

<b>TO:</b>	<b>CHAIR AND MEMBERS CIVIC WORKS COMMITTEE MEETING ON DECEMBER 12, 2016</b>
<b>FROM:</b>	<b>KELLY SCHERR, P.ENG., MBA, FEC MANAGING DIRECTOR - ENVIRONMENTAL &amp; ENGINEERING SERVICES &amp; CITY ENGINEER</b>
<b>SUBJECT</b>	<b>MEMORANDUM OF UNDERSTANDING WITH THE UNIVERSITY OF WESTERN ONTARIO (INSTITUTE FOR CHEMICALS AND FUELS FROM ALTERNATIVE RESOURCES) AS PART OF THE LONDON WASTE TO RESOURCES INNOVATION CENTRE</b>

### RECOMMENDATION

That, on the recommendation of the Managing Director, Environmental & Engineering Services and City Engineer, with the support of the Director, Environment, Fleet and Solid Waste, the attached proposed by-law (Appendix A) **BE INTRODUCED** at the Municipal Council meeting to be held on December 19, 2016 to:

- a) authorize and approve a Memorandum of Understanding with The Institute for Chemicals and Fuels from Alternative Resources/University of Western Ontario with respect to advancing our joint waste to resources (waste management, waste conversion, resource and energy recovery) objectives with the mutual understanding that the combined expertise, influence and commitment are better applied together to support common goals attached as Schedule "A" to the by-law; and
- b) authorize the Mayor and the City Clerk to execute the Memorandum of Understanding authorized and approved in a), above.

### PREVIOUS REPORTS PERTINENT TO THIS MATTER

Relevant reports that can be found at [www.london.ca](http://www.london.ca) under City Hall (Meetings) include:

- Update and Next Steps: London Waste to Resources Innovation Centre and Green Shields Energy (October 4, 2016 meeting of the Civic Works Committee (CWC), Item #10)
- Preliminary Concept for a London Waste to Resources Innovation Centre (February 3, 2015 meeting of the Civic Works Committee (CWC), Item #4)
- Update – Key Solid Waste Management Initiatives (December 16, 2014 meeting of the CWC, Item #12)

### STRATEGIC PLAN 2015-2019

Municipal Council has recognized the importance of solid waste management, climate change, other related environmental issues and innovation in its 2015-2019 - Strategic Plan for the City of London ([2015 – 2019 Strategic Plan](#)). With respect to this CWC report, three of the four Areas of Focus are addressed:

#### **Building a Sustainable City**

- Strong and healthy environment

#### **Growing our Economy**

- Local, regional, and global innovation

#### **Leading in Public Service**

- Proactive Financial Management
- Excellent service delivery

<b>BACKGROUND</b>
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**PURPOSE**

The purpose of this report is to provide Civic Works Committee and Council with a non-binding Memorandum of Understanding (MoU) to be signed by the City of London and The Institute for Chemicals and Fuels from Alternative Resources (ICFAR)/University of Western Ontario (Western).

In brief, the MoU sets out the mutual intentions of the City and ICFAR/Western to advance their joint waste to resources (waste management, waste conversion, resource and energy recovery) objectives. The MoU is based upon the mutual understanding that the combined expertise, influence and commitment of the parties are better applied together to support their common goals. This particular MoU is for a General Arrangement (Step 1) noting that any Formal Agreements (Step 2) would come back through Committee and Council.

**CONTEXT:****Municipal Council's Strategic Plan 2015-2019**

The London Waste to Resources Innovation Centre is listed as a component of London's Strategic Plan 2015-2019 under Local, regional and global innovation.

**February 9, 2015 Council Direction - London Waste to Resources Innovation Centre**

At its February 9, 2015 meeting, Council approved and adopted the following recommendation with respect to the London Waste to Resources Innovation Centre:

- a) *the concept of a London Waste to Resources Innovation Centre BE APPROVED IN PRINCIPLE; it being noted that the Centre would build upon the numerous innovative activities that have already occurred to date and are being planned for 2015 and 2016;*
- b) *the Civic Administration BE DIRECTED to:*
  - i) *identify potential partners, projects, resource requirements and funders;*
  - ii) *obtain initial feedback from potential partners; and,*
  - iii) *develop a scope of work for the London Waste to Resources Innovation Centre concept;*

**London Waste to Resources Innovation Centre (LWRIC)**

The primary goals of LWRIC are to:

- build on the existing foundation of traditional and innovative projects to divert waste from the landfill and create value added products from residues and waste;
- create a focal point (location or locations) for the ongoing examination of innovative solutions for waste reduction, resource recovery, energy recovery and/or waste conversion into value-added materials, chemicals, heat and power;
- establish partnerships and collaborations between government, academia and businesses to synergistically build on existing strengths to create opportunities to prevent waste, to create products of value from waste, and to solve existing waste management challenges; and
- be known as an innovative centre of excellence with shared facilities and resources providing leadership, implementing best practices, undertaking leading edge research, providing knowledge and support to industry, while educating and training students, researchers and postdoctoral fellows in the various fields of resource and waste management.

## DISCUSSION

Staff from the City of London and staff/professors from ICFAR/Western University have had a longstanding relationship with respect to a wide variety of environmental and engineering projects and undertakings. With respect to solid waste management, over the last 10 years City staff have:

- participated in student projects and research;
- attended student and faculty presentations and lectures;
- provided presentations and tours of waste management facilities to students and faculty;
- hosted waste management workshops for guests of Western University; and
- provided access to public information and reports and assisted with networking.

ICFAR and/or Western staff/professors have:

- championed student projects that met the needs of City staff and other organizations;
- participated in technical studies, research and experiments;
- reviewed waste management reports and other information; and
- participated on committees and working groups to transfer academic and commercial knowledge with respect to waste management technologies, programs and policies.

City staff approached ICFAR/Western with respect to formalizing the ongoing relationship between the three organizations as part of the London Waste to Resources Innovation Centre and the broad sectors of solid waste management, biomass management and related sectors that produce waste materials. Worldwide there is increasing interest in examining waste materials from the perspective of secondary resource management versus waste disposal and the additional derived benefits associated with job creation, the green economy, climate change and energy conservation.

### **Step 1 – Memorandum of Understanding – General Arrangement**

The first step in formalizing a working relationship with ICFAR/Western is to enter into a non-binding Memorandum of Understanding (MoU). The MoU sets out short term objective of the collaboration between the City and ICFAR/Western which would be to undertake testing and research; write and present reports; develop data/information; and work with industry, government and academic partners on the viability of a range of technologies and processes to create resources from waste that would normally be sent to disposal facilities. The proposed MoU is provided in Schedule A of Appendix A.

The responsibilities of the City listed in the MoU include:

- Share waste management knowledge and expertise with ICFAR/Western and other partners;
- Assist with funding applications and discussions/negotiations with potential partners;
- Provide access to the boardroom room and education room in the Material Recovery Facility (MRF), W12A Landfill Site and other City facilities;
- Participate in project development, design and/or implementation;
- Participate, when available, in discussions, tours and related activities;
- Provide solid waste materials, in appropriate quantities, for resource recovery;
- Participate and/or make available resources to assist with student research;
- Assist with reporting, being available for media interviews and related matters; and
- Keep London Municipal Council informed of progress.

The responsibilities of ICFAR/Western are to include:

- Carry out research and development projects supported by grants and contracts which generate knowledge, expertise and trained personnel with a focus on valorization of residues and wastes;
- Share waste management expertise with the City and with the industry partners;
- Act as window of access of academic expertise on behalf of the University community for the City, government agencies and potential industry partners and coordinate and lead projects and initiatives bringing together the appropriate teams from across the University aiming at maximizing synergies of expertise, infrastructure and resources; and
- Proactively engage in conversations with the City and with industry partners to ensure continuous review and improvement of current initiatives and development of new projects.

## Step 2 – Formal Agreement for Demonstration Pilot Project

The City and ICFAR/Western will work together to develop a Formal Agreement(s) to undertake activities that involve capital works, contracts with funding agencies, contracts with private companies and investors. Any Formal Agreement will follow the same approval processes as this General Arrangement and require Council approval.

## ACKNOWLEDGEMENTS

This report was prepared with assistance from Mike Losee, Division Manager, Solid Waste Management. This report has been reviewed by Legal Services.

PREPARED AND SUBMITTED BY:	RECOMMENDED BY:
<b>JAY STANFORD, M.A., M.P.A. DIRECTOR, ENVIRONMENT, FLEET &amp; SOLID WASTE</b>	<b>KELLY SCHERR, P.ENG., MBA, FEC MANAGING DIRECTOR, ENVIRONMENTAL &amp; ENGINEERING SERVICES &amp; CITY ENGINEER</b>

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Appendix A A by-law to authorize and approve a Memorandum of Understanding between the Institute for Chemicals and Fuels from Alternative Resources/University of Western Ontario and The Corporation of the City of London and to authorize the Mayor and the City Clerk to execute the Memorandum of Understanding

Schedule A Memorandum of Understanding

Attachment A Overview of City of London Solid Waste Management Facilities

Attachment B Overview of the Institute for Chemicals and Fuels from Alternative Resources (ICFAR)

c Dr. Franco Berruti, P.Eng., Director, ICFAR and Professor of Chemical Engineering, ICFAR, 22312 Wonderland Rd. North RR#3, Ilderton, Ontario, Canada N0M 2A0

## Appendix A

Bill No.  
2016

By-law No. A.-

A by-law to authorize and approve a Memorandum of Understanding between University of Western Ontario (Institute for Chemicals and Fuels from Alternative Resources) and The Corporation of the City of London and to authorize the Mayor and the City Clerk to execute the Memorandum of Understanding.

WHEREAS section 5(3) of the *Municipal Act, 2001*, S.O. 2001, c. 25, as amended, provides that a municipal power shall be exercised by by-law;

AND WHEREAS section 9 of the *Municipal Act, 2001*, S.O. 2001, c. 25, as amended, provides that a municipality has the capacity, rights, powers and privileges of a natural person for the purpose of exercising its authority under this or any other Act;

AND WHEREAS it is deemed appropriate for The Corporation of the City of London (the “City”) to enter into a Memorandum of Understanding with the University of Western Ontario (Institute for Chemicals and Fuels from Alternative Resources) (“Western”) to undertake testing and research; write and present reports; develop data/information; and work with industry, government and academic partners on the viability of a range of technologies and processes to create resources from waste that would normally be sent to disposal facilities;

AND WHEREAS it is deemed appropriate to authorize the Mayor and the City Clerk to execute the Memorandum of Understanding on behalf of the City;

NOW THEREFORE the Municipal Council of The Corporation of the City of London enacts as follows:

1. The Memorandum of Understanding between The Corporation of the City of London and the University of Western Ontario (Institute for Chemicals and Fuels from Alternative Resources), attached as Schedule A to this by-law, is hereby authorized and approved.
2. The Mayor and the City Clerk are hereby authorized to execute the Memorandum of Understanding authorized and approved under section 1 of this by-law.
3. This by-law shall come into force and effect on the day it is passed.

PASSED in Open Council December 19, 2016

Matt Brown  
Mayor

Catharine Saunders  
City Clerk

First Reading – December 19, 2016  
Second Reading – December 19, 2016  
Third Reading – December 19, 2016

## Schedule A

# Memorandum of Understanding

Between

The Corporation of the City of London (“City”)

And

The University of Western Ontario (“Western”)

Whereas the City has established a special policy area in the City’s Official Plan, referred to as the Waste Management and Resource Recovery Area, that plans for the continued evolution of the W12A Landfill and nearby lands into an “Integrated Waste Management Centre” that utilizes environmentally responsible and sustainable operations and practices and achieves a high standard of compatibility with its environs and neighbours;

Whereas the remaining life expectancy of the W12A Landfill as of January 1, 2016 is approximately nine years or less;

Whereas the City wishes to examine, support, conduct research and/or implement projects under the broad classification(s) of resource recovery, energy recovery and/or waste conversion within the special policy area, in other locations in London, or in collaboration with others outside of London as part of its continuous improvement system for solid waste management. The continuous improvement system is described in several public documents including City of London Continuous Improvement System for Waste Management (1997), A Road Map to Maximize Waste Diversion in London (2007) and Road Map 2.0 The Road to Increased Resource Recovery and Zero Waste (2013);

Whereas the City wishes to pursue projects, relationships and partnerships for the purposes of innovation, creativity, best practices and excellence in solid waste management and is proposing to operate, subject to final Municipal Council approval, under a banner known as the London Waste to Resources Innovation Centre (L-WRIC);

Whereas Western, has a broad range of expertise in the area of resource management;

Whereas through Western’s Faculty of Engineering, the Institute for Chemicals and Fuels from Alternative Resources (“ICFAR”) is a research facility (22312 Wonderland Rd. North RR#3, Ilderton, Ontario, Canada N0M 2A0) with proprietary technologies and expertise that have contributed to the successful conversion of a range of materials into energy, chemicals and inert materials and now wants to extend its relationship with the City for mutual benefits;

Whereas Western has identified Environmental Sustainability and Green Energy as an area of research strength and ICFAR/Western has various research interests in the field of biomass conversion technologies and management and wishes to coordinate R&D activities, including multi-disciplinary, multi-institutional Waste-to-Resource initiatives, for the purpose of using the broad expertise to valorize biomass and organic wastes into marketable products at the local, regional, Canada-wide and international levels.

### **1.0 Purpose of the Memorandum**

This Memorandum of Understanding (“MoU”) is intended to set out the mutual intentions of the City and Western to advance their joint waste conversion, resource and energy recovery objectives. The MoU is based upon the mutual understanding that the combined expertise, influence and commitment of the parties are better applied together to support their common goals. The MoU establishes the non-legally binding framework and set of principles for enhanced and focused coordination and collaboration to support their shared interests in waste conversion and resource and energy recovery.

The parties to this MoU acknowledge that if they wish to jointly carry out specific initiatives that may arise out of this MoU, they will have to engage in further discussion and prepare necessary agreements to define, authorize and execute, among other things, each party's roles and responsibilities, resource allocation and other details.

The MoU is not an exclusive arrangement and does not restrict either party from pursuing their mandates either on their own or in collaboration with any other party.

## **2.0 Short Term Objective**

The short term objective of the collaboration between the City and Western is to:

- build on the existing foundation of traditional and innovative projects to divert waste from the landfill and create value added products from residues and waste;
- create a focal point (location or locations) for the ongoing examination of innovative solutions for waste reduction, resource recovery, energy recovery and/or waste conversion into value-added materials, chemicals, heat and power;
- establish partnerships and collaborations between government, academia and businesses to synergistically build on existing strengths to create opportunities to prevent waste, to create products of value from waste, and to solve existing waste management challenges; and
- be known as an innovative centre of excellence with shared facilities and resources providing leadership, implementing best practices, undertaking leading edge research, providing knowledge and support to industry, while educating and training students, researchers and postdoctoral fellows in the various fields of resource and waste management.

## **3.0 General Arrangement**

This MoU sets out the General Arrangement between the parties that will be the basis for working together.

The responsibilities of the City are to include:

- Share waste management knowledge and expertise with Western and other partners;
- Assist with funding applications and discussions/negotiations with potential partners;
- Provide access to the boardroom room and education room in the Material Recovery Facility (MRF), W12A Landfill Site and other City facilities (Attachment A);
- Participate in project development, design and/or implementation;
- Participate, when available, in discussions, tours and related activities;
- Provide solid waste materials, in appropriate quantities, for resource recovery;
- Participate and/or make available resources to assist with student research;
- Assist with reporting, being available for media interviews and related matters; and
- Keep London Municipal Council informed of progress.

The responsibilities of Western are to include:

- Carry out research and development projects supported by grants and contracts which generate knowledge, expertise and trained personnel with a focus on valorization of residues and wastes (Attachment B);
- Share waste management expertise with the City and with the industry partners;
- Act as window of access of academic expertise on behalf of the Western community for the City, government agencies and potential industry partners and coordinate and lead projects and initiatives bringing together the appropriate teams from across Western aiming at maximizing synergies of expertise, infrastructure and resources; and
- Proactively engage in conversations with the City and with industry partners to ensure continuous review and improvement of current initiatives and development of new projects.

#### 4.0 Formal Agreement

The parties agree to work together to develop a Formal Agreement to undertake activities that involve capital works, contracts with funding agencies, contracts with private companies and investors. The Formal Agreement will follow the same approval processes as this General Arrangement.

#### 5.0 Effective Date and Duration

This MoU will come into effect upon the date it has been signed by all signatories and will remain in effect until December 31, 2019. This MoU will be reviewed two months prior to the anniversary date and any agreed to changes added to the MoU. Substantive changes will trigger the approval process for the MoU and this determination is at the discretion of the City and of Western.

A participant may withdraw from this MoU by providing a sixty (60) written notice to the other parties.

This MoU is subject to approval processes required by each of the parties.

DATED this \_\_\_\_\_ day of \_\_\_\_\_.

IN WITNESS WHEREOF:

THE CORPORATION OF THE CITY OF LONDON

By:

Name: Matt Brown  
Title: Mayor

By:

Name: Catharine Saunders  
Title: City Clerk

I/We have authority to bind the City.

INSTITUTE FOR CHEMICALS AND FUELS FROM ALTERNATIVE RESOURCES/  
THE UNIVERSITY OF WESTERN ONTARIO

By:

Name: John Capone  
Title: Vice President (Research), The University of Western Ontario

Acknowledgement:

By:

Name: Andrew Hrymak  
Title: Dean, Faculty of Engineering

By:

Name: Franco Berruti  
Title: Director of the Institute for Chemicals and Fuels from Alternative Resources

I/We have authority to bind the corporation.



## Attachment A

### Overview of City of London Solid Waste Management Facilities ([www.london.ca](http://www.london.ca))

The City contributes to the health of the environment and its citizens through appropriate collection and management of garbage, recyclables, yard materials, household special waste, and other designated waste materials. This involves providing pick-up and drop-off services within London, processing and creating products of value from compostable/recyclable/reusable materials; and disposing of garbage in an environmentally responsible manner, including the ongoing monitoring and management of closed landfills and other sites producing methane.

To support these services the City owns and operates an array of Solid Waste diversion and disposal assets valued at over \$64 Million. These range from public waste and recycling bins, to drop off depots and one active landfill (W12A) and many closed landfill sites.

The City also owns a centralized Material Recovery Facility (MRF) which provides recycling services to London and several neighbouring communities. The MRF was newly constructed in 2011 and is operated and maintained by an outside contractor.

Drop off locations (Community EnviroDepots) are provided for special wastes including household special waste, yard materials, electronics, scrap metal, tires, roofing, etc. Solid Waste is responsible for maintaining these assets in serviceable condition between replacement cycles, ensuring compliance with Provincial regulations and maintaining the continuity of solid waste services to the citizens of London and other customers.

General household waste is primarily collected by the City while recycling pick-up and processing services are contracted out. The City owns and operates a fleet of garbage truck.

The W12A Landfill consists of a number of assets including landfill cells, buildings, leachate and gas collection systems and stormwater maintenance ponds. This facility operates within its Operation Plan, with additional disposal cells being brought online to accommodate waste in accordance with its Environmental Compliance Approval. Based on projected use, the current landfill will reach capacity in about 2023, at which point it will require an expansion (or other long term disposal solution) to provide the city with the space needed to meet its future needs.

The W12A buildings (Incl. Site Works & Equipment) includes the roads, curbs and landscaping as well as the administration, maintenance and scale house buildings. The W12A Leachate Collection System collects and conveys leachate for treatment. This system is capable of meeting the current City's needs and is expanded as new disposal cells are constructed. The Landfill Gas Collection System collects and conveys landfill gas to the on-site landfill gas flare for destruction. This system is capable of meeting current City's needs and is expanded as new disposal cells are constructed.

On-site W12A Stormwater Management Ponds and site drainage infrastructure collect and treat surface runoff from snow and rain that impact the site. Maintenance occurs on a planned basis, with investments identified through regular inspections.

Any expansion or examination of alternatives will be undertaken as per the requirements of the Environmental Assessment Act.

Buffer land is comprised of City owned land adjacent or near the W12A Landfill that has been acquired to provide an appropriate buffer from existing operations and to provide buffering for possible future landfill expansion and resource recovery facilities. It is expected that additional land will be acquired for these purposes over the next several years.

## Attachment B

### Overview of the Institute for Chemicals and Fuels from Alternative Resources (ICFAR) ([www.icfar.ca](http://www.icfar.ca))

The Institute for Chemicals and Fuels from Alternative Resources (ICFAR) at The University of Western Ontario (Western University) is extensively involved in research and development activities related to the conversion of residues and wastes into value-added chemicals, materials, energy and products. Prof. Franco Berruti and Prof. Cedric Briens have over 30 years of experience in thermal cracking of a variety of biomass feedstocks derived from agricultural, forestry and municipal organic residues. They have published over 100 refereed journal papers on the subject and presented hundreds of conference presentations and invited contributions. Prof. Charles Xu has extensive expertise in the field of production of biomaterials and bioproducts from residues and wastes through hydrothermal conversion and catalytic upgrading processes.

The expertise of the ICFAR team includes reactor and reaction engineering. The ICFAR laboratories are equipped with pilot plants of different processing capacities, ranging from small batch units (having a volume of 1 L, to pre-commercial and commercial mobile pyrolysis reactor systems with a processing capacity of several tons of feedstock per day.

Current research focuses on:

- 1) Novel biomass feeders for cohesive biomass materials
- 2) Stationary and mobile bubbling fluid bed pyrolyzers
- 3) Stationary and mobile mechanically fluidized reactors
- 4) 1-dimensional and 2-dimensional fractional condensation
- 5) Autothermal pyrolysis
- 6) Production of bio-oils and bio-char from a wide variety of biomass feedstocks (agricultural and forestry residues, lignin, sludges, grasses, organic municipal wastes, specialty residues...)
- 7) Effect of feedstock pre-processing and products post-processing
- 8) Hydrothermal conversion of biomass
- 9) Biomass Gasification
- 10) Hydrodeoxygenation of bio-oils for the production of green diesel
- 11) Catalytic upgrading of bio-crudes
- 12) Application of bio-oils to the production of adhesives, polyurethane foams, epoxy resins, sugars, pesticides, antioxidants and biofuels.
- 13) Bio-char activation to produce activated carbons for adsorption of pollutants
- 14) Use of bio-char as filler for composites with plastics and cement
- 15) Use of bio-char as advanced material for electronic applications (superconductors, sensors, coatings...)
- 16) Use of bio-char for carbon storage and sequestration
- 17) Use of bio-char in agronomy

The ICFAR team supervised by Berruti, Briens and Xu currently includes approximately 25 graduate students and 10 post-doctoral fellows.

The ICFAR pyrolysis team has extensive international collaborations with Brazil, China, Denmark, Ecuador, France, Germany, Italy, The Netherlands, UK and USA.

ICFAR has taken the leading role in National and International networks and projects and, currently, is coordinating a multidisciplinary team of approximately 20 experts from across Western University, focusing on the "Waste-to-Resource" research theme, including members from Chemical and Civil Engineering, Biology, Chemistry, Physics, Biochemistry, Pharmacology, Political Science and Geography. The objective is to assemble the necessary expertise and resources to undertake several industrially relevant projects, assist our industry partners in carrying out R&D activities, test and validate their technologies and processes, and support their present and future commercial ventures.

Western University offers unique facilities, including ICFAR, the Environmental Field Station, the Biotron, the greenhouses, and outstanding analytical facilities in different Faculties.