PROPOSAL

PRESTRESSED CONCRETE CYLINDER PIPE (PCCP)

CONTRACT No. 19

30-36-inch PCCP

Prepared for:

City of Billings, MT

Prepared by:

Pure Technologies U.S. Inc.

600 West Broadway, Suite 500

San Diego, CA 92101

August 8, 2019

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Introduction

The City of Billings (the "City") is seeking to proactively assess the structural condition of Contract 19 transmission main ranging from 30 to 36 inches in diameter. The transmission main originates at the City's High Service Pump Station and transmits 100% of the drinking water to the City of Billings. Since this critical transmission mains has not been inspected in the past, the City requested that Pure Technologies U.S. Inc. ("Pure Technologies") review the available pipeline data and provide a proposal for assessing the pipeline with the highest risk of failure.

The City provided Pure Technologies drawings and specifications for the pipeline design contract (Contract 19). The total combined footage for the pipeline is 2.74 miles. Unfortunately, the pipeline was produced in an era when manufacturers used Class III and Class IV wire which is known in many cases to have reduced tensile strength and cause premature pipe failures in prestressed concrete cylinder pipe (PCCP).

This proposal presents a recommended scope of engineering and supporting inspection services to address condition assessment on Contract 19, by the use of SmartBall in-line acoustic technology for detection of leaks and air pockets, and PipeDiver electromagnetic in-line inspection technology for detection of wire breaks.

Pure Technologies U.S. Inc.

Pure Technologies specializes in the condition assessment of critical pipeline infrastructure – supported by proprietary technologies developed for inspection of pressure pipelines, including water mains and wastewater force mains. Since 1993, Pure Technologies has been a world leader providing non-destructive testing and monitoring technologies to better understand the condition of critical pipeline infrastructure. We have performed inspections on over 16,000 miles of medium and large diameter water pipelines and more than 800 miles of wastewater force mains for more than 120 utilities worldwide. Excavations of pipe sections identified as problematic through Pure Technologies' inspection methodologies have validated our technologies and capabilities to assess pipeline infrastructure.

Our philosophies with respect to managing critical pressure pipelines include:

1. ***"Assess and Address":*** Pure Technologies strives to maintain existing pipelines (rather than recommend their replacement) through an "Assess and Address" approach. Performing condition assessment and repairing only individual pipes that need repair can safely extend the service life of pipelines and provide significant cost savings. On average, a comprehensive condition assessment and repair program can typically be implemented for less than 10% of the capital costs to replace a pipeline.

2. ***Return on Investment***: One of Pure Technologies' key philosophies is that the project should provide "reliable" and "actionable" data and information with tangible benefits. If this is accomplished, the City will easily recognize a return that is far greater than their investment and gain the public's confidence, especially if any one of these three key benefits is realized:

    i. *Averting Pipe Failure*: Identify what immediate repairs are necessary to avert imminent pipeline failures.

ii. *Extending the Life of Pipelines*: Without an understanding of the condition of a pipeline asset, many utilities have prematurely replaced pipelines. EPA has estimated that 70% to 90% of the pipe removed from the ground has remaining life. Condition assessment and subsequent targeted repairs should provide confidence in a pipeline to extend its service life.

iii. *Improved Capital Planning*: Understanding the condition of a pipeline will provide significantly improved capital planning recommendations for future pipeline management and renewal projects.

3. ***Obtaining a Comprehensive Assessment***: Obtaining a comprehensive assessment, especially for high risk pipelines, is important. Other case studies have demonstrated that too much emphasis can be placed on pursuing an inexpensive condition assessment program while overlooking the level of actionable information that can be obtained. *The least expensive technology may not provide the best value or most cost-effective pipeline solution.* If an inspection does not provide sufficient, defensible, or actionable data, it can lead to pipeline failures or incorrectly allocated capital funds replacing the wrong pipelines at the wrong time; easily eliminating the savings that were expected by deploying a less expensive condition assessment tool. According to an American Water Works Association Research Foundation Study, the average cost of a large diameter pipeline failure is $500,000 to $1,500,000. The costs can be significantly higher in urban areas.

4. ***Risk Based Condition Assessment*:** Pure Technologies is a firm believer that a risk-based approach should be used to perform condition assessment and of critical pipelines. There is no silver bullet technology that applies to all pipelines. In general, low resolution technologies are appropriate for low risk pipelines. However, for high risk pipelines, a high degree of reliability is essential and higher resolution tools are prudent to provide a more comprehensive understanding of the pipeline.

COMPENSATION METHOD

Payment Schedule

Service	Invoicing Period
Project Planning & Mobilization	Upon Completion of Inspection
Inspection and Analysis	Upon Completion of Inspection
Final Report	Upon Completion of the Final Report

SCHEDULE

The approximate timeline of the SmartBall and PipeDiver inspection will be 5 days. One day to mobilize all equipment to site, one day for set-up, one day each for inspection using SmartBall and PipeDiver technologies including demobilization, with an additional contingency day.

Proposed Scope of Services

Phase 1: Site Reconnaissance and Project planning Document

The proposed condition assessment of Contract No. 19 30-inch and 36-inch prestressed concrete cylinder pipe (PCCP) lined cylinder pipe (LCP) water transmission main, will cover approximately 2.74 miles. Pure Technologies will conduct a site reconnaissance, review existing pipeline drawings, design specifications, hydraulic conditions, manufacturing and installation details which will be used in planning the inspection and the engineering analysis.

All information will be used to develop a comprehensive Planning Document for the condition assessment of Contract No. 19. The written Planning Document will be submitted to the City in advance of performing any field work. The Planning Document will clearly detail how the condition assessment for the main will be carried out and will, at a minimum, include:

- Background information on the pipe: As-built records, failure history, operating information and areas of greatest concern.
- Proposed assessment methodologies: Technologies and methods to be used to assess the main.
- Access requirements: What access points will be needed for assessment?
- Detailed scope of field work.
- Schedule.
- Action items for all parties involved.

Any changes to the scope that arise in the planning process which impact the pricing in this proposal will be discussed with the City of Billings and mutually agreed to before proceeding.

An aerial view showing the approximate location of Contract No. 19 water transmission main is presented in Figure 1 below.

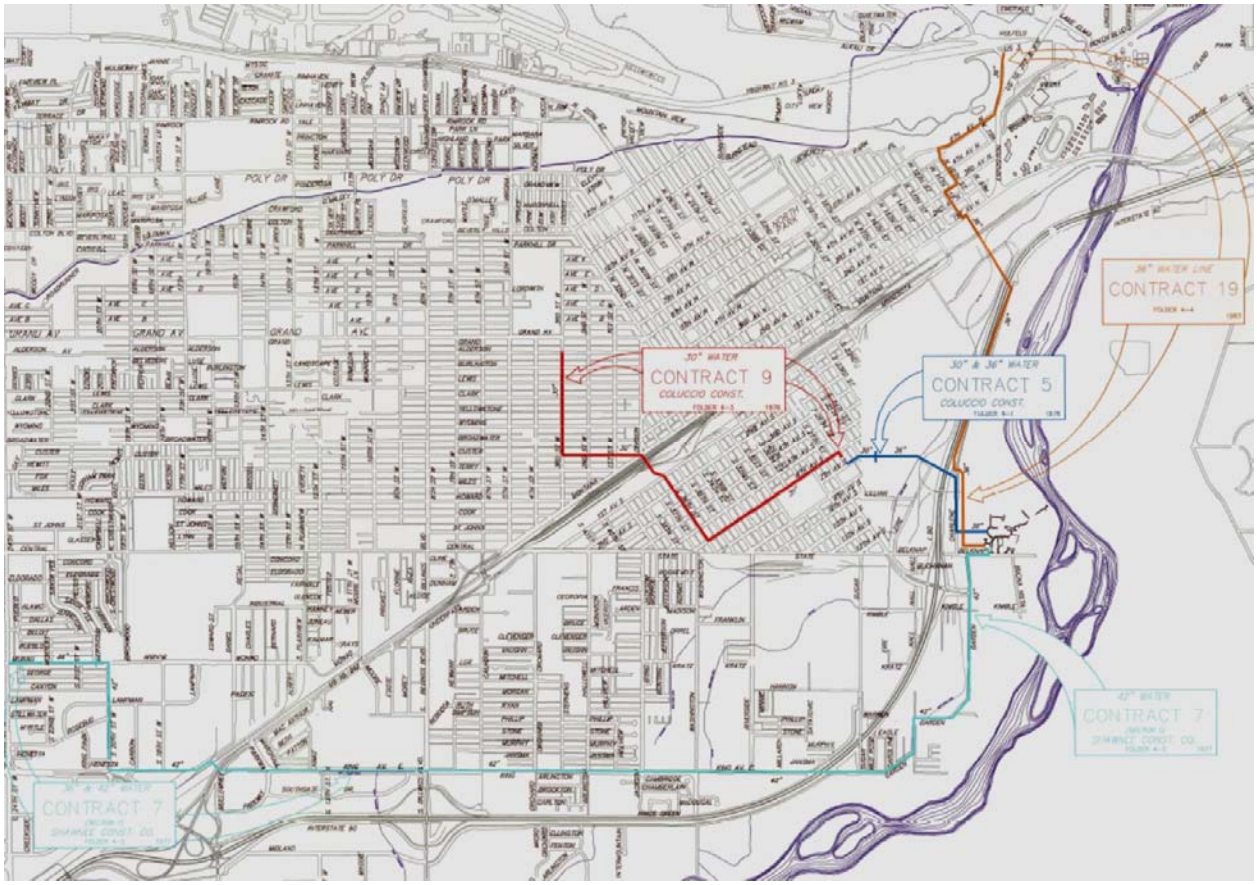

Figure 1: Approximate Location of Contract No. 19 Water Transmission Main

Phase 2 – Transient Pressure Monitoring

An important aspect of any pressure pipeline condition assessment is the evaluation of pipeline pressures, specifically transient pressures, and their impact on the structural capacity of a pipe. While most pipelines operate well below the design capacity of the particular pipe material, when pipe wall degradation due to various failure modes is combined with either the operational pressure and/or surge pressure, the likelihood of failure can be significantly increased.

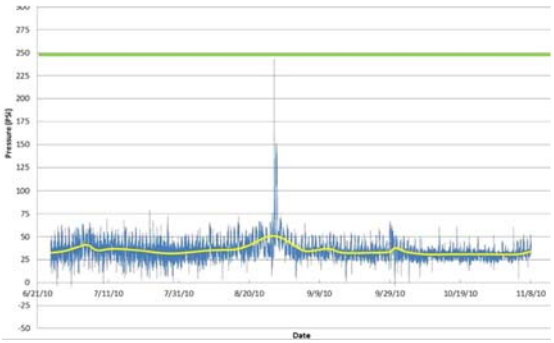

Figure 2: Transient Monitoring Event

Pure Technologies will furnish and install a transient pressure monitoring device on the 36-inch pipeline during the time the site reconnaissance is performed. This will allow Pure Technologies an opportunity to have transient data in advance of the field inspection and incorporate results in the final report.

Pure Technologies can install the temporary monitoring device near the water treatment plant. The City will need to furnish a ¼" or ½" threaded outlet.

Phase 3 – SmartBall® Leak and Air Pocket Detection

As part of the baseline inspection, Pure Technologies typically inspects each pipeline for leaks and pockets of trapped gas. Whereas leaks indicate an obvious concern, air pockets can also become a major concern often restricting flow capacity in a pipeline.

Because the sound created by leaks in large diameter pipelines attenuate much more rapidly (versus smaller diameter pipe), conventional external leak detection using listening mics and correlators is typically not feasible. Transmission mains also do not provide a sufficient number of "touch" points at which external listening mics or correlators can detect most leaks.

Because of these limitations associated with conventional external leak detection, Pure Technologies utilizes an internal acoustic leak and gas pocket detection technology that allows the acoustic sensor to pass directly by a leak. Given the sensitivity of the internal acoustic system, Pure Technologies has been able to detect leaks less than 0.1 gallons per minute. The internal acoustic leak detection systems require a minimum operating pressure in the pipeline of 15 to 20 psi. The higher the pressure in the pipeline, the lower the detection level. The pressure does not affect the technologies' ability to detect gas pockets.

Pure Technologies can deploy the internal acoustic technology using a free-swimming device called "SmartBall®." For long distance lines such as the proposed potable water main, the SmartBall® free-swimming device provides a cost-effective approach.

Pure Technologies' patented SmartBall® technology is a free-swimming device that consists of a foam ball that envelops a water-tight aluminum sphere (approximately 2-½ inches in diameter) that contains instrumentation and a power source. The inner core contains the battery power source, as well as an acoustic sensor, microprocessor, ultrasonic transmitter to track the device, an accelerometer to measure the rotation of the ball and a magnetometer to assist in identifying features along the pipeline.

Figure 1: SmartBall and SmartBall Tracking System.

The device is inserted into a live and flowing pipeline and released to allow the flow to roll it downstream. The SmartBall is designed to roll on the bottom of the pipe, which allows the accelerometer to record the rotations of the device, which in turn aides in establishing its velocity and placement of the device at any given time during the survey.

The compressible foam outer ball allows for insertion through any existing 4-inch diameter outlet. If a pressure tap is required, Pure recommends that a 6-inch access be provided. The outer foam material deadens any sound the tool may make while rolling on the bottom of the pipeline and provides mass by

which the device is pushed by the flow of the water. While the ball is traversing the pipeline, it continuously records all acoustic activity in the pipeline.

Pure Technologies utilizes proprietary SmartBall tracking receivers (SBR's), shown in Figure 2, to track the location of the device as it travels through the pipeline. The SBR's utilize a small sensor that is applied to the outer surface of a metallic surface in direct contact with the fluid column.

Once the SmartBall is retrieved, the recorded data is downloaded and analyzed by experienced data analysts. The SmartBall device can identify and locate leaks in water pipelines larger than 6-inch diameter constructed of any pipe material. The device can also pass through in-line valves (including butterfly valves > 10-inch) and negotiate unlimited bends and slopes in the pipeline.

In addition to identifying and locating all leaks along a pipeline, the SmartBall will identify and locate all gas pockets in the pipeline. Whereas the benefits of finding and repairing leaks is obvious, many utilities have become more aware of the importance of eliminating gas pockets in the line, as they can reduce capacity in the line and increase energy consumption required for pumping. Gas pockets will also exacerbate the effect of any transient events that may be occurring in a pipeline.

Because signals generated by electromagnetic inspection of prestressed concrete cylinder pipe (PCCP) may be partially masked at the joint rings where the metallic mass increases due to the thicker steel bell and spigot that overlap, the SmartBall will identify if any leaks have occurred at the joint due to a rolled gasket, a slightly opened or pulled joint and/or possible corrosion through the cylinder because of poor exterior mortar protection and/or a poor quality weld between the steel cylinder and thicker joint rings.

Phase 4 – PipeDiver Electromagnetic (EM) Inspection

One of the most important steps in pipeline management is to obtain a detailed understanding as to the structural integrity of the pipe. Electromagnetic (EM) inspection is a proven and reliable technology that detects structural anomalies on both prestressed concrete cylinder pipe (PCCP) and bar- wrapped pipe (BWP).

Specifically, the EM technology detects wire breaks on both "lined" and "embedded" PCCP, thereby identifying areas of concern where the structural capacity of the pipe may be degraded.

Pure Technologies will detail the proposed procedures, schedule and required logistics support required by the City, in the detailed Project Planning Document. PipeDiver is a non-tethered inspection platform for in-service pressurized pipelines.

Figure 3: PipeDiver Free-swimming Electromagnetic Inspection Tool

PipeDiver utilizes electromagnetic sensors to identify, quantify and locate (longitudinally) wire breaks on each individual pipe. The PipeDiver can be inserted into the pipeline either through a minimum 12-inch flanged outlet or in a depressurized section of the pipe. Travelling at 90% the flow rate of the water, the neutrally buoyant inspection vehicle can navigate most bends and valves and collect data for long deployments on a single battery charge. The PipeDiver houses Pure Technologies' electromagnetic inspection technology providing the location and quantification of broken prestressing wires.

Phase 5 – Condition Assessment, Risk Analysis and Report

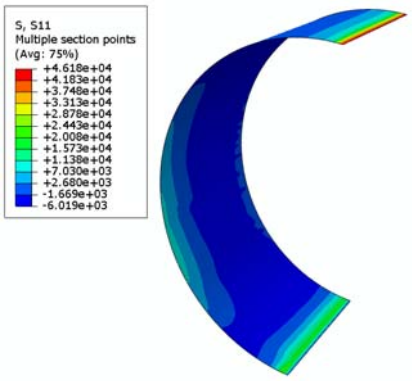

Figure 5: Pipe Wall FEA Modeling

While the inspection technologies described above will provide data on wire breaks and potential areas of cylinder corrosion on PCCP and BWP, the challenge associated with assessing and managing BWP and PCCP is determining how many broken prestressing wires (PCCP) or reinforcing bars (BWP) creates an unacceptable level of risk thereby requiring repair and/or replacement actions. Pure Technologies has developed an innovative approach for condition-based pipeline management using structural models along with hydraulic evaluation data, ultimately delivering a comprehensive decision making tool for the management of a BWP and/or PCCP pressure main. For example, wire breaks in BWP or PCCP may be present, but this may not require the immediate rehabilitation or replacement of the pipe section allowing the City to manage and/or monitor the deterioration, thereby focusing critical resources on higher risk areas of the infrastructure.

The culmination of this phase will be to submit a condition assessment report identifying distressed pipes of concern (based on likelihood of failure) and recommendations. Pure Technologies will also conduct a workshop with the City to review all inspection structural evaluation findings and recommendations.

Based on the findings of the Condition Assessment Report and the outcome of the workshop discussions, the following tasks may be warranted:

- Pure Technologies will provide a structural analysis of Contract No. 19 30-inch and 36-inch "lined" PCCP as compared to AWWA specifications of AWWA C301.
- Pure Technologies will develop one (1) Pipe Performance Curve to determine how many broken prestressing wires (PCCP) creates an unacceptable level of risk thereby requiring repair and/or replacement actions.

Final Report

Pure Technologies will evaluate the risk, based on likelihood of failure, associated with any distressed pipe identified as part of the EM inspection. All inspection findings, documentation, photographs, video recordings (as applicable), structural analysis, performance curves and recommendations will be included in the final written report to be presented in a workshop with the City.

Based on the findings of the Condition Assessment Report and the outcome of the workshop discussions, the following tasks may be warranted:

Phase 6 - Optional Field Verification/Validation, and Report

Based on the risk evaluation, Pure Technologies may recommend that the City excavate a representative sampling of distressed pipes to verify and validate the EM inspection results.

The test pit excavations will require the City to expose an entire pipe section(s), whereby Pure Technologies can utilize an exterior PipeScanner™ tool to verify wire breaks on the pipe.

Pure Technologies will perform a visual inspection of the pipe exterior and measure various parameters (spacing of prestressing wire, etc.) to confirm if the pipe was manufactured in accordance with AWWA designs standards.

A report summarizing the verification inspection methodology and results shall be submitted within thirty (30) days following completion of field work.

City of Billings Responsibilities

- If no existing access points are identified during the site reconnaissance, the City of Billings may elect to tap the pipe to provide appropriate insertion and extraction requirements for SmartBall and/or PipeDiver.
- Provide personnel familiar with the pipeline system available during site reconnaissance and field work.
- Prepare pipeline for inspection – i.e., remove ARVs at access outlets, clear brush and undergrowth to allow access to the insertion locations, de-pressurize the pipeline at insertion and extraction locations as may be required to deploy and retrieve the PipeDiver.
- Provide threaded outlet for transient pressure monitoring device.
- Traffic control as required.
- Requirements and permits for disposal of water resulting from de-watering.
- Provide excavation/backfill of pipes selected for test pit excavations and field verification. Also provide air compressor and generator.
- Repair/rehabilitation of pipe(s).
- Provide access points along pipeline for tracking inspection tools (approx 2,000 to 4,000 feet apart).
- Provide access to the pipeline if the PipeDiver tool becomes stuck on one of the butterfly valves. Provide depressurization and dewatering as necessary.
- Provide proper ventilation.
- Safety plan will need to be reviewed at least two weeks prior to inspection

- Notification to any landowners as required.
- Provide personnel familiar with the pipeline system that are available during site reconnaissance and field work.
- Confined space entry and top support as applicable.
- Provide all available reference material including pipeline drawings, plant drawings, specifications, etc.

Fee Proposal

Contract No. 19 – Using Transient Pressure Monitoring, SmartBall ahead of PipeDiver, followed by Structural Evaluation:

Perform 14,456 feet/2.74 miles Inspection on 36- inch and 30-inch Pre-Stressed Concrete Cylinder Pipe (PCCP) Lined Cylinder Pipe (LCP).

Deliverable	Unit Cost	Quantity	Total
Transient Pressure Monitoring (install & data collection for 60 days)	$8,500	1	$8,500.00
SmartBall Mobilization: Includes Travel, Equipment Shipping, Site Reconnaissance and Project Planning Document	$3,265	1	$3,265.00
SmartBall Inspection	$3,558/mile	2.74 miles	$9,748.92
SmartBall Report: Inspection Results Analysis and Reporting	$10,500	1	$10,500.00
PipeDiver Project Setup (includes planning, site reconnaissance, equipment fees and prep, shipping travel, per diem, hotels, transportation, etc.)	$78,750	1	$78,750.00
PipeDiver Electromagnetic Inspection (no insertion tubes)	$75,750/mile	2.74 miles	$207,555.00
PipeDiver Inspection Report	$10,500	1	$10,500.00
***Structural Evaluation and Pipe Performance Curve**	$9,975 Per Curve	2	$19,950.00
Total			**$348,768.92**

** The number of curves required is determined based on the results of the inspection. Each distressed pipe of a different pipe class requires its own curve in order to perform a* structural evaluation.

Contract No. 19 – Using Optional External PipeScanner EM Inspection

External PipeScanner EM **Project Set** Up (Includes equipment costs, mobilization, and planning)	$12,600	1	$12,600
External PipeScanner EM **Inspection** (EM inspection of excavated pipe sections - multiple pipes under one mobilization)	$2,100 Per Pipe Section	TBD	TBD

Budgetary Notes:

1. The proposed fees are based on performing all work under a single mobilization for both technologies performed during the same time period and complete the work in a contiguous manner without delay. Pure Technologies assumes the pipeline will be available for inspection upon arrival of our inspection team.
    a. SmartBall standby rate for delays caused by others shall be billed at $5,250 per crew per day. A re-mobilization fee of $10,000 shall apply for SmartBall.
    b. PipeDiver standby rate for delays caused by others shall be billed at $15,750 per day. A re-mobilization fee of $37,500 shall apply for PipeDiver
2. The City will be billed on completion of deliverables as outlined in above table.
3. Field work schedule will be mutually determined by City of Billings and Pure Technologies.
4. Local, State or Federal permits or taxes are not included in the proposed fee.
5. The attached Conditions of Engagement shall apply (Attachment A).

Pure Technologies is committed to providing the City of Billings the highest quality assessment and inspection in an efficient and cost-effective manner. If you have any questions, please contact me at 720-212-4112.

Respectfully,

Roy L. Martinez
Business Development Lead
Cell: 720-212-4112

Attachment A: Conditions of Engagement

The Proposal is issued upon and is subject to these Conditions of Engagement. If the Proposal is accepted by the Client, these Conditions of Engagement and the Proposal will be deemed to form part of the Contract between the Client and Pure.

1. DEFINITIONS

In these Conditions of Engagement, the following definitions apply:

Client	Any person or persons, firm or company engaging Pure to provide the Services.
Contract	The agreement awarded to Pure as a result of the Proposal.
Pure	Pure Technologies Ltd., Pure Technologies U.S. Inc., Pure Engineering Services Inc., or any of their affiliates, as the case may be, which submitted the Proposal and is a party to the Contract.
Proposal	Pure's offer to carry out the Services and includes all related correspondence plus agreed written variations or amendments thereto.
Services	Those services of whatever nature to be supplied by Pure under the Contract.
Site	The facility, land, installation or premises to which Pure is granted access for the purposes of the Contract and may include any combination of the foregoing.

2. PURE'S OBLIGATIONS

2.1 Pure will perform the Services in accordance with the procedures described in the Proposal, using reasonable skill, care and diligence and consistent with industry standards.

2.2 Pure will ensure that the equipment used in performing the Services is in a good and functional state.

3. CLIENT'S OBLIGATIONS

3.1 The Client will provide to Pure full, good faith co-operation to assist Pure in providing the Services. Unless otherwise specified in the Proposal and without limiting the generality of the foregoing, the Client will at its own expense:

(i) ensure, if required, access to private land will be given to Pure and that any official permits or permissions required for Pure to have access to the Site or carry out the Services are obtained and are in force for the duration of the Services;

(ii) inform Pure in writing of any special circumstances or danger which the execution of the Services may entail or which are inherent in the Site, including the existence and identity of any known hazardous substance or material;

(iii) perform such additional duties and responsibilities and provide such information and resources as are described in the Proposal.

3.2 The description of the Services and related compensation amount set out in the Proposal will be based upon information that the Client shall have provided to Pure, and assumptions that Pure shall have identified in the Proposal. The Client acknowledges that if any such information provided by Client is materially incomplete or inaccurate, or if the assumptions identified by Pure are not correct, then the parties will modify the Proposal to reflect the actual information, assumptions, and Services required, and the compensation to Pure will be adjusted accordingly using the change order process set out in the Contract, or if there is no such process, on an equitable basis.

4. PROPRIETARY AND CONFIDENTIAL INFORMATION

4.1 All reports generated in the performance of the Services and delivered by Pure to the Client will become the property of the Client.

4.2 Pure's equipment which is made available to the Client in connection with the Contract and the raw data generated in the performance of the Services will remain the sole and exclusive property of Pure. The Client will not acquire any proprietary rights in Pure's equipment, systems, software, technology, inventions (whether or not patentable), patents, patent applications, documentation, specifications, designs, data, databases, methods, processes or know-how ("Pure's Proprietary Technology"). Any modifications or improvements to the Pure's Proprietary Technology made during the performance of the Services will be the sole and exclusive property of Pure.

4.3 Both parties agree to keep confidential all documentation and information provided by the other during the performance of the Contract. The obligations set out in this clause 0 will remain in full force and effect after any termination or expiry, as the case may be, of the Contract.

5. LIABILITY AND WARRANTIES

5.1 Pure will indemnify the Client against any expense, demand, liability, loss, claim or proceeding whatsoever in respect of personal injury to or the death of any person, or any loss, destruction or damage to any tangible property and arising directly or indirectly from the negligence of Pure, its employees, servants or agents except to the extent caused by the negligence of the Client or any person for whom the Client is responsible. The Client will similarly indemnify Pure.

5.2 Pure will not be liable for any loss of production, loss of use of property, loss of revenue or profit, equipment downtime, business interruption, loss of goodwill, loss of anticipated savings, cost of procurement of substitute goods or services, or for any consequential, indirect, incidental, or special loss or damage suffered by the Client or any third party, or for any punitive damages, even if advised of the possibility thereof and notwithstanding the failure of essential purpose of any remedy.

5.3 Pure's cumulative liability under the Contract, whether in contract, tort (including negligence), or otherwise, will in no event exceed the aggregate consideration paid by the Client to Pure for the portion of the Services that gave rise to the liability, provided, however, that this clause 0 shall not limit Pure's indemnification obligations under these Conditions of Engagement.

5.4 The report(s) and any other recommendations or advice made by Pure relating to the pipeline or the Services will be made in accordance with the procedures described in the Proposal, using reasonable skill, care and diligence consistent with industry standards, but do not and will not constitute a warranty of the pipeline's quality, capacity, safety or fitness for purpose. Pure will not be liable to the Client for any liability or damages that arise from the Client's reliance upon or application or use of such final report or recommendations or advice made by Pure in relation to the pipeline or Services, and the Client will indemnify Pure against any liability to third parties resulting therefrom.

5.5 Pure's warranties for the Services will be set out in the Contract. Pure disclaims all implied or statutory warranties or conditions, including of merchantability, merchantable quality, durability, or fitness for particular purpose to the extent allowed by applicable law. This means Pure's warranty obligations will be limited to what is expressly set out in the Contract.

Attachment B: Agreement Between City of Billings and Pure Technologies

Signing this Letter of Agreement, by each party, constitutes an agreement to provide and perform the services summarized within and is subject to the conditions of engagement. The initial term of this agreement is for 1-year.

This Agreement is entered into this, the ___ day of _____, 20___(the "Effective Date").

THE CONSULTANT	**THE OWNER**
Pure Technologies US Inc.	City of Billings
BY: _____	BY: _____
Myron Shenkiryk	(NAME)
_____	_____
Print Name	Print Name
TITLE: _____	TITLE: _____
DATE: _____	DATE: _____