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Toronto and Area Road Builders Association

Using Recycled Crushed Aggregates:

Case Study of York Region's VivaNext Project

March 18, 2025 | 12PM

Recycled Aggregate Materials

Asphalt and concrete are 100% recyclable and can be reused as valuable construction material:

- **Reclaimed Asphalt Pavement (RAP)** is processed hot mix asphalt material that is recovered by partial or full depth removal.
- **Reclaimed Concrete Material (RCM)** is removed or processed old hydraulic cement concrete.
- **Recycled Crushed Aggregate (RCA)** is reclaimed asphalt pavement and/or concrete.

Recycled Crushed Aggregate (RCA1010)

- **Sustainable** product that offers some of the greatest environmental benefits at a low cost.
- Subject to rigorous **quality control** and best practice processes – fine material is not a by-product of recycled aggregates.
- Proven as a **high-performance** material for an increasing number of applications, with numerous studies concluding that its geotechnical properties are equal or superior to primary aggregates.

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OPSS.PROV 1010 & OPSS.MUNI 1010

- The Ontario Provincial Standard Specifications *(jointly administered by the Ontario Ministry of Transportation and the Municipal Engineers Association)* set the standards for road construction and materials in the province.

- OPSS1010 allows aggregate used in road bases, shoulders and backfill to be composed of **up to 100% recycled concrete** and **up to 30% recycled asphalt**. Hot mix asphalt can also contain up to 30% recycled asphalt pavement.

- Municipal discretion in the implementation of these standards results in varying practices .

Industry-wide support

GTSWCA
Greater Toronto Sewer & Watermain Contractors Association

Good Roads

OSSGA
ONTARIO STONE, SAND & GRAVEL ASSOCIATION

HCAT
HEAVY CONSTRUCTION ASSOCIATION OF TORONTO

CONCRETE ONTARIO
Ready Mixed Concrete Association of Ontario

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RESIDENTIAL AND CIVIL CONSTRUCTION ALLIANCE OF ONTARIO
RCCAO
Constructing Ontario's Future

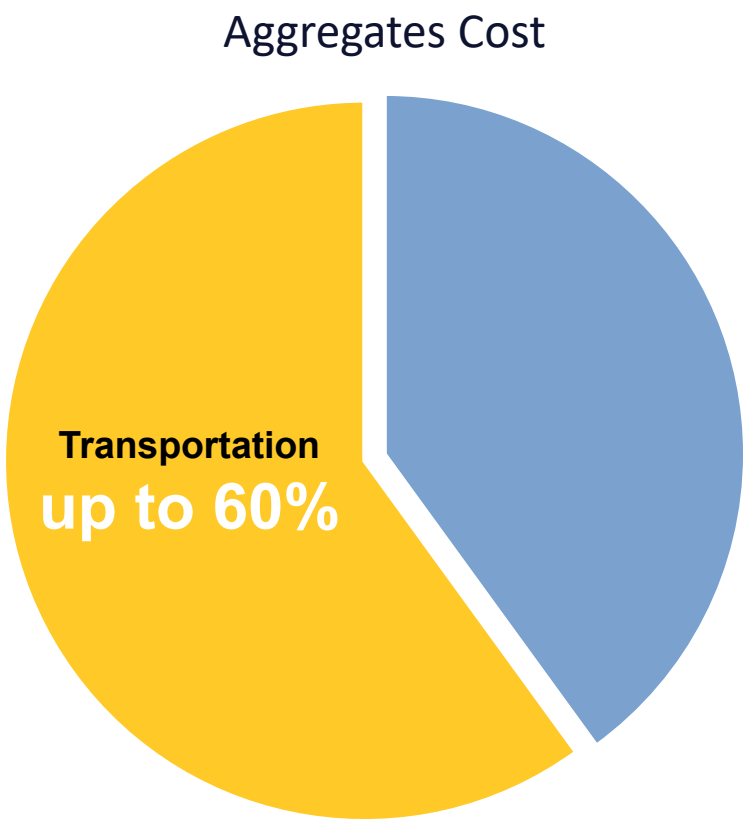
ORBA

ONTARIO SOCIETY OF PROFESSIONAL ENGINEERS

Environmental & Economic Benefits

- ☑ Lowers carbon emission and pollution
- ☑ Cost-effective and high-performing material
- ☑ Reduces landfill use
- ☑ Preserves non-renewable resources
- ☑ Extends life of pits and quarries
- ☑ Reduces traffic congestion and wear and tear on roads
- ☑ Readily available from construction and demolition activities at a closer proximity to market

Transportation of Aggregates



Daily and Annual Fuel Consumption and GHG Emissions by Distance*

	Distance	Per Year (All Truckloads)	Per Day (All Truckloads)
Fuel Consumption (Litres of Diesel Fuel)	Per km	437,500	1,989
	35 km	15,312,500	69,602
	75 km	32,812,500	148,148
	110 km	48,125,000	218,750
	Distance	**Per Year (All Truckloads)**	**Per Day (All Truckloads)**
Greenhouse Gas Emissions (Metric Tonnes of CO2)	Per km	1,189	5
	35 km	41,344	188
	75 km	88,594	403
	110 km	129,938	591

*Based on 25M tonnes – estimated amount of aggregate used in the GTHA

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Lifecycle Analysis: Estimated Savings

	Pit/Quarry Locations	Average Distance from Pit/Quarry to Project Location (km)	Average Distance from Closest Crusher of Gran A RAP to Project Location (km)	Total Tonnes per Project (approx.)	Savings (Gran A – RAP Vs. Gran A – Native)		Transportation of Finished Product to site GHG Emissions (MTCO2e)	
					$/tonne Average	$/Project	Gran A - Native	Gran A – RCA
Parking Lot	Brechin	80.5	18 (Mt. Albert)	11,000	**$7**	**$77,000**	**38.74**	**8.66**
Store Distribution Centre	Orillia	115	6 (Vaughan)	100,000	**$9**	**$900,000**	**503.13**	**26.25**
Industrial Building	Milton	52	10 (Brampton)	7,000	**$8.5**	**$59,500**	**15.93**	**3.06**
Bombardier Project	Flamboro	70	14 (Mississauga)	50,000	**$8**	**$400,000**	**153.13**	**30.63**
	Total Savings for four Projects					**$1,436,500**		**642.33**

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Unit Rates of Gran A RAP Vs. Gran A Native and Estimated Savings Based on Project Location

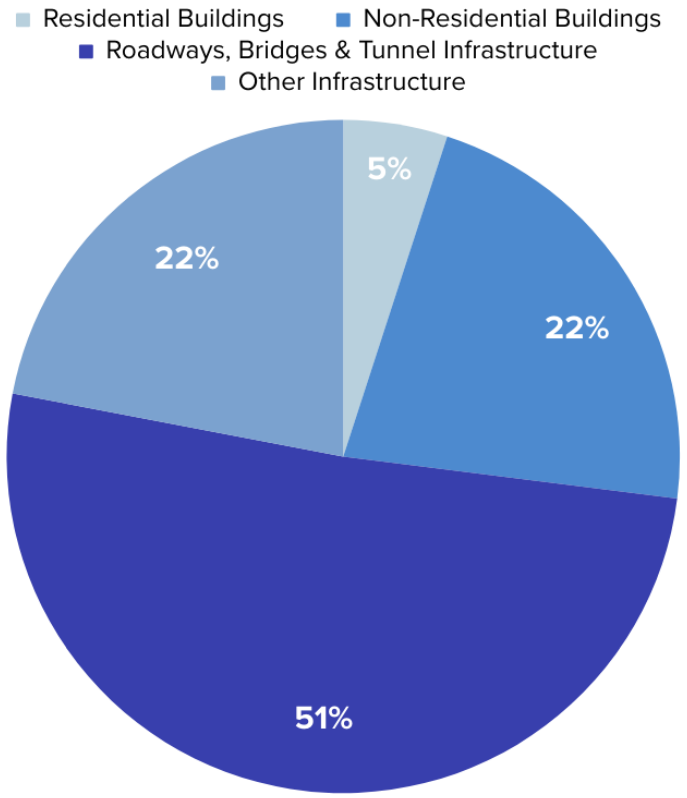
Biggest Impact is at the Municipal Level

35%

of all aggregates in Ontario are used by municipalities (**60-70 million tonnes per year**), making them the largest consumers of aggregates

50%

of municipal budgets is spent on construction and infrastructure



Aggregate Use in Ontario
(Stats Can)

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INDUSTRY CASE STUDY

VivaNext Young Street Project By RapidLink Constructors

Owner: Metrolinx & Regional Municipality of York Region

Owners Agency: York Region Rapid Transit Corporation

Contractor: RapidLink Constructors (JV: Dufferin Construction & Aecon Group)

Dufferin
A CRH COMPANY

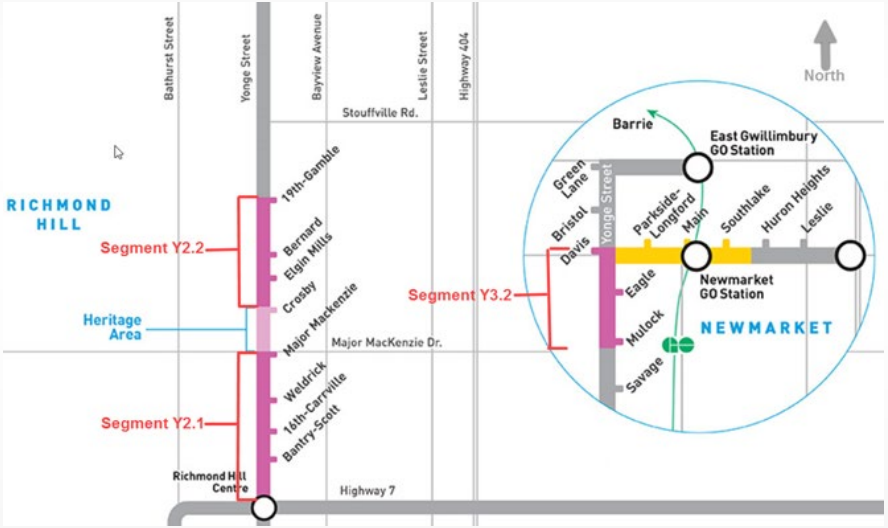
INDUSTRY CASE STUDY

VivaNext Young Street Project By RapidLink Constructors

Young St Widening

Three project segments within Newmarket and Richmond Hill, almost 10KM : **Y3.2,Y2.2,Y2.1**

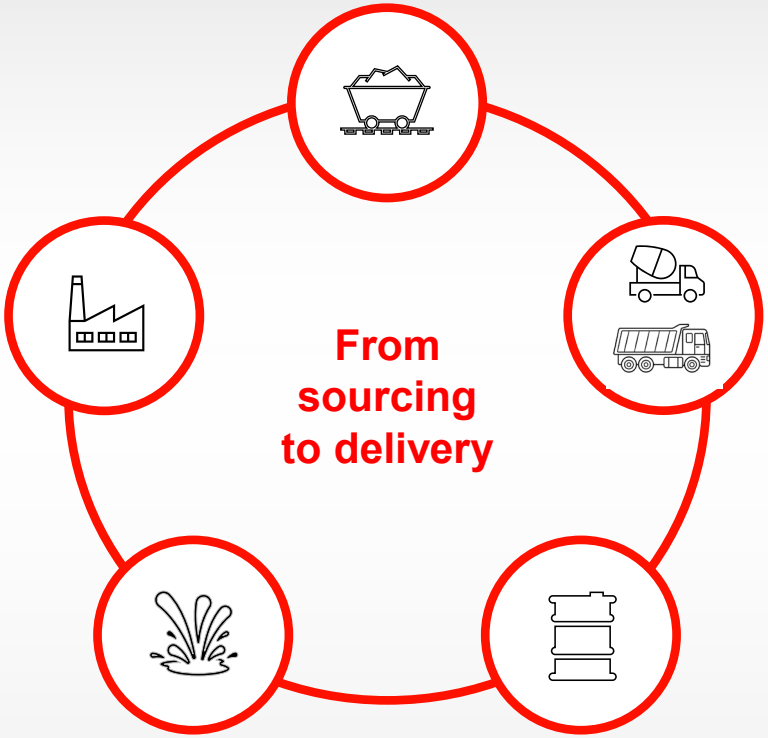
- Major utility relocations
- Median rapidways (BRT)
- Road reconstruction and widening
- Bikelane
- 20 BRT stations
- Landscaped medians
- Landscaped boulevards
- Drainage system revisions including watermain and sanitary
- Retaining Wall
- Reprofiling road and asphalt paving
- Culvert improvements and Headwalls



Sustainable enhancements are integral to our industry

IN DUFFERIN'S OPERATIONS :

- In-house and **Close to market** raw materials sourcing (Cement/Asphalt Cement, RAP & Aggregates)
- **Network** of accessible and close to market Ready-mix and Asphalt Plants
- **Recycled Water and Recycled Asphalt Pavements (RAP)**
- **Recycled Concrete Aggregates (RCA)**
- **Fuel efficiency strategies** (Truck Idling policy, Telematics, 4th Tier Equipment, Warm mix asphalt, secondary burner, energy efficient burners, aggregate moisture mitigation)
- **Enviroguard** installed on the entire Dufferin and ORM fleet
- **Mix Design Optimization** – Balanced Asphalt mix designs



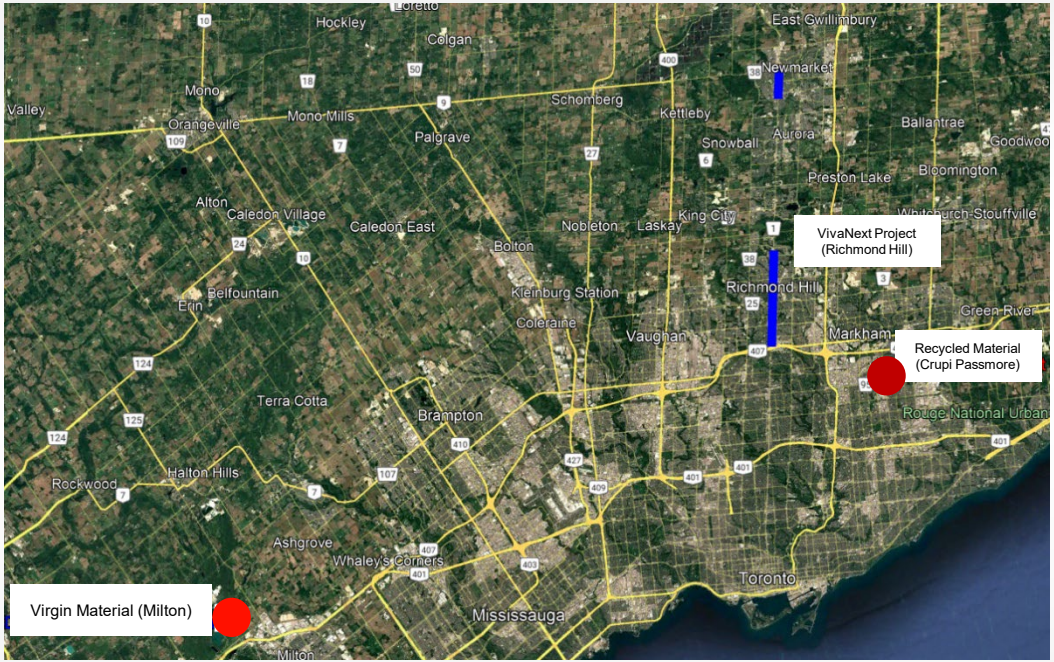
Dufferin
A CRH COMPANY

Project Team Approach

- Understanding the impact, approximate amount 200,000 tonnes Road base, subbase and trench backfill (not pipe bedding)
- Environmental and Economical Sustainability Solution Mindset
- Understanding why
- Understanding the concerns, constraints, requirement, guidelines
- Working toward solution and addressing the concerns
- Working collaboratively with all stakeholders
- Control and Approval process:
  - Follow OPSS 1010 requirement and others (e.g. permeability requirement)
  - Designer/engineering review
  - QC at the source
  - QC at the site
  - QA for the entire process

INDUSTRY CASE STUDY

VivaNext Yonge Street Project By RapidLink Constructors



Sustainable Solution:

- Recycled Materials (RCA) Source
- Shorter roundtrip hauling; reduction of carbon footprint

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What are your project requirements?

We can discuss our sustainable solutions

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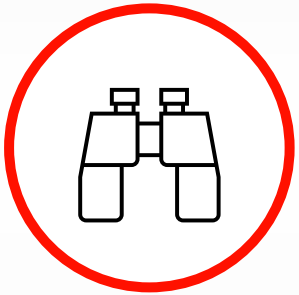
Working together on the solution is the most impactful lever to reduce the carbon emissions

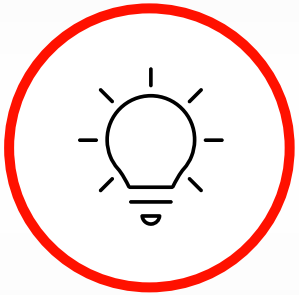


Tell us what you need:

We can design strategies together to use that **reduction lever** for your projects

Tell us your benchmark:

Our team of experts will work with you to develop a solution



Tell us your constraints:

We have the **flexibility** to adjust and meet your performance requirements

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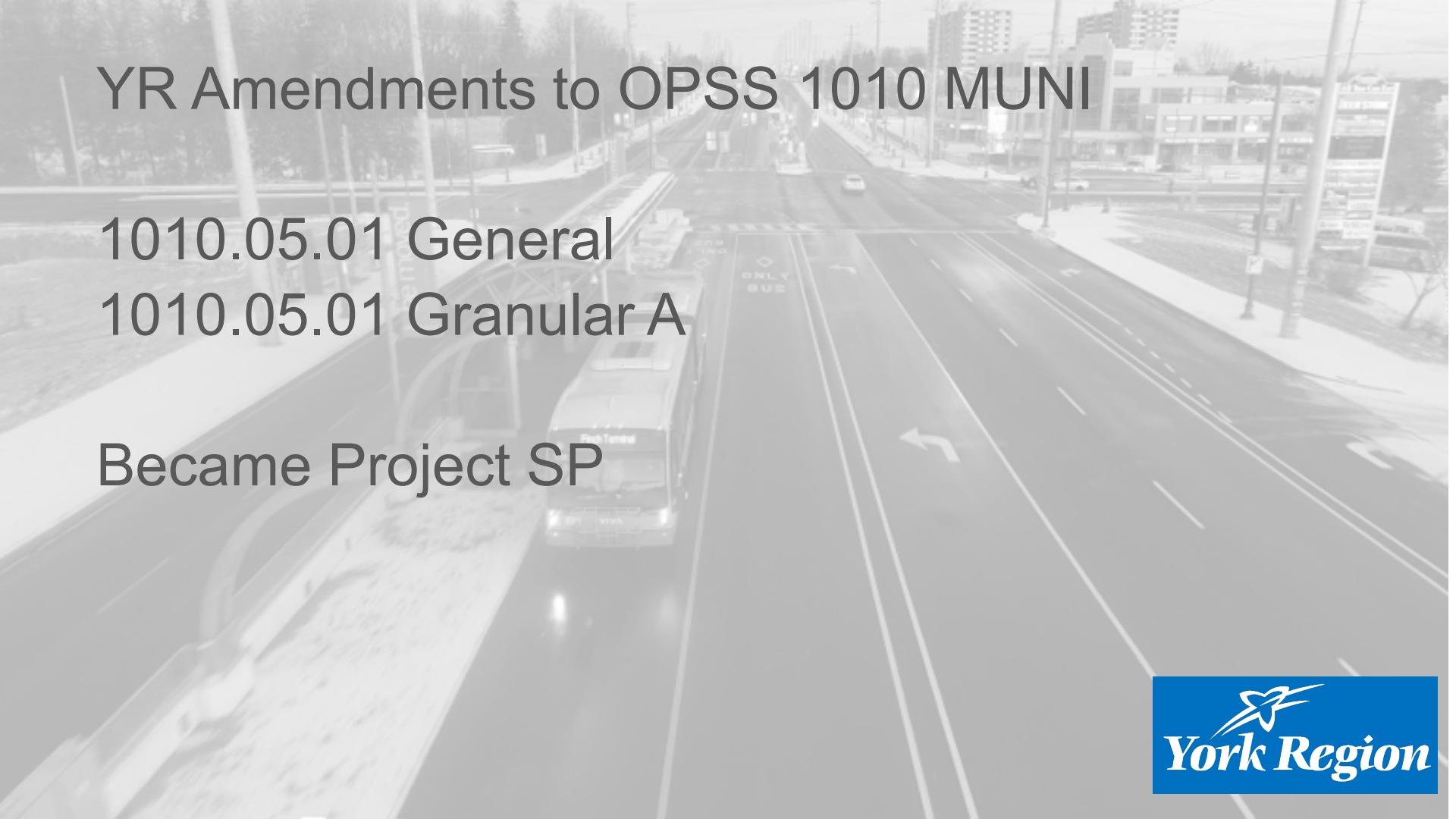
Collaborative Solutions for Contractors and Owners to Improve Project Outcomes

Jason Mainprize
District Supervisor, Roads Operations
York Region

YR Amendments to OPSS 1010 MUNI

1010.05.01 General
1010.05.01 Granular A

Became Project SP



Permeability is Essential for Drainage Function

QC/QA is priority

Ensure other base drainage components are utilized i.e. Rigid subdrains

Performance outcomes have been positive

YR Road Design Guidelines and Roadway Specifications – Recycling Overview

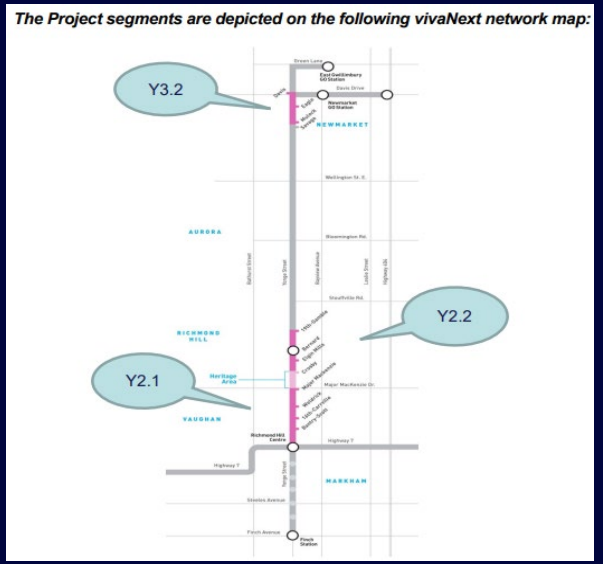
Outline *recycling options i.e. CIREAM

*Meeting a specific criteria

Utilize RAP in base course asphalt

RCM/RCA in granular base

Building Materials Solutions For York RapidLinks



Today's Agenda

Our Service Provided

Transforming Concrete Rubble into RCA (Recycled Crushed Aggregates)

Geographically Well Positioned

Strong Track Record of Quality

What You Should Expect From Crupi

Our Service Provided

The project consists of three segments:

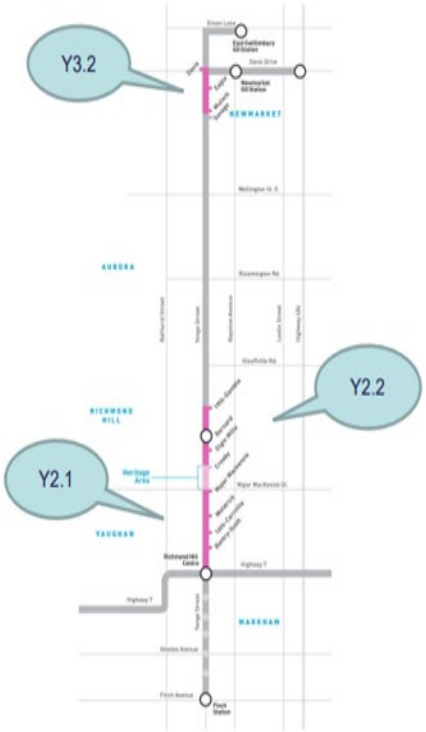
•Y2.1 from Hwy 7 (Richmond Centre) to Major Mackenzie (3.8 km)

•Y2.2 from Levendale Avenue to Gamble Road / 19th Avenue (3.1 km)

•Y3.2 from south of Mulock Drive to Davis Drive (2.5 km)

Crupi supplied ¾" RCA for the construction of a dedicated median rapidway, medians and boulevard, new bicycle lanes.

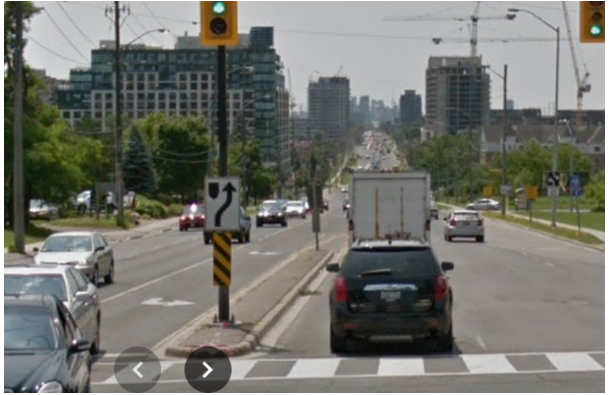
The Project segments are depicted on the following vivaNext network map:



Our Service Provided

York RapidLink Contractors removed concrete curbs, sidewalks, pads, etc. and delivered the material to a Crupi Site.

July 2015



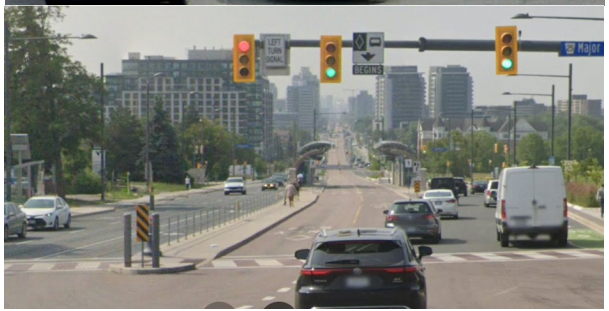
Crupi processed the material and produced RCA.

Crupi responsible for quality control on the RCA.

July 2019

Crupi loaded the material onto the York RapidLink Contractors trucks.

June 2023



A Customer-First Approach

- RapidLink integrated contract with products and services to maximize the construction value chain

- Crupi ensured acceptance of the raw material for the whole contract

- Provided RapidLink a guarantee to have the material available and with loadout efficiency

- Provided RapidLink our technical experience
- Ensured manufacturing capabilities

Solving complex problems for customers

Transforming Concrete Rubble into RCA (Recycled Crushed Aggregates)

Concrete Rubble   RCA

Essential Materials

Road Const. Rubble

Material Processing

Quality Product

Transforming Concrete Rubble into RCA (Recycled Crushed Aggregates)

- Visitors report to the scale house and have to follow all safety requirements.

- Raw material screening to ensure acceptable material for production.
- Separation of raw materials – Concrete, Concrete and Asphalt, etc.

Crupi Group

Transforming Concrete Rubble into RCA (Recycled Crushed Aggregates)

- Aggregate quality control
  - Gradations every 1,000 tonnes
  - Physicals every 5,000 tonnes
  - Proctors every 3 months

- Non Conforming Material
  - Moved into a separate pile and disposed of.

- Loading and weigh out of final product
  - After material was dumped in our yards the vehicle would usually backhaul material back to York RapidLink.

Sustainability in Action

- An Estimated 5,500 loads of concrete rubble were dumped in the Crupi Yard
  - 4 acres dedicated to this project
- Over 250,000 tonnes of ¾” RCA
  - First load shipped April 2017
  - Last load shipped June 2021
- Over 2,000 tonnes of ¾” Select Crush
- Loads ranged from 20 tonnes to 2,500 tonnes in a day
- Loading and weigh out of final product
  - After material was dumped in our yards the vehicle would usually backhaul material back to York RapidLink.

Sustainability in Action

- RCA is a key component of a circular economy because it can be reused as aggregate in construction. This reduces the need for new raw materials and keeps waste out of landfills.
- Used in roadbeds and parking lots
- Can be reused in construction
- Reduces the demand for virgin materials by offering a cost-effective alternative to quarrying new resources
- The challenges of recycling concrete because of Quality, Consistency and Performance issues were eliminated because of the QC Plan and the frequency of the testing.
- Availability and cost are always an issue but this material can be reused over and over again

Urgent Need for Sustainability

Solving Ontario's Landfill Capacity Crisis

Ontario is currently facing a crisis in landfill capacity and without immediate action we will run out of capacity within 10 years. The biggest obstacle to increasing capacity is Bill 197, which allows municipalities to veto developments outside of their boundary in an adjacent municipality.

Days Until Ontario Landfills Are Full:

3	2	1	2	0	1	5	4	4	9
Days				Hours		Minutes		Seconds	

Live countdown as per Waste to Resource Ontario

GTHA Aggregate Deficit

25M tonnes PRODUCED

73M tonnes CONSUMED

1.5B tonnes CONSUMED by 2041

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20% recycling rate by municipalities could avoid extracting up to 33M tonnes of new aggregate per year in Ontario.

That would result in annual **cost savings of $264M** and GHG emission reduction equivalent to taking **15 million gas cars off the road** for a year!

Quality Control over Exclusion

- Recycled aggregate is a valuable resource
- Municipal staff rank performance as the most important consideration, followed by sustainability
- When RCA conforms to OPSS1010, municipalities can be confident that these materials will meet all performance requirements and quality expectations
- Efforts should be directed to enforcing the quality of the product, rather than restricting its use

RCAontario.ca

Unlocking RCA Benefits

Municipalities should **prioritize sustainability as part of the initial project design** of their linear infrastructure projects and:

✓ **Include RCA use as part of the tenders** for roads, bridges, sewer and watermains, subdivisions, and transit projects

✓ **Align municipal standards with OPSS1010** to reduce administrative burden, ensure quality and compliance, and encourage wider adoption

✓ **Collaborate with industry** to build internal capacity and confidence on quality control measures and wide variety of applications for RCA

Resources

Using Recycled Crushed Aggregates Technical Seminar: *EXP Presentation*

Using Recycle Crushed Aggregates Technical Seminar: *MTO Presentation*

Using Recycled Crushed Aggregates Technical Seminar: *Supplier Presentation*

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Thank You

Raly Chakarova

Executive Director, TARBA

raly@tarba.org