DRU

Digital ROW Utilities

U S E R T R A I N I N G M A N U A L

Capture. Certify. Export. From the field.

PurposeBuilt Systems, LLC

SBA-Certified Service-Disabled Veteran-Owned Small Business

Version 1.0 · 2026 · Founded 2025 · purposebuilt.systems

DRU — Digital ROW Utilities

User Training Manual, Version 1.0

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Table of Contents

22 Chapters · Field-Ready Reference

CHAPTER 1

Introduction

Welcome to DRU

DRU (Digital ROW Utilities) is a field-grade iOS application that replaces paper cert logs, disconnected GIS apps, and hours of manual data entry with a single tool that captures, certifies, and exports utility asset data from the field.

Built by PurposeBuilt Systems, DRU is designed for utility contractors, DOT inspectors, GIS and asset management teams, and utility engineers who need ASCE 75-22 compliant documentation delivered at the speed of construction.

1.1 What DRU Does

- **AI-assisted asset detection** for hydrants, manholes, valves, and infrastructure at 98%+ confidence
- **LiDAR depth measurement** to ±0.03ft on iPhone Pro models
- **AR visualization** of underground utilities via WFS registry (230+ nationwide sources)
- **11 export formats** including GeoJSON, KMZ, DXF, ASCE 75-22 JSON, and formatted PDF as-builts
- **ASCE 75-22 certified** — all Table 2-4 mandatory attributes, Quality Levels A–D auto-calculated
- **Cryptographic audit trail** — AES-GCM encryption, SHA-256 integrity per export session

1.2 Who DRU Is For

- **Utility Contractors** — Document installations as-you-go. Export ASCE-certified as-builts the day the trench closes.
- **Utility Engineers** — Capture linear ROW infrastructure with GPS, LiDAR depth, and full cert traceability.
- **DOT Inspectors** — Verify materials on-site, scan cert tags, attach records to assets in the field.
- **GIS / Asset Management** — Get certified data in GeoJSON, KMZ, or DXF — ready for ArcGIS, QGIS, AutoCAD.

TIP

DRU pairs with **DTCD (Digital Traffic Control Diary)** to link utility installations directly to active work zones. See **Chapter 18** for integration details.

CHAPTER 2

Getting Started

Installation, permissions, first launch

2.1 System Requirements

Requirement	Minimum
Operating System	iOS 16.0 or later
Device	iPhone 12 or newer recommended
LiDAR Features	iPhone 12 Pro / 13 Pro / 14 Pro / 15 Pro / 16 Pro (any Pro model)
Storage	500 MB free for app + project data
Connectivity	Cellular or Wi-Fi for WFS registry and sync (offline capture supported)

2.2 Installation

1. Open the App Store on your iPhone.
2. Search for **Digital ROW Utilities** or scan the QR code at purposebuilt.systems.
3. Tap **Get** to install. The app is free.
4. Launch DRU when installation completes.

2.3 Permissions

DRU requires the following permissions on first launch:

- **Location (Always)** — Required for GPS capture, even when app is backgrounded.
- **Camera** — Required for AI detection, AR visualization, and material cert OCR.
- **Photo Library** — Required for attaching existing photos to assets.
- **Motion & Orientation** — Required for AR overlay alignment.

IMPORTANT

Grant **Always** for Location. If set to **While Using**, GPS capture will stop when the app is backgrounded during long captures.

2.4 First Launch

On first launch, DRU will walk you through:

1. Sign-in or account creation (email and password, or Sign in with Apple)
2. Organization profile setup (name, certifying professional license if applicable)

3. Default project creation (you can create additional projects later)
4. Permission grants (see 2.3 above)

CHAPTER 3

Project & Permit Setup

Creating and configuring projects

3.1 Projects Overview

A **Project** in DRU is the top-level container for your captured asset data. Each project has its own permit information, work area, WFS registry sources, and export settings.

All captured data — points, linear features, photos, depths, material certifications — rolls up to the project level for unified export and reporting.

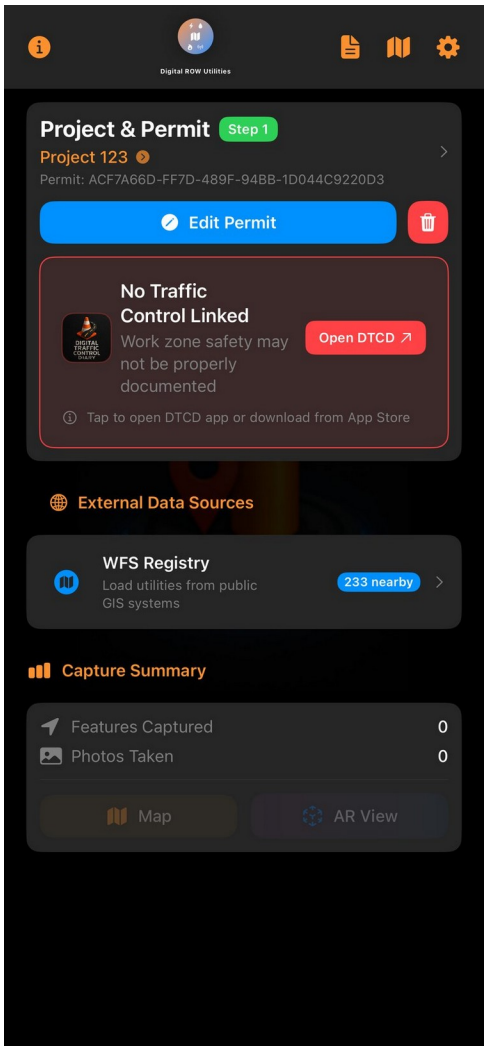

Figure 3.1 — Project & Permit screen with DTCD alert and WFS Registry shortcut

3.2 Creating a New Project

1. Tap the **Projects** tab at the bottom of the screen.
2. Tap the **+** button in the upper-right corner.

3. Enter a **Project Name** (e.g., 'Berkshire Pkwy Water Main Extension').
4. Add a **Permit ID** if applicable. This becomes part of the exported data.
5. Select **Project Type** (Water, Sewer, Storm, Electric, Gas, Telecom, Mixed).
6. Tap **Save** to create the project.

3.3 Permit Information

Permit information is embedded in all exported reports and ASCE 75-22 JSON outputs. Fields include:

- Permit ID / Number
- Issuing Authority (city, county, state DOT)
- Permit Date and Expiration
- Linked DTCD Work Zone ID (if applicable — see Chapter 18)

TIP

If your DTCD app is installed and has an active work zone, DRU will automatically suggest it for linking to your project.

CHAPTER 4

WFS Registry

230+ nationwide utility data sources

4.1 What Is the WFS Registry?

The **WFS (Web Feature Service) Registry** is a curated catalog of 230+ public utility data sources nationwide. When you enable a WFS source in your project, DRU will overlay the utilities from that source in AR view, map view, and export — giving you context for your captured data.

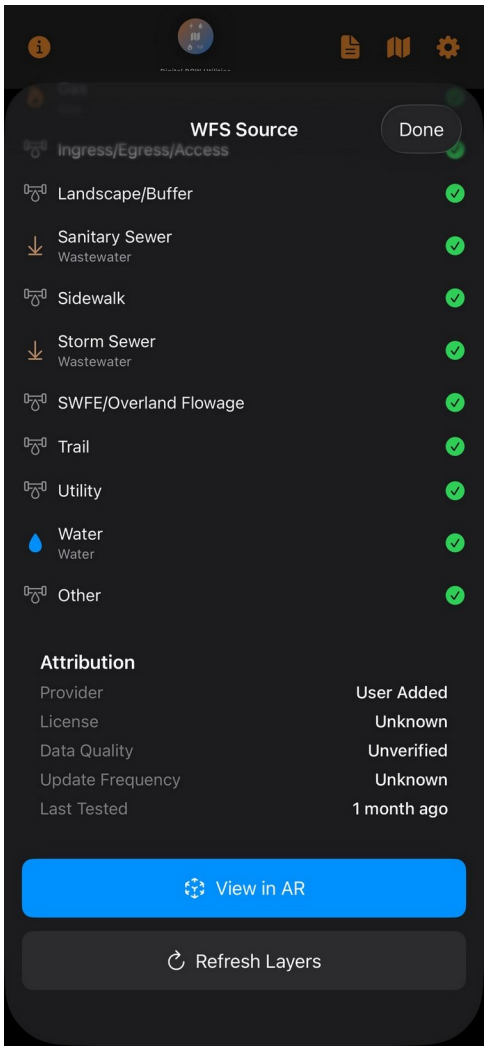

Figure 4.1 — WFS Source detail screen showing enabled utility layers

4.2 Enabling WFS Sources

1. Open a project and tap **External Data Sources → WFS Registry**.
2. Browse or search by city, county, utility type, or agency.
3. Tap a source to view its layers and attribution.
4. Enable the layers relevant to your work (Water, Sewer, Storm, etc.).

5. Tap **Add to Project** to include the source.

4.3 Layer Types

Layer	Contents
Water	Mains, services, hydrants, valves, meters
Sanitary Sewer	Mains, laterals, manholes, cleanouts, lift stations
Storm Sewer	Storm mains, inlets, catch basins, outfalls
Utility	Generic utility features (electric, gas, telecom)
Landscape / Buffer	ROW edges, buffer zones, planting strips
Sidewalk	Sidewalk runs and pedestrian features
Trail	Multi-use paths and bike trails

NOTE

WFS data is reference information only. Always verify critical asset locations in the field before excavating. Call 811 before you dig.

CHAPTER 5

Point Capture

Logging individual asset points

5.1 When to Use Point Capture

Point Capture is for logging individual asset locations — a single hydrant, a manhole, a valve box, a meter. Use Linear Capture (Chapter 6) for runs of pipe or cable.

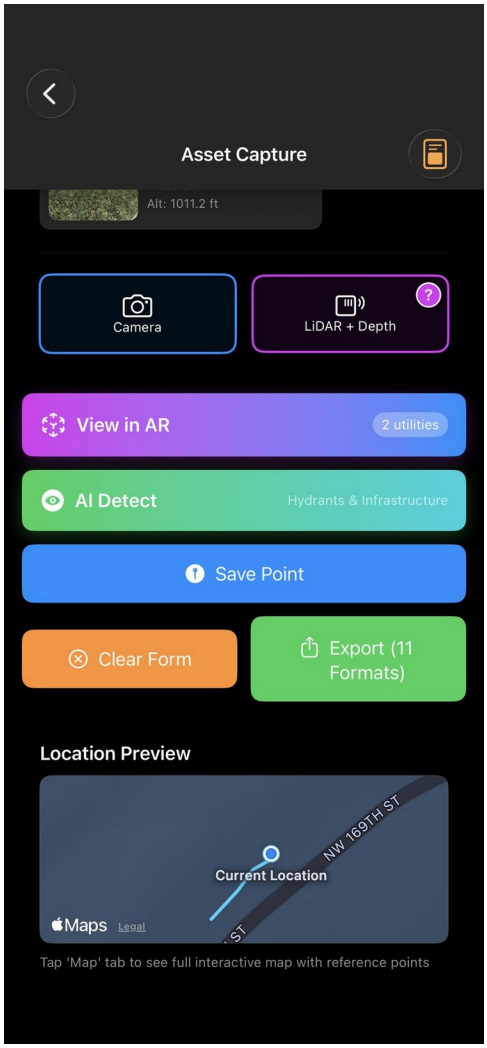

Figure 5.1 — Asset Capture screen with Camera, LiDAR+Depth, View in AR, AI Detect, Save Point, and Export options

5.2 Capturing a Point

1. Stand at or near the asset (within 3m for best GPS accuracy).
2. Open your project and tap **Capture**.
3. Select an **asset type** (Fire Hydrant, Manhole, Valve, Meter, Other).
4. Tap **Save Point** to capture the current GPS position.

5. Fill in attributes (size, material, depth if known, notes).
6. Attach photos by tapping **Camera** or pulling from your Photo Library.
7. Tap **Save** to commit the point to your project.

5.3 Point Attributes

Minimum attributes for ASCE 75-22 compliance:

- **Asset Type** — Hydrant, manhole, valve, etc.
- **Material** — PVC, DIP, HDPE, steel, concrete, etc.
- **Size / Diameter** — Nominal pipe or feature size
- **Install Date** — When the asset was installed
- **Quality Level** — Auto-calculated A / B / C / D based on capture method
- **Method** — GNSS_SBAS, RTK, Manual, etc.

TIP

Standing directly over the asset with a clear view of the sky gives the best GPS accuracy. Under tree canopy or near buildings, expect ±3–5m horizontal accuracy with SBAS. Use RTK or LiDAR depth for precision work.

CHAPTER 6

Linear Capture

Tracing pipe runs with GPS

6.1 When to Use Linear Capture

Linear Capture is for recording pipe runs, trench routes, and any linear infrastructure. Walk the length of the asset while DRU records a continuous GPS trace.

6.2 Capturing a Linear Feature

1. Open your project and tap **Capture** → **Linear**.
2. Select a feature type (Pipeline, Cable, Conduit, etc.).
3. Position yourself at the **start point** of the feature.
4. Tap **Start Trace**. DRU begins recording GPS points at 1-second intervals.
5. **Walk the length** of the feature. Stay directly above the centerline if possible.
6. Tap **End Trace** when you reach the end point.
7. Fill in attributes (material, diameter, depth, etc.) and tap **Save**.

6.3 Capture Method

The **method** attribute is auto-logged based on how you captured the feature:

Method Code	Description
GNSS_SBAS	Standard iPhone GPS with SBAS augmentation. ±3m horizontal.
RTK	Real-Time Kinematic via external receiver. ±1–2cm horizontal.
Manual	Coordinates entered manually (e.g., from as-built plans).
LiDAR_Augmented	GPS trace augmented with LiDAR depth at capture points.

IMPORTANT

Linear GPS traces depend on consistent GPS signal. If you walk through a tunnel, under a bridge, or in a dense urban canyon, the trace may have gaps or drift. Review traces on the map (Chapter 16) and clean up outliers before export.

CHAPTER 7

AI Asset Detection

Automated hydrant, manhole, and valve detection

7.1 What AI Detection Does

DRU's AI Detection mode uses on-device machine learning to recognize common utility assets in real time through your iPhone camera. Point at a fire hydrant, manhole cover, or valve box and DRU identifies it at 98%+ confidence.

Figure 7.1 — AI Detection showing 'Fire Hydrant 100%' confidence with bounding box and capture button

7.2 Using AI Detection

1. In a project, tap **Capture → AI Detect**.
2. Point your camera at the asset. DRU will display a **red bounding box** and confidence percentage.
3. Wait for confidence to exceed **90%** (bounding box should be tight around the asset).
4. Tap the **+** button in the center of the screen to capture the point.

5. DRU will pre-fill the asset type based on detection. Review and save.

7.3 Supported Asset Types

- **Fire Hydrants** — Standard dry-barrel and wet-barrel hydrants
- **Manhole Covers** — Sanitary, storm, combined, and utility manholes
- **Valve Boxes** — Water valves, gas valves, and general utility valves
- **Water Meters** — Residential and commercial meter covers
- **Catch Basins** — Storm water inlets and grates

TIP

AI Detection works best with the asset centered in the frame, 3–10 feet away, in decent lighting. Confidence below 85% means the detection is uncertain — move closer, reposition, or capture manually.

CHAPTER 8

AR Visualization

Augmented reality utility overlay

8.1 What AR View Does

AR View overlays WFS registry utilities on your live camera feed, showing pipes, cables, and features in their real-world positions through your phone screen. You can see what's underground before you dig.

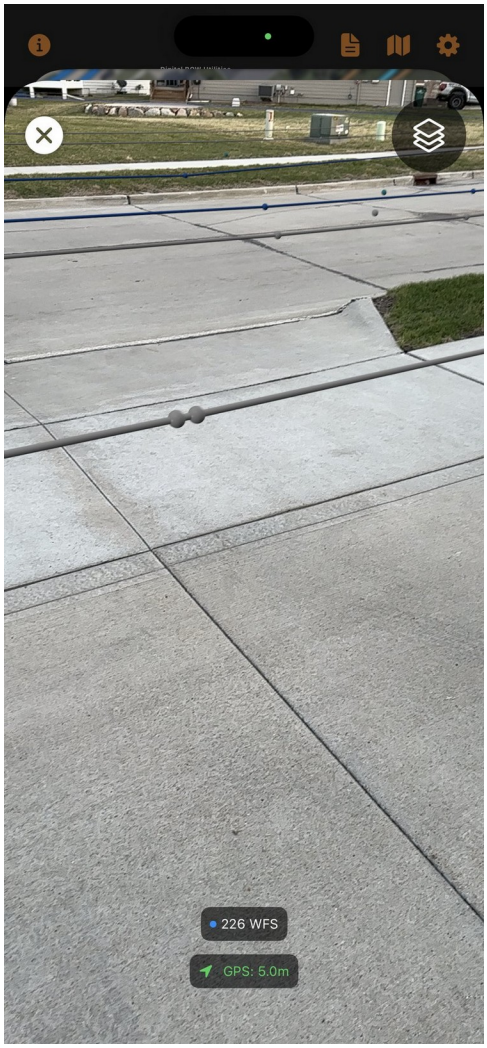

Figure 8.1 — AR View showing overlaid utilities on live camera feed with 226 WFS features loaded

8.2 Activating AR View

1. Open your project and tap **AR View** from the bottom tab bar.
2. DRU will prompt you to move your phone in a circle to calibrate the AR session.
3. Once calibrated, WFS utilities from your active sources will overlay in the camera view.
4. Walk around the area. Utilities will remain anchored to their GPS positions as you move.

8.3 Utility Color Codes

AR View colors utilities by type following industry standards:

Color	Utility Type
Blue	Water (potable)
Green	Sanitary sewer
Brown / Tan	Storm sewer
Red	Electric
Yellow	Gas / Oil / Steam
Orange	Communications / Telecom
Purple	Reclaimed water / Irrigation
White	Proposed / survey markouts

IMPORTANT

AR View is **reference only**. WFS data can be inaccurate or out-of-date. Always follow the 811 'Call Before You Dig' process and hand-dig potholes to verify critical depths before machine excavation.

CHAPTER 9

LiDAR Depth Measurement

Precision depth capture on iPhone Pro

9.1 What LiDAR Depth Does

On iPhone Pro models (12 Pro and later), DRU uses the built-in LiDAR sensor to measure depth from the phone to any point in the camera view — with ±0.03ft accuracy in the 0–5 meter range.

Common uses include measuring depth-of-cover over exposed utilities, trench depths during open-cut installation, and vertical offsets between assets.

9.2 Capturing a Depth

1. In a project, open an existing asset point or start a new capture.
2. Tap **LiDAR + Depth**.
3. DRU switches to the LiDAR camera view with a **crosshair** in the center.
4. Point the crosshair at the depth target (exposed pipe, bottom of trench, etc.).
5. Tap **Capture Depth**. DRU records the measurement.

9.3 Accuracy Guidelines

Distance	Expected Accuracy
0.3 – 2.0 m	Optimal range. ±0.03ft accuracy.
2.0 – 5.0 m	Good accuracy. ±0.05ft typical.
> 5.0 m	Degraded. Use visual sighting or tape measure instead.
< 0.3 m	Too close. Move phone back.

TIP

Good lighting and a non-reflective surface produce the best LiDAR readings. Dark shadows and mirrored surfaces (water, polished metal) can confuse the sensor.

CHAPTER 10

Material Certification OCR

Scanning certification tags

10.1 What Cert OCR Does

Material Certification OCR scans certification tags on pipe, fittings, valves, and materials and automatically extracts material type, manufacturer, diameter, wall thickness, and batch information using on-device OCR.

10.2 Scanning a Cert Tag

1. In a project, open an existing asset or start a new capture.
2. Tap **Scan Cert**.
3. Point the camera at the cert tag. DRU will auto-focus and extract text.
4. Review the parsed fields. Edit any incorrect values.
5. Tap **Attach** to link the cert to the current asset.

10.3 Fields Extracted

Field	Description
Material	PVC, HDPE, DIP, RCP, steel, etc.
Manufacturer	Vendor name (Prinsco, ADS, McWane, etc.)
Nominal Diameter	Pipe or feature diameter
Wall Thickness	For pipe only
Batch / Heat Number	For material traceability
Install Date	If printed on tag
Standard Reference	AWWA C900, ASTM D3034, etc.

TIP

Photograph the cert tag clearly in good lighting. DRU stores the original photo alongside parsed data so the original cert is available in the export PDF even if OCR misread a field.

CHAPTER 11

GPS & Positioning

GNSS, SBAS, and RTK accuracy

11.1 Understanding GPS Accuracy

DRU supports three positioning methods with different accuracy characteristics:

Method	Accuracy
GNSS_SBAS	Built-in iPhone GPS with SBAS augmentation. ±3–5m horizontal in open sky.
External GNSS	Bluetooth-paired external GPS receiver. ±1m typical.
RTK	Real-Time Kinematic via external receiver and base station. ±1–2cm horizontal.

11.2 CORS Networks (18 States Preloaded)

For **RTK precision**, DRU includes pre-loaded CORS network configurations for 18 states including Iowa's IaRTN. Pair your external RTK receiver via Bluetooth and select your CORS network in **Settings → GPS → CORS Networks**.

- Iowa IaRTN
- Minnesota MnCORS
- Wisconsin WISCORS
- Illinois INCORS
- +14 additional state networks

11.3 Accuracy Checklist

- **Clear sky view** — No dense canopy or tall buildings directly overhead
- **Time to lock** — Wait 30–60 seconds after starting capture for GPS to stabilize
- **HDOP under 2** — DRU displays HDOP in the status bar. Under 2 is good.
- **Satellites in view** — 8+ satellites recommended for field work

IMPORTANT

DRU's Quality Level auto-calculation (ASCE 75-22, Chapter 12) depends on the reported GPS accuracy. If you're using iPhone SBAS in an urban canyon and logging Quality Level A results, the accuracy claim is not supportable. Use RTK for Quality Level A work.

CHAPTER 12

ASCE 75-22 Standard

Quality Levels and mandatory attributes

12.1 What ASCE 75-22 Is

ASCE 75-22 is the American Society of Civil Engineers' Standard for Recording and Exchanging Utility Infrastructure Data. It defines mandatory attributes and quality levels for utility documentation in a way that allows data to be exchanged between agencies, contractors, and engineers without translation.

12.2 Quality Levels

Level	Definition
QL-A	Precise horizontal + vertical. Typically ±2cm. Requires RTK or pothole verification.
QL-B	Precise horizontal, good vertical estimate. Surface-located via geophysical methods + GPS.
QL-C	Approximate location from surface evidence (visible appurtenances, existing as-builts).
QL-D	Unknown location. Record only exists from anecdotal or legacy sources.

12.3 Mandatory Attributes (Table 2-4)

- **Asset ID** — Unique identifier (UUID, auto-generated by DRU)
- **Feature Type** — Pipeline, Appurtenance, Structure, etc.
- **Material** — PVC, HDPE, DIP, concrete, etc.
- **Diameter** — Nominal size
- **Coordinate** — Lat/Lon in WGS84
- **H-Accuracy / V-Accuracy** — Horizontal and vertical accuracy in meters
- **Method** — Capture method code
- **Quality Level** — A, B, C, or D
- **Datum** — EPSG:4326 / NAVD88

12.4 How DRU Auto-Calculates Quality Level

Capture Method	Auto-Assigned Level
RTK capture + LiDAR depth	QL-A
RTK capture without depth	QL-B

SBAS + manual depth entry	QL-C
Manual coordinate entry	QL-D

N O T E

You can manually override the auto-assigned Quality Level in the asset edit screen. Manual overrides are logged in the audit trail and flagged in exports.

CHAPTER 13

Data Certification

Certifying professional sign-off and audit trail

13.1 What Data Certification Is

Data Certification is ASCE 75-22's mechanism for a qualified professional (typically a licensed PE or PLS) to formally sign off on captured data. Certified data carries legal weight; uncertified data is informational only.

13.2 Certifying Professional Setup

1. In DRU settings, tap **Organization → Certifying Professional**.
2. Enter the professional's **full name**, **license type** (PE, PLS, CP, etc.), **license number**, and **state of issue**.
3. Capture a digital signature image (finger or stylus on screen).
4. Tap **Save**. This profile will be available for all project certifications.

13.3 Certifying a Project

1. Open the project and tap **Certify**.
2. Review the session summary (feature count, photos, certs attached).
3. Select the certifying professional from the dropdown.
4. Review and attest to the four ASCE certification statements.
5. Tap **Sign & Certify**. DRU generates a SHA-256 hash of the certified dataset.
6. The project is now locked for certified export.

13.4 SHA-256 Audit Trail

Every certified export includes a **SHA-256 cryptographic hash** of the dataset. If anyone modifies the exported data, the hash will not match — proving tampering.

- User who captured each feature (with timestamp)
- User who certified the project (with timestamp and license #)
- Each edit made after initial capture
- Any manual overrides of auto-calculated Quality Levels

IMPORTANT

Once certified, the project becomes **read-only** for data integrity. To make changes, create a **revision** which starts a new certification session with its own audit trail entry.

CHAPTER 14

Photo Documentation

GPS-tagged photos and best practices

14.1 Photo Types

Type	Purpose
General Photo	Context photo of the asset and surroundings
Cert Tag Photo	Close-up of material certification tag
Detail Photo	Close-up of feature detail (joint, valve stem, meter face, etc.)

14.2 GPS-Tagged Photos

Every photo DRU captures is automatically tagged with:

- GPS coordinates at the moment of capture
- Timestamp in ISO 8601 format
- Device orientation (compass heading)
- Asset ID the photo is linked to

14.3 Photo Best Practices

- **Get close** — Fill the frame with the asset
- **Show scale** — Include a hand, tape measure, or common reference object
- **Document cert tags legibly** — Wipe dirt off the tag first; use flash if needed
- **Multiple angles** — Minimum 2 photos per asset (overview + detail)
- **Before and after** — For trench photos, capture the open trench AND the backfilled surface

TIP

For night or low-light work, DRU's flash toggles on automatically if the light level is below threshold. You can also force flash on/off in the camera controls.

CHAPTER 15

Work Area Management

Defining and managing project boundaries

15.1 What a Work Area Is

A **Work Area** is the physical boundary of your project — the piece of right-of-way you're working in. Defining a work area helps DRU filter WFS data to only what's relevant, and provides a visual reference in reports and exports.

15.2 Defining a Work Area

1. In your project, tap **Work Area** → **Select Work Area**.
2. DRU opens a satellite map centered on your current location.
3. Tap to place the first corner of your work area.
4. Continue tapping to add corners, forming a polygon.
5. Tap the first corner again to close the polygon, or tap **Done**.
6. DRU calculates and displays the area in square feet/meters.

15.3 Work Area Best Practices

- **Don't over-scope** — Only include the actual work area, not the entire block
- **Include access corridors** — Include gate access, temporary easements, and equipment staging
- **Edit as work progresses** — You can expand or shrink the work area at any time
- **One work area per project** — For jobs spanning multiple non-contiguous areas, create separate projects

NOTE

The work area polygon is included in every export as a KML feature so downstream consumers see exactly where work was performed.

CHAPTER 16

Project Map Review

Reviewing captured data on the map

16.1 Opening the Project Map

The **Project Map** gives you an aerial view of all captured data, WFS overlays, work area boundaries, and capture progress. Review here before exporting.

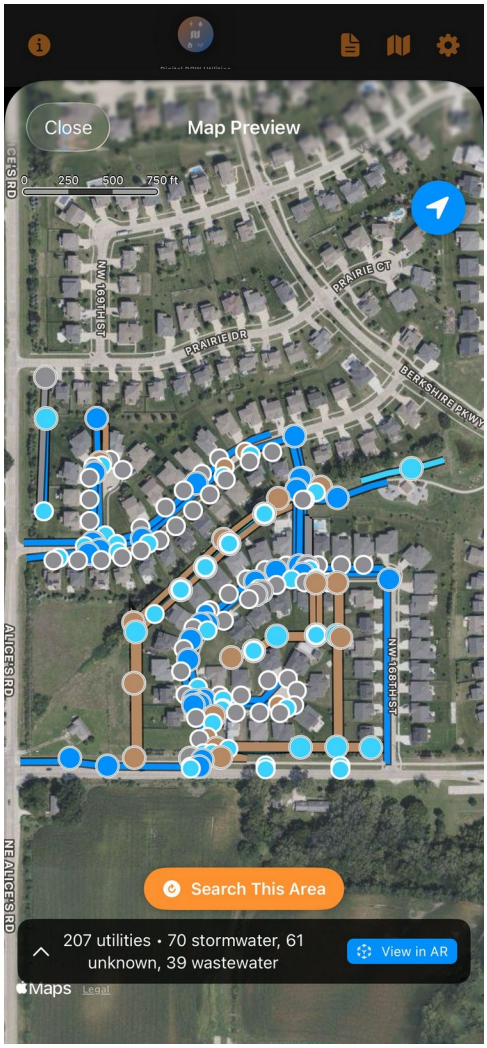

Figure 16.1 — Project Map showing captured utilities color-coded by domain

16.2 Map Controls

- **Pinch** to zoom in and out
- **Drag** to pan the map
- **Tap a feature** to see its attributes in a popup
- **Search This Area** — Refresh WFS data for the current map view
- **View in AR** — Switch to AR view of the current map region

16.3 Review Checklist

Before exporting, review the map for common issues:

- **Stray points** far outside the work area — typically GPS lock issues at start of capture
- **Overlapping features** — may indicate duplicate capture
- **Missing assets** — compare against WFS overlay to find undocumented items
- **Inconsistent attributes** — tap features to verify material, size, depth match expected patterns

TIP

Use the **Capture Summary** panel at the bottom of the project screen to see feature counts by type. Unexpected numbers are a flag to re-check your work before certifying.

CHAPTER 17

Export Formats

All 11 export formats explained

17.1 The 11 Export Formats

DRU supports 11 export formats for distributing captured data to downstream consumers:

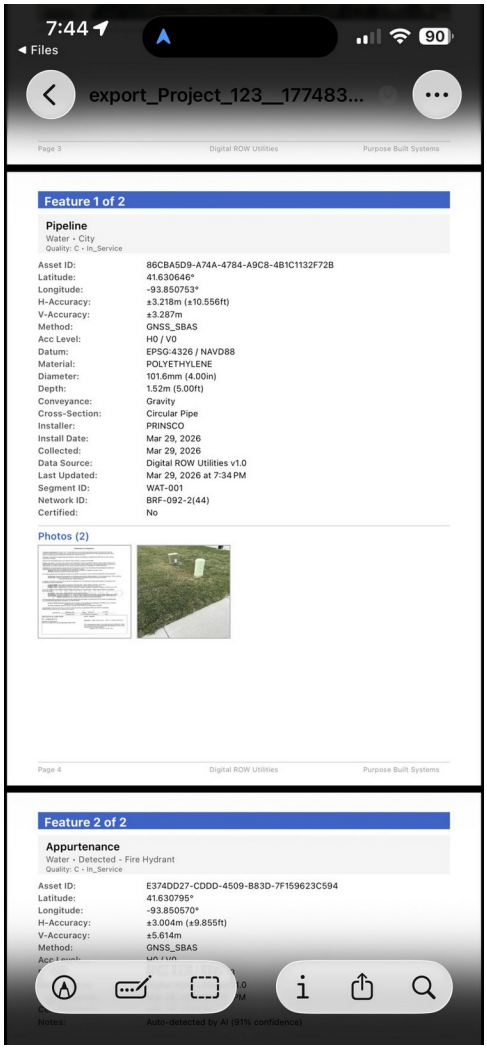

Figure 17.1 — PDF Report export showing Pipeline feature with full ASCE 75-22 attributes

Format	Description
GeoJSON	Geometry, attributes, photo refs, metadata. Best for GIS.
CSV	Tabular format with one row per feature. Opens in Excel.
KML	Keyhole Markup Language. Google Earth, ArcGIS, most GIS tools.

KMZ	Compressed KML with material cert PDFs bundled inside.
DXF	AutoCAD-compatible geometry. For AutoCAD or Civil 3D.
PDF Report	Formatted as-built with feature details, photos, location map.
ASCE 75-22 JSON	Standards-compliant JSON following the ASCE schema.
Shapefile (SHP)	ESRI Shapefile for legacy GIS systems.
GML	Geography Markup Language. For OGC-compliant systems.
GPX	GPS eXchange format. For route and track sharing.
XLSX	Excel workbook with tabs for features, photos, certs.

17.2 Export Decision Guide

Use Case	Recommended Format
GIS team (ArcGIS / QGIS)	GeoJSON or Shapefile
AutoCAD / Civil 3D	DXF
Google Earth review	KML or KMZ
Agency submittal with certs	KMZ + PDF Report
ASCE 75-22 formal submittal	ASCE 75-22 JSON + PDF Report
Spreadsheet / data analysis	CSV or XLSX

CHAPTER 18

DTCD Integration

Linking utility work to traffic control

18.1 What Is DTCD?

Digital Traffic Control Diary (DTCD) is a companion iOS + Android application by PurposeBuilt Systems for documenting traffic control setups, closures, sign inventories, and WZDx compliance feeds for active work zones.

The DRU–DTCD integration links every utility installation to an active work zone record, creating a single connected documentation package covering both the utility work and the traffic control protecting it.

18.2 The Integration Alert

When a project is opened in DRU without a linked DTCD work zone, a **red warning card** appears: "No Traffic Control Linked — Work zone safety may not be properly documented."

Tap **Open DTCD** on the alert to launch DTCD and select/create a work zone for linking.

18.3 Linking a Project to a Work Zone

1. In your DRU project, tap the **DTCD Integration** card.
2. DRU will attempt to detect active DTCD work zones from the DTCD app.
3. Select the work zone that corresponds to your current utility work.
4. DRU stores the DTCD Work Zone ID in the project.
5. All exports from this project will include the linked Work Zone ID.

18.4 Benefits of Integration

- **Unified documentation** — Utility + traffic control for the same job in one export package
- **Cross-app audit trail** — Safety documentation ties to work documentation
- **Permit alignment** — Same permit ID flows through both apps
- **Agency submittal** — One submission covers utility as-built AND work zone compliance

TIP

If you don't have DTCD installed, DRU will prompt you to download it from the App Store or Google Play. DRU works without DTCD — but the integration gives you a cleaner documentation story with traffic control context.

CHAPTER 19

Field Workflow Best Practices

Pre-field prep and in-field efficiency

19.1 Before You Leave the Office

- **Charge your phone fully** — LiDAR + AR + GPS drain battery fast
- **Bring a power bank** — Minimum 10,000 mAh for a full day of field work
- **Create the project** — Enter permit info, define work area, enable WFS sources
- **Pair RTK receiver** — If using external GPS, pair and test in Bluetooth before leaving
- **Check offline data** — DRU caches WFS data locally; verify download before going to a low-signal site

19.2 At the Site

- **Let GPS stabilize** — Wait 30–60 seconds after opening the app before first capture
- **Capture in a logical order** — Follow the pipe run, don't jump around the site
- **Photograph cert tags before backfill** — You won't have another chance
- **Review Capture Summary regularly** — Check feature counts match expectations
- **Pause and sync** — If signal is good, sync to cloud every 30–60 minutes

19.3 End of Day

- **Sync all data** — Push to cloud before leaving signal range
- **Review Project Map** — Catch issues while the work is fresh in memory
- **Write session notes** — Any unusual conditions, missing data, or follow-up needed
- **Charge device overnight** — Plus the power bank

TIP

In urban canyons or tree cover, consider using an **external RTK receiver** paired to iPhone. The built-in GPS struggles in those environments.

CHAPTER 20

Data Quality Standards

Ensuring accuracy and completeness

20.1 Quality Gates

Before certifying a project, verify the data meets these quality gates:

Gate	Verification
Completeness	All planned assets captured. Check against permit scope.
Accuracy	GPS traces smooth, not drifting. Depths realistic for asset type.
Attribution	Material, diameter, install date filled for every asset.
Photos	Minimum 2 per asset. Cert tags legible.
Certifications	Material certs attached for every installed asset.
Method Codes	Consistent and correct for how each feature was captured.

20.2 Common Data Quality Issues

- **GPS drift at start of capture** — iPhone GPS takes 30–60s to lock. Delete drift points manually.
- **Missing depths on open-cut work** — If you didn't capture LiDAR depth at the trench, you cannot claim QL-A after the fact.
- **Material cert mismatches** — OCR occasionally misreads similar characters. Review parsed certs.
- **Stale WFS data** — WFS source may show a hydrant at a location where one was decommissioned.
- **Overlapping linear features** — Two captures of the same pipe. Merge or delete duplicates.

20.3 Escalation Path

If data quality cannot meet the project's required Quality Level:

1. **Return to the field** — Recapture missing or low-quality data
2. **Downgrade Quality Level** — Manually override to QL-C or QL-D and document why
3. **Flag for engineering review** — Submit uncertified and let the engineer of record make the call

IMPORTANT

Certifying low-quality data at a higher Quality Level than it deserves is a **professional liability issue** for the certifying professional. Err on the side of downgrading when in doubt.

CHAPTER 21

Troubleshooting

Common issues and solutions

21.1 GPS Issues

Symptom	Solution
GPS won't lock	Move to open sky. Restart the app. Check Location permission is **Always**.
Accuracy ±10m or worse	Urban canyon or dense canopy. Wait for HDOP to drop below 2.
GPS drift at start	Normal — iPhone takes 30–60s to stabilize.
Coordinates way off	iPhone location services may need reset.

21.2 AR / LiDAR Issues

Symptom	Solution
AR won't calibrate	Move phone in a slow circle for 10 seconds. Ensure good lighting.
LiDAR button missing	Your device may not have LiDAR. Requires iPhone 12 Pro or newer Pro.
Depth reading unrealistic	Target surface may be reflective or too dark.
AR overlay drifting	Restart AR session. Strong GPS drift can cause this.

21.3 Export Issues

Symptom	Solution
Export fails silently	Check available device storage. Large projects need 500MB+ free.
PDF missing photos	Photos may still be syncing. Wait 5 minutes and re-export.
KMZ won't open in Google Earth	May be file size. Export as plain KML as a test.
DXF geometry wrong	Check coordinate system — DXF is best with UTM projection.

N O T E

If you're unable to resolve a persistent issue, email **matthew@purposebuilt.systems** with your project ID and a description of the issue. Include screenshots when possible.

CHAPTER 22

Glossary & Reference

Terms, checklists, and quick-reference

22.1 Glossary

Term	Definition
AR	Augmented Reality. Overlaying digital information on a live camera view.
ASCE 75-22	ASCE Standard for Recording and Exchanging Utility Infrastructure Data.
As-Built	Drawing or data showing what was actually constructed.
Audit Trail	Immutable log of who did what and when.
CORS	Continuously Operating Reference Station — base stations for RTK corrections.
DTCD	Digital Traffic Control Diary — PurposeBuilt's companion work zone app.
DXF	Drawing eXchange Format — AutoCAD's interchange file format.
GeoJSON	Geographic data in JSON format — modern web standard.
GNSS	Global Navigation Satellite System — umbrella term for GPS/Galileo/GLONASS/BeiDou.
HDOP	Horizontal Dilution of Precision — GPS accuracy metric, lower is better.
KML / KMZ	Keyhole Markup Language — Google Earth's format.
LiDAR	Light Detection and Ranging — depth sensor on iPhone Pro models.
OCR	Optical Character Recognition — reading text from images.
QL-A / B / C / D	ASCE 75-22 Quality Levels — from most precise (A) to least (D).
ROW	Right-of-Way — legal corridor where utilities and roads are located.
RTK	Real-Time Kinematic — centimeter-accuracy GPS via base station corrections.

SBAS	Satellite-Based Augmentation System — WAAS/EGNOS, improves GPS accuracy.
SHA-256	Cryptographic hash function used for data integrity verification.
WFS	Web Feature Service — OGC standard for streaming geographic features.
WZDx	Work Zone Data Exchange — federal standard for work zone data feeds.

22.2 Pre-Field Checklist

- ☐ Phone charged to 100%
- ☐ Power bank packed
- ☐ Project created with permit info
- ☐ Work area polygon defined
- ☐ WFS sources enabled for the area
- ☐ RTK receiver paired (if applicable)
- ☐ Offline WFS data cached
- ☐ Certifying professional profile ready

22.3 In-Field Checklist

- ☐ GPS locked (HDOP < 2)
- ☐ Capture method verified (GNSS_SBAS / RTK / Manual)
- ☐ Photos: overview + detail + cert tag per asset
- ☐ Material, size, depth filled for every feature
- ☐ LiDAR depth captured for critical verticals
- ☐ Regular sync to cloud (every 30–60 min in signal)

22.4 Pre-Certify Checklist

- ☐ Capture Summary counts match field notes
- ☐ Project Map review — no stray points, no overlaps
- ☐ All assets have minimum 2 photos
- ☐ Material certs attached where installed
- ☐ Quality Levels spot-checked for realism
- ☐ DTCD work zone linked (if applicable)
- ☐ Certifying professional selected

22.5 Export Decision Quick-Reference

Destination	Best Format
ArcGIS	GeoJSON

QGIS	GeoJSON or Shapefile
AutoCAD / Civil 3D	DXF (UTM projection)
Google Earth	KMZ (includes photos)
ASCE Submittal	ASCE 75-22 JSON + PDF Report
Agency Submittal	KMZ + PDF Report
Excel Analysis	CSV or XLSX
Field Crew Review	PDF Report

— End of Manual —

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