

## **Functional Requirements of the Software**

### **Industry Standards**

- a. The software shall fully support CMOM activities as defined by the USA EPA.
- b. The software shall support GASB 34 regulations.
- c. The software shall be NASSCO PACP, LACP, and MACP version 6.0 and 7.0 certified and conform to its pipeline assessment procedures.

### **Database Organization**

- a. The software shall include an optional module to offer the enforcement of Security privileges to control access and user rights to certain levels of permissions natively within the software itself.
- b. The software shall maintain a unified database of infrastructure assets (pipelines, manholes, lateral service connections, lift stations, etc.) in a single repository.
- c. The software shall offer tool bars, drop-down menus, and 'auto-complete' features to speed data entry.

### **User Interface**

- a. The software's data entry interface shall be intuitive, easy to use, and able to provide on-line help files within the software to assist remote users with questions they may have.
- b. The software shall have a Main Window composed of three areas:
  - a. The Toolbar: The Toolbar works as the software's Main Menu. Using the Toolbar you can access all of the software's functions. For each screen of the application, a different set of Toolbar elements are available. The Toolbar can be docked to any side of the screen
  - b. The Main Working area shall display the pane(s) of the current screen's selected layout. Panes included in the loaded layout shall be all docked. They shall have a fixed location and cannot be hidden. The panes shall be resizable by dragging their splitters. If the layout consists of only one pane, this pane shall be resized by main application window resizing only, because the pane shall always occupy the whole main working area. The last layout selected for a screen and its configuration (resizing) shall be remembered during the session and displayed when you navigate back to that application screen.
  - c. The Status Bar shall appear at the bottom of the software's Main Window. It shall display the current state of the system. On the left, it shall allow you to select the organization you are working for. The GPS section shall show whether a GPS device is connected and if so, it shall also show the number of satellites used to determine the location, horizontal and position dilution of precision, an average Signal to Noise Ratio of the satellites being tracked, and the GPS coordinates received from the GPS device. The database section on the right shall show the name of the database to which the software is connected. In the right corner, the nickname of the user who is logged in shall be displayed.

- c. The panes shall be synchronized, whereby interaction with the main navigation window will determine the display of data in other associated panes.
- d. Users shall be able to burn CD/DVD's or generate reports without requiring any third party software.
- e. The software's reporting engine shall allow for the generation of batch reports based on user defined object types (mainlines, projects, etc.), objects (mainline ID's, project names, etc.), the types of reports, the destination (printer, file, email, etc.), and the format (PDF, Excel, HTML, etc.).
- f. The software shall allow the user to create "single entry" continuous defects, where the continuous defect is defined by the start distance and the length.
- g. A pipe graph shall be interactive and the pane viewable during the inspection. The pipe graph shall show service connections with a graphic indicating the location of the connection. The user shall have the ability to control the graphical representation of the observations made during the inspection by selecting any combination of the following features: Connections, Defects, Continuous, Laterals, Informational, and/or Status Bar.
- h. A zoom feature shall be available for the pipe graph that allows the user to select a portion of the pipe with a mouse and zoom to that specific portion. A grid system shall be provided to display the location of a 'zoomed' observation within 10 feet.
- i. To start an inspection, the user shall be able to select structure, nodes or manhole information already within the database. If the data is not available, the operator shall be able to enter the correct information and the information shall be retained in separate tables for future selection. A graph shall be provided for structures that allow for the direction of entry and exit and flow direction of each main and lateral.
- j. The user shall be able to display live video, playback video, and captured pictures on the screen.
- k. The software shall provide a simple way to control entry standards to define specific business logic, change labels, define field controls (optional, mandatory, disabled, read only, etc.), and define default field values and input 'masks'.
  - a. The ability to change labels shall be part of the system and shall not require third party software.
  - b. All drop down look up values shall be customizable by the end user without the use of third party programs.
  - c. The software shall allow for the addition of custom fields available in the user interface without the need of third party software.
  - d. City Administrators shall be able to set visual mandatory entry fields for both pipe information and defect entry fields and import them into this basic module.
- l. Asset details and feature changes indicated by an assessment will be managed by and "Accept" or "Reject" procedure to ensure the quality of the asset data.
- m. An Automatic Voice Over feature shall be available to read out loud and record on video the observation entries.
- n. It shall be possible to Create Custom Tasks to record multiple types of inspections or surveys.
- o. NASSCO PACP Access Point and Water Level automatic creation when starting a task.
- p. Transporter or Camera speed will be displayed on the Live Video Pane.
- q. It shall be possible to copy or "Carry Forward" the relevant information from any Task or Inspection to a new Task or Inspection to reduce effort and duplicate information entry.

- r. It shall be possible to continue to record on an existing video file even if the computer was turned off.
- s. Multiple video files for the same task can be merged into a single file for ease of management.
- t. A Graphical Clock shall be used to describe the position for observations.
- u. It shall be possible to define selected and commonly used observation or codes as “Favorites” for quick entry.
- v. “Asset Location” functionality. This feature allows a user to have assets with the same names but different physical locations (cities, counties, towns, etc.) to be contained in the same database. Now multiple “123 Main Street” addresses can be stored in a single database by the contractor. This capability is especially useful for Gas Cross Bore contractors who often encounter duplicate asset names.
- w. “Change Standard” feature. Tasks created or already completed in one standard (such as PACP v6 or CUES Standard, etc.) can now be changed to a different standard allowing the user to make the appropriate changes to comply with the desired standard’s rules and validation.

### **Technical Requirements of the Software**

The software shall be coupled with a firmware controller or with a USB data acquisition device to receive multiple, simultaneous inputs from connected devices to, for example, allow mainline footage, lateral footage, manhole depth, and inclination to be received into the software without the need for manual input from multiple keyboards.

The software shall also automatically generate text overlay titling to highlight problem areas and asset inspection information. The titling options and position shall be customizable and titling display shall not require special separate controls.

### **Database Structure & Requirements**

- a. The inspection database shall include an *asset-based* architecture which allows multiple inspections to be performed and retained as a historical record for a specific physical location (asset).
- b. The software shall be able to track tasks and assignments even if the tasks are performed in multiple sessions or by different personnel.
- c. The software shall be able to import an entire asset database.
- d. The software shall have the ability to import and retain the entire list of assets despite not ever having generated an inspection.
- e. The inspection database shall have the ability to support and synchronize with multiple data sources, such as Oracle Server 10.2-11.2, Oracle Client 10g Release 2, Oracle Client x32 Version 11g (for both Win x64 and x32 with ODAC no less than version 11.2.0.3), SQL Server 2008 R2, 2012, or 2014. All or part of the inspection and asset information shall be able to be synchronized between the field and office with built-in automatic validation and error checking.
  - a. The software must be based on Microsoft Windows and can be a 32 or 64 bit Windows application, compatible with Microsoft Windows 7, Windows 8.1, Windows 10, Windows Server 2008 R2 SP1, Windows Server 2012, or Windows Server 2012 R2 SP1.
  - b. The collected CCTV survey data shall be stored in either a SQL or Oracle tables, and be available for use by the system owner.

- c. Databases shall be able to be created in the default directory or on any writable local drive available.
- f. The Database structure shall have the ability to use OLE DB drivers, such as Oracle or Microsoft SQL Server.
- g. The database shall support simultaneously the following code systems: PACP, LACP, MACP, CUES standard, EN 13508-2, GAS, and individual custom codes. The “Customer” shall provide the “Contractor” the code requirement prior to inspection creation. The Management Console code editor shall provide the ability to add, modify, and/or delete the code systems per the inspection requirements or user’s preferences. Each project shall be able to utilize a different code system and units of measurement based on the “Customer” inspection requirements. The “Customer” shall have full and independent access to the code editor for customization needs without the use of third party applications.
- h. The database structure shall retain information on the various structures found within a Sewer, Storm, Hydrant, Gas, or any other system. It is important that the structures, nodes, identifiers and related attribute information be retained as separate tables from the inspection allowing import of existing data from multiple sources. The data structure allows different projects to reside within a single database. Information gathered in projects shall be available to view by project or by system. Data gathered during project inspection shall be available to view by the selected structure. Therefore, all inspections can be viewed on a structure even if gathered in different projects.
- i. The software shall support metadata and all panes and forms shall be stored in the database so that any field or interface customization shall be immediately available to any user that connects to the database.

### **Media Handling Capabilities and Requirements**

- a. Digital video files (Inspection Videos) shall be captured and/or recorded in the MPEG 1, 2, 4, H.264, .HD, or WMV formats as specified by the client in combination of the corresponding cameras and optional software modules. The video files shall be linked to the Inspection and Observations stored in the database. The “Link” of the video capture file to the database observation entry is required and each Observation shall record the name of the video file and the frame number referencing the time in the video when the inspection was made. The inspection observation(s) shall link to the video record in real-time.
- b. A Main, Lateral, or Node Inspection may have one or many linked video files. Video recording can be paused and then restarted without generating a new file.
- c. On playback, single click selection of a Main, Lateral or Node Observation shall start the video from the moment the observation was made, and subsequent selections of observations will “jump” the video playback to the corresponding spot. If no additional observation selection is made, the software will play sequentially all linked videos in the inspection.

### **Image (Photos) Capture Format Capabilities and Requirements**

- a. The Inspection image files (pictures) shall have the ability to be exported to Industry Standard Formats to include JPEG and PNG formats and be transferable by CD, DVD and/or External Hard drive to an external personal computer utilizing standard viewers and printers.

- b. The video image capture module shall be capable of collecting multiple color video frames of the defects found during inspection and then linked to the inspection reports. There shall not be a limitation to the number of pictures allowed per observation.
- c. Images or video clips shall be easily launched for viewing during inspection report review.
- d. Images can be captured and linked to an observation directly from “live” video during the TV inspection, or from the video playback at the office.
- e. Footage count shall be attached to the corresponding video image and shall appear on the reports indicating the correct footage when the image was captured during the pipeline inspection.
- f. Shall be able to print any captured image on the color printer in the inspection truck. Picture files shall be stored and exported with inspection data.
- g. A “thumbnail” preview of all pictures at an observation shall be available. The pictures shall be able to be expanded from thumbnail to full size by utilizing the mouse.
- h. Images will be capture automatically when creating observations.

### **Export of the Database, Videos, Pictures - Capabilities and Requirements**

- a. The database, videos, pictures shall have the ability to be “Exported”. Export is the process of selecting all or portions of the original data, video, and pictures, and creating a complete and independent copy of this information, which can be run independently or synchronized by a City’s or County’s office program.
- b. The office program shall have the ability to select the Assets and Projects to transfer to a particular database.
- c. All or part of a database can be exported from the TV Inspection database with or without videos and pictures. This new file can be burned to a CD/DVD, or transferred to a USB Hard drive and brought into the office from the truck, or vice versa.
- d. Export GraniteNet Dynamic Layers to KML (Export to Google My Maps)
- e. Use the built in Data Transfer functionality to transfer additional settings (such as inspection profiles and other specific GraniteNet settings) associated with the data being transferred to another user.

### **Synchronization Capabilities and Requirements**

- a. The software shall have the ability to synchronize with assets and inspections from exported databases.
- b. The synchronization process shall have built-in error checking for duplicates, conflicts, updates and any modifications to the data being synchronized using a unique hash revision control mechanism for every data object.
- c. Log files must be created for review purposes.
- d. During the synchronization process, validation dialogs shall be used to allow the user to select which data takes precedence when a conflict is challenged.
- e. All filtering capabilities previously described must be available for all exporting and synchronization tasks.
- f. The software will allow for multiple sources of data to be effectively consolidated into a single unitary database for analysis and evaluation.

## **Televising Survey Collection/Reporting Capabilities and Requirements**

- a. The software shall be capable of customization with the ability to modify/add to the pipeline condition descriptions/codes and to group them for ease of use.
- b. The software shall allow footage reading from the existing mainline and lateral camera equipment to be automatically entered into the current survey record and directly correspond to the noted defect location throughout either the main or lateral pipe graph and in all tabular reports generated.
- c. A context-sensitive, complete on-screen help file should be available.
- d. Drop-down boxes shall be available to quickly reference common information such as defects, pipe materials, survey purpose, locations, pipe usage, etc.
- e. The software's database shall have the means to sort in ascending and descending order according to date, pipe id, street name, structure id, observed footage, pipe materials, pipe diameters, work order numbers, etc.
- f. Summary reports compiling data from multiple inspections shall be available. Reporting order shall be user defined.
- g. Individual inspection summary reports shall also be available, and tabulate pipe survey results.
- h. Quarter section (or map or project areas) summary reports are to be made available so that all surveys within a quarter section are listed showing purpose of inspection, dates, work order numbers, structure ids, street names and total lengths.
- i. A report showing defects by inspection shall be available and programmable to list specific defects observed with corresponding footage, starting and ending manhole numbers, structural pipe defects (i.e. cracks, offsets, defective laterals, collapsed pipe, etc) and service oriented defects (i.e. roots, grease, obstructions, infiltration, etc).
- j. A report showing grading scores shall be available and summarize the structure ID's, pipe material and diameter, and the grade scores for each survey with totals.
- k. Reports showing service and structural aspect scoring shall also be available and shall list the pipe ID, total observed length, number of defects and total score with reference to the condition of the total pipe, average of the pipe, total defects and average of defects.
- l. The data structure shall allow different projects to reside within a single database. Information gathered in projects shall be available to view by project or by a unique system ID number or asset ID. Data gathered during the project inspection shall be available to view by the selected structure.
- m. The data structure shall allow for the entire asset data inventory to be created or imported even if no inspections have been performed on the assets.
- n. Observation's clock positions shall be entered via a graphical clock interface.

## **Data Analysis/Reporting Capabilities and Requirements**

- a. Users shall have the ability to perform data entry and automatically control the video text overlay simultaneously to eliminate the need for dual entry.
- b. Users shall have the ability to transfer data between the Data Acquisition System and the Software Interface without the need for any user supplied programming, special scripts, or macros.
- c. The user shall be able to build a code system from active codes.



- d. The software shall have the ability to filter all data using any data field in the software. Filter state should be savable for future use. Multiple filters can be saved. Filters can be defined graphically or by SQL query language.
- e. Users shall be able to filter the list of mainline inspections or assets to be exported. Users shall be able to select the mainline inspections by any default or custom field.
- f. Upload/download features shall be available to move surveys, assets, or projects between databases, to allow information and media stored on a truck system to be incorporated into a master database on the City's network or a supervisor's computer. The software program shall be able to combine databases from multiple sources into a master database and link media to a central location. A revision control system shall automatically monitor changes and resolve conflicts between databases.

### **Vendor Requirements**

- a. Vendor shall design, develop and support the software in the US. The software shall not be designed and supported offshore.
- b. Vendor shall offer comprehensive Annual Support Plans which include Web-based troubleshooting tools, online assistance, user forums, and access to downloadable upgrades and documentation via an established Support web site.
- c. Vendor shall provide referenceable clients similar in size and scope.
- d. Vendor should not be engaged in software patent or copyright infringement litigation.

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### **Definitions**

**ASCII:** The American Standard Code for Information Interchange is a standard seven-bit code. In the software rendering a Report to ASCII means to save it in ASCII format (also known as plain text format).

**Asset:** A general term representing sewer physical structure (see Lateral Asset, Main Asset and Node Asset). All Inspections in the software can be grouped into Assets because all Inspections (and their respective Observations) are performed on Assets. Multiple inspections can be linked to an asset to provide a historical perspective.

**Code System:** A set of Codes that comprise the menu of possible choices when assigning defect description values to observations. For example, when recording a specific type of inspection observation, the Code System will provide the user with a full range of codes to choose from, including all of the types of defects that the Observation may have (e.g. crack, sag, blockage, etc.).

**Codes:** A value assigned to fields in the software. Codes control the type of information that can be entered for a particular field.

**CSV file format:** Comma-separated values contain table values as a series of ASCII text lines organized so that each column value is separated by a comma from the next column's value and each row starts a new line. This is useful for importing data into spreadsheets, such as Microsoft Excel.

**Template:** A field template is used for assigning certain fields in the software specific values. Field templates are used for Asset Addresses, Node Asset IDs, and Site IDs.

**Footage:** The distance from a Node Asset (or other starting point) from which an Inspection began. Footage is used to describe the location of observed defects in pipes. Footage also is used to describe the current camera position during an Inspection. Footage also refers to the distance in a service line inspection from either the mainline asset or the cleanout/property line.

**HTML:** The Hyper Text Mark-up Language is the language that web pages are written in to format the presentation of content. Reports exported in HTML format retain formatting and are viewable in many email applications and word processing applications.

**Inspection:** General term to refer to the procedure of investigating the quality and conditions of pipes. An Inspection means a TV inspection in which a camera presents live video and/or records video and still pictures for later playback to determine the status of a pipe.

**Integration:** The process by which one software application can interact, import, process and export data from another software application using predefined and preferably certified methods. Integration does not only copy the contents of individual fields, but also maintains the relationships between the fields and implements the required business rules to ensure the proper operation and data integrity of the software applications involved.

**Labels:** The names of fields in the software dialogs.

**Lateral Asset:** An adjoining pipe to the main pipe of a Main Asset. A Lateral Asset intersects and opens into the main.

**Lateral Inspection:** An investigation of a Lateral Asset usually undertaken in the context of a TV Inspection, but may also be an independently generated inspection.

**Lateral Observation:** A defect found during a Lateral Inspection of a Lateral Asset.

**Main Asset:** A physical structure defined by two Node Assets and the interconnecting pipe.

**Node Asset:** The physical manhole or entry point into the sewer system. It can also be any type of an end point (catch basin, pumping station, ditch, etc.)

**Node Asset Inspection:** An investigation of the type and condition of a Node Asset. This procedure also enters Node Asset data into the software.

**Observation:** General term to describe a peculiarity during an Inspection. In the software, Observations are perceived defects, informational items, or general comments noted during a TV Inspection.

**ODBC Data Source:** Open Database Connectivity standard, an integration tool to access information from a range of databases including Access, dBase, DB2, Excel, SQL Server, Oracle, and Text. Reports may be generated to ODBC data sources.

**PACP:** NASSCO's Pipeline Assessment and Certification Program. It is a coding standard used to evaluate and classify sewer pipe conditions.

**Pane:** A window containing different views of data and processes in the software. These panes are synchronized, wherein operating in one of the panes will effect changes in another pane. Panes can be laid out in any custom arrangement.

**PDF:** Portable Display Format document. PDF files are viewable independent of the application that created them using PDF Viewers such as Adobe Acrobat Reader. The software shall allow generating of Reports into this format.

**Project:** A grouping of Inspections completed or assigned and the Assets upon which these Inspections have been or will be performed by the contract, customer, or other manner. In the software, all Inspections in the system are grouped into projects since Inspections are completed for specific reasons (customers, contracts, etc.).

**Report Filter:** This is a means of selecting only relevant information to be presented in a report. In the software, reports can be filtering by applying a Report Template to include user-defined information for the Report.



**Report Preset:** A Report Preset is a setting to generate reports rapidly. It is useful to specify persistent filters for daily or weekly reports and for selecting and generating several reports at a time. Using Report Preset can substantially reduce report processing time.

**Report Template:** Defines the content and look of a report. Reports packaged with the software will be represented as templates (in conjunction with report presets to set up filtering criteria) and when run request values for variable parameters to be entered, such as dates, operators, etc.

**Report:** A paper or electronic file based presentation of data contained in the application. Customized Reports can be generated that meaningfully present the data contained in the software.

**Synchronization:** The Database Synchronization is a process of forcing two data subsets of two databases to have the same content. This is useful for data transfer between the Inspection and the Enterprise/Engineering databases, when the Inspection edition user brings the updated database to the office and synchronizes completed inspections (for example) with the Enterprise/Engineering database. Also in the software, the Panes representing different modules of the application must be integrated and synchronized so a change in one pane effects a change in another.

**Toolbar:** Graphic tool that contains buttons with small images (the same images you see next to corresponding menu items), menus, or a combination of both. The software should include many built-in toolbars that you can show, hide, and position as needed.

**Tool-tip:** Notes that appear when you position the mouse over a control element (button, field etc.) that describes the element usage.

**TV Inspection:** The main method of inspected pipes and nodes. The procedure includes viewing television output of a camera traversing the pipe between two Node Assets.

**Viewer Edition:** A special version of the software. A Viewer is any user interested in simply viewing the results of the Inspections. Viewers cannot change data stored in the software, but have full access to review all of the stored data using the appropriate Panes. Viewers can print reports and review the video