immediate involvement and the allocation of appropriate funding to manage Brazilian elodea infestations in Richmond. Staff have been in dialogue with Ministry staff regarding funding, more information can be found below related to this topic.

Analysis

Cold Weather Trial: Phase 1

City staff, in partnership with the Province, have completed the first phase of a trial-based work plan to stress the infestation within the northern portion of the water feature. The area of the Phase 1 trial is approximately 210 metres (m) long by approximately 15 m wide. Phase 1 of the plan included draining this area to expose the infestation to colder temperatures.

Since October 5, 2017, staff have completed the following:

1. Constructed and installed a custom weir to facilitate drainage;
2. Temporarily drained the northern portion of the water feature;
3. Retained a Qualified Environmental Professional (QEP) to support wildlife salvage efforts and regulatory requirements;
4. Excavated a drainage canal within the water feature to ensure conveyance of newly introduced stormwater;
5. Coordinated a professional survey of the water feature to confirm property boundaries;
6. Coordinated a geotechnical survey to ensure retaining wall structural integrity is maintained during dewatering period;
7. Worked with the Province to initiate a Pesticide Use Permit (PUP) process for the application of aquatic herbicide within the water feature.

Results

Upon completion of the trial, the water feature was exposed to dryer, colder conditions for a total of 69 days (between January and March). Although the trial experienced milder temperatures in January and March with a mean average of 5° Celsius, significantly colder temperatures were experienced in February. During February, the elodea was exposed to 13 days (137 hours) below 0° Celsius which was better than anticipated.

Discussions with the Province have also proved to be successful. As requested by Council, staff have confirmed provincial funding for the next three years to support additional management initiatives and the Province has committed to lead the arduous process for obtaining a PUP with City support. It is anticipated that the PUP process could take up to one year to facilitate and will require various stages of public consultation, slated to begin in Spring/Summer 2018. If successful, the permit will allow for the application of an aquatic herbicide (as needed) in the water feature to manage the infestation.

With the emergence of warmer temperatures, staff are now prepared to end the trial, monitor its effects, and begin the provincially-lead PUP process. To facilitate the closure of Phase 1 efforts in the field, staff will conduct minor earth works around the water feature, remove the customized weir, and allow the water feature's water levels to regenerate naturally. Staff will continue to ensure that the extent of the current elodea infestation in the south pond does not migrate to the Phase 1 area (north of the pedestrian bridge) and will monitor the site to assess emergence of the elodea during the growing season.

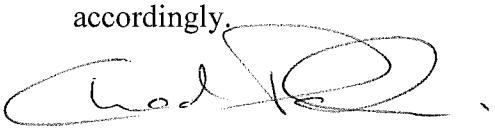
A recent discussion with representatives of Mariner's Village was consistent with the content of this report.

Financial Impact

None at this time. Future management initiatives will be further supported with an additional $222, 500 (over 3 years) in funding from the Province, dedicated to this project to use as appropriate.

Conclusion

The first phase of the trial has been implemented successfully and a positive, ongoing dialogue with Mariners Village Strata has been maintained. Staff will continue to monitor the trial throughout 2018 and assess future management options based on best management practices and public feedback resulting from the PUP process. Staff will continue to update Council accordingly.



Chad Paulin
Manager, Environment
(604-247-4672)

CP:th

City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	March 26, 2018
From:	Tom Stewart, AScT. Director, Public Works Operations	**File:**	10-6370-01/2018-Vol 01
Re:	**Annual Report 2017: Recycling and Solid Waste Management**		

Staff Recommendation

That the annual report titled, "Report 2017: Recycling and Solid Waste Management – Improving Recycling Quality" be endorsed and Attachment 1 be made available to the community through the City's website and through various communication tools including social media channels and as part of community outreach initiatives.

Tom Stewart, AScT.
Director, Public Works Operations
(604-233-3301)

Att. 1

REPORT CONCURRENCE	
CONCURRENCE OF GENERAL MANAGER	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS:
APPROVED BY CAO	

Staff Report

Origin

This report presents the City's annual progress toward waste diversion goals as outlined in the attached "Report 2017: Recycling and Solid Waste Management – Improving Recycling Quality".

This report supports Council's 2014-2018 Term Goal #4 Leadership in Sustainability:

> *Continue advancement of the City's sustainability framework and initiatives to improve the short and long term livability of our City, and that maintain Richmond's position as a leader in sustainable programs, practices and innovations.*
>
> *4.1. Continued implementation of the sustainability framework.*

This report supports Council's 2014-2018 Term Goal #9 A Well-Informed Citizenry:

> *Continue to develop and provide programs and services that ensure the Richmond community is well-informed and engaged on City business and decision making.*
>
> *9.1. Understandable, timely, easily accessible public communication.*

Analysis

Background

The City has established a waste diversion target of 80% by 2020 which is aligned with regional targets in the Integrated Solid Waste and Resource Management Plan (ISWRMP). With the full suite of programs now available in the community, and the continued commitment by community members to recycle, Richmond is on track to achieve this target and its goal to be a Recycling Smart City.

"Report 2017: Recycling and Solid Waste Management – Improving Recycling Quality" (the Report) presents the City's annual progress update (Attachment 1). The Report summarizes Richmond's comprehensive initiatives, and includes tips and resources to support recycling and sustainable waste management.

2017 Highlights

The Report provides an overview of Richmond's progress towards its waste diversion targets as well as the initiatives underway to promote increased recycling. The Report also highlights outreach initiatives and measures to improve efficiency in service delivery. By delivering responsive services that meet emerging needs and priorities, and applying community outreach, education and communication initiatives, Richmond continues to work with the community to achieve goals.

Key accomplishments in 2017 include:

- Achieved 78% waste diversion for residents in single-family homes.
- Launched the "Let's Recycle Correctly!" campaign to engage directly with residents to improve the quality of recycling and reduce contamination levels. This included the launch of instructional videos to assist residents in improving recycling quality.
- Introduced and increased awareness of the Recycling Wizard which allows residents to search for information about drop-off locations for various materials. Since its launch, there have been 38,358 online searches for collection day details and 65,571 searches for materials using the Recycling Wizard.
- Supported the Green Ambassador program which engaged 135 student volunteers as they contributed 3,130 hours to promote recycling and responsible waste management at community events. Green Ambassadors also spent 390 hours at training and engagement symposiums hosted by the City.
- Supported recycling for approximately 175,000 attendees at 69 events.
- Responded to over 20,600 customer service requests and administrative transactions related to garbage and recycling via the Environmental Programs Information Line.
- Delivered 23 waste reduction workshops with approximately 328 attendees, held 7 Recycling Workshops for 128 residents, hosted 11 Recycling Depot tours for 218 students and teachers, and participated at 10 community events to raise awareness about how to properly sort recyclables to reduce contamination.
- Served residents in vehicles every 53 seconds for drop off recycling services at the City's Recycling Depot.

These and other key accomplishments in 2017 are outlined in further detail in the Report.

Report 2017 Overview

The 2017 Report contains four chapters. The first three chapters summarize outcomes and accomplishments in the past year, provide data to report on progress related to current waste management and recycling services, and highlight the variety of public education/community outreach programs delivered across the city. The final chapter in the Report is a comprehensive tips and resources section. The Report content also features tips for residents to help them connect with City and producer stewardship programs for disposing of a variety of items.

A summary overview of each chapter follows.

Chapter 1: Annual Outlook – Improving Recycling Quality highlights the new challenges the City encountered in 2017 and its continued need to remain focused on best practices and opportunities to support its target for 80% waste diversion by 2020. A key initiative in 2017 was the "Let's Recycle Correctly!" campaign, a program designed to improve the quality of recycling to address higher standards imposed by China, a significant buyer of recycling commodities in

the marketplace. The "Let's Recycle Correctly!" campaign was designed to not only improve the quality of recycling materials, but was also leveraged to help support increased recycling.

The program includes an information and awareness campaign to inform residents about items that can cause contamination and provides tips on how to recycle these items correctly. The campaign also recognizes residents who are recycling correctly with a Gold Star on their Blue Box, along with a thank you from the City. Early measurement is showing positive outcomes as the amount of contamination is decreasing and a growing number of Gold Stars are being awarded to residents. To support the "Let's Recycle Correctly!" program, the City has focused on increasing awareness of the Recycling Wizard, which makes it easy for residents to search for information on how to recycle various items. The Recycling Wizard is available online at www.richmond.ca/recyclesearch, or in the free Richmond Collection Schedule app.

Multi-family complexes were also the focus of an information campaign to help reduce contaminants in their Green Carts. The City reached out to residents in multi-family complexes to help increase understanding about how to recycle with their Green Cart, along with tips on how to reduce contamination. As part of this program, contamination alerts were sent to 14,395 units, notifying them of the issue in their building and staff hosted 30 information sessions.

Seeing a vehicle every 53 seconds, the Richmond Recycling Depot continues to offer a valuable drop-off recycling service for residents. To support this service, the City signed a new service contract to ensure Richmond residents can continue to enjoy great service at the Recycling Depot for years to come.

Chapter 2: Programs and Services – Delivering Services to Make Recycling Easy and Convenient describes the City's comprehensive recycling and waste reduction initiatives and highlights how each program contributes to overall diversion targets and sustainability goals. This chapter provides details on the quantities collected through the Blue Box, Blue Cart, and Green Cart recycling programs, drop-off services at the Richmond Recycling Depot, Yard Trimmings Drop Off service and litter collection services. This section also includes details on the major categories of items collected through the City's Large Item Pick Up Program. It is noteworthy that residents recycled nearly 21,000 tonnes of food scraps, and yard and garden trimmings in 2017 alone, with the majority coming from single-family homes followed by townhomes and multi-family housing sites.

Chapter 3: Outreach and Customer Service – Supporting Awareness and Education presents the City's commitment to support waste reduction and reuse by working together with community members and partners. This includes working with children and youth through school programs and the Green Ambassador program to support recycling leadership in the community. Free workshops on reducing food waste and how to sort recycling correctly are offered throughout the year, as are outreach displays at various events. City staff partnered with the Richmond School District to engage 1,129 elementary school students in 10 productions to teach them how to recycle and inspire them to reduce waste. The City acknowledged elementary schools that made great efforts to reduce litter in their neighbourhood parks, presenting Maple Lane Elementary School with the award for "My School Always Sparkles" and Diefenbaker Elementary School with the "My School Now Sparkles" award. City staff members also mentored 135 high school

Green Ambassadors, who contributed more than 3,520 volunteer hours to support community events and the annual REaDY Summit.

Chapter 4: Tips and Resources – Easy Steps to Increase Recycling and Reduce Waste provides a comprehensive guide to recycling. It includes specific information on how and what to recycle in the City's Blue Box, Blue Cart, Large Item Pick Up and Green Cart programs. There is information on how to compost at home, the items accepted for recycling at the Richmond Recycling Depot, and what to do with many household items ranging from medication to recyclable mattresses. In addition to these tips and resources, the City continues to use communication tactics such as advertising and social media, to raise awareness about key programs and new initiatives.

The resources section includes information on what to do with special waste items and banned materials, including recycling and disposal options through take-back programs. There is contact information and locations for Richmond services and community partners involved in stewardship programs.

Moving Forward

As the City continues to work with residents to achieve 80% waste diversion and improve the quality of recycling, key focus areas in 2018 will include:

1. Partner with the Major Appliance Recycling Roundtable on a pilot program to evaluate opportunities to offset taxpayer costs associated with the collection of large appliances.
2. Leverage public engagement by continuing to promote Green Ambassadors and raise awareness about how to recycle correctly, as well as the importance of responsible waste management through support workshops, theatrical shows, digitally-led classroom activities, and support the 7th Annual REaDY Summit.
3. Improve recycling quality by continuing the "Let's Recycle Correctly!" program to generate awareness about the types of materials that are recyclable in Richmond's programs and how to sort recyclables properly to reduce contamination.
4. Enhance the Richmond Recycling Depot by reporting on potential changes to the configuration, including hours and days of operation and items accepted.
5. Expand public spaces recycling options by installing new public spaces recycling bins to provide convenient, accessible recycling, and enhance the container replacement and maintenance program.
6. Increase awareness of proper grease disposal through a pilot program to collect waste grease from a small number of multi-family complexes.
7. Incorporate an engaging Recycling Challenge game to help raise awareness of proper sorting of recycling and also incorporate an on-line supply ordering tool.
8. Improve litter collection efficiency by continuing to review opportunities to install additional in-ground containers in high traffic and/or remote public spaces to address garbage capacity concerns and reduce service frequency.

Another key activity in 2018 will be the commencement of a competitive request for proposals process for the City's garbage and recycling services under contract, as the existing contract expires on December 31, 2018.

Proposed Communication

Subject to Council's approval, the annual "Report 2017: Recycling and Solid Waste Management – Improving Recycling Quality" will be posted on the City's website and made available through various communication tools including social media channels and as part of community outreach initiatives.

Financial Impact

Programs related to solid waste that impact service levels are brought to Council for review and consideration throughout the year.

Conclusion

Through the annual "Report 2017: Recycling and Solid Waste Management – Improving Recycling Quality", the City is providing its residents with a progress report on the many recycling and waste management programs and activities delivered in the community. The Report also serves as a comprehensive resource guide that supports recycling, reuse and reduction activities throughout the year. By tracking progress towards its goals for waste diversion and reporting this to the community, the City is demonstrating Richmond's commitment to responsive services, responsible government and accessible information and communication.

It is through residents' participation and commitment to recycling that those living in single-family homes have achieved 78% waste diversion in 2017, which is on track for the goal to divert 80% of waste by 2020.

Suzanne Bycraft
Manager, Fleet and Environmental Programs
(604-233-3338)

Att. 1: Report 2017: Recycling and Solid Waste Management – Improving Recycling Quality

Attachment – Annual Report 2017

City of Richmond

REPORT 2017

RECYCLING AND SOLID WASTE MANAGEMENT

IMPROVING RECYCLING QUALITY

Let's trim our waste!

Richmond


LET'S
TRIM
OUR
WASTE!

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ANNUAL OUTLOOK

IMPROVING RECYCLING QUALITY

When it comes to recycling and sustainable waste management, it's clear that each success will be followed by new challenges and the need to remain focused on best practices and opportunities for improvement. Richmond residents are leaders in recycling and are now diverting close to 80% of their waste from landfills.

At the same time, in 2017, the City of Richmond continued to strive for improved operational efficiency to support enhanced service delivery through its many programs and services. The City has also been responding to a growing imperative to improve the quality of recycling, and is making progress in multiple new initiatives that support achieving its goals for continuous improvement in waste management.

One of the largest new initiatives in 2017 stems from the need to reduce contamination in recycling to keep costs down and ensure that recycling can be sold to be converted into new products. Improving the quality of recycling is no longer just an ideal – it's a requirement. This is because China, the world's largest purchaser of recycled materials, is setting higher standards for recycling quality under its National Sword campaign and will not purchase contaminated recycling. As well, the City may be subject to fines and other penalties when its contamination levels exceed 3% as part of its contract with RecycleBC.

To help address these concerns and improve the quality of recycling, the City launched its "Let's Recycle Correctly!" program. The program includes an information and awareness campaign to inform residents about items that can cause contamination and provide tips on how to recycle these items correctly. The campaign also recognizes residents who are recycling correctly with a Gold Star on their Blue Box, along with a thank you from the City. The program is being implemented in two phases, starting in 2017 and completing in 2018. Recycling teams have been randomly auditing curbside recycling and leaving behind information kits for residents. The campaign also includes a broader community campaign through advertising, media relations, social media and videos posted online.

In the first phase, more than 6,300 households were visited (5,320 single-family homes and 1,067 homes in multi-family complexes). Recycling teams were able to engage with residents at close to 30% of the homes visited. Of those engaged, 86% where happy with the program and 12% had a lot of questions that the teams answered. The teams gave Gold Stars to 2,519 households in the first phase of the program – about 39% of the homes visited. Early measurement is showing positive outcomes as the amount of contamination is decreasing and a growing number of Gold Stars are being awarded to residents.

As an added service to help make it easy and convenient for residents to find out where to recycle various household items, the City has introduced its Recycling Wizard and is promoting this new tool through advertising and social media. With the Recycling Wizard, residents simply type in a wide variety of household items and the app will tell them where each item can be recycled. The Recycling Wizard is available online at www.richmond.ca/recyclesearch, as well as in the free Richmond Collection Schedule app, which is available through the Apple and Android app stores. The app also provides residents with reminders about their collection day and other recycling tips.

With its commitment to continuous improvement and service excellence, the City also introduced a new service contract at the Richmond Recycling Depot to ensure residents can continue to enjoy great service. The Recycling Depot sees a vehicle every 53 seconds on average during operating hours as residents come to drop off recycling items such as Styrofoam, batteries, cooking oil, large and small appliances, extra yard waste and many other recyclable materials.

CITY OF RICHMOND

Improving the quality of recycling will help ensure it can be sold to processors and is important for keeping taxpayer costs down.

The City has also improved efficiencies in litter management to help keep up with population growth while ensuring that public spaces remain clean and litter free. As part of these updates, the City has made adjustments to routing for litter collection and installed large in-ground containers that have larger capacity.

Richmond also recognizes that there are opportunities to improve how recycling is managed at multi-family and commercial buildings through the design of effective waste management areas for recycling and waste collection. To support these improvements, the City has provided a guide for commercial and multi-family developments. The new *Waste Management Design Guidelines for Commercial and Multi-Family Developments* highlights developer responsibilities, provides design guidelines and criteria, and includes a new requirement for a waste management overlay plan.

Multi-family complexes have also been the focus of an information campaign to help reduce contaminants in their Green Carts. While this is different than the challenge in Blue Box/Blue Cart contamination, it's equally important to ensure only organics go into the Green Cart as the City is still subject to fines or other penalties when contamination is found. To help address this issue, the City reached out to residents in multi-family complexes to help increase understanding about how to recycle with their Green Cart along with tips on how to reduce contamination. As part of this program, contamination alerts were sent to 14,395 units, notifying them of this issue in their building, and 30 information sessions were held.

Recognizing that success in sustainable waste management is based on continuous improvement, the City is already looking ahead with plans for the upcoming year. The City will be rolling out new public spaces recycling bins and continue public engagement to support its programs and services. In particular, the City remains focused on its goals to increase recycling to achieve 80% diversion by 2020, and improve recycling quality through the "Let's Recycle Correctly!" program. As with all new initiatives in waste management, the City looks forward to working with residents to implement these new programs and achieve its goal to be a Recycling Smart City.

RICHMOND COLLECTION SCHEDULE APP - ALL TIME STATS

20,864 UNIQUE ADDRESS SEARCHES AND **38,358** TOTAL ADDRESS SEARCHES

4,771 MOBILE APPS INSTALLED

7,482 ACTIVE REMINDERS

1,535 PDF CALENDAR DOWNLOADS

65,571 RECYCLING WIZARD SEARCHES

OUR TOP ACCOMPLISHMENTS IN 2017

The following are some of the key accomplishments in 2017:

LET'S RECYCLE CORRECTLY CAMPAIGN

Introduced the "Let's Recycle Correctly!" program to raise awareness about the issues stemming from contamination in Blue Box/Blue Cart recycling, and increase understanding about how to sort and recycle correctly. The program included random audits by recycling teams who also met directly with residents to answer questions and provide tips, information kits for residents and a broader information campaign that included advertising, social media and online instructional videos.

COLLECTION SCHEDULE APP

Increased awareness of the Richmond Collection Schedule App to provide residents with reminders about their curbside collection day and information about drop-off locations for various materials using the Recycling Wizard. Since its launch, there have been 38,358 online searches for collection day details, 65,571 searches for materials using the Recycling Wizard, and 7,482 residents signed up for weekly reminders.

GREEN AMBASSADORS

Supported 135 student volunteers as they contributed 3,130 hours to promote recycling and responsible waste management at 23 community events. Green Ambassadors also spent 390 hours at training and engagement symposiums.

LITTER MANAGEMENT

Improved litter management with the installation of three in-ground containers to increase capacity while reducing the need for frequent collection, and implemented new litter collection routes to maximize operational efficiency as part of continuous improvement. Litter crews inspected and/or serviced containers more than 280,000 times in 2017.

GREEN CART CONTAMINATION

Initiated an information campaign in multi-family complexes to increase awareness about contaminants in Green Cart recycling. The City hosted 30 information sessions, met with residents to provide tips on how to reduce contamination, and sent alerts to 14,395 units to flag issues in their building.

RICHMOND RECYCLING DEPOT VISITS

Provided recycling drop-off services with more than 160,000 visits to the Richmond Recycling Depot, which equates to one visit every 53 seconds.

EVENT RECYCLING

Supported improved waste diversion by providing recycling containers for approximately 175,000 attendees at more than 69 events.

CUSTOMER SERVICE

Responded to more than 20,693 customer service requests and administrative transactions related to garbage and recycling via the Environmental Programs Information Line.

STUDENT & COMMUNITY ENGAGEMENT

Delivered 30 recycling and waste reduction workshops with approximately 460 attendees, organized 10 DreamRider productions at local schools involving 1,129 students, hosted 11 Recycling Depot tours for 218 students and teachers, and participated at 10 community events to raise awareness about how to properly sort recyclables to reduce contamination.

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OUR GOALS

Richmond's long-term goal is to be a Recycling Smart City, and the annual goals listed below are designed to help achieve this target. Each goal is designed to make it easy and convenient to recycle and reduce waste in Richmond, as well as creating and promoting opportunities for innovation, partnership and continuous improvement.

1. **Assess Major Appliance Pilot Initiative**
The City is considering a pilot program with the Major Appliance Recycling Roundtable to evaluate opportunities to offset taxpayer costs associated with the collection of large appliances.

2. **Leverage public engagement**
Continue to promote Green Ambassadors and raise awareness about how to recycle correctly, as well as the importance of responsible waste management through support workshops, theatrical shows, digitally-led classroom activities, and support the 7th Annual REaDY Summit.

3. **Improve recycling quality**
Continue the Let's Recycle Correctly! program to generate awareness about the types of materials that are recyclable in Richmond's programs and how to sort recyclables properly to reduce contamination.

4. **Enhance Recycling Depot**
Report on potential changes to the configuration of the Recycling Depot, including hours and days of operation, and items accepted.

5. **Update Environmental Programs Information Line**
Update automated voice response system to streamline and improve customer service.

6. **Expand public spaces recycling options**
Install new public spaces recycling bins to provide convenient, accessible recycling, and enhance the container replacement and maintenance program.

7. **Improve grease disposal**
Increase awareness of proper grease disposal through a pilot program to collect waste grease from a small number of multi-family complexes.

8. **Expand Richmond Collection Schedule app features**
Create a new, engaging Recycling Challenge game in the Richmond Collection Schedule app to help raise awareness about how to sort recycling correctly, and develop a tool to order recycling supplies using the app.

9. **Improve litter collection efficiency**
Continue to evaluate opportunities to install in-ground containers in high traffic and/or remote public spaces to address garbage capacity concerns and reduce service frequency.

THANK YOU TO RICHMOND RESIDENTS

Over the past decade, Richmond residents have consistently demonstrated their commitment to recycling. Thanks to their efforts, Richmond is close to achieving its target of 80% waste diversion by 2020. Residents are also recycling at the Richmond Recycling Depot, with more than 160,000 visits per year.

In 2017, we reached out to residents and asked them to help us with a new challenge – the need to improve the quality of recycling. It is no surprise that our residents are taking this new challenge to heart and working to help sort their recycling correctly. Our thanks and appreciation go to residents for working with us to help improve the quality of our recycling by sorting items correctly. We also want to send out a special thank you to residents who have demonstrated their recycling expertise and were recognized with a Gold Star.

Recycling and waste diversion takes continuous commitment, and we appreciate the way our residents work hard to keep recycling out of the garbage when they are at home and on the go in our community. We ask all residents to help us as we strive to achieve 80% waste diversion and improve the quality of our recycling. Thank you!

DID YOU KNOW?

There are three common causes of recycling contamination:

1. Materials that are not accepted in the Blue Box/ Blue Cart program are placed in the bins;
2. Recyclable materials are not sorted correctly, such as glass being placed in the Blue Box/Blue Cart; and
3. Items are not recycled properly, such as leaving food residue in containers or bundling materials in a plastic bag.

See page 23 for more details.


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2
CONVENIENT, HIGH QUALITY AND RELIABLE SERVICES
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PROGRAMS AND SERVICES

DELIVERING SERVICES TO MAKE RECYCLING EASY AND CONVENIENT

Richmond residents in single-family homes are diverting 78% of their waste, and recycling is increasing in townhomes and other multi-family complexes. To support residents and their commitment to recycling, Richmond continues to deliver services to help residents reduce their garbage and create incentives to promote increased recycling. Green Cart and Blue Box/Blue Cart recycling remain core services to help residents recycle. Residents can also drop off a growing list of recyclable items at the Richmond Recycling Depot and other drop-off facilities.

Richmond works with residents, industry partners, product stewardship groups and businesses to achieve its goal to be a Recycling Smart City and implement sustainable waste management. Through partnerships and community engagement, Richmond's commitment to continuous improvement results in enhanced services to benefit residents.

Residents in single-family homes are now diverting 78% of their waste.

CITY OF RICHMOND

RICHMOND RECYCLING AND WASTE MANAGEMENT

Richmond delivers a wide range of recycling and waste management services for residents to ensure that all waste is managed effectively and efficiently. The following are the key recycling and waste management services offered through the City of Richmond.

BLUE BOX

Weekly curbside collection for paper, newsprint, glass, plastic containers, empty aerosol cans, milk cartons, plastic/paper drink cups, spiral wound containers, and tin and aluminium containers. This program is provided to over 40,500 residential units in single-family homes and townhomes. For details, see page 32.

BLUE CART

Weekly recycling collection for paper, newsprint, glass, plastic containers, aerosol cans, milk cartons, plastic/paper drink cups, spiral wound containers and tin and aluminium containers. This program is provided to more than 35,600 multi-family units. For details, see page 34.

GREEN CART

Collection for foods scraps and yard trimmings. This program is provided to residents in single-family homes and townhomes as well as multi-family complexes. For details, see page 36.

RECYCLING DEPOT

Drop-off service for products ranging from yard trimmings and household items, to hazardous materials and take-back program products. This service is available to all residents and in limited quantities for commercial operators. The Recycling Depot also sells compost bins, rain barrels, Garbage Tags and Garbage Disposal Vouchers for use at the Vancouver Landfill. For details, see page 40.

GO! RECYCLE PUBLIC SPACES AND EVENT RECYCLING

Recycling bins in the community make it easy to recycle on the go, such as in parks, at community centres, in the Steveston business district and at the Canada Line stations and Richmond central bus stops. Richmond supports community events by loaning garbage and recycling bins for local events at no charge.

COMPOSTING AT HOME

Support for residential composting includes the sale of compost bins, a composting demonstration garden and related workshops. These services are available to all residents. For details, see page 37.

CURBSIDE GARBAGE COLLECTION

Curbside collection of garbage, not including banned items such as hazardous waste and materials that can be recycled, is available to residents in single-family homes and some townhomes. For details, see page 38.

EXTRA GARBAGE DISPOSAL

Garbage tags or disposal vouchers for the Vancouver Landfill provide options for residents when they need to dispose of additional garbage or large items. For details, see page 38.

LARGE ITEM PICK UP PROGRAM

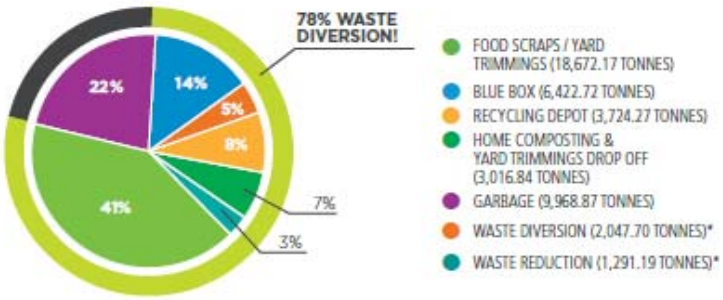
Residents in single-family homes, some townhomes and some multi-family complexes can arrange for collection of four large household items per year. For details, see page 39.

COMMUNITY AND SCHOOL ENGAGEMENT

Through partnerships with students, teachers and the School District, Richmond sponsors educational shows, awareness programs and volunteer opportunities to increase understanding of recycling and the benefits of reducing waste. For details see the Outreach and Customer Service section on page 25.

DID YOU KNOW?
Some items are banned from the garbage. Food scraps and other recyclable materials like paper, plastic containers, glass bottles, and aluminum cans are no longer permitted in the regular garbage and can instead be recycled using the City's convenient recycling programs.

SINGLE-FAMILY RECYCLING



Residents in single-family homes recycled or reduced 35,174.89 tonnes in 2017 – 78% of total estimated waste generated – through a number of recycling and waste reduction opportunities, including curbside and Recycling Depot collection, as well as composting programs.

* Estimated

RESIDENTIAL RECYCLING PROGRAMS

With weekly collection services, drop-off programs, public spaces recycling and community take back programs, it's easy and convenient to recycle in Richmond. Richmond offers residents a range of services to support recycling at home and on the go.

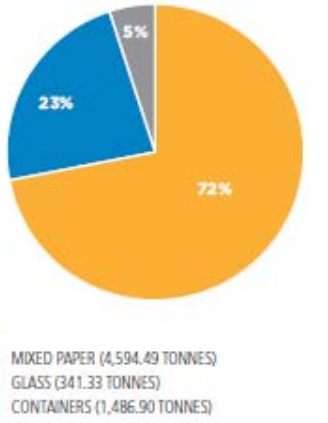
BLUE BOX RECYCLING PROGRAM

The Blue Box recycling program provides convenient collection services in the community. Residents in single-family homes and some townhome complexes use the City's Blue Box program to recycle newspaper, paper products and cardboard along with tin, aluminium, glass bottles and jars, and plastic containers. More than 40,500 residential units are serviced with weekly collection under this program.

In 2017, more than 6,400 tonnes of materials were recycled in the Blue Box program. Of this, 72% was mixed paper, 5% was glass jars and glass bottles and 23% was mixed containers.

Items that can be recycled through this program are listed in the Tips and Resources section of this publication and at www.richmond.ca/recycle.

2017 BLUE BOX RECYCLING MIX



BLUE CART RECYCLING PROGRAM

People who live in multi-family complexes can recycle the same products as residents who use the Blue Box program through the City's Blue Cart recycling program. The City provides recycling carts to create a mini-recycling depot at each complex, which is generally located in the recycling enclosure or other convenient location. This service is currently available to more than 35,600 multi-family units. The City offers information sessions and provides communication materials such as Blue Cart decals, posters and brochures for stratas and property managers to help raise awareness and increase participation.

In 2017, more than 1,960 tonnes of materials were recycled through the Blue Cart recycling program.

It is important to recycle using the correct carts. For a detailed list of items that can be recycled through the Blue Cart recycling program, see the Tips and Resources section or visit www.richmond.ca/recycle.

TIP FOR RESIDENTS

Residents in single-family homes and some townhomes can pick up complimentary Blue Box supplies at the Richmond Recycling Depot and City Hall.

Residents in multi-family complexes with Blue Cart service can pick up an indoor collection bag at the Richmond Recycling Depot or phone the Environmental Programs Information Line at 604-276-4010.

1,967.39 TONNES + 6,422.72 TONNES = **8,390.11 TONNES RECYCLED IN 2017**

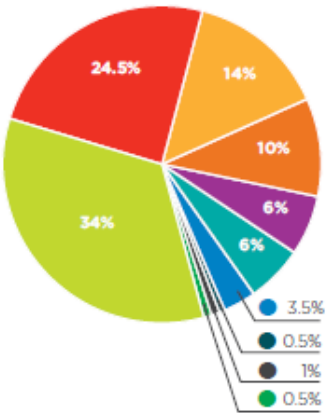
RECYCLING DEPOT PROGRAM

The Richmond Recycling Depot is located at 5555 Lynas Lane and is open from 9:00 a.m. – 6:15 p.m., Wednesday to Sunday for drop off of a broad range of materials. The Recycling Depot also sells compost bins, rain barrels, Garbage Tags and Garbage Disposal Vouchers. The Richmond Recycling Depot is a product stewardship (take back) collection site for small appliances, paints, solvents, flammable liquids, pesticides, lights and lighting fixtures.

RECYCLING DEPOT SERVICES

This facility accepts a wide range of materials including cardboard, yard and garden trimmings, mixed paper and newspapers, as well as Styrofoam, used books, cell phones, household batteries and plastic bags. The facility also accepts large appliances (e.g. fridges, stoves, washing machines), metal items (e.g. bike frames, barbecues, lawn mowers), glass bottles, glass jars, tin and aluminium cans, paints, pesticides and solvents. For a detailed list of items, see page 41. The Recycling Depot is owned and operated by the City of Richmond, with two full-time staff and additional staff support in the summer months to manage increased recycling volumes. Staff on site are available to answer questions and provide assistance with unloading awkward or heavy items.

DEPOT RECYCLING: BREAKDOWN OF MATERIALS COLLECTED IN 2017



- YARD TRIMMINGS (1,270.75 TONNES)
- SCRAP METAL (910.06 TONNES)
- MIXED PAPER (527.82 TONNES)
- LARGE ITEM PICKUP (365.17 TONNES)
- PRODUCT STEWARDSHIP (231.31 TONNES)*
- CARDBOARD (213.88 TONNES)
- PLASTIC CONTAINERS (126.65 TONNES)
- GLASS (19.27 TONNES)
- PLASTIC BAGS (38.52 TONNES)
- STYROFOAM (20.84 TONNES)

TOTAL TONNAGE = 3,724.27

In 2017, 3,724.27 tonnes of recyclable materials were collected at the Recycling Depot. This includes yard trimmings, scrap metal, mixed paper products and rigid plastic containers. For more information on drop-off programs for yard trimmings, see page 17.

* Estimated

DEPOT RECYCLING: MATERIALS AND AMOUNTS COLLECTED THROUGH TAKE BACK PROGRAMS IN 2017

PAINT
216,000 EQUIVALENT LITRES

AEROSOLS
9,275 EQUIVALENT LITRES

SOLVENTS & PESTICIDES
8,640 EQUIVALENT LITRES

SMALL APPLIANCES
89.19 TONNES

CFLS
474 BOXES

4' TUBES
362 BOXES

8' TUBES
34 BOXES

FOR SALE AT THE RECYCLING DEPOT

Residents can purchase the following items:

- Compost bins - $25 each + GST
- Rain barrels - $30 each + GST
- Extra Garbage Tags - $2 each
- Garbage Disposal Vouchers - $5 each for Richmond residents and it is worth up to $25 at the Vancouver Landfill

RECYCLE AT THE DEPOT

Richmond's free drop-off program includes:

- Styrofoam
- Batteries (household batteries 5 kg or under)
- Cell phones
- Cooking oil and animal fats
- Used books
- Plastic bags and plastic overwrap
- Large and small appliances
- Scrap metal
- Yard and garden trimmings

For a full list of items that can be recycled at the Recycling Depot, see page 41.

TIP FOR RESIDENTS

Fats, oils and grease should never be disposed down sinks, drains or garburators as the material hardens and builds up on the inside of sewage lines, causing blockages. This can lead to breaks and sewage spills or overflows. Recycle food scraps, grease solids and small amounts of cooking oil that can be absorbed with a paper towel in your Green Cart, and take used cooking oils and animal fats in a sealed container to the Richmond Recycling Depot (5555 Lynas Lane, open Wednesday to Sunday from 9:00 a.m. to 6:15 p.m.) for free disposal.

TIP FOR RESIDENTS

The Compost Hotline at 604-736-2250 offers tips and advice on how to compost and use the nutrient-rich soil produced for home gardens. Compost from yard trimmings drop-off programs and through the Green Cart collection programs is sold for use in the landscaping industry.

COMPOSTING PROGRAMS

Composting is a simple and organic process that can reduce household waste by up to 40%. Fruit and vegetable peelings, along with grass, leaves and other yard trimmings, can be added to a compost bin. In addition, composted matter produces a very nutrient-rich soil to keep lawns and gardens healthy.

BACKYARD COMPOST BIN DISTRIBUTION PROGRAM

The City of Richmond supports composting by incorporating composting information into Food Waste Reduction workshops. The City offers compost bins for sale at the Recycling Depot for $25 plus tax each. Backyard composting is the most effective way to dispose of fruit and vegetable peelings, eggshells, coffee grounds, filters, tea bags and yard trimming materials. Since this program started in 1992, 10,810 compost bins have been distributed.

Additional tips and information on composting are provided in the Tips and Resources section and at www.richmond.ca/recycle.

COMPOST DEMONSTRATION GARDEN

To help residents learn about backyard composting, the City offers a Compost Demonstration area in the Terra Nova Rural Park located at 2631 Westminster Highway just west of No.1 Road. It is open from dawn to dusk year-round. Residents are encouraged to take a self-guided tour to learn about different types of compost bins and the benefits of composting.

DID YOU KNOW?
Cut grass can act as a great slow-release fertilizer. One bag of grass clippings produces 100 g of nitrogen-rich fertilizer that can help conserve water and enrich the soil to help your garden bloom.

YARD TRIMMINGS DROP-OFF PROGRAMS

ECOWASTE INDUSTRIES

The City offers residents the option to drop off unlimited quantities of yard and garden trimmings for free at Ecowaste Industries located at 15111 Triangle Road. Proof of Richmond residency is required. Commercial landscapers servicing multi-family residential properties are also eligible for free drop-off. They must apply for this exemption.

Visit ecowaste.com or call 604-277-1410 for hours of operation and directions.

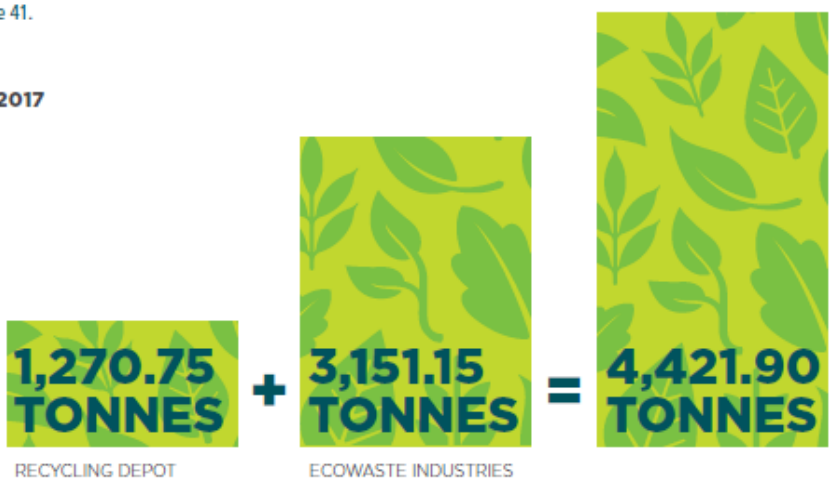
RICHMOND RECYCLING DEPOT

Residents may drop off limited quantities of yard and garden trimmings (up to 1 cubic yard) at the Richmond Recycling Depot. A fee of $20 applies for each additional cubic yard. Commercial operators may also use the Recycling Depot to drop off yard trimmings for a fee of $20 per cubic yard. The Recycling Depot is located at 5555 Lynas Lane and is open from 9:00 a.m. – 6:15 p.m., Wednesday to Sunday.

For a detailed list of all items that can be recycled at the Recycling Depot, please refer to the Tips and Resources section on page 41.

DROP OFF TONNAGE IN 2017

In 2017, 4,421.90 tonnes of yard trimmings were collected at the Recycling Depot and through the Ecowaste residential and multi-family drop-off service.



GREEN CART PROGRAM

Richmond's Green Cart recycling program is available to all Richmond residents to ensure they have a convenient service to recycle food scraps, and yard and garden trimmings, which are banned from the garbage. Green Cart recycling totalled 20,920.27 tonnes in 2017. The majority came from single-family homes followed by townhomes and apartments in multi-family housing sites.

Food scraps and yard trimmings represent about 40% of household waste, and the increase in Green Cart recycling along with Richmond's other recycling services has contributed to residents in single-family homes reducing their garbage by 78% in 2017. The Green Cart program is also an important service to support residents with an easy and convenient recycling option to meet requirements for Metro Vancouver's disposal ban on food scraps.

MULTI-FAMILY RECYCLING BY THE NUMBERS

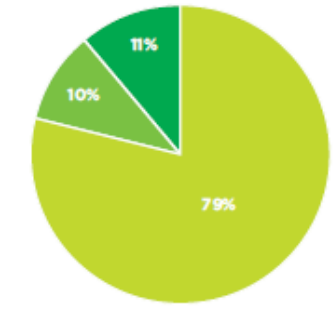
Residents in multi-family buildings are continuing to improve their recycling performance.

When it comes to Green Cart organics recycling, Richmond multi-family residents trend slightly above regional averages. In 2017, Richmond residents recycled 39.11 kg/capita or 78.22 kg/unit. The regional average in 2017 was 35 kg/capita. Drop off of yard trimmings by commercial operators serving multi-family properties in Richmond was 34.04 kg/capita or 68.08 kg/unit in 2017.

When organics and yard trimmings are combined, multi-family residents diverted a total of 73.15 kg/capita or 146.3 kg/unit in 2017.

Regional estimates indicate that multi-family residents disposed of 212 kg/capita in 2017 and recycled 82 kg/capita of paper, containers and glass.

2017 RESIDENTIAL GREEN CART RECYCLING



- SINGLE-FAMILY HOMES (16,496.68 TONNES)
- TOWNHOMES (2,175.49 TONNES)
- APARTMENTS & CONDOMINIUMS (2,248.10 TONNES)

Most household items are recyclable. Think twice before putting items in the garbage to help keep recyclables out of your Garbage Cart.

GARBAGE COLLECTION SERVICES

Richmond's curbside garbage collection services provide residents with convenient options for waste disposal. Household garbage is collected biweekly using City-provided garbage carts, and residents are offered curbside collection for up to four large household items through the City's Large Item Pick Up program.

GARBAGE COLLECTION

Richmond's biweekly Garbage Cart program, includes City-provided carts with wheels and lids and is designed to lower costs for residents who are reducing their garbage by recycling their household waste.

Residents who select smaller cart sizes are generating less garbage and as a result, they pay less for their annual curbside garbage collection. Residents can exchange their cart for a different size, and their curbside garbage collection fees are adjusted according to the size selected.

With biweekly collection, garbage is collected every other week and recycling is collected weekly. Residents receive an annual Garbage Collection Schedule, which is customized to each collection zone.

GARBAGE CART SIZE OPTIONS

There are four standard sizes of Garbage Carts, and an additional Extra Small cart is available by request.

EXTRA LARGE
360 litres
D 34.5 x W 25 x H 44.5 in

LARGE
240 litres
D 27.5 x W 24.5 x H 43 in
Standard size for single-family homes

MEDIUM
120 litres
D 21.5 x W 19 x H 37.5 in
Standard size for townhomes

SMALL
80 litres
D 20 x W 16 x H 34.5 in

EXTRA GARBAGE OPTIONS

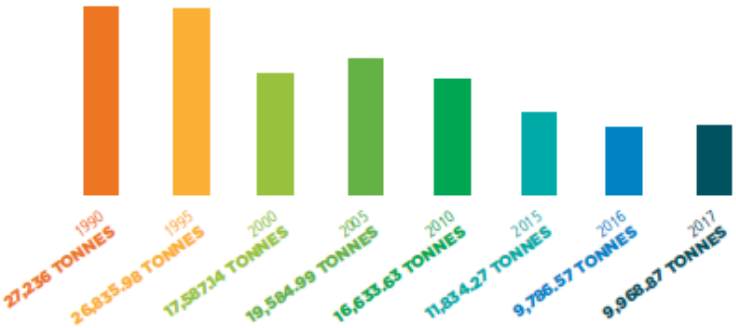
For the occasions when residents have extra garbage, the City offers several options:

- Residents can purchase $2 Garbage Tags from City facilities for excess garbage bags/cans as needed.
- Use Richmond's Large Item Pick Up program for curbside collection of up to four large items each year. To schedule a large item pick up, residents call the City's service provider, Sierra Waste Services at 604-270-4722.
- A $5 Garbage Disposal Voucher for the Vancouver Landfill (one per Richmond household per year) can be purchased at City facilities. The voucher is good for up to $25 in value for garbage drop off at the Vancouver Landfill located at 5400 72nd Street, Delta. For more information, call 604-276-4010.

10,858
GARBAGE TAGS SOLD

786
GARBAGE DISPOSAL VOUCHERS SOLD

GARBAGE DISPOSAL OVER THE YEARS



LARGE ITEM PICK UP PROGRAM

Richmond's Large Item Pick Up program provides curbside collection of up to four large items per year. This program is provided to residents in single-family homes, as well as townhomes and multi-family complexes with the City's Garbage Cart and/or Blue Box program. This service makes it easier for residents who do not have access to a vehicle to dispose of large items. Residents can contact the City's service provider at 604-270-4722 to arrange for collection of up to four large items per year. All four large items can be picked up at the same time, or in varying bundles for a total of four items annually.

Items accepted in this program include furniture, appliances and small household goods. Restrictions apply to ensure items can be handled safely and mattresses must be covered in plastic to keep them dry. If residents have more than four large items to dispose of, they can purchase a Garbage Disposal Voucher for $5 from any City facility and use the voucher to dispose of up to $25 worth of garbage items at the Vancouver Landfill.

For more information on this program, see page 39 or visit www.richmond.ca/recycle.

APPROXIMATELY 8,890 REQUESTS FOR SERVICE

3,122
MATTRESSES & BOXSPRINGS

594
WASHERS & DRYERS

352
TELEVISIONS

655
FRIDGES & FREEZERS

401
BARBECUES

222
DISHWASHERS

553 TONNES WERE COLLECTED AND OF THIS, 288 TONNES WERE RECYCLED

268
STOVES

48
MICROWAVES

1,060
OTHER

7,789
NON-RECYCLABLE HOUSEHOLD ITEMS COLLECTED FOR SAFE HANDLING AND DISPOSAL

14,511 ITEMS COLLECTED

LITTER COLLECTION SERVICES

Maintaining a litter-free city is a key focus area to ensure residents can enjoy clean parks and public spaces. The City of Richmond has made efforts to ensure that there are garbage cans, and in many cases recycling options, in public spaces throughout the city.

In addition, City crews work seven days a week to collect litter from parks, school grounds, roadsides, sidewalks and boulevards. They inspect or service garbage and recycling from litter and recycling receptacles in the community 23,515 times every month. Crews also assist with removing graffiti from City garbage cans, and they collect illegally-dumped materials found on City property and provide safe disposal and recycling of these items. Together, these measures help to support a safe and appealing community.

DID YOU KNOW?
In 2017, litter crews cleaned up 799 sites where materials were dumped illegally.

BINS INSPECTED OR SERVICED **23,515** TIMES PER MONTH OR APPROXIMATELY **282,000** TIMES PER YEAR

CREWS TRAVEL **2,932** KILOMETRES PER WEEK TO INSPECT AND SERVICE BINS

It's important to think of recycling as a commodity to sell – not waste.

LET'S RECYCLE CORRECTLY!

Richmond introduced a new information and awareness campaign – Let's Recycle Correctly! – to help inform residents about how to improve the quality of their recycling by reducing contamination.

It is becoming increasingly critical to generate quality recycling as China, the world's largest purchaser of recycled materials, is setting high standards for recycling quality under its National Sword campaign and will not purchase contaminated recycling. As well, the City is subject to fines and other penalties when contamination is found in recycling, which increases taxpayer costs.

The City's Let's Recycle Correctly! campaign began in the fall, and the goal is to help increase awareness about how to sort recycling correctly and reduce contamination. The campaign includes information kits for residents, as well as advertising, social media, promotion of the City's Recycling Wizard and other outreach. City recycling teams conducted random recycling audits throughout the community and worked with residents to help them improve the quality of their recycling. The results from the first phase of this program are already showing significant improvement in recycling quality as phase two of the program continues in 2018.

VISITED **6,387** HOMES IN TOTAL

5,320 SINGLE-FAMILY HOMES AND **1,067** HOMES IN MULTI-FAMILY COMPLEXES

2,519 GOLD STARS AWARDED

WHAT TO WATCH FOR

TYPES OF CONTAMINATION	HOW TO RECYCLE CORRECTLY
Glass bottles and glass jars in the Blue Box	Recycle in grey Glass Recycling Bin (curbside) or Glass Recycling Cart (centralized).
Recyclable items that are not accepted in Blue Box / Blue Cart (Styrofoam, plastic bags, paints and solvents, batteries and cell phones, a non-packaging plastics like toys and coat hangers)	Drop off at Richmond Recycling Depot – 5555 Lynas Lane.
Non-recyclable plastic (Ziplock bags, straws and plastic cutlery)	These are not recyclable. Please put in Garbage Cart.
Containers with food residue	Remove food and rinse before placing in recycling bin.
Propane tanks	Take to Husky Gas Stations: 8011 No. 3 Road (604-270-3822) or 9060 Bridgeport Road (604-278-0011). Or call 604-732-9253 for locations.
Electronics	Visit return-it.ca/electronics for drop-off locations.


CITY OF RICHMOND
3
NEW PARTNERSHIPS TO INCREASE RECYCLING
24

OUTREACH AND CUSTOMER SERVICE

SUPPORTING AWARENESS AND EDUCATION

Richmond recognizes that providing recycling services is the first important step in reducing waste; however, the second critical step is communication and community engagement. This includes informing residents about City and partner programs and services available in the community, educating them on how to use the programs, raising awareness about why recycling and reducing waste is important, and engaging the community to help design programs that fit their needs and priorities. The third essential step is providing excellent customer service. With its commitment to community outreach and customer service, the City goes beyond providing services – it supports residents so they can be successful in reducing their waste.

In 2017, approximately 135 youth volunteered more than 3,520 hours in Richmond's Green Ambassador program to support recycling awareness at events and outreach displays.

CUSTOMER SERVICE

Richmond's successful outreach and customer service programs are designed to help turn information and education into action. By working with children and youth through school programs and the Green Ambassadors, Richmond creates a learning environment where students gain a better understanding about recycling and sustainable waste management, and then apply their skills as volunteers and through school activities. Providing outreach, customer support services and information materials also assists residents by increasing their understanding of how to recycle along with new tools and services to promote recycling at home and on the go.

The Environmental Programs Information Line staff assisted customers with almost 20,700 service requests in 2017, answering questions, assisting with requests relating to garbage and recycling and providing guidance on where to go for additional information and resources. Richmond also assists customers directly at the Recycling Depot, and through its outreach programs in the community.

At the Depot, staff provide assistance with where and how to recycle using its drop-off options, answer questions about City programs and services and sell products such as compost bins and rain barrels as well as Garbage Tags and Garbage Disposal Vouchers. Through outreach, Richmond goes into the community to connect with residents to share information and respond to questions.

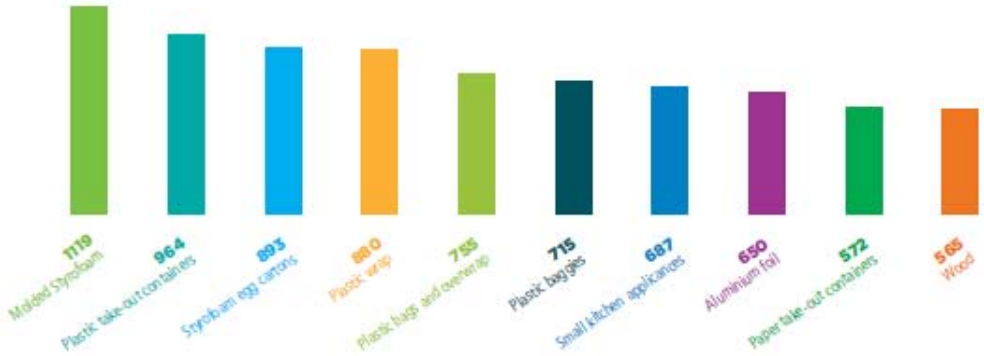
20,693 CUSTOMER SERVICE CALLS SUPPORTED

330 YOUTUBE VIDEO VIEWS

69 COMPOST BINS SOLD

11 RICHMOND RECYCLING DEPOT TOURS COMPLETED

TOP MATERIALS SEARCHED IN THE WASTE WIZARD – ALL TIME



2017 HIGHLIGHTS

NEW SEARCH & TIPS TOOLS

Richmond now offers the Recycling Wizard to help residents search for where to recycle household items. The Recycling Wizard is available online at www.richmond.ca/recyclesearch and in the Richmond Collection Schedule app, which is available for free from the Apple and Android app stores. Since its launch, there have been 65,571 Recycling Wizard searches, 38,358 address searches and 7,482 active collection reminders. The City also launched a series of instructional videos, which have had 330 YouTube views since launched in the fall.

ENGAGING STUDENTS

In 2017, Richmond sponsored 10 DreamRider productions, engaging 1,129 students from kindergarten to grade seven to raise awareness about the importance of reducing waste and how to recycle correctly. The participants are taught a sense of personal responsibility for our city streets and natural spaces, and are inspired to feel that taking care of the planet is fun. In addition, a contest called "My School Sparkles" was held. The winning schools were Maple Lane Elementary, which won My School Always Sparkles and Diefenbaker Elementary, which won My School Now Sparkles.

RICHMOND GREEN AMBASSADORS

Richmond's Green Ambassadors are dedicated high school students who participate in monthly symposiums to learn about environmental sustainability and apply what they have learned as volunteers at City events and activities. In 2017, 135 students in the program contributed more than 3,520 volunteer hours to attend training symposiums, promote recycling at community events and organize the REaDY Summit. These energetic and environmentally conscious individuals also manage green initiatives in their school.

RICHMOND HOSTS 6TH ANNUAL EARTH DAY SUMMIT

The 2017 REaDY Summit showcased how community partners, students and residents can come together to celebrate sustainable actions that can trigger a positive change in our community. Summit participants included 32 student volunteers, as well as residents from local municipalities. This year's Summit featured two youth-led keynote presentations and the opening ceremony included speeches by three students from various grades who spoke on the topic "Growing Towards Another 150".

EVENT RECYCLING

Recycling stations are recommended for special event bookings taking place in Richmond. For some events, the City hosts recycling stations with assistance from the Green Ambassador volunteers. This involves setting up recycling stations and having recycling assistants at the event to advise people on how to recycle. In 2017, the City hosted recycling stations at 23 events, including the Public Works Open House, Children's Art Festival, Doors Open, COOL Expo, Halloween Fireworks, Ship to Shore Festival, Salmon Festival, Maritime Festival, Wild Things, Harvest Fest and World Festival. Typically, very high diversion rates are achieved thanks to the efforts of the City's Green Ambassadors. Examples include:

- Ship to Shore King of the Sea – 54% diversion rate
- Steveston Salmon Festival – 68% diversion rate
- Richmond Canada Day (Imperial Landing) – 70% diversion rate
- Richmond Canada Day (Steveston Village) – 76% diversion rate
- Maritime Festival – 78% diversion rate
- Harvest Festival – 70% diversion rate
- World Festival – 75% diversion rate

The City also supports events by providing organizers with recycling bins and garbage carts at no charge, as well as complimentary collection services. This makes it easy for event organizers to keep the venue clean and recyclables out of the landfill. In 2017, 69 event organizers used the City's event recycling program to help keep recyclable materials out of the garbage at events.

GREAT CANADIAN SHORELINE CLEAN-UP

Jointly led by the Vancouver Aquarium and World Wildlife Foundation, the Great Canadian Shoreline Clean-Up focuses on educating and empowering people to make a difference through community clean-up events. As part of this initiative, Environmental Programs partnered with Parks to support 19 community clean-up events on the City's waterfront.

COMMUNITY WORKSHOPS

Richmond's free community workshops provide education and tips that support recycling and waste reduction techniques. In 2017, the City hosted 41 community workshops and Richmond Recycling Depot tours with a total of 674 participants. A summary of workshops that focus on helping residents towards the City's goal for 80% waste diversion is provided below.

For information on the workshops, email esoutreach@richmond.ca. To attend free workshops offered by the City, visit richmond.ca/register for workshop details and registration information.

COMMUNITY WORKSHOPS

TYPE OF WORKSHOP	NUMBER OF WORKSHOPS	NUMBER OF PARTICIPANTS	DESCRIPTION
Food Waste Reduction Workshops	23	328	Reduce food waste by learning harvesting, freezing/canning, and fermenting techniques to store foods.
Recycling Workshops	7	128	Learn how to sort household recyclables properly to reduce contamination. Understand the recycling process and the importance recycling has on the environment.
Richmond Recycling Depot Tours	11	218	Interactive tour of the Richmond Recycling Depot designed to teach residents about the drop-off options available and materials accepted for recycling.
Total	41	674	


CITY OF RICHMOND
4
PROGRAMS & PARTNERSHIPS IN WASTE MANAGEMENT
30

TIPS AND RESOURCES

EASY STEPS TO INCREASE RECYCLING AND REDUCE WASTE

In Richmond, we care about our community, and we are working together to trim our waste. The City works with residents and community partners to make it easy and convenient to reuse and recycle at home and on the go. It's all about making recycling a way of life. This at-a-glance resource on the various types of recycling programs and services available through the City of Richmond is a valuable guide to support being recycling smart in Richmond. The Tips and Resources include highlights such as how and where to recycle, what to do with hazardous waste and where to find additional information.

Resources also include contact information and locations for Richmond services and community partners involved in take back collection through product stewardship programs. Together these Tips and Resources help to support maximum recycling with minimum contamination in the waste going to the landfill.

Richmond's Environmental Program staff share information on tips and resources by phone, through outreach events and on the website.

CITY OF RICHMOND

BLUE BOX

Richmond's Blue Box recycling program provides convenient collection for residents in single-family homes and some townhomes to recycle mixed paper, plastic containers, milk cartons, paper and plastic drink cups, flower pots, empty aerosol cans and spiral wound tins like frozen juice concentrate containers as well as glass bottles and glass jars, which are separated into the grey Glass Recycling Bin.

Recyclable materials from the Blue Box program are collected from single-family homes and some townhome complexes on the same day that garbage is collected. Containers are placed into the Blue Box, glass bottles and glass jars are placed in the grey Glass Recycling Bin and all paper products, including newspaper and flattened cardboard are placed in the yellow Mixed Paper Recycling Bag. Blue Boxes are available in two sizes: regular (16 gallons) and tall (22 gallons) for extra capacity.

It is important to ensure materials are sorted correctly into the proper recycling receptacles. For example, recyclables must be placed individually in bins – not stacked, nestled, or in plastic bags. Also, non-packaging plastics like toys, hangers and laundry hampers are not accepted in the Blue Box but can be brought to the Richmond Recycling Depot.

For a list of items accepted in Blue Box recycling, see page 33 or visit www.richmond.ca/recycle.

Set Out Time

Before 7:30 a.m. on collection day.

Report a Missed Collection

Call 604-276-4010 or email garbageandrecycling@richmond.ca.

How to Get a Mixed Paper Recycling Bag, Glass Recycling Bin or Blue Box

There is no charge for new or replacement Blue Boxes, Glass Recycling Bins or Mixed Paper Recycling Bags.

For additional Blue Box supplies call 604-276-4010 or pick them up at the following locations:

Richmond Recycling Depot
5555 Lynas Lane
Wednesday to Sunday (Closed on Mondays, Tuesdays & Statutory Holidays)
9:00 a.m. to 6:15 p.m.

City Hall
6911 No. 3 Road
Monday to Friday (Closed on Saturdays, Sundays & Statutory Holidays)
8:15 a.m. to 5:00 p.m.

Please note: Tall Blue Boxes are only available at the Richmond Recycling Depot.

WHAT GOES WHERE:

MIXED PAPER RECYCLING BAG

ACCEPTED	HOW TO RECYCLE	NOT ACCEPTED
✓ Newspapers, inserts & flyers ✓ Flattened cardboard boxes ✓ Catalogues & magazines ✓ Cereal boxes ✓ Clean pizza boxes ✓ Corrugated cardboard (small pieces) ✓ Envelopes ✓ Junk mail ✓ Paper bags ✓ Paper egg cartons ✓ Paper gift wrap & greeting cards ✓ Telephone books ✓ Shredded paper (place inside a paper bag to avoid scattering) ✓ Writing paper (notepads, loose leaf paper, white or coloured paper, printed paper)	• Remove plastic liners/covers. • Remove any food residue. • Flatten boxes. • **Place in** Mixed Paper Recycling Bag. • Cardboard bundle size: 3 ft x 2 ft x 4 in (90 cm x 60 cm x 10 cm) *Note:* Oversized/excessive amounts of cardboard can be dropped off at the City's Recycling Depot at 5555 Lynas Lane.	x Cardboard boxes with wax coating x Plastic bags used to cover newspapers/flyers x Metallic wrapping paper x Ribbons or bows x Musical greeting cards with batteries x Padded envelopes x Plastic lined paper bags (pet food, tortilla chips) x Plastic or foil candy wrappers

GLASS RECYCLING BIN

ACCEPTED	HOW TO RECYCLE	NOT ACCEPTED
✓ Clear or coloured glass bottles & glass jars (pickle jars, jam jars, spaghetti sauce jars, soy sauce bottles)	• Remove lids & caps. • Remove food residue. • Empty & rinse. • **Place in** Glass Recycling Bin.	x Glasses, dishes, cookware, window glass or mirrors x Ceramic products x Lids & caps (place in Blue Box)

BLUE BOX FOR CONTAINERS

ACCEPTED	HOW TO RECYCLE	NOT ACCEPTED
✓ Empty aerosol cans & caps (food items, air fresheners, shaving cream, deodorant, hairspray) ✓ Microwavable bowls, cups & lids ✓ Paper food containers & cartons (ice-cream, milk, liquid whipping cream) ✓ Paper & plastic drink cups with lids ✓ Plastic containers, trays & caps (bakery containers & deli trays) ✓ Plastic and paper garden pots & trays ✓ Spiral wound paper cans & lids (frozen juice, potato chips, cookie dough, coffee, nuts, baby formula) ✓ Aluminium cans & lids ✓ Aluminium foil & foil containers (foil wrap, pie plates, food trays) ✓ Plastic bottles & caps (food items, condiments such as ketchup, mustard & relish, dish soap, mouthwash, shampoos, conditioners) ✓ Plastic jars & lids ✓ Plastic tubs & lids (margarine, spreads, dairy products such as yogurt, cottage cheese, sour cream, ice cream) ✓ Tin cans & lids	• Remove food residue. • Remove caps or lids; place loose in the Blue Box. • Empty and rinse. • **Place in** Blue Box. *Note:* Flatten containers where possible.	x Aerosol cans with hazardous materials (spray paint) or with remaining content* x Ceramic plant pots x Compostable/biodegradable plastic bags & containers x Containers for motor oil, vehicle lubricant or wax products x Foil-lined cardboard lids from take-out containers x Garden hoses x Plastic bags & over wrap* x Plastic string or rope x Styrofoam materials* * Take to the Richmond Recycling Depot

CITY OF RICHMOND

BLUE CART

All multi-level multi-family complexes like apartments and condominiums and some townhomes have a mini-recycling depot with Blue Carts for recycling mixed paper, plastic containers, milk cartons, paper and plastic drink cups, flower pots, empty aerosol cans and spiral wound tins like frozen juice concentrate containers as well as glass bottles and glass jars, which are separated into the Glass Recycling Cart. They are generally located in the garbage room or other convenient location.

For sorting recycling, containers are placed in the Containers Recycling Cart, glass bottles and glass jars are placed in the Glass Recycling Cart and paper products including newspaper and flattened cardboard are placed in the Mixed Paper Recycling Cart. These recyclable materials are banned from landfill.

The carts are emptied once a week. Statutory holidays do not generally affect the collection; however, Christmas Day may delay collection by one day if it falls on a weekday. For information about the recycling depot location in your building, contact your building manager or property manager.

It is important to ensure materials are sorted correctly into the proper recycling carts. For example, recyclables must be placed individually in carts – not stacked, nestled, or in plastic bags. Also, non-packaging plastics like toys, hangers and laundry hampers are not accepted in the Blue Cart but can be brought to the Richmond Recycling Depot.

For a list of items accepted in Blue Cart recycling, see page 35 or visit www.richmond.ca/recycle.

Cart Emptying

Some carts are retrieved from their site, however, some are brought out to a collection area.

Carts brought out must be at the collection area before 7:30 a.m.

Report a Missed Collection

Call 604-276-4010 or email garbageandrecycling@richmond.ca.

How to Get an Indoor Collection Bag for Blue Cart Recycling

There is no charge for new or replacement Blue Cart recycling bags. For additional bags call 604-276-4010 or pick them up at the following locations:

City Recycling Depot
5555 Lynas Lane
Wednesday to Sunday (Closed on Mondays, Tuesdays & Statutory Holidays)
9:00 a.m. to 6:15 p.m.

City Hall
6911 No. 3 Road
Monday to Friday (Closed on Saturdays, Sundays & Statutory Holidays)
8:15 a.m. to 5:00 p.m.

WHAT GOES WHERE:

MIXED PAPER RECYCLING CART

ACCEPTED	HOW TO RECYCLE	NOT ACCEPTED
✓ Newspapers, inserts & flyers ✓ Flattened cardboard boxes ✓ Catalogues & magazines ✓ Cereal boxes ✓ Clean pizza boxes ✓ Corrugated cardboard (small pieces) ✓ Envelopes ✓ Junk mail ✓ Paper bags ✓ Paper egg cartons ✓ Paper gift wrap & greeting cards ✓ Telephone books ✓ Shredded paper (place inside a paper bag to avoid scattering) ✓ Writing paper (notepads, loose leaf paper, white or coloured paper, printed paper)	• Remove plastic liners/covers. • Remove any food residue. • Flatten boxes. • Cut cardboard into small pieces – 12 in x 12 in (30 cm x 30 cm) • **Place in** Mixed Paper Recycling Cart. *Note:* Oversized/excessive amounts of cardboard can be dropped off at the City's Recycling Depot at 5555 Lynas Lane.	x Cardboard boxes with wax coating x Plastic bags used to cover newspapers/flyers x Metallic wrapping paper x Ribbons or bows x Musical greeting cards with batteries x Padded envelopes x Plastic lined paper bags (pet food, tortilla chips) x Plastic or foil candy wrappers

GLASS RECYCLING CART

ACCEPTED	HOW TO RECYCLE	NOT ACCEPTED
✓ Clear or coloured glass bottles & glass jars (pickle jars, jam jars, spaghetti sauce jars, soy sauce bottles)	• Remove lids & caps. • Remove food residue. • Empty & rinse. • **Place in** Glass Recycling Cart.	x Glasses, dishes, cookware, window glass or mirrors x Ceramic products x Lids & caps (place in Containers Recycling Cart)

CONTAINERS RECYCLING CART

ACCEPTED	HOW TO RECYCLE	NOT ACCEPTED
✓ Empty aerosol cans & caps (food items, air fresheners, shaving cream, deodorant, hairspray) ✓ Microwavable bowls, cups & lids ✓ Paper food containers & cartons (ice-cream, milk, liquid whipping cream) ✓ Paper & plastic drink cups with lids ✓ Plastic containers, trays & caps (bakery containers & deli trays) ✓ Plastic and paper garden pots & trays ✓ Spiral wound paper cans & lids (frozen juice, potato chips, cookie dough, coffee, nuts, baby formula) ✓ Aluminium cans & lids ✓ Aluminium foil & foil containers (foil wrap, pie plates, food trays) ✓ Plastic bottles & caps (food items, condiments such as ketchup, mustard & relish, dish soap, mouthwash, shampoos, conditioners) ✓ Plastic jars & lids ✓ Plastic tubs & lids (margarine, spreads, dairy products such as yogurt, cottage cheese, sour cream, ice cream) ✓ Tin cans & lids	• Remove food residue. • Remove caps or lids; place loose in the Blue Cart. • Empty and rinse. • **Place in** Containers Recycling Cart. *Note:* Flatten containers where possible.	x Aerosol cans with hazardous materials (spray paint) or with remaining content* x Ceramic plant pots x Compostable/biodegradable plastic bags & containers x Containers for motor oil, vehicle lubricant or wax products x Foil-lined cardboard lids from take-out containers x Garden hoses x Plastic bags & over wrap* x Plastic string or rope x Styrofoam materials* * Take to the Richmond Recycling Depot

CITY OF RICHMOND

GREEN CART

Food scraps are banned from the garbage, which means they must be recycled or composted. With the Green Cart program, all Richmond residents have access to food scraps recycling and when you recycle with a Green Cart, you are helping turn food scraps and yard trimmings into compost for nutrient-rich soil.

Residents with curbside collection may continue to use Green Cans for excess food scraps and yard trimmings. Paper yard waste bags and tied bundles of yard trimmings are also accepted. Please visit www.richmond.ca/greencart for more information.

Please note that Green Carts stay with the property. Residents with curbside collection may exchange their Green Cart for a different size for $25. If residents move to another house in Richmond, they will have a Green Cart at that location. If there is no cart, or to exchange a cart size, please call 604-276-4010.

WHAT GOES IN THE GREEN CART:

ACCEPTED

FOOD SCRAPS & FOOD SOILED PAPER

- ✓ Breads, pasta, rice & noodles
- ✓ Coffee grounds & filters
- ✓ Dairy products
- ✓ Fruit
- ✓ Eggshells
- ✓ Meat, poultry, fish, shellfish & bones
- ✓ Paper towels/napkin/plates
- ✓ Pizza delivery boxes
- ✓ Small amounts of grease/oil absorbed into paper towel
- ✓ Solid grease
- ✓ Table scraps & food scrapings
- ✓ Tea bags
- ✓ Vegetables

YARD TRIMMINGS

- ✓ Flowers
- ✓ Leaves
- ✓ Grass clippings
- ✓ Other organic yard materials
- ✓ Plants (living or dead/dried)
- ✓ Plant trimmings
- ✓ Tree & hedge prunings

HOW TO RECYCLE

- Collect food scraps in your kitchen container.
- Empty materials from your kitchen container into your Green Cart.
- Place yard trimmings into Green Cart along with your food scraps (Extra yard trimmings can go in large paper bags or additional labelled Green Cans).
- Place your Green Cart at the curb along with unlimited paper yard trimmings bags and/or Green Cans, Blue Box recycling and garbage by 7:30 a.m. on your regular collection day.

Note: For centralized Green Cart service, the collection details are arranged between the City and the strata council or property manager. Residents do not have to set the carts out for pick up.

NOT ACCEPTED

- x Coffee cups
- x Compostable and biodegradable plastic bags
- x Styrofoam cups, meat trays or takeout containers
- x Garden hoses or flower pots
- x Liquid grease
- x Lumber
- x Pet feces or kitty litter
- x Plastic bags and plastic overwrap
- x Plastic wraps
- x Prunings over 4 inches (10 cm) in diameter
- x Rocks, dirt or sod

Yard Trimmings Drop-off Locations

Richmond residents and commercial landscapers can drop off yard trimmings (see above for materials accepted) at the following locations.

Ecowaste Industries
15111 Triangle Road
Open Monday to Friday from 7:00 a.m. to 4:30 p.m. (last load in at 4:15 p.m.)
Open Saturday from 8:00 a.m. to 4:00 p.m. (last load in at 3:45 p.m.). Closed Sundays.

Commercial operators will be charged a fee unless pre-approved for servicing residential properties in Richmond.

Visit ecowaste.com or call 604-277-1410 for detailed information.

City Recycling Depot
5555 Lynas Lane
Wednesday to Sunday (Closed on Mondays, Tuesdays & Statutory Holidays)
9:00 a.m. to 6:15 p.m.

There is no charge for dropping off amounts less than one cubic yard (a car, station wagon or minivan load). Large loads are charged a fee of $20 per cubic yard. Commercial operators will be charged a fee of $20 per cubic yard at the Richmond Recycling Depot.

HOME COMPOSTING

Home composting turns your food scraps and yard trimmings into nutrient-rich soil that can be spread on lawns and flowerbeds.

BACKYARD COMPOST BIN

Compost bins are available to Richmond residents at the Recycling Depot for $25 plus tax. The bin dimensions are 32 inches (81 cm) high, 28 inches (71 cm) wide and 28 inches (71 cm) deep. They are suitable for residential backyard composting of grass, leaves, vegetable trimmings, fruit trimmings and other miscellaneous organic garden trimmings.

COMPOST HOTLINE

The Compost Hotline offers support and tips for best practices in home composting. It is operated by City Farmer, which has researched and promoted the best methods of urban composting since 1978.

Compost Hotline
Phone: 604-736-2250
Email: composthotline@telus.net

COMPOST DEMONSTRATION GARDEN

A compost demonstration garden is located at 2631 Westminster Highway in the Terra Nova Rural Park. Composting demonstration units are on display for viewing year-round, from dawn to dusk.

Nitrogen Rich Green Materials:

- PLANT TRIMMINGS
- FRUIT & VEGETABLE PEELINGS
- FRESH GRASS CLIPPINGS
- COFFEE GROUNDS & TEA LEAVES

Carbon Rich Brown Materials:

- DRY LEAVES
- SAWDUST
- STRAW
- SHREDDED NEWSPAPER CLIPPINGS

HOW TO COMPOST

1. USING A BACKYARD COMPOST BIN, START WITH A GOOD LAYER OF COARSE ORGANIC MATERIAL, SUCH AS STRAW, LEAVES OR PRUNING AT THE BOTTOM TO ALLOW AIR TO CIRCULATE.
2. ADD A GOOD LAYER OF NITROGEN-RICH GREEN MATERIAL FOLLOWED BY ONE LAYER OF CARBON-RICH BROWN MATERIAL, UNTIL THE BIN IS FULL.
3. COMPOST REQUIRES AIR. TURN AND STIR YOUR COMPOST WEEKLY SO THE ORGANISMS GET NECESSARY OXYGEN.
4. COMPOST REQUIRES MOISTURE. WATER YOUR COMPOST BIN FREQUENTLY, TO ENSURE IT STAYS AS MOIST AS A WRUNG-OUT SPONGE.
5. GIVE IT TIME - IN 12-18 MONTHS, MATERIAL AT THE BOTTOM AND MIDDLE OF THE BIN SHOULD BE COMPOSTED. USE THIS THROUGHOUT YOUR GARDEN. USE THE UN-COMPOSTED MATERIAL TO START A NEW BATCH. CHIPPING OR CHOPPING THE MATERIAL CAN INCREASE THE SPEED OF THE PROCESS. REGULAR AERATION IS KEY TO SUCCESSFUL COMPOSTING.

CITY OF RICHMOND

GARBAGE COLLECTION

CURBSIDE COLLECTION SERVICE

Biweekly Garbage Cart Program

Garbage Carts are collected biweekly (every other week). Annual curbside garbage collection fees are based on the size of the cart – the smaller the cart, the lower the fees. Residents may exchange their Garbage Cart for a different size for $25 by calling 604-276-4010.

For cart size options, visit www.richmond.ca/garbage.

Preparing Garbage for Collection

It's important to secure or wrap loose garbage to prevent loose materials from being scattered by wind or animals. Garbage must be securely packed in plastic bags. This includes ashes, kitty litter, disposable diapers, vacuum cleaner sweepings and other loose household garbage.

All garbage must be placed at curbside before 7:30 a.m. on collection day but no earlier than 8:00 p.m. the day before. Do not place receptacles or other items on the road.

Residents are responsible for cleaning up any loose materials that have been scattered over the ground by animals, wind or vandalism.

Extra Item Disposal Options

Purchase Garbage Tags or Garbage Disposal Vouchers to dispose of extra garbage.

$2 Garbage Tags

Garbage Tags for curbside collection are available for purchase at all City facilities. One Garbage Tag is good for an additional garbage bag or can.

Garbage Disposal Vouchers

Richmond residents may purchase a Garbage Disposal Voucher for $5 at all City facilities. These vouchers are good for up to $25 at the Vancouver Landfill, and are valid anytime. They are limited to one per household. Visit www.richmond.ca/recycle for a list of City facilities selling Garbage Tags and Garbage Disposal Vouchers.

Large Item Pick-Up Program

Residents in single-family homes, some townhomes and multi-family complexes with City Garbage Cart and/or Blue Box service, can arrange for curbside collection of four large household items each year. See page 39 for details.

Sign Up for the Richmond Collection Schedule App

Get weekly collection reminders by downloading the free Richmond Collection Schedule app at the Apple or Android app stores to receive reminders about curbside garbage and recycling collection, and to use the Recycling Wizard for tips on where to recycle.

The following items are **not** accepted in the garbage:

MATERIAL	HOW TO RECYCLE OR DISPOSE
X **DEMOLITION WASTE**	• Take to Ecowaste Industries at 15111 Triangle Road, or call the RCBC Recycling hotline at 604-RECYCLE (732-9253).
X **DIRT, ROCK, CONCRETE OR BRICKS**	• Take to Ecowaste Industries. Visit ecowaste.com or call 604-277-1410 for accepted items & hours.
X **DRYWALL** (Gypsum, sheetrock, plasterboard, gyproc & wallboard)	• Special restrictions apply. Please call the RCBC Recycling Hotline for details at 604-732-9253.
X **HAZARDOUS WASTE**	• Call RCBC Recycling Hotline at 604-732-9253, visit www.metrovancouverrecycles.org or see page 46 - 52 for drop-off locations.
X **MATERIALS THAT ARE TOO BIG OR MAY DAMAGE GARBAGE TRUCK**	• See Large Item Pick Up program on page 39 for disposal options.
X **PROVINCIAL PRODUCT STEWARDSHIP COLLECTION (TAKE BACK) ITEMS**	• Visit bcstewards.com or call 604-732-9253.
X **RECYCLABLE MATERIALS** (Mixed paper, cardboard, plastic containers, empty aerosol cans, tin & aluminium cans, glass bottles & jars, and other materials accepted in the Blue Box/Blue Cart program)	• Recycle with the Blue Box or Blue Cart program. • Remember to recycle glass separately using the Glass Recycling Bin/Cart. • See pages 32 - 35 for details.
X **YARD TRIMMINGS & FOOD SCRAPS**	• Place in Green Carts or for yard trimmings only, paper yard waste bags. • For yard trimmings only, one cubic yard or less may be dropped off at Recycling Depot. Unlimited amounts of yard trimmings can be dropped off at Ecowaste Industries with proof of residency. • Check Green Cart section for restrictions and accepted materials on page 36.

For a list of drop-off locations, use the City's Recycling Wizard available on the Richmond Collection Schedule app and at www.richmond.ca/recyclesearch or call the RCBC Recycling Hotline at 604-732-9253.

COLLECTION SERVICE FOR LARGE HOUSEHOLD ITEMS

Richmond's Large Item Pick Up program provides a convenient collection service for up to four large household items per year, including mattresses, furniture and appliances. The program is available to residents in single-family homes, as well as townhomes and multi-family complexes with the City's garbage collection service and/or Blue Box program.

This program is designed to make it more convenient for residents to dispose of large household items and to help reduce illegal dumping. As well, through this program, large household items that can be recycled will be diverted from the landfill, which will help Richmond achieve its goal for 80% waste diversion from the landfill by 2020.

STEPS ON HOW THE PROGRAM WORKS:

1. To schedule collection of up to four items per year, residents can contact the City's service provider, Sierra Waste Services at 604-270-4722 or schedule online at www.richmond.ca/largeitem.
2. Sierra Waste Services will contact you to provide a pick up date and confirmation number.
3. On your scheduled pick up date only, place items at the curb or for multi-family complexes, in the area designated by the strata or property manager, before 7:30 a.m. or no earlier than 8:00 p.m. the night before.

Safety Consideration: If the large item is a freezer, refrigerator, icebox or other container that is equipped with a latch or locking device, the door/latch must be removed and placed beside the large item for safety reasons.

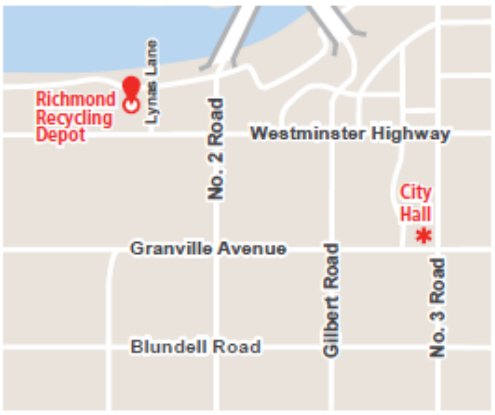
DID YOU KNOW?
Water-logged mattresses cannot be recycled and pose safety hazards for lifting. Mattresses must be covered in plastic to ensure they can be collected and recycled. Reuse the bag from newly-purchased mattresses or purchase bags from home hardware and supply stores.

LIST OF ITEMS ACCEPTED

ACCEPTED	NOT ACCEPTED
✓ Appliances (e.g. stove, dishwasher, washer and/or dryer, hot water tank, refrigerator, freezer, microwave, cooler) ✓ Barbecues (remove propane tank and/or lava rock briquettes) ✓ Bed frame ✓ Electric lawnmowers ✓ Furniture (e.g. couch, coffee table, chair, desk, dresser, TV stand, cabinet, drawer, table, hutch, crib, high chair, entertainment centre) ✓ Headboard ✓ Outdoor furniture (e.g. chairs, patio tables, patio umbrellas) ✓ Small household goods, which must be in boxes or bundled and are a reasonable size (one box or bundle is equal to one of the resident's four allotted items) ✓ Weight training equipment (e.g. treadmills, ellipticals, stationary bikes, stair masters, weight sets) ✓ Mattresses or boxsprings – please cover your mattress with a plastic bag.	x Car bodies or parts x Carpets x Construction materials x Drywall x Gas lawnmowers x Hazardous waste x Lumber, demolition or home renovation materials x Propane tanks x Tree stumps x Tires Note: Items that contain any hazardous liquids such as gas, oil, etc. will not be accepted. See page 47 - 52 for disposal locations or call the RCBC Recycling Hotline at 604-732-9253.

Note: The item(s) must be able to be safely handled from the curbside in order to qualify for collection.

CITY OF RICHMOND



RECYCLING DEPOT

The Richmond Recycling Depot is located at 5555 Lynas Lane and is open from Wednesday through Sunday from 9:00 a.m. to 6:15 p.m. The Depot accepts Styrofoam, batteries, cell phones, used cooking oil, large appliances, large metal items and yard trimmings, as well as recyclables normally placed curbside.

Residents are encouraged to use the curbside recyclables collection for glass bottles and glass jars, rigid plastic containers, newsprint and mixed paper. Businesses are encouraged to subscribe to onsite collection services if a large quantity of recyclables is produced. Residents and small business operators can drop off one cubic yard of recyclables and three large appliances at the Depot per day.

In addition, the Depot is a Product Stewardship (take back) Collection site for paint, solvents, flammable liquids, pesticides, lights, lighting fixtures and small appliances.

FOR SALE AT THE RECYCLING DEPOT

Residents can purchase the following items:

- Compost bins - $25 each + GST
- Rain barrels - $30 each + GST
- Extra Garbage Tags - $2 each
- Garbage Disposal Vouchers (cost is $5 for Richmond residents and value is up to $25 at the Vancouver Landfill)

TIP FOR RESIDENTS

Residents can purchase compost bins from the Richmond Recycling Depot. To learn more about how to compost, see page 37, or visit the Compost Demonstration Garden located at 2631 Westminster Highway in the Terra Nova Rural Park.

MATERIALS ACCEPTED AT THE RICHMOND RECYCLING DEPOT

Please note: All materials must be sorted into different containers at the Recycling Depot. Please visit www.richmond.ca/depot for drop-off details.

- ✓ Aluminium materials (aluminium foil, pie plates)
- ✓ Appliances (small and large electrical/battery operated appliances including dishwashers, washing machines, stoves, barbeques, ovens, microwaves, fridges, freezers, vacuums, hair dryers, toaster ovens, etc.)
- ✓ Batteries (small household batteries less than 5 kg)
- ✓ Books
- ✓ Cell phones (including batteries)
- ✓ Clean untreated wood
- ✓ Cooking oil and animal fat
- ✓ Corrugated cardboard (flattened, clean corrugated boxes)
- ✓ Exercise and hobby machines (treadmills, elliptical / cross trainers, cycling machines)
- ✓ Flammable aerosols
- ✓ Flammable liquids
- ✓ Flower pots (paper/plastic garden pots)
- ✓ Gasoline (in approved ULC containers)
- ✓ Glass bottles and jars (clear and coloured)
- ✓ Lights (fluorescent tubes, compact fluorescent lights, light emitting diodes, halogen and incandescent lights, high intensity discharge and other mercury containing lamps)
- ✓ Lighting fixtures
- ✓ Magazines
- ✓ Metal items (bike frames, clean 45 gallon drums, clean automotive parts, lawn chairs, steel coat hangers, steel or lead piping)
- ✓ Paper (mixed paper products including flattened boxboards, envelopes, junk mail, flyers, inserts, office paper, paper egg cartons, telephone books, etc.)
- ✓ Newspaper
- ✓ Paints (household paints)
- ✓ Paint aerosols
- ✓ Pesticides (domestic pesticides)
- ✓ Plastic containers
- ✓ Plastic grocery shopping bags and plastic overwrap
- ✓ Sewing, knitting and textile machines
- ✓ Styrofoam packaging
- ✓ Tin cans
- ✓ Tools (power tools such as angle saws, jigsaws, trimmers, drum machines, etc.)
- ✓ Yard and garden trimmings

TIP FOR RESIDENTS

You can find drop-off locations and how to recycle a variety of household items using the Recycling Wizard on the free Richmond Collection Schedule App (available at the Apple and Android app stores). Plus, the app sends you weekly collection day reminders!

The Recycling Wizard is also available online at www.richmond.ca/recyclesearch.

COMMUNITY RESOURCES AND PARTNERS

METRO VANCOUVER RECYCLES — REUSE AND RECYCLE IN THE REGION

A convenient web tool called Metro Vancouver Recycles makes it easy to connect with people who could use products you don't need, or to find options for recycling products that cannot be included in your curbside collection, visit metrovancouverrecycles.org.

There are also convenient links to online services if you want to sell or give away goods. The following are just a few examples in the Metro Vancouver region:

Metro Vancouver Recycling Directory
metrovancouverrecycles.org

MetroVan Reuses
bc.reuses.com

Richmond Shares
richmondshares.bc.ca

Recycle BC
recyclebc.ca

RCBC COMMUNITY RESOURCES

Recycling Hotline
Monday to Friday, 9 a.m. to 4 p.m.
Phone: 604-RECYCLE (604-732-9253)
Email: hotline@rcbc.bc.ca
RCBC Recyclepedia at rcbc.bc.ca/recyclepedia
Smart Phone App: BC Recyclepedia App
(available at iPhone App Store and Android Market)

DID YOU KNOW?
Four, 2-litre plastic bottles can be recycled into one t-shirt, filling for a ski jacket and two ball caps.

PRODUCT STEWARDSHIP PROGRAMS

The City of Richmond works with local companies and organizations like Product Care and Encorp to support BC's Product Stewardship Programs.

These programs are often called take back programs or Extended Producer Responsibility (EPR) programs, and they are based on the principle that whoever designs, produces, sells or uses a product is also responsible for minimizing that product's environmental impact. The key participants in these programs are the BC government, local governments, producers, retailers and consumers who bring their products to designated collection sites when they are at their end of life. The cost of these programs is covered by consumers and producers, sometimes in the form of a deposit or levy that is charged at the time of purchase. In the case of beverage containers, there are refunds available when they are returned at a collection site.

Take back programs are important as they expand the opportunities for recycling beyond the curbside collection services. There are many household items that can be recycled through businesses and organizations in the community who participate in BC's Product Stewardship Program. Many of these items are also considered hazardous waste, and they are restricted from garbage as they are not accepted at the landfill. The take back programs help to ensure that these expired or end-of-life products will be disposed of safely, and recycled where possible.

PRODUCT STEWARDSHIP PROGRAM CATEGORIES

The following categories highlight the products that can be returned to retailers and other community partners. For a list of drop-off locations for each category, please see pages 47 to 52.

TAKE BACK PROGRAMS	WHAT IS INCLUDED	STEWARDSHIP AGENCY
BATTERIES	Household batteries	Call2Recycle **Contact** call2recycle.ca 1-888-224-9764 info@call2recycle.ca Drop off site locator 1-877-273-2925
BEVERAGE CONTAINERS	Almost all types of beverage containers	Encorp Pacific (Canada) **Contact** return-it.ca/locations 1-800-330-9767 or 604-473-2400 returnit@returnit.ca Note: Beverage containers like pop and juice cans and bottles can be returned for a refund of the deposit at a number of Return-It Depot locations in Richmond.
CELL PHONES	Mobile/wireless devices that connect to a cellular or paging network, including all cell phones, smart phones, wireless personal digital assistants (PDAs), external air cards and pagers, as well as cell phone batteries and accessories, including headsets and chargers	Canadian Wireless Telecommunications Association **Contact** RecycleMyCell.ca 1-888-797-1740 info@recyclemycell.ca
ELECTRONICS	Televisions and computer and printer products such as desktop computers, display devices, portable (laptop) computers, desktop printers and fax machines and computer accessories like keyboards, pointing devices, track balls and mice	Encorp Pacific (Canada) **Contact** return-it.ca/electronics 1-800-330-9767 or 604-473-2400 returnit@returnit.ca
MEDICATION	All expired or leftover prescription medication, non-prescription medication and mineral supplements, anti-fungal and anti-bacterial creams	Health Products Stewardship Association **Contact** healthsteward.ca/returns/british-columbia 613-723-7282 or 1-844-535-8889 info@healthsteward.ca

DID YOU KNOW?
100% of brewer packaging is either reusable or recyclable, and in addition to standard beer cans and bottles, brewers reuse or recycle their aluminium kegs and their secondary packaging including plastic shrink wrap, cardboard and wooden pallets.

DID YOU KNOW?
A littered aluminum can takes 500 years to disintegrate, but it only takes six weeks to be manufactured, filled, sold, recycled, remanufactured, refilled and be back out on the marketplace.

TAKE BACK PROGRAMS	WHAT IS INCLUDED	STEWARDSHIP AGENCY
PACKAGING AND PRINTED PAPER	Aerosol cans, microwavable bowls/cups/lids, paper food containers & cartons, plastic & paper drink cups with lids, plastic containers/jars/tubs/trays, aluminium cans, tin cans, etc. Visit recyclinginbc.ca for a complete list	RecycleBC **Contact** recyclebc.ca 778-588-9504 or 1-855-875-3596 info@recyclebc.ca
PAINTS, SOLVENTS, PESTICIDES AND GASOLINE	Paints, solvents, pesticides and gasoline	Product Care Association **Contact** regeneration.ca 1-877-592-2972 contact@productcare.org
SMALL APPLIANCES AND POWER TOOLS	Kitchen countertop appliances (e.g. toasters, microwaves, coffee makers and food processors), electric bathroom scales, hair dryers, carpet cleaners, vacuum cleaners, portable fans, power tools, sewing and exercise machines	ElectroRecycle is a non-profit, province-wide, small electrical appliance recycling program in B.C. and the first of its kind in Canada through the Canadian Electrical Stewardship Association (CESA) with the help of BC's Product Care Association **Contact** electrorecycle.ca 1-877-670-2372 info@cesarecycling.ca
TIRES	Car tires, truck tires and some agricultural and logger/skidder tires	Tire Stewardship BC (TSBC) **Contact** tsbc.ca 1-866-759-0488
THERMOSTATS	Mercury-containing and electronic thermostats	Heating, Refrigeration and Air Conditioning Institute of Canada in partnership with the Canadian Institute of Plumbing and Heating, and delivered by Summerhill Impact. **Contact** switchthestat.ca 416-922-2448 (ext 232) jcourt@summerhillgroup.ca
USED OIL AND ANTIFREEZE	Motor oil, oil filters, empty oil containers, antifreeze and used antifreeze containers	BC Used Oil Management Association **Contact** usedoilrecycling.com/en/bc 1-866-254-0555 reception@usedoilrecycling.ca

HAZARDOUS WASTE AND OTHER DISPOSAL ITEMS

The careless handling of hazardous products can cause serious injury as well as damage to the environment. Hazardous products that are dumped in sewers or green spaces can injure livestock, wildlife and plant life. Careful and often specialized disposal is essential for these materials.

There are certain materials that Metro Vancouver disposal facilities do not accept, either because there are already disposal programs set up for these items, or because they are hazardous to waste collection workers, the public and the environment.

At disposal sites, garbage loads are inspected for banned and prohibited materials. Loads that arrive at the disposal sites containing prohibited materials are assessed a $65 minimum surcharge, plus the cost of removal, clean-up or remediation. Loads containing banned materials are assessed a 50% tipping fee surcharge.

Many common hazardous household and automotive products must be recycled or disposed through special depots. Disposal sites and take back collection options for hazardous and banned materials are listed on the following pages. Please note that this information is provided as a reference for your convenience; however, it is not guaranteed. Please call first to confirm that the site is still open to accept these take back products and to check hours of operation.

For a list of drop-off locations, use the City's Recycling Wizard available on the Richmond Collection Schedule app and at www.richmond.ca/recyclesearch, or call the RCBC Recycling Hotline at 604-732-9253.

BANNED AND HAZARDOUS MATERIALS

BANNED HAZARDOUS AND OPERATIONAL IMPACT MATERIALS	BANNED MATERIALS THAT CAN BE RECYCLED WITH CITY SERVICES	BANNED PRODUCT STEWARDSHIP MATERIALS
x Agricultural waste x Asbestos x Automobile parts and bodies x Barrels, drums, pails or other large (205 litre or greater) liquid containers, whether full or empty x Biomedical waste x Dead animals x Gypsum x Hazardous waste x Inert fill material including soil, sod, gravel, concrete and asphalt exceeding 0.5 cubic metres per load x Liquids or sludge x Mattresses x Propane tanks x Refuse that is on fire, smoldering, flammable or explosive x Wire and cable exceeding 1% of load	x Beverage containers x Clean wood x Containers made of glass, metal or banned recycled plastic 1 2 4 5 x Corrugated cardboard x Food waste x Green waste x Recyclable paper	x Antifreeze and antifreeze containers x Batteries x Electronics and electrical products, including metal household and commercial appliances x Fluorescent lights x Gasoline x Lead-acid batteries x Oil, oil filters and oil containers x Packaging and printed paper x Paint x Pesticides x Pharmaceutical products and medications x Solvents and flammable liquids x Thermostats x Tires

For a complete list of banned materials, please visit www.metrovancouver.org/services/solid-waste/bylaws-regulations/banned-materials

TIP FOR RESIDENTS

To spot hazardous waste, look for the words Danger, Warning, or Caution on the product label, and any of the symbols shown above.

ANTIFREEZE AND EMPTY CONTAINERS [DB]

DROP-OFF LOCATION	ADDRESS	PHONE
Cowell Motors Ltd. - Volkswagen	13611 Smallwood Place	604-273-3922
Jaguar Land Rover Richmond*	5660 Parkwood Way	604-273-6068
Jiffy Lube	10991 No. 4 Road	604-448-0142
Mobil 1 Lube Express*	3011 No. 5 Road	604-278-1999
Rainbow Auto Service	142 - 11788 River Road	604-276-2820

For a complete list of antifreeze or containers accepted, visit http://usedoilrecycling.com/en/bc or call 604-732-9253.

APPLIANCES - SMALL [DB]

DROP-OFF LOCATION	ADDRESS	PHONE
City's Recycling Depot	5555 Lynas Lane	604-276-4010
Ironwood Bottle & Return-It Depot	110 - 11020 Horseshoe Way	604-275-0585
OK Bottle Depot	7960 River Road	604-244-0008
Regional Recycling	13300 Vulcan Way	1-855-701-7171
Richmond Return-It Depot	135 - 8171 Westminster Hwy	604-232-5555

For a complete list of small appliances accepted, visit electrorecycle.ca or call 604-732-9253.

AUTOMOTIVE BATTERIES [DB]

DROP-OFF LOCATION	ADDRESS	PHONE
Kal Tire	2633 No. 5 Road	604-278-9181
Regional Recycling *	13300 Vulcan Way	1-855-701-7171

Note: All retail locations accept a used car battery for each new one purchased. For a list of collection sites, please visit www.recyclemybattery.ca

BABY CAR SEATS

DROP-OFF LOCATION	ADDRESS	PHONE
City of Vancouver Landfill *	5400 72nd Street, Delta	604-873-7000
Pacific Mobile Depots (occurs third Saturday of every month)	Britannia Community Centre, 1661 Napier Street, Vancouver	604-718-5800
Queensborough Landing Return-it Depot	Unit A - 409 Boyne Road, New Westminter	604-540-4467

DB: Disposal ban | * A fee is charged
Please note: Drop-off locations may change without notice. Please call individual locations to confirm address and hours of operation.

CITY OF RICHMOND

BATTERIES AND MOBILE PHONES [DB]

Batteries weighing five kilograms or less.

DROP-OFF LOCATION	ADDRESS	PHONE
Best Buy	700-5300 No. 3 Road	604-273-7335
City's Recycling Depot	5555 Lynas Lane	604-276-4010
Dr Battery	102 - 4460 Jacombs Road	604-273-8248
Home Depot (batteries only)	2700 Sweden Way	604-303-9882
London Drugs	5971 No. 3 Road	604-448-4811
	3200 - 11666 Steveston Highway	604-448-4852
Pharmasave	116 - 10151 No. 3 Road	604-241-2898
Rona	7111 Elmbridge Way	604-273-4606
Staples	8171 Ackroyd Road	604-270-9599
	110 - 2780 Sweden Way	604-303-7850

For a complete list of batteries accepted, please visit call2recycle.ca or call 1-888-224-9764.

For a complete list of mobile phones drop off locations, visit call2recycle.ca/locator.

All cellular/mobile phone stores accept used cellular/mobile phones for refurbishing or recycling.

To erase information from your device, including text messages, contacts and personal files, use Cell Phone Data Erasers by recyclemycell.ca/recycling-your-device available for free.

CARBON MONOXIDE (CO), SMOKE AND COMBINATION SMOKE AND CO ALARMS [DB]

DROP-OFF LOCATION	ADDRESS	PHONE
London Drugs (smoke detectors only)	5971 No. 3 Road	604-448-4811
	3200 - 11666 Steveston Highway	604-448-4852
Regional Recycling	13300 Vulcan Way	1-855-701-7171

For a complete list of alarms accepted, please visit regeneration.ca or call 604-732-9253.

ELECTRONICS: AUDIO VISUAL EQUIPMENT, COMPUTERS, MONITORS, TVs, PRINTERS, FAX MACHINES, SCANNERS, VIDEO GAMES & ACCESSORIES

DROP-OFF LOCATION	ADDRESS	PHONE
Best Buy	700 - 5300 No. 3 Road	604-273-7335
Ironwood Bottle & Return-It Depot	110 - 11020 Horseshoe Way	604-275-0585
OK Bottle Depot	7960 River Road	604-244-0008
Regional Recycling	13300 Vulcan Way	1-855-701-7171
Staples	8171 Ackroyd Road	604-270-9599
	110 - 2780 Sweden Way	604-303-7850

For a complete list of materials accepted, please visit return-it.ca/electronics or call 604-473-2400.

EXERCISE & HOBBY MACHINES [DB]

DROP-OFF LOCATION	ADDRESS	PHONE
City's Recycling Depot	5555 Lynas Lane	604-276-4010
Ironwood Bottle & Return-It Depot	110 - 11020 Horseshoe Way	604-275-0585
OK Bottle Depot	7960 River Road	604-244-0008
Regional Recycling	13300 Vulcan Way	1-855-701-7171

EYEGLASSES

DROP-OFF LOCATION	ADDRESS	PHONE
Drop off at a local optometrist or eye care professional.		

FIRE EXTINGUISHERS

DROP-OFF LOCATION	ADDRESS	PHONE
Vancouver Fire*	22131 Fraserwood Way	604-232-3473

DB: Disposal ban | * A fee is charged

Please note: Drop-off locations may change without notice. Please call individual locations to confirm address and hours of operation.

DID YOU KNOW?

The Product Stewardship Program helps with take back of many recyclable materials and is guided by the principle that whoever designs, produces, sells or uses a product takes responsibility for minimizing that product's environmental impact. The costs for recycling these products are covered through environmental handling fees that are charged on the sale of products and through refundable deposits on items like beverage containers.

FLAMMABLE LIQUIDS [DB], PESTICIDES [DB], SOLVENTS [DB], GASOLINE [DB]

(Gasoline must be in approved ULC container)

DROP-OFF LOCATION	ADDRESS	PHONE
City's Recycling Depot	5555 Lynas Lane	604-276-4010
Regional Recycling	13300 Vulcan Way	1-855-701-7171

For a complete list of flammable liquids, gasoline, pesticides and solvents accepted, please visit regeneration.ca or call 604-732-9253.

GENERAL HAZARDOUS MATERIALS

DROP-OFF LOCATION	ADDRESS	PHONE
Tervita*	160 -13511 Vulcan Way	604-214-7000
Terrapure Environmental*	9 - 7483 Progress Way, Delta	604-952-1220

GYPSUM DRYWALL [DB]

No other materials attached to or on drywall

DROP-OFF LOCATION	ADDRESS	PHONE
City of Vancouver Landfill *	5400 72nd Street, Delta	604-873-7000
Ecowaste Industries Ltd. *	15111 Triangle Road	604-277-1410
New West Gypsum Recycling *	38 Vulcan Street, New Westminster	604-534-9925
Vancouver Transfer Station (Maximum 1/2 sheet with a paid load of garbage)	377 W. Kent Avenue N.	604-326-4600

HYPODERMIC NEEDLES

Purchase a "Sharps Container" from a pharmacy and return the container to same pharmacy when full.

LIGHTS & LIGHTING FIXTURES [DB]

DROP-OFF LOCATION	ADDRESS	PHONE
City's Recycling Depot	5555 Lynas Lane	604-276-4010
London Drugs (lightbulbs only)	5971 No. 3 Road	604-448-4811
	3200 - 11666 Steveston Highway	604-448-4852
Rona	7111 Elmbridge Way	604-273-4606

For a complete list of lighting products accepted, please visit regeneration.ca or call 604-732-9253.

LUBRICATING (USED) OIL [DB], OIL FILTERS [DB], PLASTIC OIL CONTAINERS [DB]

DROP-OFF LOCATION	ADDRESS	PHONE
Cowell Motors Ltd - Volkswagen	13611 Smallwood Place	604-273-3922
Jaguar Land Rover of Richmond*	5660 Parkwood Way	604-273-6068
Jiffy Lube	10991 No. 4 Road	604-448-0142
Mobil 1 Lube Express*	3011 No. 5 Road	604-278-1999

For a complete list of lubricating oil, oil filters and plastic oil containers accepted, visit bcusedoil.com or call 604-732-9253.

DB: Disposal ban | * A fee is charged

Please note: Drop-off locations may change without notice. Please call individual locations to confirm address and hours of operation.

CITY OF RICHMOND

Working together with the City of Richmond, producers, retailers and residents can divert hazardous waste and other special disposal items from the landfill. Producers and retailers who support product stewardship and related take back programs assist with recycling and proper disposal, and residents can use these programs to help turn waste into resources.

MATTRESSES AND BOXSPRINGS DB

DROP-OFF LOCATION	ADDRESS	PHONE
Canadian Mattress Recycling*	1210 Cliveden Avenue, Delta	604-777-0324
City of Vancouver Landfill*	5400 72nd Street, Delta	604-873-7000

Richmond's Large Item Pick Up Program: Contact Sierra Waste at 604-270-4722. Please note some restrictions apply. Visit www.richmond.ca/largeitem for program details.

MEDICAL DEVICES & EQUIPMENT DB

DROP-OFF LOCATION	ADDRESS	PHONE
Ironwood Bottle & Return-It Depot	110 - 11020 Horseshoe Way	604-275-0585
OK Bottle Depot	7960 River Road	604-244-0008
Regional Recycling	13300 Vulcan Way	1-855-701-7171

MUSICAL INSTRUMENTS DB

DROP-OFF LOCATION	ADDRESS	PHONE
Ironwood Bottle & Return-It Depot	110 - 11020 Horseshoe Way	604-275-0585
OK Bottle Depot (electrical instruments only)	7960 River Road	604-244-0008
Regional Recycling	13300 Vulcan Way	1-855-701-7171

PAINT & PAINT AEROSOL CONTAINERS DB

DROP-OFF LOCATION	ADDRESS	PHONE
City's Recycling Depot	5555 Lynas Lane	604-276-4010
Regional Recycling	13300 Vulcan Way	1-855-701-7171
Rona	7111 Elmbridge Way	604-273-4606

For a complete list of paint & paint aerosol containers accepted, please visit regeneration.ca or call 604-732-9253.

DB: Disposal ban | * A fee is charged
Please note: Drop-off locations may change without notice. Please call individual locations to confirm address and hours of operation.

PHARMACEUTICAL [DB]

All pharmacies accept left over or outdated prescription drugs, non-prescription medications, herbal products, mineral supplements, vitamin supplements and throat lozenges for safe disposal.

For a list of pharmacies and/or drugs, medications, herbal products and mineral supplements accepted, visit healthsteward.ca/returns/british-columbia or call 604-732-9253.

Note: Please do not wash these items down the drain or throw them in the garbage.

PROPANE TANKS - REFILLABLE (EMPTY)

DROP-OFF LOCATION	ADDRESS	PHONE
City of Vancouver Landfill*	5400 72nd Street, Delta	604-873-7000
Husky Gas Stations*	8011 No. 3 Road	604-270-3822
	9060 Bridgeport Road	604-278-0011

PROPANE TANKS (SMALL) - DISPOSABLE (EMPTY)

DROP-OFF LOCATION	ADDRESS	PHONE
City of Vancouver Landfill	5400 72nd Street, Delta	604-873-7000
Husky Gas Stations*	8011 No. 3 Road	604-270-3822
	9060 Bridgeport Road	604-278-0011

OUTDOOR POWER EQUIPMENT [DB]

DROP-OFF LOCATION	ADDRESS	PHONE
City's Recycling Depot	5555 Lynas Lane	604-276-4010
Regional Recycling	13300 Vulcan Way	1-855-701-7171

SEWING, KNITTING & TEXTILE MACHINES [DB]

DROP-OFF LOCATION	ADDRESS	PHONE
City's Recycling Depot	5555 Lynas Lane	604-276-4010
Ironwood Bottle & Return-It Depot	110 - 11020 Horseshoe Way	604-275-0585
OK Bottle Depot	7960 River Road	604-244-0008
Regional Recycling	13300 Vulcan Way	1-855-701-7171
Richmond Return-It Depot	135 - 8171 Westminster Hwy	604-232-5555

STYROFOAM - MOLDED PACKAGING & FOOD CONTAINERS

DROP-OFF LOCATION	ADDRESS	PHONE
City's Recycling Depot	5555 Lynas Lane	604-276-4010

London Drugs customers can return the moulded packaging Styrofoam from their appliance, computer and accessories products to any London Drugs store with proof of purchase.

STYROFOAM CHIPS (PEANUTS)

DROP-OFF LOCATION	ADDRESS	PHONE
Packaging Depot	6360 Kingsway, Burnaby	604-451-1206
	5524 Cambie Street, Vancouver	604-325-9966

TELUS EQUIPMENT (RENTAL OR RETAIL) [DB]

All TELUS rental or retail equipment such as cordless/corded phones, Voice Over IP (VOIP) phones, Global Positioning System (GPS) equipment and video/telephone conference equipment can be returned via Canada Post, call 604-310-2255 for more information.

DB: Disposal ban | * A fee is charged
Please note: Drop-off locations may change without notice. Please call individual locations to confirm address and hours of operation.

CITY OF RICHMOND

DID YOU KNOW?
Recycled tires are used in products such as athletic tracks, playground safety surfaces, synthetic turf fields and roofing products.

THERMOSTATS DB

DROP-OFF LOCATION	ADDRESS	PHONE
Andrew Sheret Ltd.	4500 Vanguard Road	604-278-3766

For more information, call 1-800-267-2231 ext. 224.

TIRES DB

DROP-OFF LOCATION	ADDRESS	PHONE
Island City Automotive*	180 - 5400 Minoru Blvd	604-273-4023
Canadian Tire	3500 No. 3 Road	604-273-2939
	11388 Steveston Highway	604-271-6651
Express Lube & Tune Centre*	2840 No. 3 Road	604-278-1018
Kal Tire	2633 No. 5 Road	604-278-9181
Metro Tires Ltd.	13320 Mitchell Road	604-321-9004
Midas Auto & Tire Service	4660 No. 3 Road	604-273-9664
OK Tire Store	5831 Minoru Boulevard	604-278-5171
Redline Automotive Ltd.	1 - 11711 No. 5 Road	604-277-4269
Roadrunners Dial A Tire Ltd.	125 - 11780 River Road	604-274-8473
Vancouver Landfill (Passenger/light truck, with/ without rims limit of 10)	5400 72nd Street, Delta	604-873-7000

Note: All retail locations accept a used tire for a new one purchased.
For a complete list of tires accepted, visit tsbc.ca or call 1-866-759-0488.

BICYCLE TIRES AND TUBES

DROP-OFF LOCATION	ADDRESS	PHONE
Village Bikes	3891 Moncton Street	604-274-3865

For more information, visit tsbc.ca/bike.php or call 1-866-759-0488.

TOOLS - POWER (ELECTRONIC & ELECTRICAL) DB

DROP-OFF LOCATION	ADDRESS	PHONE
City's Recycling Depot	5555 Lynas Lane	604-276-4010
Ironwood Bottle & Return-It Depot	110 - 11020 Horseshoe Way	604-275-0585
OK Bottle Depot	7960 River Road	604-244-0008
Regional Recycling	13300 Vulcan Way	1-855-701-7171
Richmond Return-It Depot	135 - 8171 Westminster Hwy	604-232-5555

TOYS (ELECTRONIC & ELECTRICAL) INCLUDING VIDEO GAMING SYSTEMS & ACCESSORIES DB

DROP-OFF LOCATION	ADDRESS	PHONE
Best Buy	700 - 5300 No. 3 Road	604-273-7335
Ironwood Bottle & Return-It Depot	110 - 11020 Horseshoe Way	604-275-0585
OK Bottle Depot	7960 River Road	604-244-0008
Regional Recycling	13300 Vulcan Way	1-855-701-7171

UPHOLSTERED FURNITURE (COUCHES, ARMCHAIRS, ETC)

DROP-OFF LOCATION	ADDRESS	PHONE
Canadian Mattress Recycling*	1210 Cliveden Avenue, Delta	604-777-0324
City of Vancouver Landfill*	5400 72nd Street, Delta	604-873-7000

Richmond's Large Item Pick Up Program: Contact Sierra Waste at 604-270-4722. Please note some restrictions apply. Visit www.richmond.ca/largeitem for program details.

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CITY OF RICHMOND
Environmental Programs Information Line:
604-276-4010
www.richmond.ca/recycle

Printed on recycled paper.

City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	April 18, 2018
From:	Tom Stewart, AScT. Director, Public Works Operations	**File:**	10-6000-01/2018-Vol 01
Re:	**2018 National Public Works Week**		

Staff Recommendation

That the staff report titled "2018 National Public Works Week", dated April 18, 2018 from the Director, Public Works Operations, be received for information.

Tom Stewart, AScT.
Director, Public Works Operations
(604-233-3301)

REPORT CONCURRENCE	
CONCURRENCE OF GENERAL MANAGER	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS:
APPROVED BY CAO	

Staff Report

Origin

The Canadian Public Works Association's annual National Public Works Week is from May 20 to 26, 2018 and to celebrate, the City will host three events. This report provides information on the upcoming events that will be held to acknowledge National Public Works Week.

This report supports Council's 2014-2018 Term Goal #9 A Well-Informed Citizenry:

9.2. Effective engagement strategies and tools.

Analysis

Each May, National Public Works Week recognizes the many people dedicated to their communities by working in public works careers. Municipalities celebrate National Public Works Week with open houses, school and educational events, and displays of public works equipment. The City recognizes National Public Works Week through a proclamation outlining the following areas:

- Public Works services provided in the community are an integral part of Richmond residents' everyday lives.
- The support of an understanding and informed citizenry is vital to the efficient operation of Public Works systems and programs such as water, sewers, streets and highways, public buildings and solid waste collection.
- The health, safety and comfort of this community greatly depend on these facilities and services.
- The quality and effectiveness of these facilities, as well as their planning, design and construction, is vitally dependent upon the efforts and skills of Public Works staff.
- The efficiency of the qualified and dedicated personnel who staff the Public Works department is materially influenced by people's attitude and understanding of the importance of the work they perform.

The City will recognize National Public Works Week by hosting three significant events:

1. *Project WET*

   Project WET, the City's annual water education program developed in partnership with the Richmond School District, will be held from May 8 to May 10. The program will be presented to 12 elementary school classes, with approximately 350 students and teachers expected to attend. This interactive program teaches intermediate students the importance of water consumption, conservation, quality and supply. Students will also learn about Richmond's recycling programs, dikes, pump stations and sewerage and drainage operations.

2. *National Public Works Week Breakfast and Scholarships*

   A breakfast to celebrate Public Works staff will be held on Thursday, May 10 at 6:30 a.m. in the Works Yard garage. The breakfast provides an opportunity for employees to celebrate their achievements and to acknowledge the hard work that's put into maintaining the City's infrastructure 24 hours a day, seven days a week. Additionally, recipients of the $1,000 City of Richmond/CUPE Local 394 scholarships will be invited to receive their scholarships on stage. These scholarships are awarded annually to two Richmond high school students who have elected to pursue trades professions.

3. *Public Works Open House*

   The annual Public Works Open House will take place on Saturday, May 12 from 11:00 a.m. to 3:00 p.m. at the Works Yard. Nearly 6,500 residents attended in 2017. The free event allows residents to meet City staff; learn about the work they perform and the programs offered; have fun exploring the various booths; participate in the interactive displays; eat at one of the food vendors and listen to live entertainment.

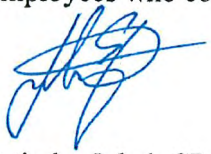
   This year, we will be introducing Kidstruction, a collaboration amongst Public Works sections that encourages hands-on, educational free-play. Favourites such as hands-on Lafarge cement building zone, excavator lessons, crafts, games, play areas, environmental sustainability displays and Richmond Fire and emergency displays will return again this year. The CUPE 394 sponsored car show will be located at Dover Park. To ensure traffic flows smoothly and minimize interruptions, we will have traffic control personnel working on Lynas Lane from 9:00 a.m. to 5:00 p.m.

Financial Impact

None.

Conclusion

The City's Engineering and Public Works Division, together with Community Services and Community Safety Division, play an active role in celebrating the annual National Public Works Week. Three events are held to recognize and highlight the people who provide and maintain the infrastructure services known as Public Works. Cities across Canada participate by raising awareness of Public Works contributions, and encourage community support for these dedicated employees who consistently improve the quality of life for residents.



Jatinder Johal, CPA, CGA
Manager, Public Works Administration
(604-233-3330)

JJ:jj