ORDINANCE NO. 2013-3663

AN ORDINANCE TO AUTHORIZE THE EXPENDITURE AND DIRECT THE SAFETY SERVICE DIRECTOR TO ENTER INTO A CHANGE ORDER WITH THE ENGINEERING FIRM MWH AMERICAS INC FOR AN AMOUNT NOT TO EXCEED $288,500.00, FOR IMPROVEMENTS TO THE FREMONT WATER POLLUTION CONTROL CENTER IN FREMONT, STATE OF OHIO AND DECLARING AN EMERGENCY.

BE IT ORDAINED BY THE COUNCIL, CITY OF FREMONT, STATE OF OHIO:

SECTION 1. The Fremont City Council hereby authorizes the expenditure and directs the Safety Service Director to enter into a change order attached as Exhibit A with the engineering firm MWH Americas Inc, in an amount not to exceed $288,500.00 for improvements to the Fremont Water Pollution Control Center.

SECTION 2. The $288,500.00 allocated by Fremont City Council is to be appropriated from fund No. 590 the sewer improvement fund.

SECTION 3. It is hereby found and determined that all formal actions of this Council concerning and relating to the passage of this ordinance were adopted in an open meeting of this Council, and that all deliberations of this Council and any of its committees that resulted in such formal action were in meetings open to the public in compliance with all legal requirements, including Section 121.22 of the Revised Code of Ohio.

SECTION 4. The immediate operation of the provisions of this ordinance is necessary for the immediate preservation of the public peace, health, safety and welfare of the citizens of the City of Fremont. Said emergency being the need to comply with time deadlines set by the Ohio EPA and to prevent combined sewer overflows from occurring in the future.

This ordinance, provided it receives a two-thirds yea or nay vote of all the members elected to the Fremont City Council, is hereby declared to be an emergency measure and this ordinance shall be in full force and effect from and after its passage by the Council of the City of Fremont, approval by the Mayor, and publication and posting as required by law.

James G. Weaver
James G. Weaver
President of Council

PASSED: 10-3-13
Effective Date: 10-3-13

YEAS: 6 NAYS: 0

Elaine J. Huntley
Elaine J. Huntley, Clerk of Council

James H. Ellis III
James H. Ellis III, Mayor

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Approved as to form:

James F. Melle, Director of Law
City of Fremont, Ohio

EXHIBIT A

Attachment C

CHANGE ORDER 4

Contract No. ______________
Change Order No. 4
Effective Date May 31, 2013

In accordance with Article 7 of the Consulting Services Agreement (Lump Sum) dated April 25, 2012 ("Agreement") between City of Fremont ("CLIENT") and MWH AMERICAS, INC. ("CONSULTANT"), this Change Order modifies the Agreement as follows:

1. **Change in Services**: Amendment to Attachment A – Project City of Fremont WPCC Expansion – Scope of Services, Section 4 – SubTask 1C for the various engineering and field services as defined in the supplemental pages for Attachment A. These pages replace the existing scope for Sub-Task 1C except for those services already performed under 4.1, 4.3 and 4.4.

2. **Change in time of Performance** (attach schedule if appropriate): It is expected that this work will be completed nine months after Notice to Proceed and signed Change Order #4.

3. **Change in CONSULTANT's Compensation**: Amendment to Attachment A – Project City of Fremont WPCC Expansion – Scope of Services, Page 17 SCOPE and LUMP SUM FEE SCHEDULE. Authorized Fee of $360,000 and actual funding increase of $288,500 as per attached. The total authorized contract value increases to $5,182,500 with $133,750 remaining in unauthorized allowance.

All other terms and conditions remain unchanged.

CLIENT	CONSULTANT
______________________	[signature]
Signature	Signature
______________________	KRISTEN M. Miller
Name (Printed or Typed)	Name (Printed or Typed)
______________________	06.05.13
Date	Date

FREMONT

Amendment 4 to Attachment A

Section 4 SubTask 1C Modified: Sewer Survey, GIS & Model Development

Based on review of the existing Mike Urban hydraulic model of the Fremont collection system and available mapping data (CAD map and the City's atlas maps) along with review of the City's inventory of sewer plan and profile sheets and through conversations with City staff, the documentation of the City's sewer infrastructure is incomplete and inaccurate in places. In order to support on-going and future capital planning efforts, it is strongly recommended that the City perform a comprehensive sewer system survey and inspection. The outcome of this effort will be a GIS database containing an accurate and up-to-date representation of the combined sewer system that can be used for asset management purposes and as the basis for an updated hydraulic model.

The previously developed Mike Urban model is set up as a purely hydraulic routing tool and does not contain any dry weather or hydrologic (wet weather flow generation) parameters. It is our understanding that all flows were generated externally from the model based on flow monitoring data that was extrapolated upwards to approximate flows from a series of design storm events. The externally generated flows were then loaded into the model at each of the 17 flow monitoring locations and routed through the modeled collection system to the WPCC. This modeling methodology is not considered accurate or robust. Specifically, under this methodology there is no way to account for or simulate back-to-back rainfall events, varying antecedent moisture conditions or the spatial variability of rainfall. It is unclear what the 'design storm approach' referenced in Section 4.2.2.1 of the NFA is but use of a dynamic model's inherent runoff volume generation and routing capabilities is preferred for simulating large rainfall events. The Mike Urban model is not a calibrated model, meaning that model-generated flows have not been compared to actual observed flows to ensure accuracy in simulations results. The documentation of the development and calibration of a dynamic model is typically a requirement for EPA-approval of a LTCP and is also critical to ensure that any CIP based on modeling results is defensible to regulators and ratepayers.

An added benefit of our proposed approach is that it includes the capture of pipe condition data through still photographs taken at each end of a given combined sewer. Since each manhole in the combined system will be opened as part of the sewer system survey and inspection, it is an excellent opportunity to take a photograph of each incoming and outgoing pipe by using a camera mounted on a pole and lowered into the manhole. In most cases, manned entry is not needed and this is an efficient way to collect valuable visual data related to pipe condition without the level of effort needed for a comprehensive CCTV program.

The tasks included in this scope of work include:

- Combined sewer system survey and inspection
- GIS database development (combined sewer system)
- Hydraulic model development and calibration

1.0 Combined Sewer System Survey and Inspection

Within the combined sewer system, a review of the existing CAD map indicates approximately 1,400 manholes. In order to account for inaccuracies in the mapping, 1500 combined sewer system manholes will be surveyed and the connecting pipe data will be documented. For each manhole surveyed, the following data will be collected via Granite XP's Engineering software package:

A. Unique manhole ID
B. Manhole rim coordinates (X, Y, Z) Z needs to be within 0.1ft.
C. Depth to invert of all incoming and outgoing pipes (to be measured using a tape or rod)
D. Pipe shapes and dimensions of all incoming and outgoing pipes
E. Manhole configuration diagram showing the orientation of the incoming and outgoing pipes with sizes and flow direction indicated. Directional orientation of the diagram will be indicated (such as north to the top of the page).
F. Photograph looking down into the manhole as well as one street view photo facing north.
G. A photograph looking up into each incoming and outgoing sewer pipe will be taken using a camera mounted on a pole and lowered into the manhole. Catch basin connections will not be photographed.
H. Manhole inspection form will indicate anything out of the ordinary about the manhole (standing water, evidence of surcharge (ragging on rungs, etc.)
I. At complicated intersections/junctions we will provide a plan view sketch that clarifies the connectivity between manholes/pipes. Field crews will be provided maps of pre-identified intersections at a scale that the connectivity can be marked.
J. Where flow regulating structures are encountered (weirs, orifice plates, gates, etc.) these will be drawn on the manhole sketch and relevant measurements taken. For example, at a weir wall the depth to the top of the weir and a best estimate of the length of the weir will be recorded. Manned entry is not anticipated for this phase of the inspection. If critical structures are identified, we may wish to send field crews back out to perform more detailed measurements through manned entry. For the purposes of developing the level of effort, we have assumed 50 manned entry sites.
K. Access problems including paved over manholes.
L. Manholes in need of immediate repair will be reported to the City.

2.0 GIS Database Development

The collection system infrastructure data will be managed through the use of proprietary software, Granite XP's Engineering module. This software is capable of exporting a database compatible with ESRI GIS software through use of an ESRI Integration Module to the software. Once the field survey and inspection work has been completed, the Granite XP Engineering database will be exported to a GIS database format that will include nodes (manholes) and links (pipes) along with the attribute data collected in the field.

Where gaps in the data exist, a manual review of the inspection database will be performed to determine the cause. Causes for data gaps may include that either the upstream or downstream manhole for a given pipe was inaccessible. Best engineering judgment and review of existing data sources will be used to resolve data gaps related to missing manholes or pipes. For pipes to be included in the hydraulic model, addition data validation will be performed as part of the modeling task (3.0) to resolve discrepancies in pipe sizes or invert elevations, etc.

Deliverable: An ESRI GIS geodatabase including surveyed manholes and connecting pipes along with collected attribute data.

3.0 Model Development

The ESRI GIS data developed under Task 1.0 and 2.0 will be imported directly into InfoWorks CS, a fully dynamic hydraulic and hydrologic model. InfoWorks' internal data validation routines will be run to check for errors in data such missing inverts or rim elevation or pipes with negative slopes (as shown in the figure above). At a minimum, the model network will extend upstream far enough to include the pipes where flow monitors have been or will be located, including the meters being installed to monitor County flows.

InfoWorks stores flow generation parameters in subcatchment boundary areas that represent small drainage areas tributary to given pipe segments. Subcatchments will be delineated for the entire service area. Both wet and dry weather flow generation parameters are stored in the subcatchment database as follows:

- Dry weather flows will either be derived from population data or water usage data. Flow monitoring data will be used to developed diurnal patterns for both weekday and weekend dry weather flow patterns. In addition, flow monitoring data will be used to quantify groundwater infiltration parameters.
- In the combined sewer areas of the City, the percentage of impervious surfaces will drive the generation of runoff. Both directly connected and indirectly connected impervious areas will be quantified from a review of aerial photography and GIS or CAD planimetric data such as buildings and roads.
- In the separate sanitary sewer areas where Rainfall Derived Inflow and Infiltration (RDII) is variable and sources are generally unknown, default runoff parameters will be modeled and adjusted during the calibration effort.

3.0 Calibrate Model

Flow monitoring data from 18 sites installed in 2010 will be used for model calibration. In addition, it is assumed that 12 additional meters will be installed in 2012 that will record inflows from the County. In addition to these temporary flow monitors, the City's CSO monitoring data will be used during the wet weather calibration.

3.1 Review Flow Meter Data

In 2012, Fremont provided electronic version of existing flow meter data along with the native flow monitoring software needed to read the files and export them out to an Excel format. All data has been exported to Excel for review. Meter data will be reviewed to ensure that calculated flows based on depth and velocity data are correct given the pipe size and geometry.

As a check on both the quality of the flow monitoring data and on system connectivity, a flow balance will be performed. Flow monitoring schematics will be prepared for all meters in the system. Next, dry weather flow volumes will be calculated for each monitor and compared to ensure that downstream meters recorded higher flow than upstream meters. If multiple meters are located upstream of a downstream meter, the total volume of the upstream meters should be compared to the downstream meter volume. Where meter data doesn't balance, the meter schematic and system connectivity will be reviewed. If no reasonable explanation for the problem can be determined, the modeler will use their best engineering judgment to discount the data from one or more meters. Decisions to discount meter data will be documented in the Model Development and Calibration Report.

3.2 Selection of Dry Weather Calibration Events

Flow monitoring data will be reviewed to identify periods where no rainfall has occurred for at least three days. From this set of possible dry weather calibration events, periods where all flow monitors recorded quality data will be identified. If no single period exists where all flow meters were operational and recording good data, it may be necessary to select multiple calibration events. Ideally, a one week period of dry weather flow will be selected for calibration. However, if one continuous week of quality dry weather data cannot be identified, a period including one weekday and one weekend day should be selected.

3.3 Dry Weather Calibration

Calibration of dry weather and storm flows requires the model sewershed to be divided into monitored subcatchments. A monitored subcatchment comprises all the contributing areas upstream of each individual flow monitor. The characteristics of each monitored subcatchment are adapted to produce the best fit between observed and predicted data. Parameters will remain within reasonable limits and can be justified in terms of site checks or other investigations.

Prior to dry weather flow calibration, there are several useful checks that will be undertaken. A model simulation will be run with dry weather flow only. The following checks will be undertaken:

(i) Check for flooding on the catchment surface and for surcharged links. Both are unexpected during dry weather. Surcharged links may indicate incorrect or missing invert levels. All surcharged links will be checked and resolved and, if justified, an explanation given (e.g. inverted siphon).

(ii) Check that no flow arrives at any outfalls other than the main outfall, as this would indicate DWF spills at overflows.

(iii) Check the volume balance at each manhole.

Once all known inflows have been represented in the model, a DWF simulation will be run and plots generated comparing model predictions with the recorded data from the selected dry weather event(s). These plots will include the numerical values of peak depth, peak discharge, minimum discharge and volume at each site. The manhole containing the flow monitor must be included in the model and the details of the upstream and downstream manholes will also be included in the model to ensure that the correct hydraulic conditions are simulated.

The objective of DWF calibration is to confirm that the assignment of population, industrial/commercial and infiltration derived flow is substantially correct across the catchment, both in terms of peak flows and volumes. It is also a good indication of errors with network connectivity. Adjustments will be made where necessary to the diurnal profiles, waste water generation rates, populations and infiltration flows until a good fit between observed and predicted dry weather flows is achieved. Due consideration will be given to the accuracy of flow meter data, particularly with respect to shallow sites and during overnight low flow periods. Where there is any doubt about the accuracy of the data the modeler will clearly document the reason for the model's variation from observed data.

The model will be simulated to ensure that any modifications have been completed correctly. Once satisfactory calibration has been achieved, this will be documented and no further change to the dry weather flow parameters made. The final hydrographs produced will show comparisons of flow, depth and velocity for all monitors from all events. The expected levels of accuracy from the comparisons are $\pm$ 10% for peak flow and volumes, $\pm$ 4" for depths. Percentage error and whether compliant or non-compliant with these targets will be reported for each event at each flow site. Non-compliance is acceptable, provided that it is justified by limitations either in the flow survey data or available system data.

3.4 Wet Weather Calibration

3.4.1 Select Wet Weather Calibration Events

Flow monitoring data will be reviewed to identify a minimum of three storm events suitable for model calibration purposes. Selected events will be preceded by a sufficient number of dry weather days so as to ensure that flows have returned to dry weather conditions at the beginning of the event. We will strive to select at least three events with differing durations. The durations will be, if possible, around half, once and twice the time of concentration of the system. Other factors to consider in selecting wet weather calibration events include:

- Relatively uniform coverage of rainfall data throughout the collection system
- Flow and rainfall depth data availability throughout the collection system
- Range of storm depths, durations and intensities

3.4.2 Wet Weather Calibration

Comparative flow, depth and velocity plots of all selected events (minimum of three) will be produced and reviewed by the modeler for the model as built. These plots will include the numerical values of peak depth, peak discharge and volume. The plots will be reviewed in the following manner:

1. Review plots on a site by site basis, typically working downstream from the furthest upstream monitor to the main outfall.
2. Changes may be made to the model including Runoff Surface Areas, Runoff Routing coefficients, initial losses, or Runoff Volume Model. Details of changes made to the model will be recorded and kept for future reference.
3. Following changes made to the model, further simulations will be carried out and the above procedures repeated until the model is deemed verified.

As well as reviewing fits at monitor sites, ongoing checks will be carried out for flooding or any anomalous behavior in other parts of the system. This process will include a review of the perceived reliability of the recorded data for each site and storm event.

The expected levels of accuracy from the comparisons are:

- +25%/-15% for peak flow
- +20%/-10% for volumes, and
- +1.5ft /-0.5ft for depths where surcharge occurs.

Percentage error and whether compliant or non-compliant with these targets will be reported for each event at each flow site. Non-compliance is acceptable, provided that it is justified by limitations either in the flow survey data or the available system data. The emphasis of the calibration process will be on determining and attaining fitness for purpose, rather than on the strict numerical agreement with flow survey data that may be subject to recording errors. Consideration must also be given to operational issues, for example blockages, pumping station failures, or intervention by operators at control structures.

Model calibration must, as far as is practicable, be based on genuine data which has been collected on site or from other reliable data sources, and that arbitrary changes to model parameters in order to improve fit will not be made.

System connectivity, invert levels and pipe sizes, including interpolated values, will not be altered in the model unless confirmed on site. Where interpolated pipe details have been used, but acceptable verification cannot be achieved, it may be necessary to carry out manhole surveys to confirm details.

3.5 Wet Weather Verification

Once an acceptable match between simulated and observed flows has been achieved across a minimum of three calibration events, the model will be verified using a fourth storm event, if available. The intent of this process is to verify that the model accurately simulates system operation without any adjustments. After the verification event has been simulated, comparison plots between the model and the flow meter data will be prepared and reviewed. If the match is not acceptable, the event should be added to the set of calibration events and further adjustments performed. This process should be repeated until verification is achieved. It should be noted that achieving good matches to multiple storm events in the sanitary portion of the collection system can be very difficult due to uncertainty in the sources of RDII. In the event that a good match cannot be achieved for all calibration events, emphasis will be placed on improving the model's ability to simulate the system's response to larger storm events

4.0 Future Conditions

Once the existing condition model (the model representing the system at the time of the flow monitoring period) has been fully calibrated and validated, it will form the basis for a future conditions model upon which improvements will be built. We will coordinate with the City and review past reports to identify future growth areas to be included in the model as well as near-future improvements to the system. MWH will identify up to six projects for improvements to the system.

5.0 Model Development and Calibration Report

At the conclusion of the model development and calibration effort, a Technical Memorandum will be developed documenting the effort. The report will include a summary of the data sources used to develop the model including infrastructure data, flow monitoring data and rainfall data. The report will include a summary of the flow and rainfall monitoring program including as assessment of the quality of the data. The report will include a complete set of plots comparing modeled data to observed data for both dry weather and wet weather calibration events.

6.0 Model Simulations to Confirm System Flows

The goal of the modeling effort is to confirm the need for and sizing of LTCP Recommended Improvements including a future high rate treatment facility at the WWTP. Once the model has been built and fully calibrated, it will be used to confirm earlier recommendations regarding projected flows to the Plant under different CSO control scenarios. Under the previous modeling efforts, design storms were simulated to represent 12, 4, 2 and 0 CSOs per year. We will simulate a Typical Year of rainfall and quantify the projected number of annual CSOs under the control level scenarios previously evaluated (12, 4, 2 and 0 CSOs/Yr). An existing Typical Year of rainfall from a neighboring community will be used for this analysis.

A technical memorandum will be developed summarizing model predictions of peak flows to the plant under different CSO control scenarios.

FREMONT, OHIO
SCOPE AND LUMP SUM FEE STRUCTURE
Change Order No. 4

Task		Fee
Task 1A – WPCC Preliminary Design (with Basis of Design)		$ 470,000
Task 1B – Optional Multiple Process Development/analysis		$ 40,000
Task 1C – Collection System Study/Plan		$ 110,000
Task 1D – Funding and Stakeholder Meetings		$ 50,000
Task 2A – WPCC 30% Detailed Design with VE And Construction Cost Estimate		$ 1,124,000
Change Order No.4: Task 1C Collection System Modified	$ 360,000	
Remaining Original Funds ($110,000 -$38,500 invoiced)	$ 71,500	
TOTAL –Authorized Additional Funds		$ 288,500
Original Contract General Allowance: $130,000		
Remaining General Allowance:		$ 130,000
TOTAL – Original Authorized (Tasks 1A-1D and 2A)		$ 1,794,000
TOTAL – Current Authorized Amount Tasks 1A-1D, 2A, Allowance and Task 1C Modified		$ 2,212,500

Change Order No.1, per signed document: Task 2B – WPCC Final Design	$ 2,840,000
Change Order No.1 General Allowance: $130,000	
Change Order No.2: Task 6.26 Haynes Street Sewer Extension	$ 80,000
Change Order No. 3: Items 6.27 through 6.30: Environmental investigations, Administration Building modification, Environmental Survey, and Interim Plant Safety	$ 46,250
Remaining General Allowance:	$ 3,750
TOTAL – Original Authorized (Task 2B)	$ 2,966,250
TOTAL – Current Authorized Amount (Task 2B and Allowance)	$ 2,970,000