

SCHEDULE E

Form of Completion Report for Studies

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Upon completion of the Feasibility Study, a copy of the Final Study must be submitted along with this Completion Report for Studies.

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How to complete the Completion Report for Studies

The purpose of the Completion Report for Studies is simple: to share the story of your community's experience in undertaking a Feasibility Study with others seeking to address similar issues in their own communities.

Please write the report in plain language that can be understood by people who are not specialists on the subject. A Completion Report for Studies is typically in the range of 5–10 pages, but may be longer or shorter, depending on the complexity of the Feasibility Study.

GMF grant recipients must enclose **final** copies of the Completion Report for Studies and the Final Study, both in electronic format, with their final Request for Contribution. The reports, including all attachments and appendices, must be submitted in PDF format with searchable text functionality. Reports that are not clearly identifiable as final reports, such as those displaying headers, footers, titles or watermarks containing terms like "draft" or "for internal use only," will not be accepted by GMF. Additionally, reports must be dated. If you have questions about completing this report, please consult GMF staff.

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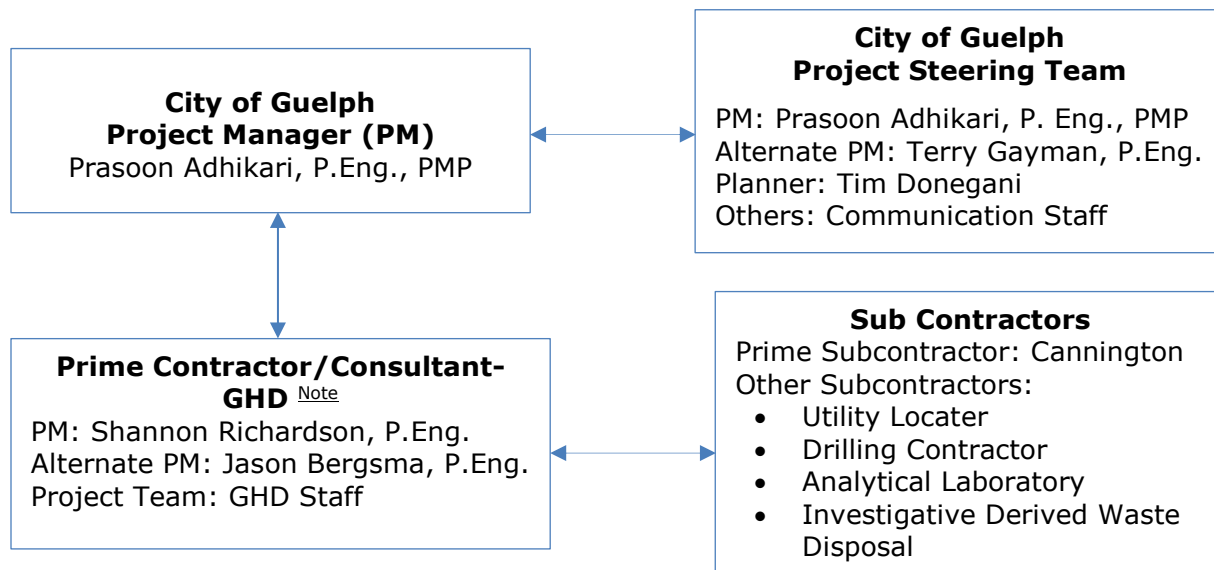
Completion Report for Studies

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1. Introduction

The Project involved several environmental works (such as Environmental Site Assessments/Closure Assessment, Remediation in and around the old tanks, and Risk Management Plan (a requirement under Source Water Protection Program) for the Site, among others, associated with the decommissioning of old underground fuel storage tanks (USTs); and design, supply and installation of new aboveground fuel storage tanks (ASTs) and a new Waste Oil UST located at the City's Public Works Yard (45 Municipal Street, Guelph, ON).

The project team for the aforementioned work comprised of staff from the City of Guelph, GHD Contractor Limited (Consultant/ Prime Contractor) and Cannington Construction Limited (Sub-Contractor to GHD), and was structured as follows:



Note: This was a "design-build" project awarded to the GHD Contractor Limited via a competitive Request for Proposal (RFP) process.

The City of Guelph Project Team consisted of:

- Prasoan Adhikari, City's Environmental Engineer with over 16 years of experience in civil and environmental engineering assumed the role of the Project Manager (PM).
- Terry Gayman, City's Manager for Infrastructure, Development and Environmental Engineering (now the City Engineer/General Manager) with 16 years of experience in civil and environmental engineering assumed the role of Alternate Project Manager.
- Tim Donegani, City's Policy Planner (no longer with the City) with over 11 years of experience in Planning, which includes leading City's Brownfield Community Improvement Plan assumed the role of a Project Planner.
- The City's communication staff

The Consultant/ Contractor Project Team included:

- GHD's PM: Shannon Richardson, P. Eng. with over 20 years of experience in managing environmental projects in Canada and the USA was the Consultant's/Contractor's PM for the project.
- GHD's Alternate PM/Project Coordinator: Jason Bergsma, P. Eng. with over 10 years of experience in managing environmental projects in Canada and the USA was the Consultant's/Contractor's PM for the project.
- Cannington Construction Limited: was retained as a subcontractor by GHD to complete the construction activities (old fuel tanks removal, new tanks installation, remedial excavation etc.) at the Site.
- Other Subcontractors: included utility locator, driller, analytical laboratory, waste hauler, field supplier etc.

2. The Feasibility Study

Site Background: The Site, approximately 2.6 hectares (6.4 acres) in size, is operated as a public works yard since 1950s. The Site is occupied by a 3,465 square metre (37,300 square foot) building located in the centre of the Property (Maintenance Building), a 2,305 square metre (24,810 square foot) building in the eastern portion of the Property (Sand and Salt Storage Building), and three small ancillary buildings used for equipment storage. A private fuel outlet and dry pad mounted electrical transformer are located west and south of the Maintenance Building, respectively. The western portion of the Property is currently utilized primarily for vehicle parking.

Land use surrounding the Site is mixed (municipal, parkland, vacant, and industrial). There are no surface water bodies at or near the Site. The closest water body to the Site is the Speed River, approximately 460 metres north of the Site (refer to the Site Location Map attached herewith).

Purpose of the Environmental Works: The main purpose of this project was to complete the decommissioning of the existing USTs located at the Site (see below); complete the environmental investigations, source water assessment/risk management plan, removal and remediation of the USTs location; and design, supply and installation of new ASTs and a waste oil UST.

There were three USTs associated with the fuelling operations at the Site since 1970s, which were decommissioned:

- A 25,000 L, fiberglass, double walled, gasoline UST installed in 1996 (replacing one single walled 22,700 L steel UST originally installed in 1976);
- A 25,000 L, fiberglass, double walled, diesel UST installed in 1996 (replacing one single walled 22,500 L steel UST originally installed in 1976); and
- A 22,700 L, steel, singled walled, coloured diesel UST installed in 1976 with anode corrosion protection.

There was also a 251 L Waste Oil UST, which was decommissioned, associated with the vehicle maintenance operations at the Site.

Project Approach/ Methodology: Based on the USTs decommissioning practices in 1976; age of the existing USTs (approximately 20 years ago; tanks installed in 1990s); type of the existing tanks (a single-walled steel tank), there was a concern that the USTs could be leaking and impacting the soil and groundwater within and around the Site. Additionally, the Site is located in a close proximity to the municipal drinking water well (Edinburgh Well). Hence, to ameliorate the potential environmental concerns and the need for the tanks to be upgraded to current standards and regulations, the City undertook the following environmental/source water protection studies and remedial activities at the Site:

- Phase One Environmental Site Assessment (ESA) of the Site

- Phase II ESA (Subsurface Investigation) based on the findings of the Phase One ESA
- USTs, Associated Piping, Pump Island, and Ancillary Equipment Decommissioning
- Remediation, and UST Closure Assessment
- Risk Management Plan for the Site as per the Source Water Protection Program

The additional non-environmental work included:

- Feasibility Study for New ASTs Sites/Locations
- Geotechnical Study for the New ASTs Location
- Design, Supply and Complete Installation of one AST and one Waste Oil UST
- Drainage Study and Environmental Compliance Approval (ECA) for new stormwater works associated with the new fuel station

Stakeholder Consultation: The following key internal and external stakeholders were consulted prior to initiating the project:

- Internal stakeholders included City's Engineering and Transportation Services (project management and working at Public Works Yard), Legal Services (contract/agreement with the Consultant/Contractor); Facilities Services, and Senior Leadership Team (for approval), and Councillors (information and budget).
- External stakeholders included consultant/contractor (GHD and Cannington), who were consulted to develop a scope of work and/or to complete the project; Technical Standards and Safety Authority (TSSA); and the Ministry of Environment, Conservation and Parks (MECP), who were notified of the Project work.

3. Feasibility Study Findings and Recommendations

The summary of findings of the aforementioned environmental assessments; Risk Management Plan (Source Water Protection Program); and Remediation within and around the old USTs are as follows. Included with this report is a photo log of the work undertaken at the Site.

Phase One ESA (per O. Reg. 153/04, as amended): The Phase One ESA identified the following 10 on-site and off-site Area of Potential Environmental Concerns (APECs):

APEC	Potentially Contaminating Activities (PCA)	Location of PCA	Contaminants of Concern Note	Media Potentially Impacted
APEC#1: Historical Off-Site Land Use (North)	<ul style="list-style-type: none"> Transformer Manufacturing, Processing and Use 	Off-Site: North Property boundary	PHCs, PCBs	Groundwater
APEC#2: Current and Historical Off-Site Land Use (East)	<ul style="list-style-type: none"> Gasoline and Associated Product Storage in Fixed Tanks Operation of Dry Cleaning Equipment (where chemicals are used) Transformer Manufacturing, Processing and Use 	Off-Site: East Property boundary	PHCs, PCBs, VOCs, BTEX, metals	Groundwater
APEC# 3: Current and Historical On-Site Fueling Operations	<ul style="list-style-type: none"> Gasoline and Associated Product Storage in Fixed Tanks 	On-Site: South-central	PHCs, BTEX, Metals	Soil and Groundwater
APEC#4: Historical Off-Site Land Use (South)	<ul style="list-style-type: none"> Gasoline and Associated Product Storage in Fixed Tanks 	Off-Site: South Property boundary	PHCs, BTEX, Metals	Groundwater
APEC#5: Historical On-Site Releases	<ul style="list-style-type: none"> On-Site Releases 	On-Site: Central	PHCs, BTEX, Metals, ABNs	Soil and Groundwater

APEC	Potentially Contaminating Activities (PCA)	Location of PCA	Contaminants of Concern Note	Media Potentially Impacted
APEC#6: Unknown Fill Quality	<ul style="list-style-type: none"> Importation of Fill of Unknown Quality 	On-Site: Property wide	Metals, ABNs, PAHs, PHCs, VOCs	Soil and Groundwater
APEC#7: Dry Pad Mounted Electrical Transformer	<ul style="list-style-type: none"> Transformer Manufacturing, Processing, and Use 	On-Site: South-eastern	PHCs, PCBs	Soil and Groundwater
APEC#8: Current and Historical Vehicle Maintenance and Repair Operations	<ul style="list-style-type: none"> Gasoline and Associated Product Storage in Fixed Tanks 	On-Site: Central	PHCs, VOCs, ABNs, PAHs, Metals	Soil and Groundwater
APEC#9: Current Salt Storage and Management	<ul style="list-style-type: none"> Salt Manufacturing Processing and Bulk Storage 	On-Site: Eastern	SAR, Cl, Na, EC	Soil and Groundwater
APEC#10: Generator Building	<ul style="list-style-type: none"> Gasoline and Associated Product Storage in Fixed Tanks 	On-Site: North-central	PHCs, BTEX	Soil and Groundwater

Note: **ABN**- Acid, Base, and Neutral; **BTEX**- Benzene, Toluene, Ethylbenzene, and Toluene; **Cl**- Chloride; **EC**- Electrical Conductivity; **Na**- Sodium; **PAHs**- Polycyclic Aromatic Hydrocarbons; **PCBs**- Polychlorinated Biphenyls; **PHC**- Petroleum Hydrocarbons; **SAR**- Sodium Adsorption Ratio; **VOCs**- Volatile Organic Compounds

Phase II ESAs (per CSA Z768-01): Based on the findings of Phase One ESA, a total of 33 boreholes, of which 14 were converted into monitoring wells, were advanced at the Site to investigate the APECs identified within and around the Site between September 2017 and December 2019 (i.e. before and after the USTs were removed from the Site).

All soil and groundwater data were compared to the Full Depth Generic Site Conditions Standards for coarse grained soil in a Potable Ground Water Condition (Table 2 Standards).

Soil Quality Results:

- Zinc, SAR, ethylbenzene, and PAHs were detected in soil above their associated Table 2 Standards at one or more locations.
- APECs exhibiting exceeding soil concentrations include APEC #3 (Current and Historical On-Site Fuelling) where elevated ethylbenzene was detected, APEC #9 (Current Salt Storage and Management) where an elevated SAR was detected,

and APEC #10 (Generator Building) where elevated concentrations of select PAHs were detected.

- The source of the elevated zinc concentrations (BH3-17: by the Waste Oil Tank and BH10-18: by the Salt Offload Area) is not known.
- UST decommissioning activities resulted in the excavation and off-Site disposal of ethylbenzene soil exceedances at BH2-17 and clean closure of the USTs was achieved.
- Soils exhibiting concentrations above their associated Table 2 standards appear to be localized and are positioned beneath asphalt which would prevent human and ecological direct contact with contaminated soils. Further, groundwater quality does not exceed the Table 2 Standards for any of the soil parameters detected at elevated concentrations. As such, soils do not appear to be acting as a source of groundwater impairment.
- The Membrane Interface Probe (MIP) survey did not identify any significant sources of chlorinated solvents in the vicinity of MW7B-18, where chlorinated solvents were detected marginally above the groundwater standards.

Groundwater Quality Results:

- Sodium was detected above the Table 2 Standard at monitoring well MW8B-18 located in the vicinity of the former fuelling operations but was not detected above the Table 2 Standard at other wells, including those positioned downgradient of MW8B-18.
- Chloroform was detected at the east property boundary in November 2018. Subsequent sampling of the affected well (MW7B-18) indicates chloroform concentrations at or below the Table 2 Standard, based on three consecutive monitoring events.
- Tetrachloroethene (PCE) was detected at the east property boundary in November 2018. Subsequent sampling of the affected well (MW7B-18) indicates fluctuating concentrations of PCE above and below the Table 2 Standard. PCE was not detected above the Table 2 Standard in monitoring wells upgradient (MW11B-19) or downgradient (MW10B-19) of monitoring well MW7B-18 or in soils in the vicinity. The source of the PCE is not known.

Remediation, and UST Closure Assessment (May 2019):

The following activities were completed at the Site by Cannington (a TSSA licensed petroleum contractor operating under License Number FS R0029721001) as part of the tank closures:

- Removal and off-site disposal of four USTs installed in the 1990s, including 25,000 litre (L), fiberglass, double walled, gasoline UST; one 25,000 L, fiberglass, double walled, diesel UST; one 25,000 L, fiberglass, double walled, coloured diesel UST; and one 2,200 L, steel, double walled, and one 251L waste oil UST

- Removal of associated underground and aboveground piping and fuel dispensers
- Excavation and off-Site disposal of petroleum impacted soil. In total, 1,586 tonnes of impacted soils were excavated, direct loaded into trucks, and transported off-Site to GFL's Dorchester, Ontario facility for appropriate treatment, if required, and disposal.
- Backfilling and compaction of the UST excavation with Site soils and imported granular fill material from a virgin source (Lafarge Guelph Yard located at 7051 Wellington Road 124, Guelph)
- Restoration of the UST excavation and adjacent areas

The following environmental engineering consulting services were completed at the Site by GHD as part of the tank closures (also known as a Closure Assessment):

- Oversight of UST removals
- On-Site inspection and field screening of soils for petroleum impact during UST removals
- Collection and chemical analysis of confirmatory soil samples from the in-situ soils at the base and sidewalls of the excavation (total 19 samples, which includes one duplicate sample) and the stockpiled Site soils (three soil samples) used as backfill material. Soil samples were submitted to an accredited laboratory for analysis of PHC fractions (F1 to F4); BTEX; methyl tertiary butyl ether (MTBE), and lead.
- The confirmatory soil and stockpile sample results were either not detected at concentrations above the laboratory reporting limit or were detected at concentrations below the applicable Table 2 Standards. It is noted that in all cases, the laboratory reporting limit was below the applicable soil quality standard. As such, the clean closure of the USTs was achieved.

Risk Management Plan per Source Water Protection Program (August 2020):

A Risk Management Plan (RMP) is a legally binding instrument that is negotiated and agreed to by the person, or business who is, or will be, engaged in the activity(ies) that is(are) a significant threat to drinking water, and the Risk Management Official (RMO). The Clean Water Act (CWA 2006) and Ontario Regulation 287/07 describe the legal requirements of a RMP and the responsibilities of municipalities, the RMO and Risk Management Inspectors (RMIs), and the Source Protection Authority (Grand River Conservation Authority in the City's case) in implementing and enforcing RMPs.

The RMP describes existing and proposed risk management measures that are to either continue or are to be put in place to provide confidence that the identified threat activity will cease to be or not become a significant threat to drinking water. The risk management measures included best management practices and consider the potential financial impact on the person who is, or will be, engaged in the activity(ies), or their business.

For further details on City of Guelph's RMP, refer to the [City's Guidance Document for Preparing Risk Management Plans, 2016](#)

The Site operations required a RMP in accordance with the Grand River Source Protection Plan Policies for the handling and storage of dense non-aqueous phase liquids (CG-CW-37) and fuel (CG-CW-34).

The objectives of the RMP are:

- To document a binding agreement between the City and the Landowner/Operator (City's Public Works Department in this case) to describe activities/circumstances on the Site and the existing or proposed risk management measures to be implemented to manage the activities/circumstances such that they cease to be or do not become a significant drinking water threat to the municipal drinking water sources for the City.
- To document the responsibilities of the Landowner/Operator (City's Public Works Department) in implementing the RMP.
- To document the role of the City in enforcing the RMP using tools/powers provided under Part IV of The CWA, 2006.

The RMP for the Site is comprised of the following key documents and requirements based on the existing Site activities:

- List of chemicals/products handled/stored on-site.
- 2017 Liquid Fuel Handling Code
- Environmental Compliance Approval for the existing stormwater management works (e.g. oil and grit separator) at the Site and Monitoring Requirements
- Stormwater Management Operations Manual
- Standard Operating Procedure for the Site activities
- Environmental Reports for the Site
 - Historical Environmental Assessment Reports
 - Conceptual Source Water Protection Assessment
 - Phase One ESA
 - Phase II ESA
 - UST Closure Report
- Site Specific Health and Safety Plan
- Spill Prevention and Control Plan and Emergency Response Plan
- Salt Management Plan

Environmental and Financial Findings:

The key environmental benefits and financial findings of this project can be categorized into the following four categories:

No.	Environmental	Financial
I.	<p><u>Environmental condition of the Site:</u> The Phase II ESA completed at the Site provided the environmental health of the Site (i.e. existing soil and groundwater conditions), which indicated low-level impact in the soil and groundwater but not to the extent that was anticipated based on the use of the Site as a Public Works yard since 1950s.</p>	<p>Shallow Boreholes (BH)/Monitoring Wells (MW) did not yield any water; as such deeper MWs had to be installed, which added approximately \$24,000 to the Phase II ESA to install 10 MWs in the bedrock.</p>
II.	<p><u>Remediation of the USTs area:</u> The timely decommissioning of the USTs and remediation around the tanks showed no soil or groundwater impact indicating that there were no releases or spills from the tanks, which lead to the clean closure of the USTs.</p>	<p>Since no impacts were found in the soils within and around the USTs location, there was a cost saving (exact cost unknown) in the remediation of the area.</p>
III.	<p><u>Replacement of old USTs with new ASTs:</u> With the exception of waste oil tank, all other tanks were replaced with one AST with three compartments, one each for gasoline, diesel and colored diesel. The new AST would reduce the risk of potential leaks from the USTs. A faster response to leaks or spills for AST decreases the chance of soil and/or groundwater contaminations as well.</p>	<p>This task was about 86% (\$1.3 million) of the project cost. Since the replacement tank is an AST, the future environmental and/or remediation/risk assessment cost, in case of release or spill, will be much less in comparison to the USTs.</p>
IV.	<p><u>Risk Management Plan for the Site activities:</u> The completion of RMP for the Site in accordance with the CWA, 2006 describes activities/circumstances on the Site and the risk management measures to be implemented to manage the activities/circumstances such that they cease to be or do not become a significant drinking water threat to the municipal drinking water sources for the City.</p>	<p>This task may have added some operational cost to implement the best management practices above and beyond the current practices but in the long-term the potential increase in the operational cost would be significantly lower than the cost of mitigating any threats to the City's drinking water resources.</p>

Public Sector Accounting Standard's (PSAB) PS 3260- Liability for Contaminated Sites: The purpose of this standard is for all levels of government to identify, assess, and report on liabilities that exist when contaminated sites exceed environmental standards. As such by completing the aforementioned works the Site may no longer be included in the City's PSAB's PS 3260 list, which means that the cost of environmental remediation or risk-assessment will not be included in the City's liabilities and expenses.

Future Site Development: In the future, if the City decides to move the Public Works yard to a different location, and sell the property to a private developer for a residential development; the environmental cost to complete Phase Two ESA (as per O. Reg. 153/04, as amended), risk assessment, implementation of risk management measures, Record of Site Condition filing with the MECP etc. could be up to \$400,000.

4. Lead Applicant's Next Steps

The following could be deemed the key recommendations and benefits for the Site:

- The findings of the ESAs have provided the environmental baseline for the future Site development.
- The ongoing groundwater and stormwater infrastructure (oil-water and oil-grit separators) monitoring can ensure no future impairment of groundwater from the Site activities.
- The undertaking of several studies/investigations to create a RMP for the Site have required several BMPs to be implemented, which will ensure that there is no significant drinking water threat to the City's water resources from the Site activities.

5. Lessons Learned

Some of the key lessons learned from this project:

- This project was in the making for over a year. During the planning phase, we estimated the cost to complete the project internally; so that the costs received in response to the RFP were within our estimated budget.
- We were aware that the majority of the cost for the project would be associated with the new AST and since the City had no internal expert on fuel tank installation, the project was advertised as a "design & build" project. In doing so, the majority of the project risks were assigned to the prime contractor.
- Retaining a single firm to complete all aspects of the project (environmental, source water protection, tank removal/installation, geotechnical, stormwater water studies etc.) avoided scope creep, cost overrun and schedule delay (to some extent).
- The Site is located in a Well Head Protection Area (WHPA)-B with Vulnerability Scores (VS) of 8 and 10; so, in the execution phase of the project, we avoided the area with VS of 10 for the new tank location, and in doing so avoided all the additional risk management measures that came with it.

Some of the key challenges associated with the project are as follows:

- Relatively longer timelines associated with the project; for instance, the Phase One ESA commenced in November 2017 and completion of the Project Site continued into the August of 2020 because of Site constraints (existing Public Works yard), need for an additional Phase II ESA, a long lead-time associated with the new AST, weather conditions, internal review times associated with all the reports (including detail design), among others.
- As the Site is a Public Works yard, the project did interrupt the normal functioning of the Site. For instance, the western portion of the Site, including one of the access gates, was impacted because of the location of the new AST (southwester corner of the Site) and the need for access to the construction vehicles and equipment. Also, there was an impact to the vehicle maintenance building, as two of the three maintenance pits had to be temporarily shut down because the restricted access due to the extent of UST remedial excavation.
- The source of low-level Chlorinated-VOCs noted at the east property boundary has not been identified yet.

Some of the key benefits to the City and potentially other municipalities:

- The approach, experience gained and lesson learned from this investigation can be best utilized to build capacity to manage other similar sites in the City.
- Other municipalities with similar projects could benefit from the City's experience, as the City can share information such as: notification and coordination with internal City staff, early and regular consultation with the

regulators, involvement with the consultant to scope out the work; regular oversight of consultant's work; regular meetings on project status, progress, and future activities; detail review and timely approval of change orders; comprehensive review and comments on consultant's draft reports, designs and drawings; among others.

6. Knowledge Sharing

It has always been the City's intention to make the information obtained from this project available to other municipalities. Also, if there is an interest, the City is willing to highlight the project through an FCM webinar or workshop.

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