

April 14, 2025

Kentucky Small Drainage Inspection Procedures Manual



Please use the following link for the most current version of this manual.

<https://transportation.ky.gov/Maintenance/Pages/default.aspx>

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100 - Introduction

Purpose and Need

Transportation resilience, defined by the Federal Highway Administration as the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions, is an important component of the Kentucky Transportation Cabinet's (KYTC) mission. Resilience involves planning, designing, maintaining, and repairing transportation infrastructure to better prepare for climate impacts and natural disasters. Climate models predict conditions that will gradually differ over the coming decades compared to those encountered historically. For Kentucky, these models predict a warmer and wetter environment. Recent events in Kentucky have demonstrated the devastating power of extreme weather events.

In July 2022, eastern Kentucky experienced catastrophic flash flooding. This caused water to rise rapidly and violently in communities located along streams in low-lying areas. The flash flooding critically damaged infrastructure such as roads, bridges, water supply, and power lines.

Weather hazard events pose a significant threat to the safety, reliability, effectiveness, and sustainability of transportation infrastructure and operations. The KYTC is committed to gathering a better understanding of the transportation network to better plan for disruptions.

The KYTC is embarking on an effort to collect inventory and condition data on all small drainage structures located on routes classified with State Primary System or State Secondary System designations. This data will allow the KYTC to better prepare for heavy rain events by identifying and addressing deficiencies within the small drainage structure inventory.

A small drainage structure is defined as any vehicular structure, cross drain, pipe, or culvert that spans an obstruction or depression that is less than or equal to twenty feet in length along the centerline of the roadway and is greater than 12 inches in diameter and transverse to the roadway centerline. For multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening, the total distance between the extreme ends of the pipes will be used to determine its categorization as a small drainage structure.

In contrast to the National Bridge Inspection Standards (NBIS), there is no federally mandated minimum inspection cycle for structures with spans less than 20 feet along the roadway centerline. The *Kentucky Small Drainage Inspection Procedures Manual* has been developed by the KYTC to outline the general practices and procedures used to inspect and inventory small drainage structures that do not meet the NBIS definition of a bridge.

The goals of this manual are:

1. To provide, in one source, the KYTC's general procedures for the collection of inventory and condition data of the small drainage structures throughout the state.
2. To provide a basis for uniformity between the KYTC personnel in performing and reporting small drainage structure inspections.

References & Standards

Culvert & Storm Drain System Inspection Guide, American Association of State Highway Transportation Officials (AASHTO) 1st Edition, 2020. Available for purchase:

<https://store.transportation.org/Item/CollectionDetail?ID=213>

National Bridge Inspection Standards (NBIS). Available:

<https://www.fhwa.dot.gov/bridge/nbis.cfm>

The KYTC State Primary Road System:

<https://transportation.ky.gov/Planning/Pages/State-Primary-Road-System.aspx>

Abbreviations

The following abbreviations, when used in this Manual, represent the full text shown.

AASHTO	American Association of State Highway and Transportation Officials
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HDPE	High Density Polyethylene
HDPP	High Density Polypropylene
KYTC	Kentucky Transportation Cabinet
LRS	Linear Referencing System
NBIS	National Bridge Inspection Standards
OMS	Operations Management System
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
QC	Quality Control
QA	Quality Assurance

Definitions

Abrasion – The wearing away of the surface of a small drainage structure due to mechanical action such as friction, rubbing or scraping.

Barrel Unit Name – The number of individual barrels for a drainage structure.

Checks – Cracks or splits that occur along the grain of wood, typically as a result of the drying process.

Condition Ratings – A rating system (Good, Fair, Poor, Severe) used to assess structure integrity.

Critical Finding – A condition that poses a potential safety hazard to the traveling public.

Decay – Decomposition of wood caused by microorganisms such as fungi.

Delamination – Condition where the surface of a small drainage structure has separated from the underlying material, usually at the level of the reinforcing steel.

Differential Settlement – Uneven vertical movement of the soil or foundation supporting the small drainage structure.

Efflorescence – The formation of a white, powdery deposit of soluble salts that migrate to the surface of porous small drainage structure materials such as concrete and masonry.

Exfiltration – The process by which water exits the small drainage structure.

Functionality Ratings – A rating system evaluating whether a structure is open, blocked, or collapsed.

GPS Coordinates – The latitude and longitude of the structure, including inlet and outlet locations.

Infiltration – The process by which water enters the small drainage structure.

Inspection Type – Includes Initial (Inventory), Routine, and Special inspections, each with specific purposes and procedures.

Inventory Date – The date when the structure's data was recorded or last updated.

Lined Structure – A designation indicating whether a structure has been lined with a similar or dissimilar material to improve the functionality or structural integrity of the structure.

LRS - A system in which feature locations are identified by a relative measure along a linear element.

LRS Direction – The designated route direction (e.g., North/East, South/West).

Meandering – The process within a waterway in which erosion occurs on the outer edge of a curve in the waterway and material deposits occur on the inner edge of the curve. Over time, the location of the waterway shifts.

Non-Entry Inspection – A visual inspection conducted from outside the structure when conditions prevent entry.

Person Entry Inspection – An inspection where personnel physically enter the structure.

Piping – The process of water flowing through the soil surrounding a small drainage structure.

Ponding – The accumulation of water in a particular area of a waterway, causing it to form a pond-like body.

Quality Assurance (QA) – Verification processes to maintain the overall quality of the inspection and maintenance program.

Quality Control (QC) – Procedures to ensure inspections and reports meet required standards.

Remote Entry Inspection – Use of remotely operated equipment for internal inspection.

Scour – The erosion of soil around small drainage structures due to swiftly moving water.

Shakes – A separation along the grain of wood, typically between or through the growth rings. Shakes are caused by natural factors in standing trees, such as bacteria entering through the roots.

Skew – Angle (in degrees) that the centerline of the small drainage structure is skewed away from a line perpendicular to the centerline of the roadway.

Sloughing – Slow downward movement or slipping of soil from the embankment's surface due to a loss of cohesion in the soil.

Small Drainage Structure: Any vehicular structure that spans an obstruction or depression that is less than twenty feet in length along the centerline roadway, or any cross drain, pipe, or culvert greater than 12 inches in diameter and transverse to the road centerline.

Small Drainage Structure Identification Number – A unique structure ID assigned during the initial inventory based on date, inspector initials, and sequence number.

Spalling – Deterioration of a concrete surface resulting in flaking or peeling of sections of concrete.

State Primary System – Interstates, parkways and other long distance, high volume intrastate routes of statewide significance that generally link major urban areas within the state.

State Secondary System – Regionally significant routes of shorter distance that provide mobility and access to land use activity; generally, serve smaller cities and county seats within a region.

Synthetic – Materials made by chemical synthesis such as polyvinyl chloride (PVC), High-density polyethylene (HDPE) and Polypropylene (PP).

Undermining – The process of eroding the base or foundation of a small drainage structure.

200 - Inventory

Data Updates

An important function of drainage maintenance is a complete, accurate, consistent, and current record of each small drainage structure on the state highway system.

Newly completed small drainage structures, or modification of existing small drainage structures that would alter previously recorded data in the inventory, should be entered in the database as soon as practical after a change in status of the structure for small drainage structures within the Commonwealth.

Inventory Data

Basic inventory data for small drainage structures include location, material type and features that describe the structure. The list below defines the items to be collected for each structure.

Inventory Date

Date of inventory and date of most recent update to any inventory information (either in the mobile or desktop application)

GPS Coordinates

- Structure Location: Represented by a point indicating its approximate field location. Coordinates for both the inlet and outlet (take the inlet first) pinpoint the culvert's midpoint. Coordinates can be manually entered into the application if GPS accuracy is not available.
 - Latitude
 - Minimum of six decimals for structure, inlet* and outlet*
 - Longitude
 - Minimum of six decimals for structure, inlet* and outlet*

Route

- Route Number that is carried over the structure
- Mile-point (begin point) of the route where structure is located

LRS Direction

- Route direction (all, N/E, S/W)

Lanes

- Lanes (1-4, or Ramp) carried over the structure

Offset

- This value is automatically generated to be 0' if the GPS data for the Inlet and Outlet creates a small drainage structure centerline that crosses the roadway centerline.

- If the GIS data does not result in a point at which the small drainage structure crosses the route centerline, the value is then automatically generated as the perpendicular distance from centerline of route identified and midpoint of the small drainage structure. Due to the accuracy capabilities of the GNSS equipment and difficulties experienced in a variety of field conditions, offset values may vary with each point collected:
 - Offsets of 15 feet or less are acceptable, as this distance allows for the structure to be located while in the field.
 - For offsets that are greater than 15 feet the coordinate data shall be collected again until an acceptable offset is obtained.

Small Drainage - Structure Identification Number

- Agency specific identification value assigned during the initial inventory that uniquely identifies each structure – for the KYTC, this will be setup as the date, initials of the person inventorying the structure, and a sequential number that initiates/terminates each day:
 - Example: 20240701JDS05
 - The above culvert was inventoried on July 1st, 2024, by John Doe Smith – it was the 5th (05) structure inventoried by Mr. Smith that day.

Management Unit

- County in which the structure resides

Small Drainage Type

- Shape of the structure classified according to the following descriptions – ***Users may define custom shapes in the “Comments” section as needed:**
 - Pipe
 - Arch
 - Box
 - Ellipse
 - Unknown
 - Other

Small Drainage Material Type

- Structure material is classified according to the following material types used in the shared database. ***Users may define custom sub-types in the “Comments” section as needed:**
 - Aluminum
 - HDPE
 - HDPP
 - Concrete
 - Steel
 - Unknown
 - Other

Small Drainage Status

- Structure status in the field – in Active use or retired (Inactive)

- Active – Structure is currently intended to convey material underneath roadway
- Retired (Inactive) – Structure is currently abandoned and not intended to convey material underneath roadway

Small Drainage Box Height

- Height of structure barrel (tallest point of ellipse or arch). Reported in tenths of feet.

Small Drainage Box Width

- Width of Structure barrel (widest point of ellipse or arch). Reported in tenths of feet.

Small Drainage Size (Dia)

- Pipe diameter. Reported in inches

Lined

- This field is a check box. If the structure is lined, then the field is checked. If the structure is not lined, the field is left unchecked. The default value is not lined (unchecked).

Small Drainage Skew

- Angle that the centerline of the small drainage structure is skewed away from a line perpendicular to the centerline of the roadway.
- This field is a drop-down selection. User will estimate skew as the closest value represented in the selection menu:
 - 0° (Perpendicular)
 - 15°
 - 30°
 - 45°
 - 60°
 - 75°

Barrel Unit Name

- Number of barrels at the structure location – default value is “1”. If there are more than six (6) barrels at the location or structure type/material varies, additional information may be included in the “Comments” section.
- List of values available:
 - (None)
 - 1
 - 2
 - 3
 - 4
 - 5
 - 6

Small Drainage Length (Optional)

- Length from inlet end to outlet end of barrel. Reported to nearest whole foot – this value will be calculated using the inlet and outlet GPS coordinates but may be manually input.

Comments

- Special notes about the location or characteristics of the small drainage structure.

300 - Inspection

Inspection Types

There are three types of inspections for small drainage structures. The current focus for the KYTC is performing Initial (Inventory) inspections to create a comprehensive database of the small drainage structure inventory. Routine and Special inspections are discussed as a basis for developing future inspection policies.

All inspections shall be conducted with a minimum of two personnel on site.

Initial (Inventory)

Description: The first inspection of a structure, as it becomes a part of the small drainage inventory, or when there is a change in the configuration of a structure (e.g., widening, lengthening, supplemental bents, etc.). Initial inspections are conducted on new small drainage structures, recently modified small drainage structures, or small drainage structures that have not yet been entered into the Operations Management System (OMS). Data necessary to create an asset record for future tracking of inspection, defects and maintenance, along with basic condition data is collected during the initial inspection.

Purpose: The determination of baseline structural conditions and the identification and listing of any existing problems or locations in the structure that may have potential problems.

Procedures: Initial Inspection data should be collected using Work Manager. **Appendix A** of this document contains the Work Manager Application User Manual.

Routine

Description: Recurring inspection conducted at regular intervals defined by the agency that include visual and non-destructive assessment.

Purpose: The determination of the small drainage structure condition and functionality. Changes to the inventory data are also recorded.

Procedures: Routine Inspection data should be collected using Work Manager. **Appendix A** of this document contains the Work Manager Application User Manual.

Special

Description: Unscheduled inspections in response to event-driven emergencies such as flooding, traffic accidents, the appearance of sinkholes or at the discretion of the Cabinet.

Purpose: Following an event, structural or functional damage is documented and a recommendation to repair or replace the small drainage structure is prepared. Special inspections may be used to monitor known conditions or deficiencies at a small drainage structure until repairs can be performed. Special inspections may be used to confirm repairs after they are performed.

Procedures: Special Inspection data should be collected using Work Manager. **Appendix A** of this document contains the Work Manager Application User Manual. Additional sketches and measurements should be documented on paper and attached to the inspection record. Changes to the inventory data should be documented using the Initial Inspection procedures.

Condition Assessment and Reporting

Critical Finding Procedure

When an inspector identifies a condition that creates a potential safety hazard for the travelling public it is a “critical finding”. When a critical finding is identified, the inspector shall contact the responsible Project Delivery and Preservation Branch Manager. If the potential for imminent roadway failure exists, the inspector shall remain onsite until Maintenance staff arrives and takes control of the site.

Small Drainage Inlet/Outlet Condition Ratings and Actions

Small Drainage Inlet/Outlet Condition is an overall assessment of end treatments and appurtenant structures. The following condition ratings are assigned.

	1	2	3	4
	Good	Fair	Poor	Severe
Condition	Like new, with little or no deterioration, structurally sound.	Some deterioration, but structurally sound.	Significant deterioration, that may require maintenance or repair.	Very poor conditions that indicate possible imminent failure of which could threaten public safety.
Action Needed	No action is recommended.	No immediate action is recommended. Note in inspection report only.	Inspector evaluates need for corrective action and makes recommendation in inspection report. Maintenance personnel should be informed.	Corrective action is required and urgent. Engineering evaluation is required to specify appropriate repair. Initiate Critical Finding Procedure .

For all materials, this category includes cracking, scour, stability, settlement and rotation. For concrete structures, this category also includes surface damage, spalling and delamination. For metal structures, this category also includes deformation, damage and corrosion. Additional items considered in the condition assessment are:

- Embankment – The soil slope area surrounding the small drainage structure. Sloughing and cracking are indicators of movement that could affect the integrity of the structure. Erosion leads to a loss of vegetation and can result in sloughing. Piping is the flow of water along the outside of the small drainage structure, causing loss of embankment.
- Concrete Footings and Invert Slab – An assessment of the footings and base slab of small drainage structures. This includes differential settlement and movement, scour and stability, cracking, spalling, delamination and existing patches.

- Barrel Alignment – The horizontal and vertical alignment of the small drainage structure. Misalignment can result in reduced hydraulic performance and erosion.
- Barrel Condition – The full pipe or the sides and top slab of box culverts.
 - Synthetic – the shape, surface damage and local buckling, splits and cracking are inspected.
 - Concrete – cracking, spalling, delamination, patching and deterioration are inspected.
 - Corrugated metal – surface damage, corrosion, abrasion and shape are inspected.
 - Masonry – masonry units, movement, mortar and efflorescence are inspected.
 - Timber – connections, missing members, decay, checks, shakes, structural cracks, delamination, abrasion/impact damage and distortion are inspected.
- Joints – The connections between segments of the small drainage structure. Joint separation should be noted. Infiltration and exfiltration of water and material through the joints can lead to settlement and misalignment of the structure.
- Seams – The longitudinal joints in built-up corrugated metal pipes. Special attention should be paid to seam alignment, bolts and fasteners and bolt holes and deficiencies noted.
- Water Tightness - Infiltration and exfiltration of water along the structure aside from the inlet and outlet should also be noted.
- Approach Roadway – The pavement, guardrails and shoulders above the small drainage structure. Documentation of settlement, cracking, patches or other indicators of subsurface movement that may indicate possible stress in the small drainage structure should be recorded.
- Channel Alignment and Protection – The waterway immediately upstream and downstream of the small drainage structure. Erosion and meandering of the stream can lead to undermining of the embankment, further erosion around the structure and excessive sedimentation within the structure. A misalignment of the waterway relative to the small drainage structure can lead to ponding, scouring and undermining of the structure.

Condition Rating Examples**Condition – (CS1) Good**

Figure 1: Concrete pipe with no defects.



Figure 2: Steel pipe with insignificant corrosion.

Condition – (CS2) Fair

Figure 3: Concrete pipe with abrasion and minor misalignment of pipe sections.



Figure 4: Steel pipe with minor corrosion and perforations forming.



Figure 5: Concrete culvert with minor scour and abrasion at curtain wall and bottom slab.



Figure 6: Distorted HDPE pipe end with some damage.

Condition – (CS3) Poor

Figure 7: Significant scour away from roadway with separation of apron from end section.



Figure 8: Significant distortion of pipe with large perforations.



Figure 9: Significant pipe section misalignment.



Figure 10: Crushed pipe end.



Figure 11: Crushed pipe section.



Figure 12: Pipe separation and significant corrosion.

Condition – (CS3) Poor (Continued)

Figure 13: 18" diameter steel pipe with significant corrosion.



Figure 14: Concrete box culvert with localized spalling and corroded reinforcing steel.

Condition – (CS4) Severe

Figure 15: Failed headwall and collapsed pipe end.



Figure 16: Failed headwall.



Figure 17: Heavy scour of bottom slab and wingwalls encroaching below roadway

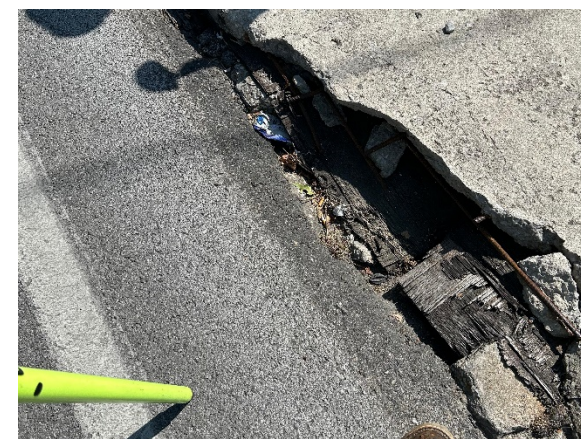


Figure 18: Heavy spalling of curb inlet with exposed steel

Functionality Ratings and Actions

Functionality is an assessment of the ability of the structure to pass water. The following functionality ratings are assigned.

	1	2	3	4
	Good	Fair	Poor	Severe
Functionality	Open. Functionally adequate. (<10% Blocked)	Blocked but functioning. Functionally adequate. (10%-25% Blocked)	Blocked and not functioning. Functionally inadequate. (25%-50% Blocked)	Collapsed and/or non-functioning. (>50% Blocked)
Action Needed	No action is recommended. Note in inspection report only.	No immediate action is recommended, but maintenance personnel should be informed	Inspector evaluates need for corrective action and makes recommendation in inspection report.	Corrective action is required and urgent.

Functionality Rating Examples

Functionality – (CS1) Good



Figure 19: Pipe 0% blocked



Figure 20: Pipe less than 10% blocked and functionally adequate

Functionality – (CS2) Fair

Figure 21: Pipe blocked less than 25%.



Figure 22: Pipe blocked less than 25%.

Functionality - (CS3) Poor

Figure 23: Pipe 25% to 50% blocked and functionally inadequate.



Figure 24: Pipe 50% blocked and functionally inadequate.



Figure 25: Pipe up to 50% blocked and functionally inadequate.



Figure 26: Pipe 25% to 50% blocked and functionally inadequate.

Functionality – (CS4) Severe

Figure 27: Pipe collapsed and functionally inadequate.



Figure 28: Pipe greater than 50% blocked and functionally inadequate.



Figure 29: Pipe greater than 50% blocked and functionally inadequate.



Figure 30: Pipe greater than 50% blocked and functionally inadequate.



Figure 31: Pipe 100% blocked and not functioning.
Pipe 100% blocked and not functioning.



Figure 32: Pipe 100% blocked and non-functioning.

Inspection Photos

Basic mandatory photographs must be maintained in the electronic file. Photographs should be digital, color, of good quality and clarity. These photographs are required for each initial inspection.

1. **Inlet Elevation:** View of the structure from the inlet side.
2. **Inlet View Through Culvert:** View sighting through the barrel from the inlet side.
3. **Outlet Elevation:** View of structure from the outlet side.
4. **Outlet View Through Culvert:** View sighting through the barrel from the outlet side.
5. **Deficiencies:** Include, as required, photographs of problem areas found and documented during the inspection (cracking, spalling, scour, erosion, etc.)
6. **Cardinal Approach Photo:** Taken viewing along the roadway looking ahead (ascending mile-point)

Inspection Equipment

Inspectors shall carry the following inspection equipment during inspections:

- Tablet or smartphone with Cellular Capabilities with Work Manager application
- GNSS receiver, with precision $\leq 60\text{cm}$. Ex. Trimble Catalyst with Catalyst 60 license.
- 25' tape measure
- Laser distance meter
- 6' folding ruler
- Sounding hammer
- Flashlight
- Level
- Waders/Boots
- Brush clearing tool(s)
- PPE
- Gas meter (for confined space entry ONLY)

400 - Quality

QC/QA Review for Inventory and Inspections

Definitions

- Quality Control (QC) is the enforcement of procedures that are intended to maintain the quality of small drainage structure inspection, reporting and evaluation.
- Quality Assurance (QA) involves the verification of the level of quality of the small drainage structure inspection, appraisal and maintenance program.

Procedures:

I. Purpose

To ensure the safety of Kentucky's small drainage structures, a thorough and consistent inspection process by qualified inspectors is essential. Additionally, the information gathered from field inspection reports plays a critical role in prioritizing repair and replacement projects. It is vital that these reports provide accurate, uniform assessments and condition ratings for effective decision-making. To achieve this, a robust QC/QA process should be implemented.

II. Objectives

- **Enhance consistency** in the data collected and standardize inspection practices across districts.
- **Ensure proper training** for all inspection personnel, ensuring they operate within the limits of their qualifications and adhere to the required rating standards.
- **Improve communication** between inspectors, District Maintenance Engineers, and Central Office Management.
- **Maintain adherence** to the Critical Findings Procedure, ensuring timely reporting of critical maintenance needs.
- **Refine reporting procedures** for maintenance activities identified during inspections.
- **Enhance tracking** of structure conditions over time for better long-term planning and resource allocation.

III: Quality Control

Training:

- Inspection personnel will be provided a copy of the Small Drainage Inspection Procedures Manual.
- Inspection personnel shall familiarize themselves with the Small Drainage Inspection Procedures Manual prior to performing inspections.
- New inspection personnel shall be accompanied in the field by an inspector with inspection experience on small drainage structures until the new inspector is satisfactorily proficient in the collection of inventory and inspection data.

Data Collection:

- GPS location shall be collected using a GNSS receiver, with precision $\leq 60\text{cm}$.
- Laser distance tools, digital levels and other data collection tools that require calibration shall be calibrated per the recommendations of the manufacturer.

Data Entry:

- All data shall be entered into the work manager application using a tablet or smartphone with cellular capabilities and the current version of the work manager application.
- The work manager application was developed with pulldown menus for data consistency.
- Individual work manager users should sync data as often as possible and at a minimum upon completion of each day's inspection work.

District Review:

- The District Project Delivery and Development Branch Manager shall assign an experienced individual to perform a third-party review of approximately 10% of the inspection reports completed each day and discuss needs or concerns. Any unresolved discrepancies during district office review of the inspection report should have secondary field review by both the inspector and reviewer.
- Upon acceptance at district level all reports shall be submitted to Central Office Division of Maintenance Roadway Preservation Branch for final review.

IV: Quality Assurance

- Each District Project Delivery and Development Branch Manager should maintain individual records on each person involved with small drainage structure inspection in the district. Records should include inspection experience, training pertinent to small drainage structure inspection and specific dates of training.
- Independent field inspections will be performed by the Central Office Division of Maintenance Roadway Preservation Branch on a sample of small drainage structures selected from each district during the initial inspection phase. Small drainage structures will be randomly selected to represent a cross section of structures in the district, by type, size, material used in construction, configuration, condition, and inspectors responsible for inspections.
- The Central Office Division of Maintenance Roadway Preservation Branch will check to verify that Critical Findings are being recognized, documented and reported appropriately.

V: QA Review Findings

At the conclusion of each district's QC/QA office and field reviews, findings will be reported to the district.

Work Manager - Asset Collection Application

USER MANUAL

A usage guide for inputting, maintaining, and creating inspections for Small Drainage assets with the Work Manager Application (iOS and Android) across the Commonwealth of Kentucky.

A. Open the App – Work Manager

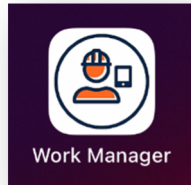


Figure A-1

B. Sign In

A sign-in form for the Work Manager app. It has a light blue header with the text "Work Manager". Below the header, there are two input fields: "Username" and "Password", each with a horizontal line for text entry.

Figure B-1

1. Username – FIRSTNAME.LASTNAME
2. Password¹ – Initially Provided by KYTC
 - a. Ensure that the configuration is set to WM_KY_PROD
 1. If incorrect, select small wrench in bottom right corner and update appropriately

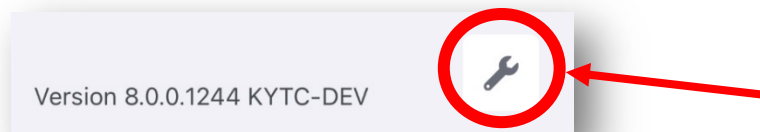


Figure B-2

3. Once logged in, ensure user is in the proper Admin Unit (County) – this value will remain the same with each login until manually changed, even after logging out.
 - a. Select the Menu in the top left corner

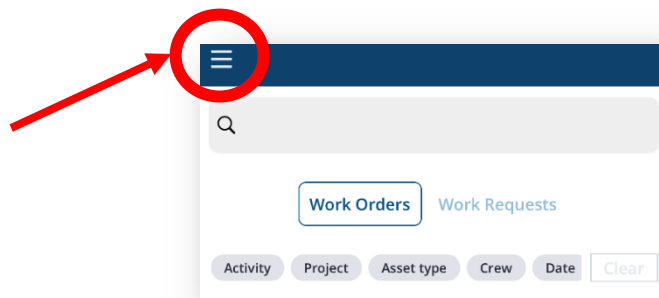


Figure B-3

1 – Password will be reset by the user after the initial login

- b. Go to Settings -> Admin Unit -> Adjust as Necessary

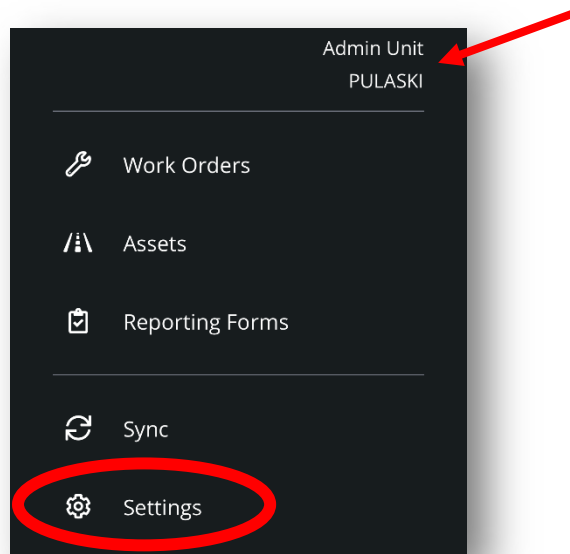


Figure B-4

- c. Also, while in settings, ensure that the **Location Accuracy** is enabled to improve precision location tracking – only need to update this setting during initial login.

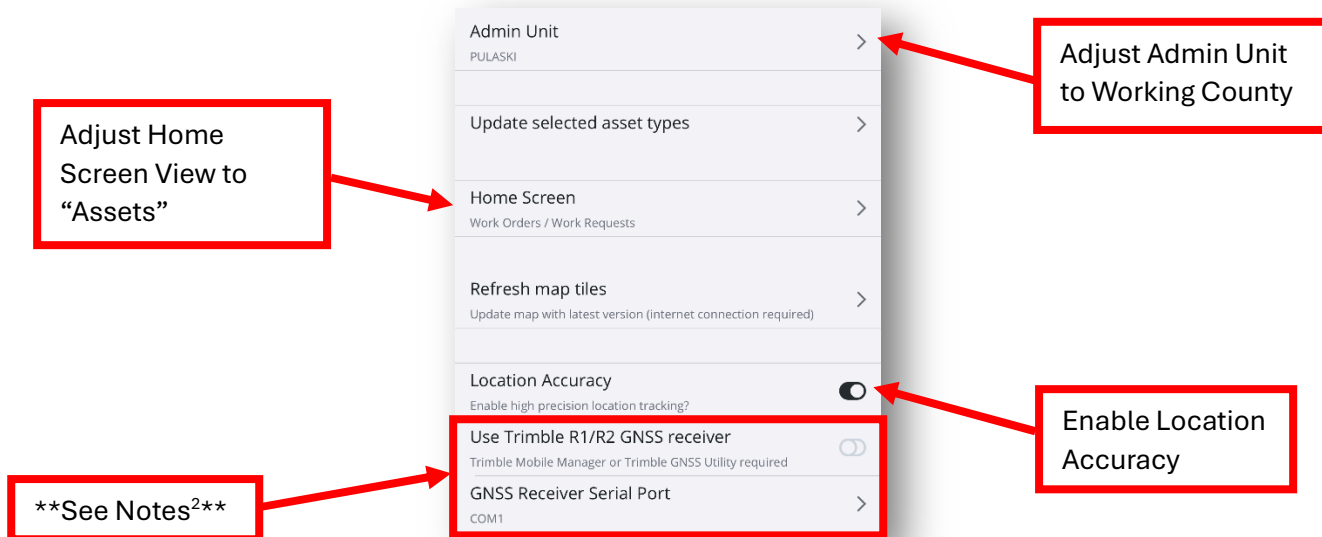


Figure B-5

- d. User can also adjust the home screen setup here – home screen should be set to **Assets** so that user can create assets and/or input inspections as needed without the need to switch between screens each time user logs into the app.

2 – Users may use a Trimble GNSS receiver in conjunction with the app to improve location accuracy while collecting data – users may also utilize other GPS/GNSS units to improve location accuracy within the app, but only Trimble brands will work jointly with the app.

C. Adding a New Asset

1. Select “**Add Asset**” from the Home Screen



Figure C-1

2. Ensure **Small Drainage** is selected for the asset type – there could be other options depending on if more than one asset type is enabled for the user – and tap on “Create New Asset”

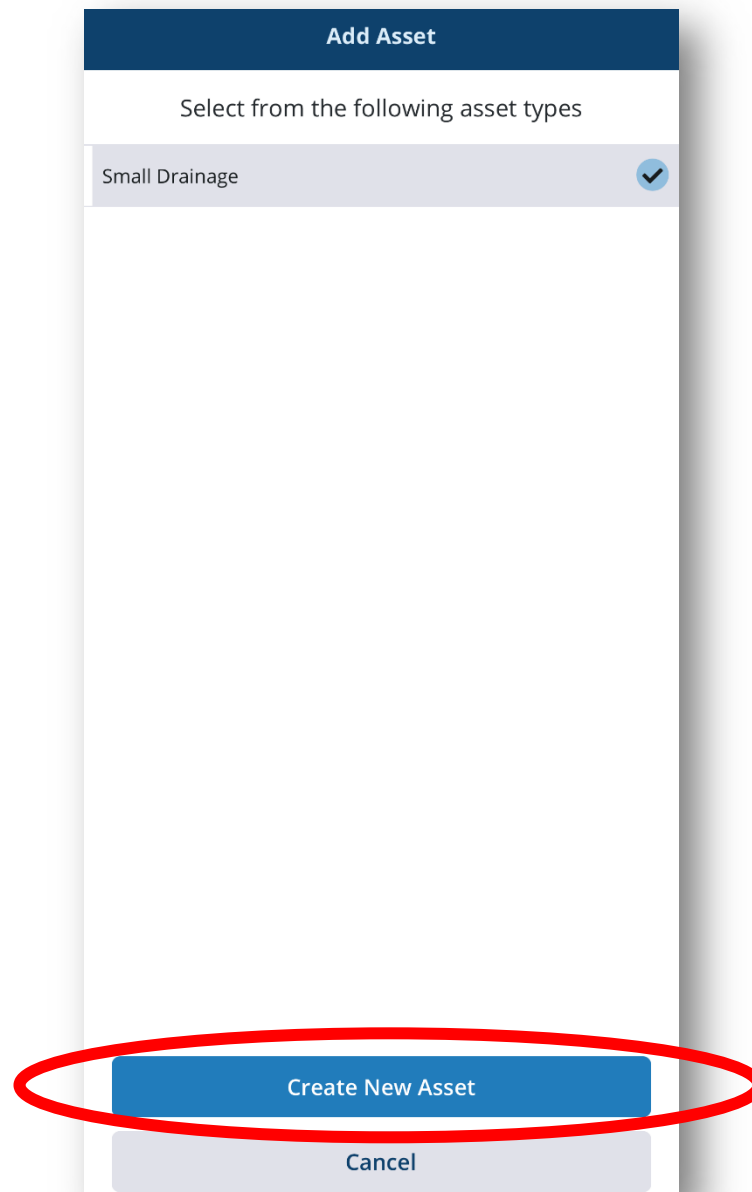


Figure C-2

3. When the map appears, user should stand at/above the inlet side to drop the first point.³
 - a. First point will automatically be set as the inlet. When ready, make sure and tap the location icon in the top right corner to pin-point – it may take a few iterations to ensure the first point is correct – and then select “Add” to drop the inlet point.
 1. To improve efficiency in the field, one user may need to walk to the inlet and the other team member walk to the outlet – in the event that these locations are distanced, user can create the asset by standing at the roadway edge for the inlet/outlet points to create “place holders for the inlet/outlet and then manually update GPS coordinates once the asset is created in the **Small Drainage Details** Section (See Figure C-5)
 - b. Move to the outlet and repeat the process.

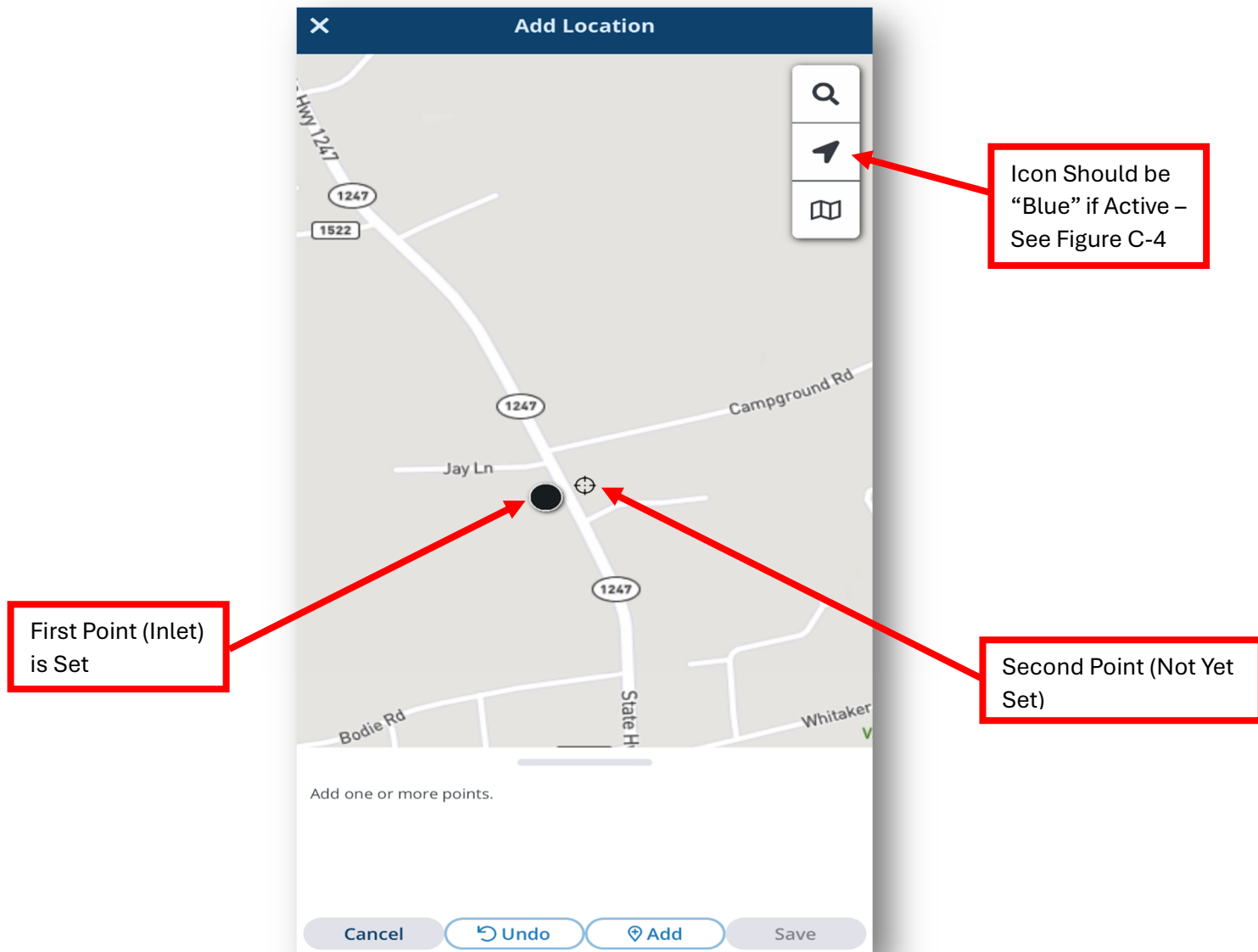


Figure C-3

3 – Users can manually search by address and input a GPS coordinate to more accurately locate this point if using a handheld unit that is more accurate and doesn't communicate directly with the app. This will help ensure the asset is assigned to the correct roadway at the right location. For details – see **Part E** details.

4. Once the points are selected, the route the asset is linked to will be highlighted in **RED** – ensure the proper route is highlighted before proceeding – and the associated route information will be shown below the map.
 - a. If route highlighted is not correct or if the offset⁴ is very large, user may need to repeat the processes from **Step C3** above – simply select the “Undo” button (must do this for both points) and start back with **Step C3**.

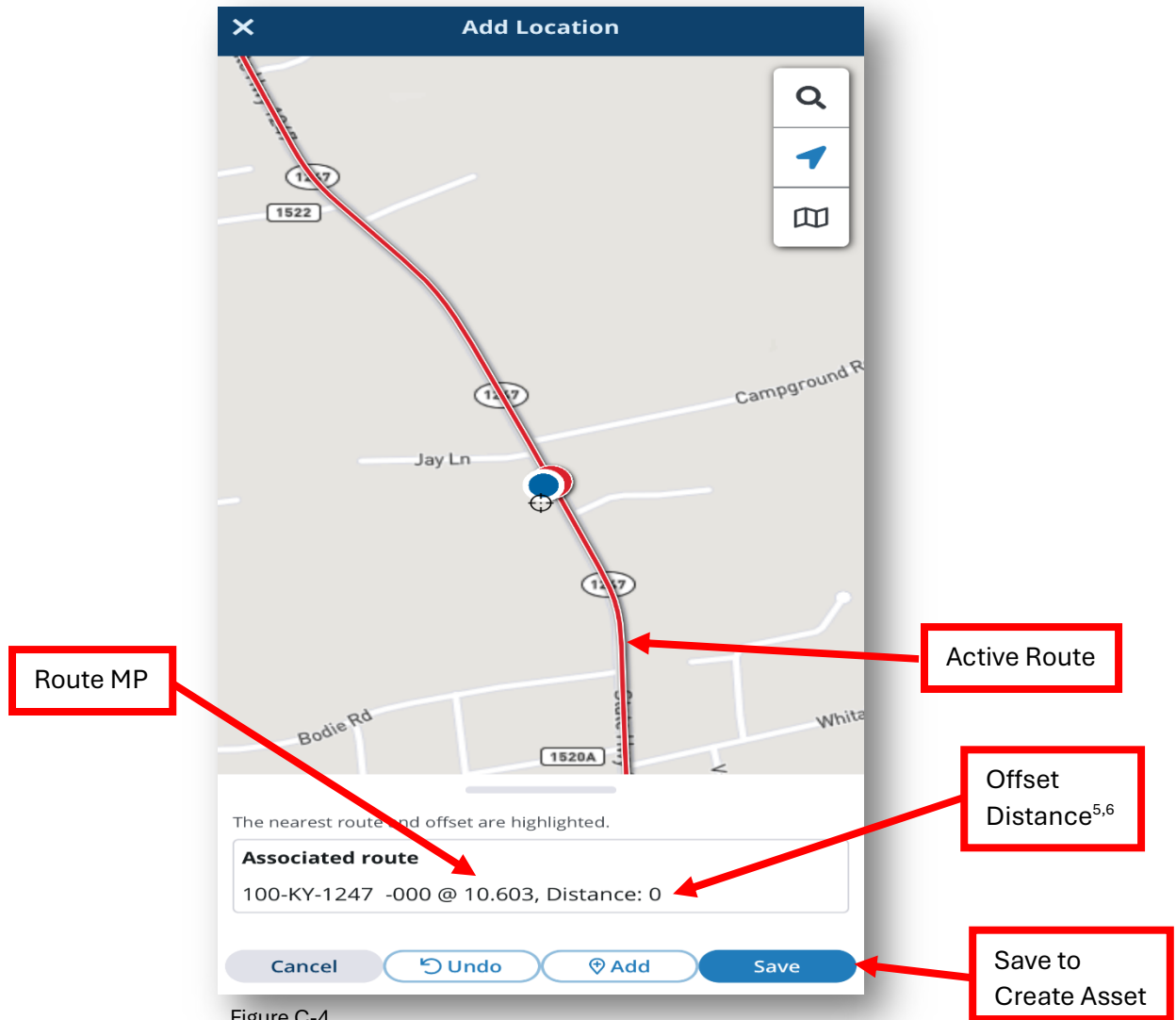


Figure C-4

- b. Once the appropriate location (route, location, and offset) is highlighted – select “**Save**” to create the asset.

4 – Offset distance is the distance measured from the centerline of the roadway to the centerline of the asset created.

5 – Offsets could vary slightly for variable reasons – users created a “false” point and later input actual GPS coordinate, lower precision in areas with poor service, or human error. Anything larger than 15’ should be reviewed to assure location is as accurate as possible given conditions.

6 – These values should be as close to 0 as possible to ensure the ability to relocate later - less than 15’ required.

5. Updating/Editing Asset Details – once the user selects save, the next screen will appear and user will select **Small Drainage Details** to edit details of the asset as needed.

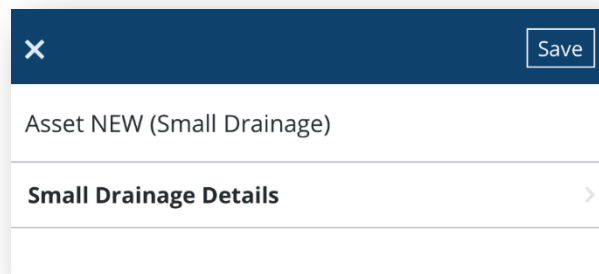


Figure C-5

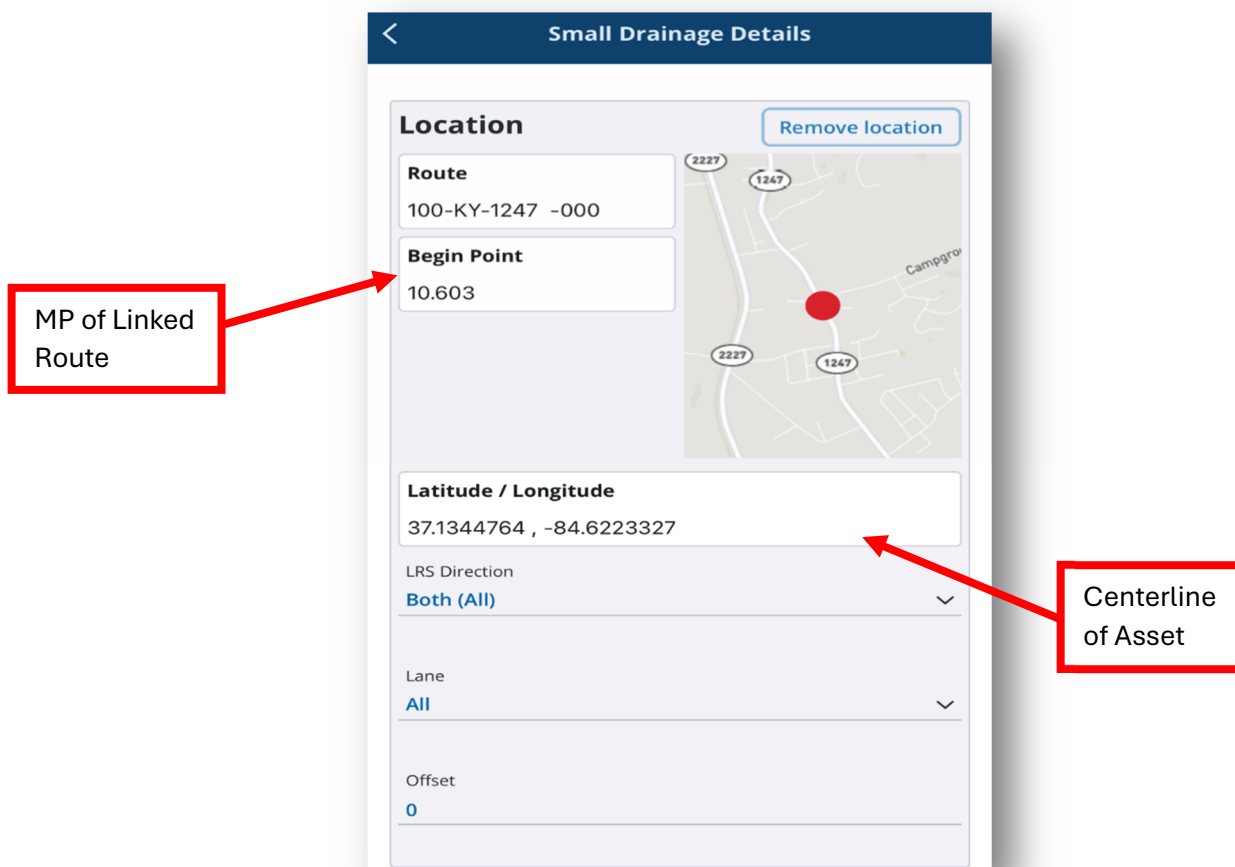


Figure C-6

- a. Small Drainage
 1. User must input an identifier here
 - a. Standard ID - Date, user, and sequential number
 - i. Example in **Figure C-7** was collected May 3, 2024 by user “MJE” and is the eighth (08) structure collected that day.
- b. Management Unit
 1. Automatically set by the Admin Unit selected initially – can edit here if user forgot to update initially
- c. Small Drainage Type⁷
 1. Select from Dropdown the asset type
 - a. None, Pipe, Arch, Box, Ellipse, Unknown, or Other
- d. Date Update
 1. Automatically populated each time a change is made (desktop or mobile)

Small Drainage

20240503MJE08

Management Unit

PULASKI

Small Drainage Type Name

Pipe

Date Update

Small Drainage Material Type Name

Concrete

User Update

Optional

Small Drainage Status

Active

Field Inlet Latitude

37.13449

Field Inlet Longitude

-84.62239

Field Outlet Latitude

37.14352

Field Outlet Longitude

-84.62229

Figure C-7

Figure C-8

- e. Small Drainage Material Type Name⁷
 1. Select from dropdown the predominant material type of the asset
 - a. None, Aluminum, HDPE, HDPP, Concrete, Steel, Unknown, or Other
- f. User Update
 1. Automatically populated based on who created/made latest edits
- g. Small Drainage Status
 1. Automatically populated – if culvert not in use, can be set to “Inactive”
- h. Field Inlet Latitude/Longitude and Field Outlet Latitude/Longitude
 1. If values are blank, the points initially selected when the asset was created will remain. If either value is edited, all four (4) values must be updated.

⁷ – For structures that have multiple types (pipe, box, other) and or material (concrete, steel, HDPE), the predominant shape and material shall be used and a comment can be added to the “Comments” section for clarification.

- i. Small Drainage Box Height (Ft)
 - 1. Only used for box culverts and ellipses (tallest point)
- j. Small Drainage box Width (Ft)
 - 1. Only used for box culverts and ellipses (widest point)
- k. Small Drainage Size (Dia in Inch)
 - 1. Only used for pipes – measure diameter
- l. Lined
 - 1. Is the culvert lined – check if “yes”. Lining material may be noted in the “Comments” section.
- m. Small Drainage Skew
 - 1. Estimate Skew Value of Culvert to Roadway – must select a value
 - a. 0°, 15°, 30°, 45°, 60°, 75° – estimate to nearest 15°

Small Drainage Box Height (Ft)

Optional

Small Drainage Box Width (Ft)

Optional

Small Drainage Size (Dia in Inch)

18

☐ Lined ?

Small Drainage Skew

0

Figure C-9

Barrel Unit Name

1

Small Drainage Length

Optional

Comments

Inventory Date

Figure C-10

- n. Number of Barrels
 - 1. Select number of barrels (1-6) – if more than six (6), additional clarification can be made in “Comments”
- o. Small Drainage Length
 - 1. Collect this value if feasible, but the application will calculate using GPS coordinates of inlet and outlet if left blank
- p. Comments
 - 1. Input any special circumstances as needed.
- q. Inventory Date
 - 1. Must populate in the field

6. Once all values are edited appropriately, user must go back to the previous screen using the back arrow in the top left corner (Figure C-11) and must select “**Save**” in the top right corner (Figure C-12) to save all values.

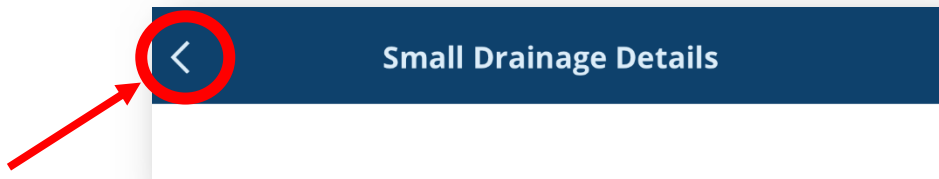


Figure C-11

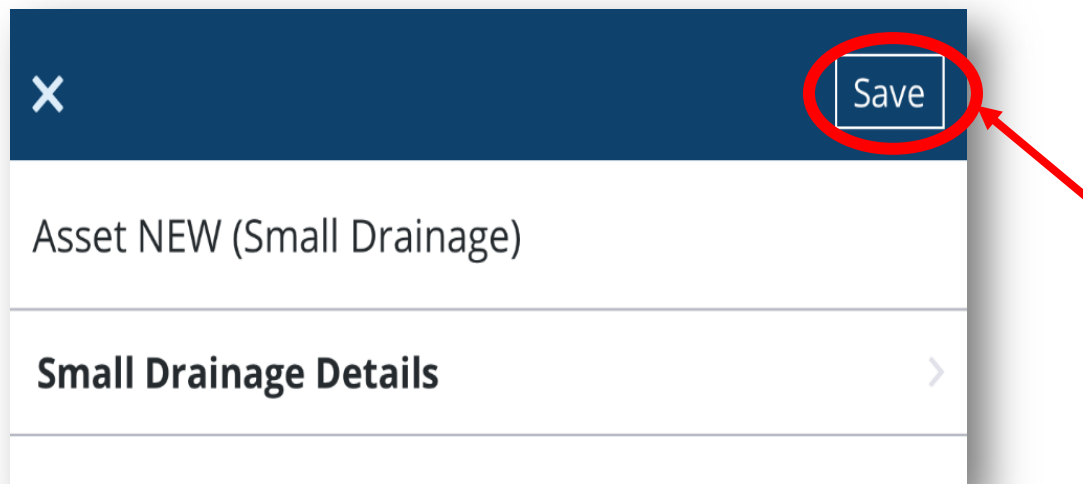


Figure C-12

D. Creating a New Inspection

1. Upon saving the asset, user will return to the home page – from here, user must zoom in and tap on the culvert that was created (Figure D-1), then tap “**Create Inspection**” (Figure D-2), ensure MP location is accurate⁸ for selected asset and select “**Yes**” (Figure D-3)
 - a. Any user may also edit any of the values created in **Step C5** for the existing asset from the screen shown in Figure D-2

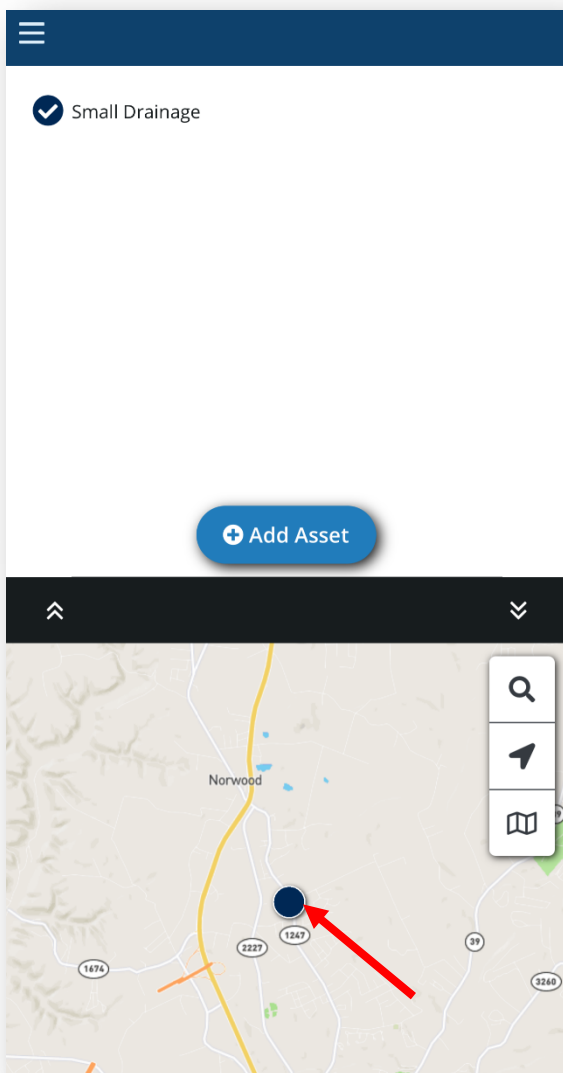


Figure D-1

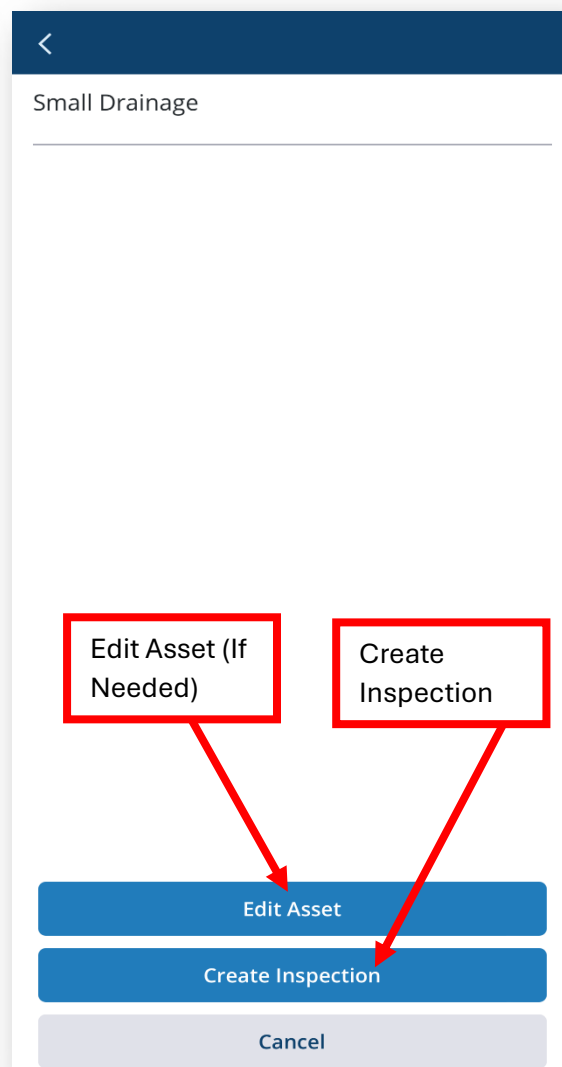


Figure D-2

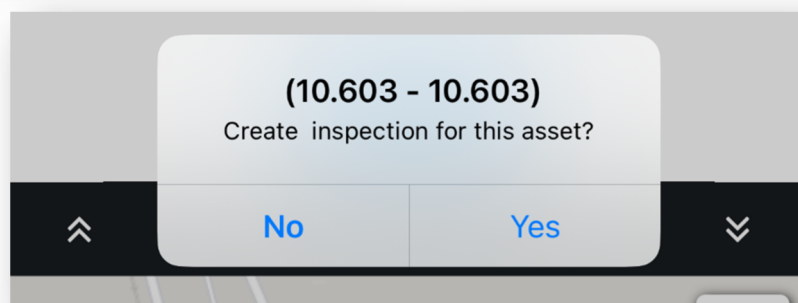


Figure D-3

⁸ – In cases where there are multiple assets in close proximity to one another and may overlap, ensure mile-point displayed matches the asset user wishes to edit and/or create an inspection for.

2. Select **Small Drainage Inspection** on the next page to begin the inspection.

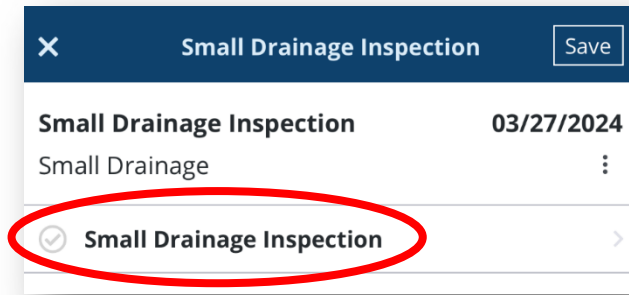


Figure D-4

3. Upon selection, a new screen will appear with four (4) topics to address – this screen will be known as the “Inspection Screen” – Inlet Condition, Outlet Condition, Functionality, and Assessment topics are now shown with an option for a comment (condition, defects, special circumstances, etc.) and an option to add photo(s).

Figure D-5

4. Small Drainage Inlet Condition

- Assess inlet – note defects⁹ in the “Comments” – Example shown in Figure D-6.
- Consider conditions, make a decision based on guidelines provided in Procedures Manual for inlet condition – Good, Fair, Poor, or Severe
- Add pictures by selecting the  icon – if icon is not visible, touch “Photo”
- Add Photos (Take¹⁰ photo or Upload¹¹ photo) here
 - A minimum of 2¹² photos required at inlet – elevation view and view through barrel(s) – sample photos in Figure D-8 – once added, photos will appear in initial inspection screen. Additional photos (defects) may be included – select “Done” in the top right corner when all photos are taken

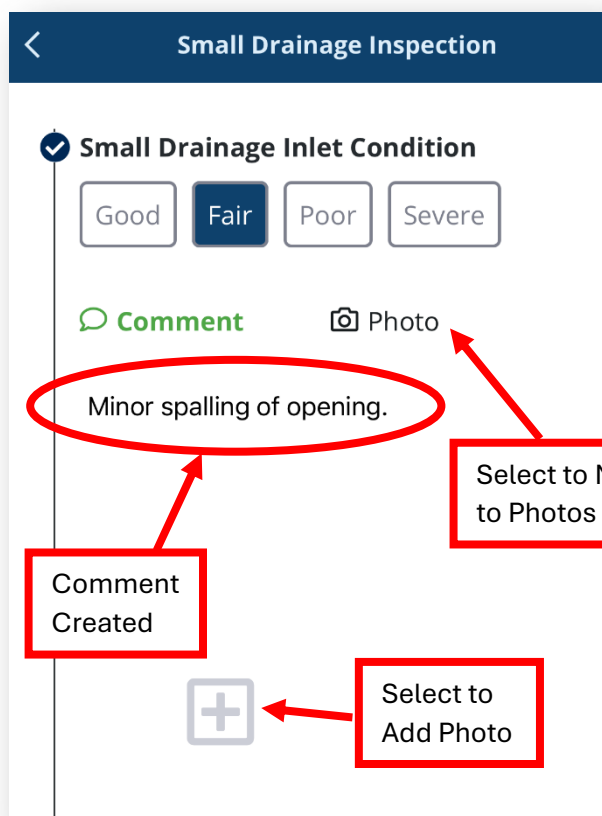


Figure D-6

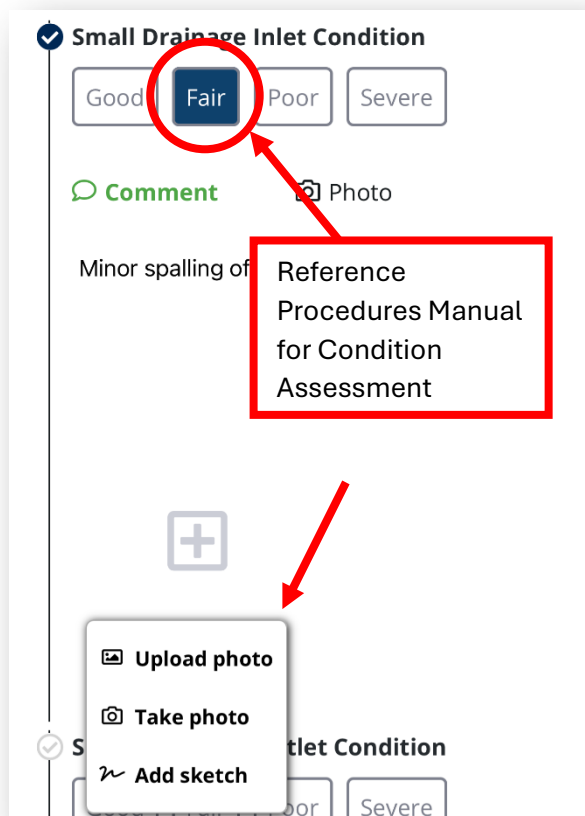


Figure D-7

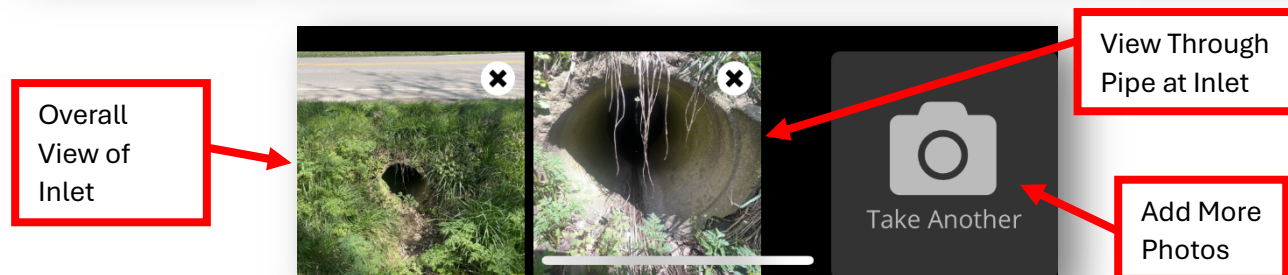


Figure D-8

9 – Defects might include spalling or cracking of the headwall or wings, separation of pipe sections, or sediment deposits/drift blocking the inlet.

10 – For culverts close to roadway grade, it may be more efficient for one individual to take all photos – photos can be uploaded later to inspections if needed.

11 – For culverts under considerable fill or with numerous defects that may require both team members to traverse slopes and/or take photos, it is best to have photos sent to the individual that created the inspection and uploaded afterwards.

12 – Additional photos of any defects may be included here.

5. Drainage Outlet Condition

- a. Repeat **Step D4** above at the outlet¹³

✓ **Small Drainage Outlet Condition**

Good Fair **Poor** Severe

Comment Photo

Last 3' of pipe has broken off and pipe is blocked

Comment Created

Select to Add Photos

Figure D-9

✓ **Small Drainage Outlet Condition**

Good Fair **Poor** Severe

Comment Photo

Last 4' section of pipe has broken off is blocked

View Through Pipe at Outlet

Overall View of Outlet

Separated Pipe Section (Defect) at Outlet

Figure D-10

13 – Individual photos may be captioned if not generic views – this process is highlighted in step – **Step D8**

6. Functionality

- Review the Procedures Manual and assessed conditions to select from the following choices: **Open** (less than 10% blocked), **Blocked but Functioning** (10%-25% blocked), **Blocked and not functioning** (25%-50% blocked), and **Collapsed** (and/or Non-Functioning – blocked more than 50%).
- At a minimum, users should include a photo of the view through the culvert here (from either end) – may include additional photos if there are variable blockages at the inlet/outlet and/or collapsed/broken sections of the culvert.
- Comment as needed

The form is divided into two main sections: **Functionality** and **Assessment**. The **Functionality** section has four buttons: "Open", "Blocked but Functioning", "Blocked and not functioning", and "Collapsed". Below these are "Comment" and "Photo" icons. The **Assessment** section has four buttons: "Clean", "Repair", "Replace", and "Do Nothing". Below these are also "Comment" and "Photo" icons.

Figure D-11

The **Functionality** section shows the "Blocked but Functioning" button selected. The comment field contains the text: "blockage at outlet with 4' section broken off and tilted downward." Two photos are attached: one showing a close-up of a culvert inlet with a blockage, and another showing a view through the culvert.

Figure D-12

7. Assessment

- Review all conditions and reference the Procedures Manual to select from the following choices: Clean, Repair, Replace and "Do Nothing"
- At a minimum, users should include one photo – this will be deemed the appropriate location for the "Cardinal¹⁴ Approach Along Roadway" photo
- Comment as needed

The **Assessment** section shows the "Repair" button selected. The comment field contains the text: "Remove broken section, clear blockage, and extend as necessary." One photo is attached, showing a view looking ahead along a roadway, captioned "Cardinal Approach".

Figure D-13

14 – Cardinal direction deemed the view looking ahead (increasing mile-points) along the roadway – this photo must be captioned – see **Step D8**

8. Captioning Photos

- Only the cardinal approach roadway over the culvert is required to be captioned – other photos outside of generic views may be captioned as needed
- To caption – photo must first be taken and saved.
- Once back on the “Inspection Screen”, select the photo in the inspection screen and then tap “Edit” in the top right corner

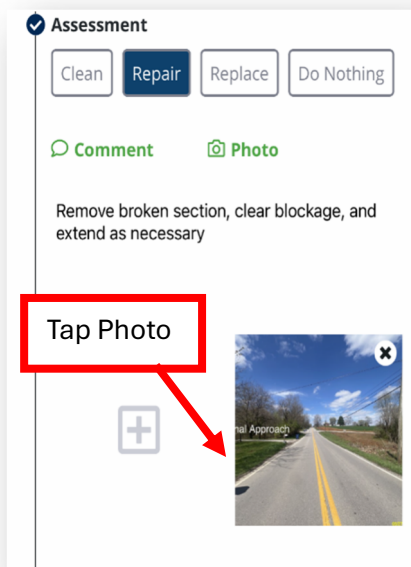


Figure D-14

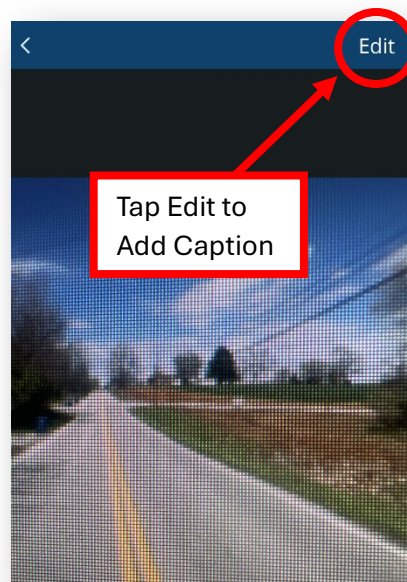


Figure D-15

- Tap on small “A” at bottom of screen and textbox will appear – double tap to insert text. Box can be resized – tap and drag a corner of the text box. Move box - tap and drag the box – text size will automatically adjust. Tap “**Save**” when finished making edits.¹⁵ Other icons are shown adjacent for additional information:

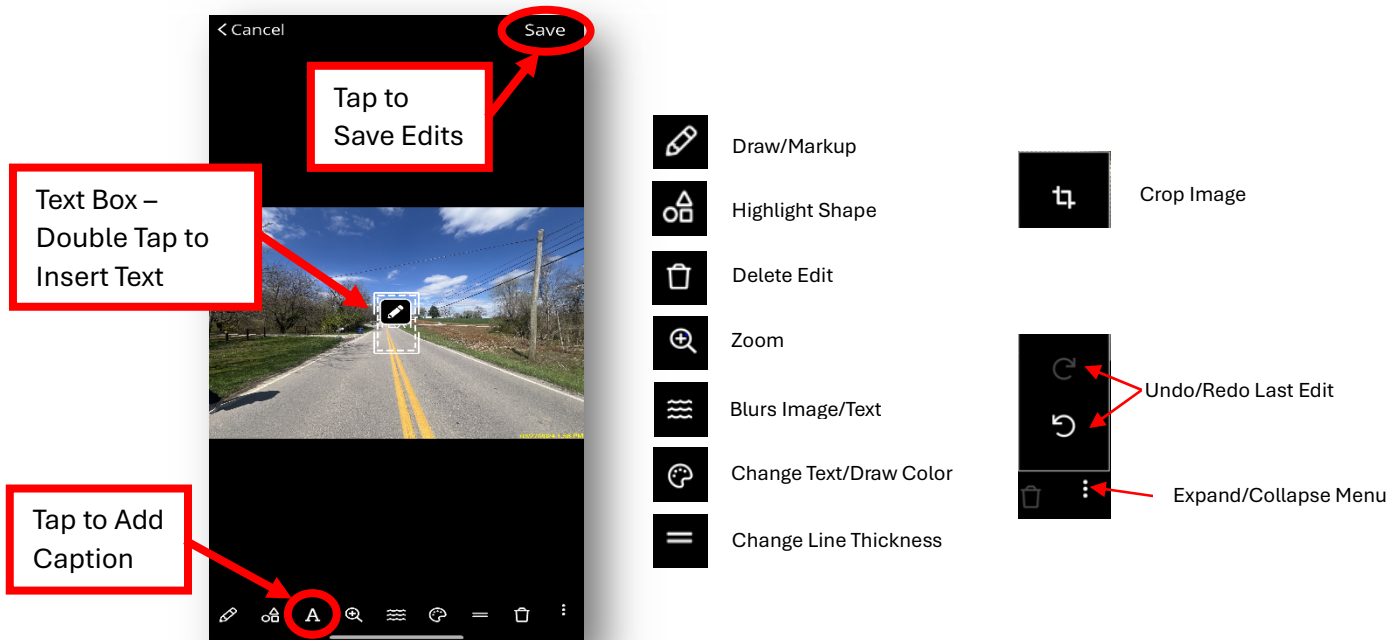


Figure D-16

¹⁵ – Ensure that all edits are made before saving – once saved, captions and other edits cannot be undone.

9. Completing Inspection

- Once all comments and photos have been uploaded and captioned as necessary, user can review the comments and photos from the inspection screen for each step – user may then select **Mark Complete** to start the process to finalize the inspection
- Once **Mark Complete** has been tapped, user will return to the previous screen and must select **“Save”** to save the inspection.
- User may return to the inspection and make edits (to anything except captions on existing photos) – comments may be edited/deleted, photos may be edited/deleted, and user may add additional photos – this process is highlighted in **Step D10**.

Figure D-17

Figure D-18

Figure D-19

Figure D-20

Figure D-21

10. Editing an Existing Inspection

- From home screen, select the menu at the top left and go to **“Reporting Forms”**
- Select the asset from the list (Top) or from the map (Bottom)
- Tap **“Open”** to the right of the inspection for the appropriate asset
- Select the inspection and edit as necessary



Figure D-22

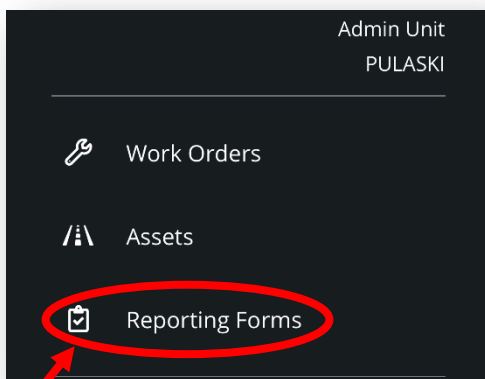


Figure D-23

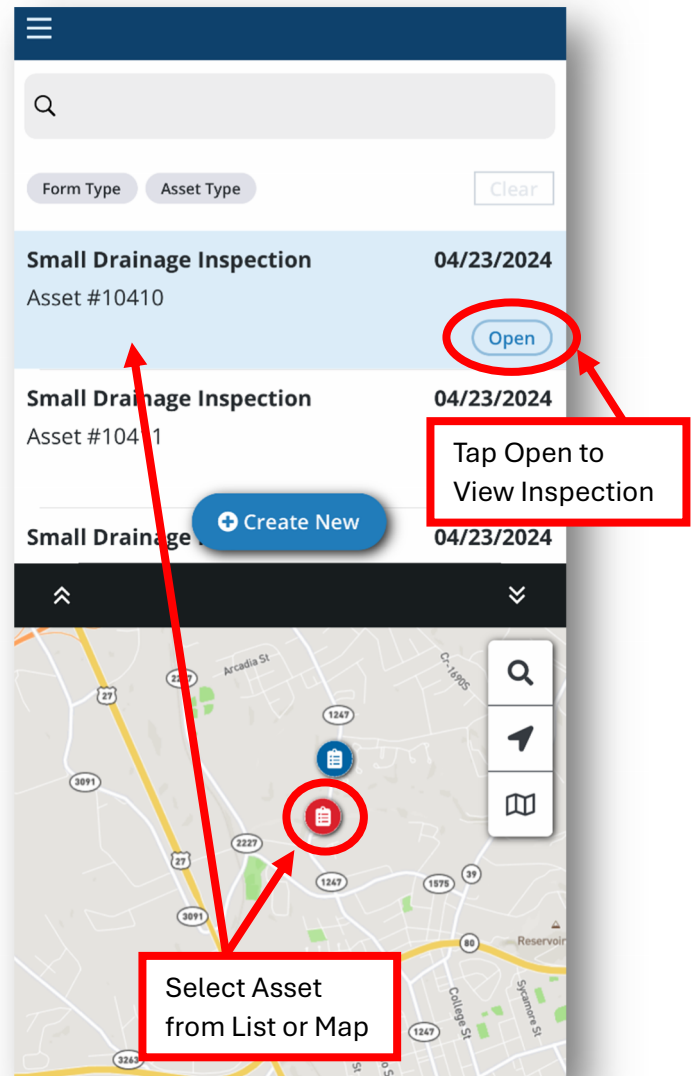


Figure D-24

E. Searching for Location with Coordinates to Add Assets

1. If users do not have a GPS unit that will work with the app and cannot get accurate location in the field, coordinates for a location may be searched to accurately drop inlet/outlet locations in the application.
 - a. Obtain Latitude and Longitude for inlet location – users may have a higher accuracy handheld GPS unit that does not work with the app or user devices
 - b. On the “**Create Asset Screen**”, select the small magnifying glass in top right corner
 - c. On next screen, select “**Address**” and type in the coordinates – include the negative if necessary
 - d. Tap on the Lat/Long that is now populated below and a point will be dropped at this location (inlet)
 - e. Verify and Tap “Add” to add this location
 - f. Repeat process for the outlet location

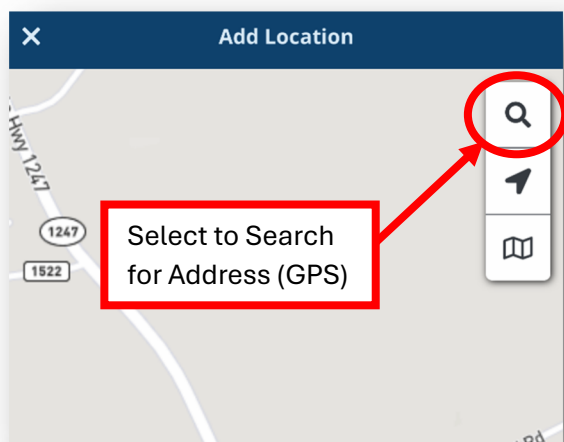


Figure E-1

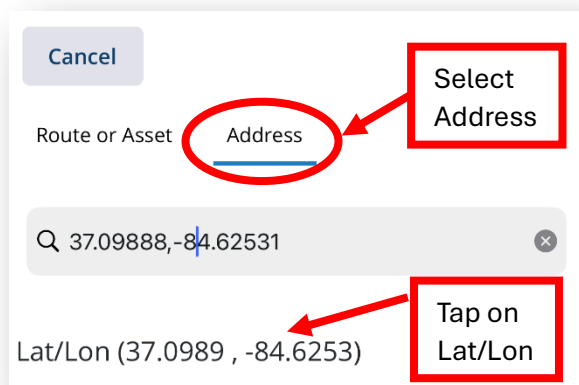


Figure E-2

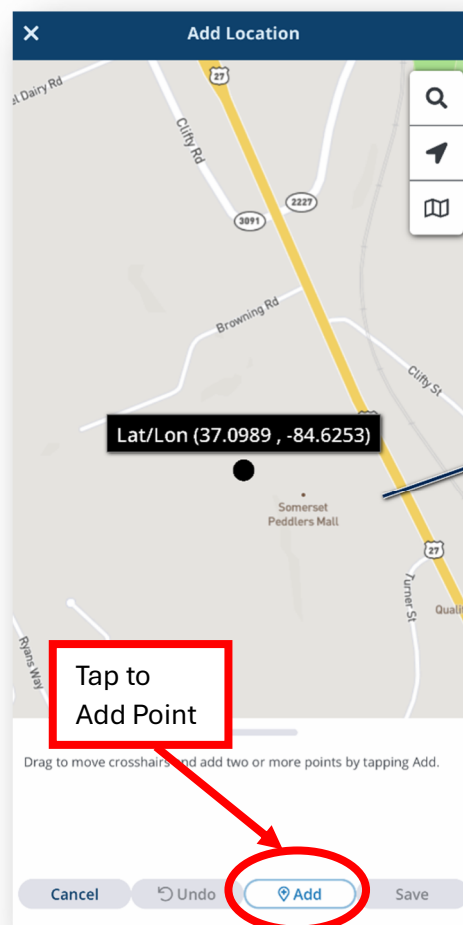


Figure E-3