

Subject: Wastewater Energy Transfer (WET) Pilot Project – 665 Albert Street

File Number: ACS2023-PRE-EDP-0011

Report to Environment and Climate Change Committee on 21 March 2023

and Council 12 April 2023

Submitted on March 10, 2023 by David Wise, Director, Economic Development and Long Range Planning, Planning, Real Estate and Economic Development Department

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Ward: Somerset (14)

Objet : Projet pilote de transfert de l'énergie des eaux usées (TEEU) – 665, rue Albert

Dossier : ACS2023-PRE-EDP-0011

Rapport au Comité de l'environnement et du changement climatique le 21 mars 2023

et au Conseil le 12 avril 2023

Soumis le 10 mars 2023 par David Wise, Directeur, Développement économique et planification à long terme, Services de la planification, des biens immobiliers et du développement économique

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Quartier : Somerset (14)

REPORT RECOMMENDATION(S)

That the Environment and Climate Change Committee recommend Council:

- 1. Authorize the General Manager of Infrastructure and Water Services, or their designate, to review and consider the approval of a connection to the City's wastewater infrastructure to supply wastewater to a proposed Wastewater Energy Transfer (WET) system for the Dream LeBreton development, subject to receipt of a detailed design, a third-party review and to the satisfaction of General Manager;**
- 2. Approve the proposed WET System Design Review Fee and an annual Energy Transfer Fee for the WET system connection to the City's wastewater infrastructure based on a required flow rate (\$/L/sec) being considered to support anticipated energy demands for the Dream LeBreton development;**
- 3. Delegate the authority to the General Manager of Infrastructure and Water Services, or designate, to negotiate, enter into, execute and amend a Wastewater Energy Transfer Agreement with Theia Partners Inc. / Enviri Holding Inc. Partnership and any other agreements necessary to give effect thereto upon such terms and conditions satisfactory to the General Manager of Infrastructure and Water Services, guided by the proposed Draft Term Sheet attached as Document 3, and in a form satisfactory to the City Solicitor;**
- 4. Direct staff to report back to Council by Q4 2024 on a review of existing procedures to enable district energy infrastructure to locate within the municipal road allowance / rights-of-way, including addressing instances where such infrastructure may cross property lines; and**
- 5. Direct staff to report back on the results of the WET System pilot project, no later than 18 months following implementation of the WET System.**

RECOMMANDATION(S) DU RAPPORT

Que le Comité de l'environnement et du changement climatique recommande au Conseil :

- 1. Autoriser la directrice générale des Services d'infrastructure et d'eau, ou son représentant, à analyser et à envisager d'approuver un raccordement à l'infrastructure d'eaux usées de la Ville visant à fournir des eaux usées au système proposé de transfert de l'énergie des eaux usées (TEEU), au projet d'aménagement de Dream LeBreton, sous réserve de la réception d'une**

conception détaillée et d'un examen réalisé par un tiers à la satisfaction de la directrice générale;

2. **Approuver les frais d'examen de la conception du système de TEEU proposé et les frais annuels de transfert d'énergie pour le raccordement de ce système à l'infrastructure d'eaux usées de la Ville, selon le débit (\$/L/s) envisagé pour répondre à la demande prévue en énergie de l'aménagement de Dream LeBreton;**
3. **Déléguer à la directrice générale des Services d'infrastructure et d'eau, ou à son représentant, le pouvoir de négocier, de conclure, d'exécuter et de modifier une entente de transfert de l'énergie des eaux usées avec Theia Partners Inc./Envari Holding Inc. et toute autre entente nécessaire, aux conditions qu'elle juge satisfaisantes (d'après la liste des conditions préliminaires proposée ci-jointe en tant que document 3) et dans une forme qui satisfait l'avocat général;**
4. **Demander au personnel de faire rapport au Conseil d'ici le quatrième trimestre de 2024 sur l'examen des procédures existantes permettant d'établir l'infrastructure énergétique de quartier au sein de l'emprise routière municipale, notamment de trouver des occasions où une telle infrastructure peut traverser les limites de propriété; et**
5. **Demander au personnel de faire rapport sur les résultats du projet pilote, au plus tard 18 mois après la mise en service du système de TEEU.**

EXECUTIVE SUMMARY

In January 2022, the National Capital Commission (NCC), in collaboration with the Canada Mortgage and Housing Corporation (CMHC), announced that Dream LeBreton had been chosen as the successful proponent to construct the first phase of development under the Master Concept Plan for LeBreton Flats. The proposed development is targeting the Canadian Green Building Council's Zero Carbon Standard for Design and Performance, as well as LEED Gold for both New Construction and Neighbourhood Development.

A Wastewater Energy Transfer (WET) system is proposed to fulfil Dream's commitments to the NCC to build an energy efficient and net zero carbon development. Wastewater Energy Transfer (WET) systems capture and use heat found within sewer systems. Using heat exchanger technology, energy can be drawn from wastewater to provide low carbon heating and cooling solutions for individual buildings, new developments, and even whole

communities. In Canada, there are several WET projects that are either operating, under construction, or planned in Toronto, Vancouver, Halifax, and Mississauga.

One of the main benefits of a WET system is that it uses renewable thermal energy from the municipal wastewater system to reduce fossil fuel uses in buildings, which is Ottawa's largest source of greenhouse gas (GHG) emissions.

In June 2022, the City of Ottawa and Theia Partners Inc. / Envari Holding Inc. Partnership (referred to as “Theia Partners / Envari” within this report) entered into a Memorandum of Agreement (MOA) with the Planning, Real Estate and Economic Development (PRED) and Infrastructure Water Services (IWS) departments to formalize a commitment between the parties to pursue the design, construction, operation and maintenance of a WET system to be coupled to the City’s Interceptor Outfall Sewer (IOS) and the East-West Tunnel (EWT) of the Combined Sewage Storage Tunnel (CSST) as a “pilot project”. The WET project was labeled as a pilot because it would be Ottawa’s first WET system.

In keeping with the terms of the MOA, the following milestones have been achieved since August 2022:

- A cross-departmental Technical Advisory Committee (TAC) was established with representatives from IWS, PRED, Corporate Real Estate Office (CREO), Legal and Finance was formed in August 2022 to address the risks/benefits and business terms regarding the proposed WET system to service the Dream development;
- The proponent engaged in an engineering process to establish how and where the WET well could be connected to the municipal sewer system;
- The parties received information on WET projects from municipalities with similar systems, and attended in-person site visits in Washington DC on September 27, 2022 where two examples of operational WET systems were demonstrated;
- The City undertook a jurisdictional review of WET system access fees;
- The parties have reviewed proposed WET concept designs for an enlarged WET well that would maximize the thermal potential of the IOS and have future capacity to heat and cool buildings on adjacent lands; and
- The parties have drafted a Term Sheet which reflects the terms and conditions intended to serve as a framework for the development of a WET Agreement between the City and Theia Partners / Envari.

The WET system concept is technically feasible. Safeguards will be established in the

WET Agreement to ensure that the risks to the City's infrastructure and sewer operations are mitigated, and assets are protected from any impacts at the cost of the proponent.

Council approval of a connection to the City's wastewater infrastructure is required because neither the Sewer Use By-law 2003-514 nor the Sewer Connection By-law 2003-513 contemplate WET systems. Council approval is also required to establish a WET System Design Review Fee and an annual Energy Transfer Fee for the use of the City's wastewater, and delegated authority is requested for the General Manager of Infrastructure and Water Services to enter into a Wastewater Energy Transfer (WET) Agreement with Theia Partners / Envari. All of these must be in place before staff or Theia Partners / Envari invest additional resources in detailed design.

This report includes:

- A description of the proposed WET system as a zero carbon thermal solution;
- A summary of the milestones achieved to date between the City and Theia Partners / Envari in keeping with the Memorandum of Agreement;
- Potential benefits, risks of WET systems to the City and mitigation strategies;
- A summary of the proposed WET System Design Review Fee and Energy Transfer Fee;
- A description of next steps to finalize the WET system connection and report back on lessons learned from the WET pilot as well as to report back on a review of existing procedures to enable district energy infrastructure to locate within the municipal road allowance / rights-of-way.

RÉSUMÉ

En janvier 2022, la Commission de la capitale nationale (CCN), en collaboration avec la Société canadienne d'hypothèques et de logement (SCHL), a annoncé que le soumissionnaire Dream LeBreton avait été sélectionné pour mener à bien la première phase d'aménagement conformément au Plan directeur conceptuel des plaines LeBreton. Le projet proposé vise le respect de la norme du bâtiment à carbone zéro pour la conception et la performance du Conseil du bâtiment durable du Canada ainsi que la certification LEED Or à la fois pour les nouvelles constructions et l'aménagement des quartiers.

Pour remplir l'engagement de Dream LeBreton envers la CCN, soit de construire un aménagement écoénergétique et carboneutre, est proposé un système de transfert de

l'énergie des eaux usées (TEEU). Le principe? Emmagasiner et utiliser la chaleur dans les réseaux d'égouts. En faisant appel à la technologie d'échangeur thermique, on peut extraire l'énergie des eaux usées pour proposer des solutions de chauffage et de climatisation sobres en carbone dans les immeubles, les nouveaux complexes immobiliers, et même des voisinages entiers. Au Canada, plusieurs projets de TEEU sont en activité, en construction ou planifiés à Toronto, Vancouver, Halifax et Mississauga.

L'un des grands avantages de ce système, c'est qu'il utilise l'énergie thermique renouvelable du réseau d'eaux usées municipal pour réduire l'utilisation de combustibles fossiles dans les bâtiments, qui est la principale source d'émissions de gaz à effet de serre à Ottawa.

En juin 2022, la Ville d'Ottawa et les partenaires Theia Partners Inc. et Envari Holding Inc. ont conclu un protocole d'entente (PE) avec la Direction générale de la planification, de l'immobilier et du développement économique (DGPIDE) et la Direction générale des services d'infrastructure et d'eau (DGSIE) pour officialiser l'engagement des parties à concevoir, construire, mettre en marche et entretenir un système de TEEU qui serait raccordé à l'égout de décharge-intercepteur (ÉDI) de la Ville et le tunnel est-ouest (TEO) du tunnel de stockage des égouts unitaires (TSEU), le tout sous forme de « projet pilote ». On parle d'un projet pilote puisqu'il s'agirait du tout premier système de TEEU à Ottawa.

Conformément aux modalités du PE, les étapes suivantes ont été franchies depuis août 2022 :

- Un comité consultatif technique (CCT) inter-directions générales, composé de représentants de la DGSIE, de la DGPIDE, du Bureau des biens immobiliers municipaux (BBIM), des Services juridiques et de la Direction générale des services des finances, a été mis sur pied en août 2022 pour soupeser les risques et les avantages et traiter des conditions commerciales relatives au système de TEEU proposé qui desservira l'aménagement de Dream LeBreton.
- Le soumissionnaire a mis en branle un processus d'ingénierie pour déterminer comment et où le TEEU pourrait être raccordé au réseau d'égouts municipal.
- Les parties ont été renseignées par des municipalités dotées de systèmes de TEEU similaires et se sont rendues en personne à Washington D.C., le 27 septembre 2022, pour assister à la démonstration de deux systèmes de TEEU en activité.
- La Ville a analysé les pratiques d'autres municipalités en ce qui concerne les droits d'accès au système de TEEU.

- Les parties ont examiné les plans conceptuels d'un grand puits de TEEU qui maximiserait le potentiel thermique de l'ÉDI et permettrait, à l'avenir, de chauffer et de climatiser les bâtiments de terrains voisins.
- Les parties ont rédigé une liste des conditions provisoire, pour orienter l'entente de TEEU entre la Ville et les partenaires Theia Partners Inc. et Envari Holding Inc.

Ce système est conceptuellement faisable sur le plan technique. Des mesures de protection seront prévues dans l'entente de TEEU pour atténuer les risques pour l'infrastructure et le fonctionnement des égouts municipaux et protéger les actifs en cas de problème, les coûts connexes étant assumés par le soumissionnaire.

L'approbation du Conseil est nécessaire pour un raccordement à l'infrastructure municipale d'eaux usées, car ni le *Règlement municipal sur les égouts* (n° 2003-514) ni le *Règlement municipal sur le raccordement des égouts* (n° 2003-513) ne traitent des systèmes de TEEU. Son approbation est également requise pour l'instauration de frais d'examen de la conception du système de TEEU et de frais annuels de transfert d'énergie pour l'utilisation des eaux usées de la Ville. Par ailleurs, il faut déléguer à la directrice générale des Services d'infrastructure et d'eau le pouvoir de conclure une entente de TEEU avec les partenaires Theia Partners Inc. et Envari Holding Inc. Ces conditions préalables doivent être remplies avant que le personnel ou Theia Partners Inc. et Envari Holding Inc. investissent des ressources supplémentaires dans la conception détaillée.

Le présent rapport comprend :

- une description du système de TEEU proposé, y compris son emplacement, un plan provisoire de raccordement à l'ÉDI et aux égouts du TEO, et des éléments à prendre en compte pour la taille du puits de TEEU;
- le partage des rôles et responsabilités entre les parties;
- les avantages potentiels, les risques et les stratégies d'atténuation connexes;
- les droits proposés d'examen de la conception et de transfert d'énergie du système de TEEU;
- une description des prochaines étapes du raccordement du système de TEEU et d'élaboration d'un processus normalisé d'examen et d'approbation pour de futurs raccordements du genre à Ottawa.

BACKGROUND

In August 2021, the Public Works and Environmental Services Department provided a letter of support to explore a pilot project to leverage city sewers as an energy source with

any proponent for the National Capital Commission's LeBreton Flats redevelopment project.

In January 2022, the National Capital Commission (NCC), in collaboration with the Canada Mortgage and Housing Corporation (CMHC), announced that Dream LeBreton had been chosen as the successful proponent to construct the first phase of development under the Master Concept Plan for LeBreton Flats.

The Dream LeBreton development site is 1.1 hectares and is located at the northeast corner of Albert and Booth Streets, known municipally as 665 Albert Street (see Document 1). O-Train Line 1 and the Pimisi O-Train Station are situated immediately north of the site. Both the City's sanitary trunk sewer, known as the Interceptor Outfall Sewer (IOS) and the East-West Tunnel (EWT) of the Combined Sewage Storage Tunnel cut through the northwest portion of the property. There are a number of vacant land parcels in close proximity to the site which are anticipated to be developed in the future (see Document 1).

The Dream LeBreton development proposes two high-rise residential buildings (31 and 36 storeys), comprising 608 rental units, 247 (40 per cent) of which are to be affordable housing units. The proposed development is targeting the Canadian Green Building Council's Zero Carbon Standard for Design and Performance, as well as LEED Gold for both New Construction and Neighbourhood Development. A proposed Wastewater Energy Transfer (WET) system is intended to fulfil Dream's commitments to the NCC to build an energy efficient and net zero carbon development. According to the Canada Green Building Council, the Dream LeBreton project will be the country's largest residential zero-carbon development.¹

Official Plan and Zoning By-law Amendments were approved in support of the development in October 2022. The owner and developer, Dream Asset Management Corporation, is currently seeking Site Plan Approval for the development with construction expected to commence in Q2 2023 and initial occupancy in Q4 2025.

In June 2022, the City of Ottawa and Theia Partners Inc. Partnership/ Envari Holding Inc. entered into a Memorandum of Agreement (MOA) with the Planning, Real Estate and Economic Development (PRED) and Infrastructure Water Services (IWS) departments to formalize a commitment between the parties to pursue the design, construction, operation

¹ A zero-carbon development is a community or neighborhood that produces no net emissions of greenhouse gases. These developments are significant because they help reduce our dependence on fossil fuels and combat climate change.

and maintenance of a WET system to be coupled to the City's wastewater infrastructure, to be situated on the Dream LeBreton property.

Energy from Wastewater

Wastewater flushed from homes and businesses is a significant source of energy. Hundreds of liters of warm wastewater are generated per person in Ottawa each day from domestic hot water use, laundry, industrial processes and heating systems' condensate. On average, 545 million liters of wastewater are treated each day at the Robert O. Pickard Environmental Centre (ROPEC), before it is returned to the Ottawa River.

When sanitary supplies from buildings combine in the municipal wastewater infrastructure, the typical temperatures are in the range of 5°C to 20°C, varying with time of day, season, amount of precipitation and building catchment. In general, sewage temperature is colder in winter when heat extraction for heating is desired, and warmer in summer when heat rejection for cooling is desired.

Water, and sewage which is comprised mostly of water, has a relative high heat capacity. This means that a lot of thermal heat can be extracted per degree of temperature change in the wastewater and it can provide a more consistent source temperature and higher heat capacity than ambient air provides for an air source heat pump.

Types of WET Systems for Municipal Infrastructure

In 2021, J.L. Richards & Associates Ltd was retained by the City to undertake a [Waste Heat Scoping Study](#) of the resource potential, and viable use cases for implementing below-ground thermal energy resources from Ottawa's sewer system and aquifer systems. The report was specific to heat exchange systems able to be deployed at large municipal sewers. Other WET technologies such as for in-building applications exist, however, they were outside the scope of the study and therefore not included.

Wastewater Energy Transfer (WET) systems consist of a heat exchange process combined with a pumping loop for sewage to capture and use heat found within wastewater systems. Using heat exchanger technology, energy can be drawn from wastewater to provide low carbon heating and cooling solutions for individual buildings, new developments, and even whole communities.

The report describes three technologies commonly available, that can be classified according to the location of the main heat exchanger used to extract waste heat from the sewage:

- Technology 1 - Internal Sewer Pipe Heat Exchanger (inserted inside the pipe);

- Technology 2 - Integral Sewer Pipe Heat Exchanger (integral to the pipe wall);
- Technology 3 - External Heat Exchanger.

Theia Partners / Envari are proposing that the WET system for the Dream LeBreton development using Technology 3. As illustrated in Figure 1, sewage will be diverted from the City's sewage collection system at the Interconnection Point to fill a separate sump pit or wet well for temporary sewage storage. Sewage contained in the wet well will be filtered to remove large solids and pumped to a heat exchanger within a mechanical room or building to recover or reject heat. After passing through the heat exchanger, the pumped sewage will be combined with filtered solids and discharged to the municipal sewer downstream of the point of diversion.

There are two manufacturers of this type of technology:

- Huber Technology Inc. (Huber) is a German company that specializes in the supply of wastewater treatment process equipment for municipal and industrial applications and represented locally by Noventa Energy Partners, based in Toronto.
- SHARC Energy Systems is a Canadian company based in Vancouver, BC. SHARC works with engineering partners Canada-wide, with offices in seven Ontario cities including Ottawa, to provide design services specific to the integration of their system. Figure 1 below is characteristic of a SHARC system.

The proposed WET system concept, ultimate size of the WET well and the technical considerations for the connection will be further refined by Theia Partners/Envari once the heat exchange system is selected for the project (i.e. Noventa's Huber system or SHARC).

WET Systems as a Zero Carbon Thermal Solution

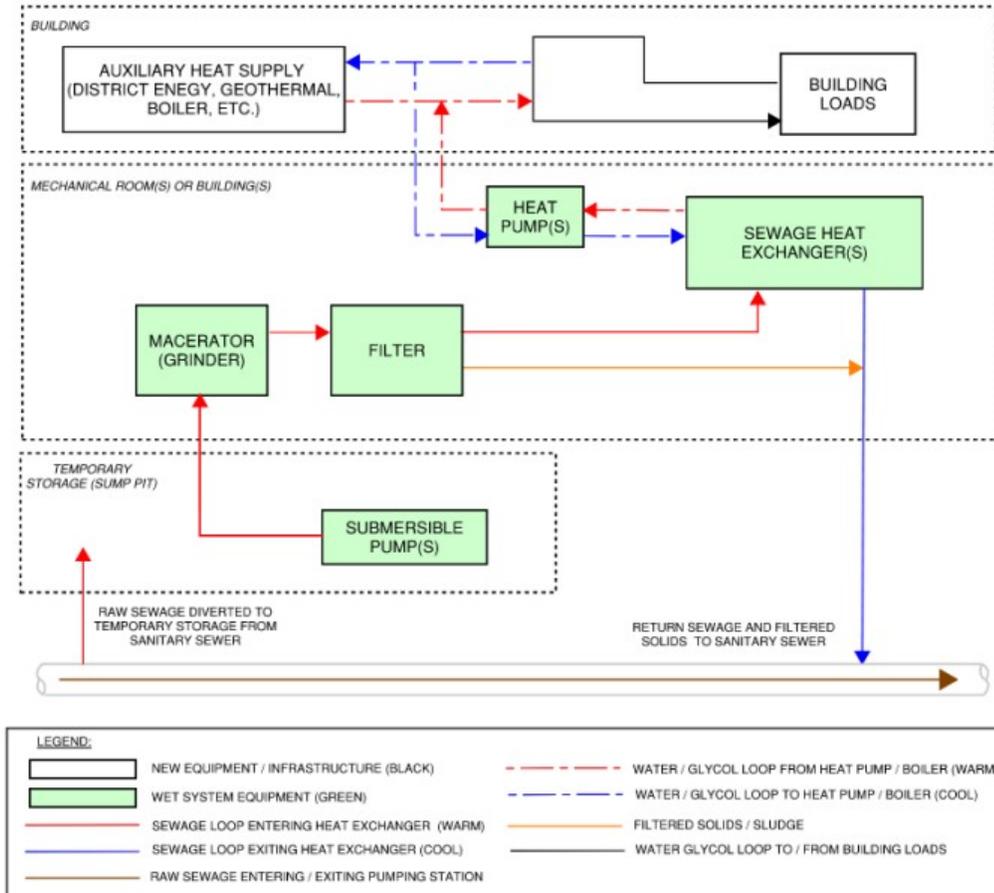
One of the main benefits of a WET system is that it uses renewable thermal energy from municipal wastewater system to reduce fossil fuel uses in buildings, which is Ottawa's largest source of greenhouse gas (GHG) emissions.

In Canada, where commercial and residential buildings make up 17 per cent of the annual carbon emissions, capturing the thermal energy from wastewater could remove up to 54.7 million metric tonnes of greenhouse gases annually, the equivalent to taking 18.6 million cars off the street. ²

² <https://www.watercanada.net/feature/wastewater-heat-recovery-sharc/>

WET systems are dependent on the flow rate from the sewer system for heating energy. Flow rates within large urban centers are ideal, as they provide constant sewer flows.

Figure 1: External Heat Exchanger WET System³



WET System Examples in Canada

In Canada, there are several WET projects that are either operating, under construction, or planned, including:

1. Toronto Western Hospital (private / Huber) – under construction
2. Vancouver's False Creek Neighbourhood Energy Utility (municipally owned / SHARC) – in operation
3. Halifax's Cogswell Redevelopment Area (municipally owned) – under construction

³ Sewer Waste Heat Scoping Study Final Report, J. L. Richards, dated November 29, 2021, which explains a WET system using a macerator as used in the SHARC technology. Another technology (i.e. Huber) uses a filter system.

4. Mississauga's Lakeview Village development (region municipally owned) – planned

Council Directions

In Ottawa, City Council has approved a number of plans, programs, policies or projects which support the transition from fossil fuel building heating sources to low carbon and renewable options. WET systems provide another way to support the transition. Key Council decisions are summarized in Document 2.

DISCUSSION

Recommendation #1: Authorize the General Manager of Infrastructure and Water Services, or designate, to review and consider the approval of a connection to the City's wastewater infrastructure to supply wastewater to a proposed Wastewater Energy Transfer (WET) system for the Dream LeBreton development, subject to receipt of a detailed design, a third-party review and to the satisfaction of General Manager;

There are two existing by-laws that govern Ottawa's wastewater infrastructure, neither of which currently contemplate WET systems:

1. The Sewer Use By-law 2003-514 applies to all discharges to the City's wastewater collection system, be they from residential, business, or industrial discharges to the sewers. The focus of the Sewer Use By-law is primarily to set limits on the types of substances that can be discharged into the sewer system. The proposed WET system will not change the quality of the wastewater so the quality of the influent and effluent will remain the same, which would therefore not implicate the Sewer Use By-law.
2. The Sewer Connection By-law 2003-513 sets out permit requirements for any construction, alteration, blanking, temporary or permanent connection or reuse of all building sewers and public sewage works and installation of maintenance holes.

Council approval of a connection to the City's wastewater infrastructure is required before Theia Partners / Envari will invest additional resources in detailed design.

This section describes the proposed:

- Location of the WET system
- Connection concept to the IOS
- Size of the WET well

Memorandum of Agreement

In June 2022, the City of Ottawa and Theia Partners / Envari entered into a Memorandum of Agreement (MOA) with the Planning, Real Estate and Economic Development (PRED) and Infrastructure Water Services (IWS) departments to formalize a commitment between the parties to pursue the design, construction, operation and maintenance of a WET system to be coupled to the City's Interceptor Outfall Sewer (IOS) and East West Tunnel (EWT) of the Combined Sewage Storage Tunnel (CSST) as a "pilot project". The WET project was labeled as a pilot because it will be Ottawa's first WET system.

The overarching purpose of the collaboration between the City and Theia Partners / Envari is to pilot the WET system and provide new affordable housing stock in the city that does not rely on fossil fuels for thermal energy.

In keeping with the terms of the MOA, the following milestones have been achieved since August 2022:

- A cross-departmental Technical Advisory Committee (TAC) with representatives from IWS, PRED, Corporate Real Estate Office (CREO), Legal and Finance was formed in August 2022 to explore the risks/benefits and business terms regarding the proposed WET system to service the Dream development.
- Theia Partners /Envari engaged in an engineering process to investigate the feasibility and costs associated with establishing a WET system.
- The parties received information on WET projects from municipalities with similar systems, and attended in-person site visits in Washington DC on September 27, 2022, where two examples of operational WET systems were demonstrated;
- The City undertook a precedent jurisdictional review of WET system access fees;
- The parties received proposed WET system concept designs that explored opportunities to up-size the WET well in order to have future capacity for adjacent lands;

A Draft Term Sheet, included in Document 3, was prepared as a working draft which will serve as a framework for the development of a WET Agreement between the City and Theia Partners / Envari. The Term Sheet is not a binding document but will be used to guide the preparation of a new WET Agreement.

Interceptor Outfall Sewer

The Interceptor Outfall Sewer (IOS) is a large diameter trunk sewer that was constructed

in 1964 to intercept all flows west to east from discharging into the Ottawa River and redirect flows to the R.O. Pickard Environmental Centre (ROPEC) sewage treatment plant. There are five major regulators and one junction chamber that control flow from collector sewers into the IOS.

East West Tunnel of the Combined Sewage Storage Tunnel

Flow at the interception points of the original outfalls and the interceptor sewer is controlled by regulating system overflows to provide system relief. The Combined Sewage Storage Tunnel (CSST) was completed in November 2020 to reduce the frequency of sewage overflows during storms from entering the Ottawa River. The East-West Tunnel (EWT) has only been in operation during high rain events or as part of planned plant shutdowns and is intended to serve as a storage tank which then releases flow slowly back into the IOS.

Location

The proposed location of the WET connection is east of the IOS Booth-Wellington Regulator, situated adjacent to Booth Street. This location allows the WET facility to leverage flow from the IOS which conveys the combined flow from the West Nepean Collector, Booth Street Collector, and Cave Creek Collector. This maximizes the available flow and smooths out the typical daily variations in flow and temperature.

There is an existing registered easement in favour of the City for access and maintenance to the IOS within the Dream property. Should the WET connection be approved, this easement will likely need to be released and replaced with a new easement which will contemplate the WET system.

Thermal Capacity in the IOS

The thermal energy of the diverted sewer flows determines the energy that is available to the WET system to supply heating and cooling loads. The available thermal capacity of a sewer is dependent on the flow, the initial sewer temperature, and the change in temperature after passing through the heat exchanger. It is assumed that heating, and not cooling, will be the controlling demand for the WET system design and its end users.

The assessment of thermal capacity in the IOS, based on the methodology outlined in J. L. Richards' Sewer Waste Heat Scoping Study⁴, is estimated to contain approximately 5 to 7.5 megawatts of energy. The Dream LeBreton development will require approximately 2.5 megawatts of energy to support both heating and cooling demands. There is no positive

⁴ [Sewer Waste Heat Scoping Study Final Report, J. L. Richards, dated November 29, 2021](#)

obligation on the City to guarantee effluent temperature or flow rates for the operation of the WET system.

Benefits

The Dream LeBreton WET project represents a significant opportunity for community benefit given the long term GHG reductions as compared to the traditional fossil fuel based “business as usual” development option. The proximity of the IOS and EWT sewers to the Dream LeBreton site represents a significant opportunity and environmental benefit for the City and its residents.

In addition, the pilot project will demonstrate Ottawa as a leader in Canada by testing new innovative technologies that can significantly reduce emissions from building heating and cooling. It will also help showcase this project to others who may wish to contemplate these systems elsewhere in the city. The project will also provide staff with significant opportunities to build in-house expertise and knowledge of WET systems.

Risks to the City

The City will review and approve the proposed Civil Connection Concept to the municipal sewage works. The balance of the WET system equipment on the Dream LeBreton site will be owned, operated and maintained privately by Theia Partners / Envari. Risks to the City have been identified in Table 1. Risks will be evaluated, mitigated, monitored and updated throughout the detailed design, approval, construction, inspection and commissioning and operation phases of the WET pilot project.

Table 1: Summary of Risks to the City

Risk	Mitigation
1. Potential impacts to the life cycle and performance of the City's sewer infrastructure by ongoing use of the WET system	Ongoing monitoring and inspection of the wastewater infrastructure to observe and track potential impacts in the area of the WET Interconnection Point as well as above and below. The City will have the ability to terminate the connection should impacts not be resolved in a satisfactory or timely manner.
2. Construction between the IOS and EWT could result in damage to either sewer	Work will be carefully planned to avoid unintended damage, including geotechnical/structural monitoring during the

Risk	Mitigation
	work, emergency response planning in advance of the work, and City leveraging ability to direct flows between IOS and EWT. Third party review of WET detailed design and construction phasing to be carried out. All damages to City infrastructure will be covered by Theia Partners/Envari
3. Debris in the IOS and/or EWT as a result of upstream WET system blockages could necessitate more frequent cleaning or flushing of the wastewater system	Detailed design will include measure(s) for protecting wastewater infrastructure against debris build-up. Theia Partners / Enviri will be responsible for all cleaning and flushing costs resulting from the operation of the WET system, and maintaining compliance with the Sewer Use By-law and any applicable regulations.
4. WET system to be located on private property where access, operation, and maintenance of the WET system may impact site and landscape design at grade. Existing sewer easements do not contemplate WET systems. Terms for a new sewer easement agreement will be required which could cause delays.	Ensure that the parties understand and accept the proposed works. Responsibilities of the parties will be outlined at key milestones within the WET agreement.
5. WET system access located in a high foot-traffic area on the site could pose a potential public safety risk.	Theia Partners / Enviri will incorporate measures to protect public safety and prevent tampering with infrastructure. This may include fencing site, locked hatches, etc. Landscape plans to reflect these measures.
6. Operational staff access constraints to the sewer in the area of the WET system	Ensure safe and suitable access is provided for IWS Operations staff or their designates, as part of detailed design and identify

Risk	Mitigation
	necessary measures when the City is inspecting sewer infrastructure to not disrupt WET system or that the connection is not damaged.
7. Sewer odour and noise leading to public complaints	Detailed design to include suitable odour control and mitigation measures, smooth flow geometry, critical equipment separated from hazardous atmospheres, and corrosion resistant materials where feasible. Noise mitigation during construction and operation to be included in the final design and approval process.
8. Sewer corrosion	Theia Partners/Enviri will be responsible for any corrosion due to H ₂ S or any other gases/liquids/solids generated as a result of the WET operation.
9. The WET pilot project is abandoned by the Proponent	The WET agreement shall require that in the event of termination or expiry of the agreement, Theia Partners / Enviri will be required, at its sole cost, to remove all connections between the WET System and the IOS and restore the IOS to the satisfaction of the City.

Next steps

If Council authorizes the General Manager of Infrastructure and Water Services to review and consider approval of a WET connection to the City's wastewater infrastructure, staff will continue to work with Theia Partners / Enviri to identify and resolve issues as they emerge during detailed design. The City will not enter into a WET agreement or proceed with the project until all issues have been resolved in a satisfactory manner (Recommendation 3).

If the connection is approved, there is no obligation or expectation that the City make any financial commitments to the WET system project. There is an expectation that the City be compensated for the use of wastewater (Recommendation 2). The City may be asked to

make additional commitments such as in-kind support on possible funding applications or commitments to connect future City-owned development lands to the WET system. Staff will bring these decisions back to Council if required.

Lessons learned through this pilot project will be considered in a follow-up report following implementation of the WET system project (Recommendation 5).

Recommendation #2: Approve the proposed WET System Design Review Fee and an annual Energy Transfer Fee for the WET system connection to the City's wastewater infrastructure based on a required flow rate (\$/L/sec) being considered to support the anticipated energy demands for the Dream development;

WET System Design Review Fee

The purpose of the WET System Design Review Fee is to cover the anticipated costs to review the detailed design once submitted and inspect the existing wastewater system to facilitate design. Any costs related to CCTV will be the responsibility of the proponent. Given that this is a pilot project and the total costs to the City are not yet known, staff have estimated the amount of staff time based on other infrastructure review processes.

The WET System Design Review Fee is estimated to recover costs in accordance with the City's User Fees and Charges Policy.

Energy Transfer Fee

The purpose of the proposed annual Energy Transfer Fee is to enable the City to receive a source of annual revenue for granting access to the municipal wastewater asset as a source of zero emission energy based on thermal energy demand.

Staff recommend an annual Energy Transfer Fee that is:

- In line with fees charged in other jurisdictions
- Calculated based on peak flow demand (in L/s)
- Applied only when the temperature of the effluent is above 8.6°C

Jurisdictional Review of WET Fees

Staff completed a precedent review of WET fees applied in other jurisdictions that either have programs in place or are being developed to support WET systems. They include: King County, Washington (USA), Berlin (Germany), Stuttgart (Germany), Marseille (France), and Toronto (Canada).

Calculation of WET Fees

Typically, energy pricing reflects peak energy demand, which is priced per kilowatt (kW).

King County, Washington and the City of Toronto apply a flat rate per tonne of energy with fluctuations subject to the consumer price index. The amounts ranged from one half to three quarters of a cent per ton-hour of energy (1 ton hour of energy is equal to 12,000 British thermal units or BTU), which equates to \$6.77/kW annually.

However, because both the amount of wastewater flow available and the amount of heat that can be extracted from it are limited, City of Ottawa staff recommend that pricing should reflect scarcity. The amount of energy that can be supplied to a WET system is the product of the volume of wastewater put through it and the degree to which the temperature of the wastewater is increased or decreased. Staff therefore converted a fee scale based on energy demanded (in kW) to one based on peak flow demand (in L/s). The converted fee in L/s equates to \$108.75 per L/s.

Temperature Considerations

The amount of energy that can be supplied to a WET system from the sewer must also consider the temperature of the effluent. For example, if the temperature of the sewer system drops during the heating season by a degree, then there is less energy available if the fee is based on a fixed amount of flow. The increase or decrease in temperature is commonly referred to as delta T, meaning "temperature difference". Generally, the larger the delta T in the sewer compared to heating or cooling demand, the higher the amount of effluent that is required for the heat exchange system.

The temperature in the IOS periodically drops below 8.6°C, for example, during heavy rainfall events or spring snow melts. This is significant as base temperature fluctuations may impact the capacity and/or effectiveness of the WET system to provide sufficient heating to the buildings. For these reasons, staff recommend that the WET fee would not apply when the temperature of the effluent drops below 8.6°C. The volume demand charge will therefore be calculated on maximum flow required when the sewer water temperature is above 8.6°C. As outlined in the Draft Term Sheet, Theia Partners / Enviri will be required to install thermal meters at the inflow and the outflow of the heat exchange system to measure the flow, temperature, energy and peak thermal power that has been derived from or rejected to the City's wastewater and data reports will be made available to the City.

As described in the Draft Term Sheet, Theia Partners / Enviri shall be responsible to pay the annual Energy Transfer Fee to the City, commencing on the commencement date for the project (i.e. the date on which the commissioning is completed) and annually thereafter. The annual revenue is estimated to be between \$15,000 and \$42,000. Revenues from this fee will be used to recover the cost of staff time and equipment

required for executing planned inspections of the City infrastructure once in operation.

Recommendation #3: Delegate the authority to the General Manager of Infrastructure and Water Services, or designate, to negotiate, enter into, execute and amend a Wastewater Energy Transfer (WET) Agreement with Theia Partners Inc. / Enviri Holding Inc. Partnership and any other agreements necessary to give effect thereto upon such terms and conditions satisfactory to the General Manager of Infrastructure and Water Services, guided by the proposed Draft Term Sheet attached as Document 3, and in a form satisfactory to the City Solicitor;

The 2022 MOA between the City of Ottawa and Theia Partners / Enviri required certain conditions to be satisfied by Theia Partners / Enviri before the City provides its approval to move forward with the project. These include but are not limited to joint endorsement on detailed engineering drawings, cost recoveries related to inspection of the WET system and for the sale of the effluent.

Should all the technical, legal, and financial concerns be resolved, staff are seeking delegated authority to negotiate and execute a Wastewater Energy Transfer Agreement, using the framework described in the Draft Term Sheet, with Theia Partners Inc. / Enviri Holding Inc. Partnership, on the terms satisfactory to the General Manager, Infrastructure and Water Services and on legal terms satisfactory to the City Solicitor.

Draft Term Sheet

In 2022, staff drafted a Draft Term Sheet, included as Document 3, to guide the terms and conditions for the connection of the WET system to City infrastructure between the City and Theia Partners / Enviri that will be used to develop a WET Agreement. The Term Sheet includes the legal, administrative, and financial considerations for the pilot project, including at a minimum the following:

Administrative

- Prior to construction of the WET System, Theia Partners / Enviri will include the City in the detailed design review of the Project, provide the City with the final design drawings, plans and specifications for the WET connection for the review and acceptance by the GM, IWSD or designate;
- The WET well and associated heat exchange equipment will be privately owned and operated and does not require municipal approval.

Legal

- Theia Partners / Enviri, at its sole expense, will design, construct, own, operate and

maintain the WET system facility;

- The WET design shall take into consideration minimizing the potential for: (a) sewage spills or discharges to the natural environment (b) noise or odour (c) impact to the proper management, operation and/or maintenance of the Sewage Works; and (d) avoiding any damage to City property and assets;
- The City will not warranty the volume, quality, temperature or chemistry of the wastewater in the IOS / EWT or as to the operation, maintenance or condition of the IOS / EWT;
- Theia Partners / Envari assumes all liability for any damage to the IOS / EWT during construction and operation;
- The City shall not be liable and will have the right to notify Theia Partners / Envari of the intent to isolate the WET System from the Sewage Works at the Interconnection Point at any time during the Term of the WET Agreement for reasons including short and long term maintenance, in the case of emergency, or upon the occurrence of damage or obstruction to the proper operation of the system, noise or odour, spills or discharge, or in the event of non-compliance of applicable laws;
- Upon termination or expiry of the agreement, Theia Partners / Envari will be required, at its sole cost, to remove all connections between the WET System and the IOS / EWT and restore the IOS / EWT to the satisfaction of the City.

Financial

- The City shall require that an independent third-party review be undertaken of the detailed design drawings, up to a maximum cost to Theia Partners / Envari of \$20,000.00;
- Required fees including a WET System Design Review Fee, the annual Energy Transfer Fee, insurance and securities.

Revisions to the Draft Term Sheet are likely to be required in working through the detailed design stage of the project.

Over the proposed term of the Wastewater Energy Transfer Agreement, the energy marketplace is likely to evolve significantly, including regulatory conditions related to carbon taxation. This may affect the financial and regulatory aspects of the Wastewater Energy Transfer Agreement. Staff will therefore consider adding clauses into the agreement in the event that such amendments are required.

Recommendation #4: Direct staff to report back to Council by Q4 2024 on a review of existing procedures to enable district energy infrastructure to locate within the municipal road allowance / rights-of-way, including addressing instances where such infrastructure may cross property lines.

Staff anticipate a sharp increase in the number of district energy systems within Ottawa over the short to medium term. The Municipal Consent process is the established process to approve encroachments within the right-of-way. PRED staff, in consultation with Legal, Finance and Corporate Services will examine the existing approval process and determine whether or not to recommend changes that could facilitate a more efficient and cost-effective method to enable district energy infrastructure to locate within the municipal right-of-way.

Components of the review will include:

- A review of the established process used in the approval of previous district energy systems such as the Zibi development; and
- A review of existing procedures and timelines for review and approval with a focus on private utilities such as district energy systems.

Recommendation #5: Report back on the results of the WET System pilot project, no later than 18 months following implementation of the WET System.

The proposed WET system in support of the Dream LeBreton project, connected to the IOS and EWT wastewater infrastructure would represent Ottawa's first WET System project that could serve as a catalyst or showcase project for future WET system projects in the city.

Staff will summarize the lessons learned from the WET pilot project, including the following:

- Whether the City should contemplate future WET System connections to the wastewater infrastructure;
- Whether there are additional technical or operational impacts that should be considered in future projects;
- Whether the risks posed to the City were mitigated successfully;
- What the costs and revenue could be for the City and the proponent;
- The extent to which WET Systems support advancing the City's climate change goals; and

- What a streamlined approvals process for future WET system projects should address.

A review of the total cost to the City for the maintenance and inspection of the WET System pilot, and whether the imposed fees were sufficient to recover those costs will also be undertaken. Staff will also discuss and may bring forward recommendations on roles the City could play with regards to future WET system projects more broadly such as mapping areas that have future WET system connection potential or other energy sources such as waste heat energy.

FINANCIAL IMPLICATIONS

Third party review costs of up to \$20,000 will be the responsibility of Theia Partners / Envari. Third party costs in excess of \$20,000 would be funded from 910222 - 2023 Climate Change Master Plan. The WET System Design Review Fee is estimated at \$12,000 to recover costs in accordance with the City's User Fees and Charges Policy. In addition to the WET System Design Fee, additional fees such as design, review and inspection fees, as appropriate, will be collected in accordance with the requirements relating to any development application or permit approval. The fee is anticipated to cover costs associated with design review, excluding CCTV costs which will be the responsibility of the proponent. The total costs to the City to maintain and inspect the WET system once operational will be estimated to validate the proposed Energy Transfer Fee. Theia Partners / Envari, at its sole expense, will design, construct, own, operate and maintain the WET facility. All financial obligations including but not limited to the fees, costs, insurance and securities will be borne by Theia Partners / Envari.

LEGAL IMPLICATIONS

There are no legal impediments to implementing the report recommendations. For further clarity, it is noted that the Wastewater Energy Transfer ("WET") System is a privately owned and operated system. The City does not exercise regulatory oversight, including review or issuance of any permits for these systems. The WET Agreement to be entered into between the parties will impose terms and conditions required to permit the connection of the WET System to City wastewater infrastructure.

COMMENTS BY THE WARD COUNCILLOR(S)

Councillor Troster is aware and supportive of the WET Pilot Project in principle.

ADVISORY COMMITTEE(S) COMMENTS

CONSULTATION

No public consultation was undertaken related to this report.

ACCESSIBILITY IMPACTS

Accessibility impacts are being assessed as part of the ongoing Site Plan Control application for the proposed development.

ASSET MANAGEMENT IMPLICATIONS

The WET pilot project proposes to extract heat from municipal wastewater as a source of renewable thermal energy. If approved, the connection to the municipal sewage system will be the only element of the system located within the City's sewer network. The pilot project recommendation includes an examination of the potential risks to the City's infrastructure and sewer operations as a result of this proposal. The risk management strategy discussed in the report includes the review and approval by the City of detailed connection design, as well as the preparation of a WET Agreement that will establish obligations and liability relating to such risks. Further, there will be ongoing participation by the City in all stages of this project including construction, commissioning and operation.

CLIMATE IMPLICATIONS

The WET pilot project supports the policy directions found within Ottawa's new Official Plan, which identifies climate mitigation and resiliency as one of six strategic cross-cutting issues. The plan contains policies that emphasize sustainability interventions as part of building design.

The project also supports two Climate Change Master Plan priorities: Energy Evolution and Private Action. Based on an analysis of the Energy Evolution model data, Ottawa will require 19 waste heat recovery systems by 2050 to meet the 100 per cent emission reduction scenario. Each of these systems would need to service on average 520,000 m² of floor space by 2050. It is assumed that most of the 19 WET systems required will be interfaced with a district energy system so that roughly 20 per cent of district energy systems will be WET based and the remaining 80 per cent will rely on other resources, such as geothermal, air source heat pumps, high temperature phase change thermal storage, renewable natural gas and electric resistance heating.

These systems are required particularly in high heating demand areas of the city as without their employment there will be an over reliance on natural gas for heating.

Although the Energy Evolution plan makes provision for the employment of renewable natural gas (RNG), RNG is a limited resource. If waste heat is not employed and RNG is substituted for it, we will exhaust all available RNG supplies and not meet our 100 per cent reduction target.

ENVIRONMENTAL IMPLICATIONS

The proposed development is targeting the Canadian Green Building Council's Zero Carbon Standard for Design and Performance, as well as LEED Gold for both New Construction and Neighbourhood Development. Along with the proposed WET system, the buildings will also include photovoltaic panels, and rainwater will be collected and reused within the buildings.

RISK MANAGEMENT IMPLICATIONS

There are risk implications. These risks have been identified and explained in the report and are being managed by the appropriate staff.

RURAL IMPLICATIONS

There are no rural implications associated with this report.

SUPPORTING DOCUMENTATION

Document 1 – Site location and abutting lands proposed for future development

Document 2 - Key Council Decisions to Transition from Fossil Fuel Heating

Document 3 – Draft Term Sheet (outline for WET Agreement)

DISPOSITION

The departments involved in the pilot project (Planning, Real Estate and Economic Development, Infrastructure and Water Services, and Finance and Corporate Services) will continue to work with the proponent through the detailed design, construction, commissioning, and operational phases of the project. Legal Services, in consultation with all departments will finalize the details of the WET Agreement, subject to receipt of detailed design and a third-party review.