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Quote: 0000020725

Date: Oct 3, 2014

Submitted by: Best Equipment Co.

Part No.	Unit	Qty.	Extended
<p>Add-on SAT System for ROVVER X Professional includes everything needed to upfit a ROVVER X Professional system for lateral launch inspection, including the RAX-SAT150 reel with 150m of standard cable and 30m of push rod cable; RX140 SAT crawler with additional wheels; PTP70 pan-and-tilt camera with FX adaptor; set of 5 guide pipes; and double cable guide pulley.</p>			
<p>Build Center installation to include pick-up and drop-off at Fairwood Ave.</p>			
<p>TV Monitor for Launch Camera</p>			
<p>Dual Monitor Corner Mount</p>			
Total:			US 195,800.00

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Notes: This proposal may be withdrawn if not accepted within the period shown below. All equipment remains the property of the seller until sum stated above is paid in full. We propose to furnish labor and material, complete in accordance with above specifications, and subject to the conditions found on this agreement, for the sum stated above in accordance with the terms as specified.

Expiration Period: Feb. of 2015

Terms: Cash

FOB: Columbus, OH

Currency: US \$

Respectfully Submitted,
Best Equipment Co.

The above, prices, specifications, and conditions are satisfactory and are hereby accepted. You are authorized for the work specified. Payment will be made as specified.

Accepted by _____

Date _____

David J. Wehr - Envirosight Specialist - Best Equipment
10/9/14

Lateral TV Camera Inspection System

1.0 System Basics

Complete inspection system shall have:

- 1.1 Three components:
 - a. Automatic cable drum with cable
 - b. Operator pendant with viewing and system controls
 - c. Crawler with zoom camera for 6" diameter and larger pipe inspection
- 1.2 Can Bus communications protocol
- 1.3 Ability to connect to a network via network cable port for lifetime remote firmware upgrades and/or diagnostic services.
- 1.4 Camera and crawler operator functions to be able to work simultaneously.
- 1.5 Electrical requirement not more than 575W, or 5 A at 115 Vac (220 Vac available)

2.0 Operator Pendant and Wireless Controller

The system control pendant shall have:

- 2.1 Power on/off switch.
- 2.2 Standard ability to connect to a network in order to access remote server download of for lifetime automatic performance and feature upgrades.
- 2.3 Optional ability to connect to a network in order to work with repair studio software for remote diagnosis.
- 2.4 Integral error code maintenance and repair protocol which informs the operator of current or pending operating or maintenance tasks that need to be addressed by flashing a code during use. Codes correlate with a specific repair or maintenance activity
- 2.5 Pendant shall be capable of being used on the desktop or mounted into the desktop for a more permanent installation.
- 2.6 Dual software programmed joysticks for camera and crawler functions.
- 2.7 Video signal output.
- 2.8 Right 3-axis multifunction joystick to control crawler's forward/reverse, left/right turning and speed.
- 2.9 Left 3-axis multifunction joystick to control camera's pan/tilt, zoom and home functions. The left hand joystick shall also have the ability to change into a lateral launch mode in which it shall have the ability to control the positioning and deployment of the lateral launch camera in addition to the functions previously listed.
- 2.10 Controls for manual and automatic focus of camera.
- 2.11 Ability to display crawler pressure, temperature, sonde status, pitch (inclination) and roll.
- 2.12 Pressure to be listed onscreen and saved within system history for predictive maintenance.
- 2.13 Controls for adjusting illumination intensity of camera and auxiliary lighting.
- 2.14 Ability to control cable reel functions: auto, manual, speed, direction, torque of the cable reel.
- 2.15 Have a master single button to regain control from wireless controller.
- 2.16 Minimum 20' control cable that connects the automatic cable drum with the pendant via an emergency on/off switch box junction.
- 2.17 Ability to inform operator if one is getting close to flipping the crawler.
- 2.18 Ability to directly engage or disengage electronic clutch.
- 2.19 Ability to operate crawler in cruise control mode where an operator does not need to touch the joystick for crawler speed.
- 2.20 Ability to view system operational history and performance
- 2.21 On/off control of digital zoom function.
- 2.22 On/off control of auto shutter speed.
- 2.23 Ability to toggle front-view camera, integral rear view camera, and accessory rear view camera.
- 2.24 On/off control for camera lasers.

- 2.25 Ability to control laser intensity of increments of 25%.
- 2.26 Control for remotely controlled motorized camera lift.
- 2.27 Button to activate automated software routine (Macro) for viewing laterals on the left.
- 2.28 Button to activate automated software routine (Macro) for viewing laterals on the right.
- 2.29 Button to activate automated software routine (Macro) for performing a circumferential scan of a pipe joint.
- 2.30 The ability to operate larger (10" minimum diameter) and smaller crawlers (minimum 4" diameter) with no need for additional control unit or cable upgrades.
- 2.31 CAN-bus control architecture allowing for precision control, diagnostic monitoring and future upgradeability.
- 2.32 Tilttable, touch screen monitor for system operation and monitoring of system status.
- 2.33 Portable battery powered belt clip wireless controller with crawler, camera and cable reel controls for easy direct single person deployment and retrieval of the crawler at the access point (manhole/basin).
- 2.34 Wireless controller to have 8 dual function buttons with clear labels as the function of each.
- 2.35 Wireless controller to have colored LED indicators to inform operator as to what functions the buttons are activated for.
- 2.36 Wireless controller to be digitally encoded to the system with which it is delivered.
- 2.37 Digital control to have a range of at least 50' without radio frequency interference being able to compromise the signal. RF systems will not be accepted
- 2.38 Wireless encoder must work with a single specific system in order to provide secure control when several systems are being operated in the same area. For operator safety and system protection, there can be no chance for operational interference.

3.0 Steerable Motorized Crawler

The system crawler shall have:

- 3.1 6-wheel drive (3 wheels per side) to generate traction necessary to crawl 1000' in wet and slippery pipes.
- 3.2 In 8" configuration with the middle wheel remaining, the 4 larger wheels will overlap the middle ones to provide continuous traction to go over joints and debris and avoid high centering where 4 wheel crawlers can no longer move forward.
- 3.3 The tractor shall have proportional left, right, forward and reverse capability via manual and automatic controls via a joystick and direct buttons amongst the operator pendant and wireless controller.
- 3.4 Proportional steering means that the 3 wheels on the left and the right of the crawler will move proportionally at the same time to move the crawler in the intended left, right, forward, backward or combination direction. Crawlers that can only drive in a single direction to the left, right, forward or backward at a time (bump steering) will be deemed unacceptable.
- 3.5 Maximum size of 12.2 x 4.3 x 3.5" (lwh), allowing proper clearance in 6" and lined pipes.
- 3.6 A minimum of two powerful EC drive motors. Motors must maintain full power even at lower speeds without depending on drawing more current to do so.
- 3.7 An electronic clutch that can be engaged and disengaged without needing to move the crawler. Systems that demand movement of the crawler to engage or disengage a mechanical clutch will be deemed unacceptable.
- 3.8 System to be isolated in a way where major crawler electronic components will not be destroyed if there is a cut and connection between power and other wires within the cable.
- 3.9 Can accept an option for a remotely operated lift that can raise the camera a minimum of 7" from its lowest position.

- 3.10 When in 8" wheel configuration, crawler must insure that the bottom of the pan and tilt zoom camera is at least 1 3/8" from the bottom of a flat surface to enable crawling over obstacles.
- 3.11 Full sensor package with inclination, roll, sonde, pressure, heat and motor readings.
- 3.12 Integral rearview color camera with high-lux tri-LED lighting to be positioned at the top rear of the crawler body and not to have any visible increase in the diameter of the crawler body or be integrated with the rear connector.
- 3.13 Ability to remotely toggle between rear- and forward-viewing cameras using the operator control pendant.
- 3.14 Slotted locking mechanism, the simple turn of which drives 3 stainless bearings into the rotate shaft of the camera for secure, easy attachment with 1-bar waterproof rating.
- 3.15 Keyway on camera rotation shaft to ensure damage-free mating of electrical pins between crawler and camera.
- 3.16 Rear receptacle that allows cable attachment with 2 turns of the stainless-steel cable connector's outer barrel. Not tools required.
- 3.17 A spring-loaded pin on the rear receptacle to lock the stainless-steel cable connector's outer barrel, ensuring a secure connection and delivering pull strength beyond the 1000-lb-rated break strength of the cable.
- 3.18 Minimum weight of 18.5 lbs. (with small wheels).
- 3.19 Length of no more than 12.2" (18" with camera and optional lift installed) for easy navigation through 90-degree inverts without rolling.
- 3.20 Crawler body must be machined from a single continuous and complete piece of machined aluminum. Two piece bodies from top to bottom or front to rear crawlers will be deemed unacceptable.
- 3.21 Single piece crawler body to have single top-plate access for control boards, single bottom-plate access for motors, and dual side-plate access for gears, ensuring maximum protection against leaks caused by bending stress. Tractor chassis of bronze, brass or other soft metals shall be deemed unacceptable.
- 3.22 Tapered wheels that conform to pipe sidewall.
- 3.23 Machined keyway on all 6 axles to ensure positive drive and facilitate quick wheel change-out. Spacers and wheels shall attach with a single screw; plates and spacer-bars shall be deemed unacceptable.
- 3.24 Machined tight fitting axle to wheel keyway to assure wheel stays on the unit without turning if a bolt loosens. Systems that use bolts and washers as the only means to secure a wheel will be deemed unacceptable.
- 3.25 CAN-bus control architecture allowing for precision control, diagnostic monitoring and future upgradeability.
- 3.26 Three (6) wheel sets and spacers supplied for inspection of pipes 6-36". (See below for standard and optional wheels specified)
- 3.27 Compatibility with the following standard wheel and spacer sets: (Wheels must be included in the bid price)
 - 3.27. a 20mm wide spacers (set of 4)
 - 3.27. b 3.33" (86mm) rubber wheels (set of 6)
 - 3.27. c 4.33" (110mm) grooved rubber wheels (set of 4)
 - 3.27. d 4.33" (110mm) soft composite grease wheels with traction grit impregnation (set of 4)
 - 3.27. e 5.31" (135mm) grooved rubber wheels (set of 4)

- 3.28 Compatibility with the following optional wheel and spacer sets: (Not included in the bid price)
 - 3.28. a 3.33" (86mm) soft composite grease wheels with traction grit impregnation (set of 4)
 - 3.28. b 4.33" (86mm) pointed carbide wheels (set of 6)
 - 3.28. c 5.31" (110mm) pointed carbide wheels (set of 4)
 - 3.28. d 5.31" (135mm) soft composite grease wheels with traction grit impregnation (set of 4)
 - 3.28. e (4) 5.31" (135mm) by wide (2.6") sediment rubber wheels (set of 4)
- 3.29 Ability to fit in 8" pipe with top mount auxiliary lighting attached.
- 3.30 A tilting rear cable connector that points vertically to protect cable during deployment into manhole, but which tilts to horizontal position during operation. Rear connectors that integrate a rear camera will not be accepted.
- 3.31 Strong stainless steel locking mechanism to augment the strain relief internal to the cable.
- 3.32 Stainless cable connector shell to carry a lifetime warranty.
- 3.33 512 Hz integral sonde to facilitate locating crawler.
- 3.34 Optional Auxiliary lighting that has: (Indicate price as an option)
 - a. Twin hi-lux tri-LED lamps for inspecting large pipes.
 - b. Ability to mount to crawler with instant-contact slide-connector positioned at top rear of crawler or optional camera lift. Any exposed wiring or pigtails shall be deemed unacceptable.
 - c. Waterproof design (when mounted) with ability to withstand 1 bar external pressure.
 - d. Rear-viewing color camera with single hi-lux tri-LED lamp (necessary when using lift and needing to see above water flow)

4.0 Motorized Automatic Cable Drum

The system cable reel shall have:

- 4.1. Capacity for the systems 1000' cable.
- 4.2. A hub equipped with a continuous-contact slip-ring assembly to allow the cable to be dispensed and retrieved while the camera and tractors are operational.
- 4.3. An environmentally sealed slip ring whose contacts shall be of an alloy of gold.
- 4.4. A motorized system with sensors that monitor cable tension in order to coordinate cable feed/retrieval with direction and exact speed of the crawler.
- 4.5. Ability to perform all forward, backward and different speed functions without the operator having to control any cable reel functions directly.
- 4.6. An emergency stop switch.
- 4.7. Ability to operate in both automatic and manual modes.
- 4.8. External cable reel chassis to be made of strong and lightweight aircraft grade aluminum.
- 4.9. Work with pendant based speed and torque controls to adjust for different conditions and user preferences.
- 4.10. Weight of no more than 125 lb. (including 1000' of cable).
- 4.11. CAN-bus control architecture allowing for precision control, diagnostic monitoring and future upgradeability.
- 4.12. Work with a remote wireless pendant granting control of crawler and reel while away from the primary control pendant.
- 4.13. Ability to operate manually, with direct control of speed, direction and torque.
- 4.14. Large extension pulley arm option for extending the cable drop point 3' from the cable reel.
- 4.15. Teflon coated integral drip tray at bottom beneath stored cable. Allows for liquids to drain and be collected in a specific area for health and safety reasons. Can be slid out the front without tools for emptying and cleaning.
- 4.16. BNC video output for local video connection.

- 4.17. Size of no larger than 21 x 14.5 x 24.5" (hwd) with standard cable roll bar that extends 15" from the front of the reel.
- 4.18. Two handles to be at the top left and right of the cable reel for moving and transport.
- 4.19. Extended roll bar to be able to be placed back against the reel for storage and shipment without the need for additional fasteners or tools.
- 4.20. Pendant-based power/torque controls for winching back crawler in optional-free-wheel mode.
- 4.21. Ability to run automated software routines (Macros) in which the reel, crawler and camera function are automatically coordinated to accomplish a specific task without operator intervention.
- 4.22. All moving hazardous components to be completely covered/enclosed to prevent injury -- hand or clothing can't reach dangerous moving parts. Open access design of the front, top and sides where an operator can touch level-wind mechanism, gears, chains and belts will be deemed unacceptable.
- 4.23. Supplied cable protection accessories, including:
 - a. Upper cable guide that uses Delrin (or similar) roller mounted to lightweight aluminum frame to protect cable from abrasion during operation, and to limit operator strain during setup.
 - b. Lower roller assembly that uses Delrin (or similar) roller mounted to lightweight aluminum frame to protect cable from abrasion during operation, and to limit operator strain during setup. Designs requiring use of interlocking poles shall be deemed unacceptable.

5.0 Lightweight Heavy Duty Transmission Cable

The system cable shall have:

- 5.1. 1000' of cable with maximum 6 continuous-length multi-conductor wires for lightweight and easy maintenance performance.
- 5.2. Kevlar reinforcement to provide minimum break strength of 1000 lbs.
- 5.3. Diameter of no more than 0.255" (6.5mm).
- 5.4. Weight of no more than 10.8 lb. per 328' (.03 lb. per ft.) to promote portability, long crawler runs and easy handling for multiple sized crawlers.
- 5.5. Strain relief to be internal to the cable and cable connector. No external wires, pig tails or other visible external strain mechanisms will be accepted.
- 5.6. Waterproof rating of at least 1 bar or 1 atmosphere.
- 5.7. Tough outer jacket to resist tears and scrapes.
- 5.8. Smooth outer jacket to reduce friction.
- 5.9. Steel-armored jacket at crawler end to prevent cable damage around pipe bends.
- 5.10. Solid stainless steel screw on connector at crawler end that locks with two turns, and which engages a locking spring-loaded pin on the rear of the crawler to secure the cable and provide strain relief. Connections that require ANY tools or screws will be deemed unacceptable.
- 5.11. Crawler electrical connection with keyway to prevent damage to electrical pins when mating with camera or crawler.
- 5.12. Ability to be re-terminated by soldering no more than 6 wires, then sealed and strain-relieved using a quick-dry epoxy. Procedure shall take no more than half an hour to complete. More than 6-wire wire solder repair and Scotch-cast style solutions that require longer cure times will be deemed unacceptable.
- 5.13. Compatibility with fully automatic cable reel, manual cable reel.
- 5.14. Cable to be only single connection regardless of use of optional items such as additional lighting, side scanning camera, rear camera, laser circle, laser dots, remotely operated lift or large pipe carriage.

- 5.15. Ability to connect directly to the following without any modification or exterior wires, ability to be operated by system controls in this specification:
- a. 4" minimum pipe ID crawler
 - b. 6" minimum pipe ID crawler with integral motorized lift
 - c. 10" minimum pipe ID crawler

6.0 Lateral Launch System

6.1 System Equipment List:

- 1 - Pan and Tilt Camera
- 1 - Lateral Launch Crawler with launching positioning unit and mechanical lateral launch drivers
- 1 - Front view launching camera
- 1 - Rear view driving camera
- 1 - Automatic Cable Drum 400' Tag-line with 100' Launching Cable

7.0 Pan and Tilt Push Camera

- 7.1 The camera shall pan and tilt and be capable of viewing both the mainline and laterals for complete inspection. It shall have a variable focus for pipe size adjustments and be able to be towed in the mainline via the crawler and pushed up the lateral via a pinch roller mechanism from the mainline through the lateral connection. Camera shall be available with ATEX Zone 2 explosion proof rating. Camera must have NRTL approval for IP68 (IEC60529) or NEMA 6P (NEMA250) enclosure type ratings to offer protection for the operator and equipment in wet and damp environment.
- 7.2 When connected to crawler there cannot be external wires, connectors, clamps or tie-downs. The camera will pan a full 360 degrees and tilt (+/- 90°) allowing for full view of laterals and joints. Camera will have the ability to capture maximum detail from pipe walls.
- 7.3 Camera shall be constructed from Aluminum for a light weight durable design. Camera construction shall include all solid-state circuitry designed to withstand shocks and vibrations while being pushed, pulled or propelled through the pipe.
- 7.4 All camera electronics shall be of modular construction for ease of exchange and repair, and shall be designed to facilitate future upgrades.
- 7.5 The front of the camera housing shall have a windshield made of impact resistant, distortion-free material.
- 7.6 The housing shall be fully sealed and waterproof (IP68) to withstand external pressure up to 10 bars without damage or leaking.
- 7.7 The camera power supply shall be provided from a solid-state power source and the camera input shall be 12 volts DC.
- 7.8 The lighting for the camera shall be supplied through an isolated power supply and shall regulate the light voltage up to a nominal 36 volts DC.
- 7.9 Pan/Tilt Motor power shall be 12V/3Watt
- 7.10 A variable transmitter 512hz and 640hz shall be located inside the camera head; operator shall be able to switch between the two signals via the control pendant.

- 7.11 Camera illumination must be provided with a minimum of 28 field-replaceable LED's that have a 50 degree lighting angle and provide 45000mcd/piece to light pipes up to 60" diameter
- 7.12 Camera shall have a valve for purge and pressurization of camera-body. The internal pressure of the camera shall be displayed on the CCU diagnostics screen and will alarm when pressure is low. Cameras that are not pressurized or do not have the ability to monitor the internal pressure of camera will be deemed unacceptable.
- 7.13 The pan and tilt camera shall have a motorized self leveling feature in order to maintain an upright picture image during inspection, this feature can be overridden in order to pan and tilt as needed, then back engaged when camera is in the home position.
- 7.14 Camera must not weigh more than 49oz. Camera must have a maximum size of 2.95 inches in order to fit into pipe diameter of 4 inches.
- 7.15 Rotation axle must be made of a minimum of 15mm stainless steel
- 7.16 Pan and tilt must have integrated clutch for pan and tilt motor
- 7.17 Camera must be NTSC color.

8.0 6" to 24" Wheeled Steerable Lateral Launch crawler

- 8.1 Launcher crawler shall be offered with ATEX Zone 2 explosion proof rating. Launcher crawler must have NRTL approval for IP68 (IEC60529) or NEMA 6P (NEMA250) enclosure type ratings to offer protection for the operator and equipment in wet and damp environment.
- 8.2 Crawler shall be a gear driven; six all wheel drive tractor to carry the camera and launching cable for rapid remote inspection of mainline pipes that range from 6" to 24", and be able to launch the camera into lateral lines up to 100' from the crawler. Tractors propelled by chains, belts or continuous tracks will be deemed unacceptable.
- 8.3 The tractor shall provide sufficient traction, under suitable conditions, to tow up to 1100 feet of mainline transmission cable, 100' of launching cable and up to 1000' of lateral camera transmission cable.
- 8.4 The tractor shall have proportional left/right steering, forward, reverse, capability via a joystick and other controls via the operator pendants attached to the CCU and the cable reel.
- 8.5 The tractor shall have a maximum size of 12.4" (314mm) long by 4.7" (119mm) High by 4.3" (109mm) wide to allow for proper clearance in 6" and lined pipes.
- 8.6 A minimum of two 50 watt DC motors shall power the tractor.
- 8.7 Crawler shall include a camera positioning docking tube that will raise, lower and rotate left/right to position camera head in center of mainline or above flow, and position camera for launching into lateral.
- 8.8 Camera shall mount to the front of the crawler in the lateral positioning docking tube. Cable shall attach to rear of crawler with 2 turns of the outer stainless housing on the end of the cable. A spring loaded pin on the crawler body shall lock into the end of cable housing to secure cable connection and provide a pulling strength that is beyond the 1000 lb rated break strength of the cable.

- 8.9 Crawler shall have a maximum speed of 75 feet per minute
- 8.10 The tractor shall be no longer than 12.4" (314mm) in order to easily navigate through 90-degree inverts without rolling.
- 8.11 The tractor chassis shall be a single piece of machined stainless steel with only a top plate to access the control boards, a bottom plate to access the motors and two side cover plates to access the gears. Bronze or brass bodies or soft metals will not be acceptable for body chassis.
- 8.12 The tractor shall have a machined key way on all 6 axles, wheels shall be mounted by only one bolt to facilitate fast easy wheel changes and ensure an exact fit with all wheels. No plates or spacer-bars will be accepted. Machined axle key must be able to be replaced in the field without having to replace the axle. Crawlers without keyways or keyway fittings that can be replaced in the field without removal of the axle will be deemed unacceptable.
- 8.13 Crawler shall be controlled via PipeBus software technology to allow for precision control, diagnostic monitoring and future upgradeability.
- 8.14 Tractor shall work with the following standard wheel sets:
- a. Set of 4 common 36mm dia. by 20mm wide spacers
 - b. (6) 3.33" (86mm) dia. rubber wheels
 - c. (4) 4.33" (110mm) dia. soft composite grease wheels with traction grit impregnation
 - d. (4) 5.31" (135mm) dia. grooved rubber wheels
- 8.15 The tractor must have auxiliary light connection port on top of the crawler.
- 8.16 The tractor shall have the ability to add triple super bright Solarc LED low profile (1.7" dia.) auxiliary light that is remotely controlled via a controller on the operator pendant.
- 8.17 Crawler must fit in 6" diameter pipe with dual auxiliary lighting attached
- 8.18 The tractor shall have a tilting rear cable connector that points vertically when deploying the system into a manhole but can tilt into a horizontal position during operation in order to protect cable and connector during deployment.
- 8.19 Strain relief provided must be internal to the cable connector so that there is no external strain relief cables to get caught up in the pipe. Crawlers with external strain relief cables will be deemed unacceptable.
- 8.20 Crawler and cable stainless connectors must have a lifetime warranty.
- 8.21 The tractor shall have a standard inclinometer.
- 8.22 Crawler shall have an additional roll sensor to avoid flipping the crawler. Sensor shall sound an audible or visible alarm when crawler center of gravity exceeds 20 degrees in the pipe.

- 8.23 Launcher crawler shall be maximum of 44lbs
- 8.24 Launcher crawler must have a motorized tilt and lift armature to allow for the positioning of the camera into lateral inverts up to the 12 o'clock position.
- 8.25 Launcher crawler must have two free-wheels with a swivel tilt to allow for easy insertion into manhole inverts.
- 8.26 Safety lowering pegs shall be integrated into the body to attach a forked lowering hook for safe lowering operations. Transporters that utilize attached straps, wire or cable as a method of lowering or lifting the transport unit have been deemed unsafe and shall not be accepted.
- 8.27 The housing shall be fully sealed and waterproof (IP68) to withstand external pressure up to 10 bars without damage or leaking.

9.0 Lateral Launch Cable Drive Mechanism

- 9.1 The driving mechanism shall be located on top of the crawler in order to keep the drivers and positioning cameras out of debris and high flow in the pipe. Lateral drives internal to the crawler body or located on the bottom of the crawler shall not be accepted.
- 9.2 The driving mechanism shall be four stainless steel pinch rollers with a single Allan head screw tension adjustment. All driving components shall be protected via a locking hinged door. Systems that require the use of tools, screws or any other assembly style devices to load and unload the cable shall not be accepted. Lateral cable drivers must not be exposed in order to protect from offsets, debris and obstructions found in normal working conditions. Cable drivers not enclosed in a protective housing shall not be accepted.
- 9.3 Lateral Launch-Drive attachment shall be cable of launching a minimum of 100' of lateral push cable into the lateral line via the lateral launch system from the mainline. The drivers shall be operated via the desktop pendant. Both manual and cruise forward and reverse launching shall be available the desktop pendant.
- 9.4 A front view camera shall be integrated into the SAT-drive attachment to assist in positioning the launching pod. A rear view camera shall be integrated into the SAT-drive attachment to allow for rear-viewing during the SAT system retrieval process and to allow for avoiding obstacles and effective steering during the retrieve. Rear and forward view cameras shall be displayed on the operator pendant and can be toggled between one another.
- 9.5 The housing shall be fully sealed and waterproof (IP68) to withstand external pressure up to 10 bars without damage or leaking.

10.0 Lateral Camera Positioning Device

- 10.1 The camera shall be positioned by a motorized positioning cradle used to insert the camera into the laterals. The cradle position shall be operated via the desktop pendant.
- 10.2 An automatic one-button home position that sets the cradle and camera into the center of the mainline shall be available via the desktop pendant.
- 10.3 The motorized cradle shall be able to be moved to accommodate laterals from any clock position.

- 10.4 The cradle shall be easily removed to allow for various lengths of launching cradle in order to accommodate the mainline pipe size.

11.0 Lateral Launch Motorized Cable Drum

- 11.1 The cable drum provided shall contain both the push cable for the lateral camera and the tag line cable connecting to the lateral launch cable drum. Systems that do not allow both cables to roll up into the drum, or systems that require the operators to attach a launch cable outside of the cable drum have been deemed unsafe and shall not be accepted.
- 11.2 The lateral launch cable drum shall be synchronized with the mainline cable drum
- 11.3 The hub of the cable drum shall be equipped with a continuous contact slip-ring assembly to allow the cable to be dispensed and retrieved while the camera and tractor are operational. The slip ring contacts shall be of an alloy of gold and rhodium and must be housed in an environmentally sealed housing.
- 11.4 Cable feed out and retrieval must happen automatically via a motorized system with sensors that correspond with the movement of the mainline cable drum. Cable reels that require the crawler to pull the cable off the reel or operator control while the crawler is in use will be deemed unacceptable.
- 11.5 The cable drum must have an emergency stop switch.
- 11.6 The cable drum must be able to operate in both automatic and manual modes.
- 11.7 The cable drum must have speed and torque controls to adjust for different pipe conditions and user preferences.
- 11.8 The cable reel shall not weigh more than 44 pounds with cable.
- 11.9 The maximum reel dimensions shall be no more than 29.5in X 11.8in X 26.5in (LxWxH).
- 11.10 Cable drum must come with stationary mounting plate where cable drum remains secure, but can easily be removed for maintenance, shipping or portable use without the use of any tools or loose hardware.

12.0 Footage Counter

- 12.1 The system shall include a footage counter attached to the counter arm assembly, which extends from the cable drum. The footage counter assembly shall be constructed of machined aluminum parts and shall include the necessary guide wheels to maintain cable tension. The footage counter shall measure passage of the cable from the wheel graduated in 0.1-foot steps up to 1650 feet. The footage counter shall function electronically and transmit footage data for monitor display and video recording.

13.0 Lateral Launch Cable Assembly

- 13.1 100' of push cable shall be provided with water-tight connectors trailed by 400' of 6 wire continuous length multi-conductor tag line cable.
- 13.2 The cable must be Kevlar reinforced and have minimum break strength of 1000 lbs. Tag line cable shall be no greater than .19 inches in diameter. A connector strain relief fixture must be internal to the cable and cable connector. Cable and connectors must be waterproof up to 10 bar. Cable must have tough outer jacket to resist tears and scrapes. Outer jacket must be smooth to reduce friction. Tag line and push cable shall be linked by a stainless steel cable coupler. Push cable camera connect end must have connector that has electrical keyway for proper alignment of cable to camera connector without damaging electrical pins

14.0 Compatibility, Installation and Training

- 14.1 The equipment bid shall be installed in an existing TV truck with the EnviroSight CCTV System.
- 14.2 The bid price shall include picking up the existing truck at 1250 Fairwood Ave. Columbus, Ohio 43206, installing the equipment and returning the truck to the same location.
- 14.3 The installation and equipment bid shall not void any warranty on the existing EnviroSight equipment.
- 14.4 Two days of training and maintenance of the equipment shall be provided at 1250 Fairwood Ave. Columbus, Ohio 43206.

File: Lateral TV Camera