Procurement Ledger: Pressure & Flow Anchor (PFA)

Role: Pump/Well Sentry | **Quantity:** 1,280 Units

The Pressure & Flow Anchor (PFA) is the "Sentry of the Source," serving as the primary hardware interface for monitoring groundwater extraction and ensuring the mechanical safety of the pumping infrastructure. This document outlines the granular costs and procurement strategy required to deploy the PFA at every well station in Subdistrict 1, establishing the foundational data for the regional "Digital Water Ledger."

1. Granular Hardware & Component Costs

Category	Component Description	Supplier	Part # / Type	Cost (Unit)
Housing	NEMA 4X EMI-Shielded Enclosure	Hoffman	A080604CHNF	$55.00
Computing	NXP i.MX RT (Cortex-M7) Sled	Digi-Key	RT1020-Series	$95.00
Diagnosis	400A Split-Core CT Clamps (x3)	Magnelab	SCT-1250	$110.00
Hydrology	Submersible Depth Sounder (SS)	Dwyer	PBLTX-Vented	$185.00
Hydrology	Vented Tubing (300ft roll)	Dwyer	Tubing-PVC	$45.00
Pressure	200 PSI SS Line Transducer	TE Conn	M5200-Series	$70.00
Actuation	30A Industrial Control Relay	Omron	G7L-2A-BUBJ	$45.00
Power	AC Step-Down + 40Ah LiFePO4	MeanWell	DRC-100A	$115.00
Wiring	12AWG Shielded Control Wire	Belden	8719	$30.00
TOTAL	**Per Unit Hardware Cost**			**$750.00**

2. Engineering & Strategic Justification

- **Hydrostatic Well-Depth Sounder ($185):** This is the most critical hydrological instrument in the FarmSense stack. The Dwyer PBLTX uses a vented 316-Stainless Steel diaphragm to measure the water column height above the sensor. By including 300ft of vented tubing ($45), the PFA can track minute-by-minute draw-down and recovery levels of the aquifer. This data is non-negotiable for Water Court defensibility, providing empirical proof that a

farm is staying within its legal pumping envelope and identifying regional "cones of depression."

- **Industrial Diagnosis (Split-Core CTs):** The Magnelab SCT-1250 clamps are non-invasive transformers that measure the amperage draw across all three phases of the pump motor. By analyzing the "Energy Signature" of the pump, the NXP processor can detect "Dry Pumping" (where air enters the lines) or early-stage impeller cavitation. This "Predictive Maintenance" capability prevents the burn-out of $20,000 submersible motors, paying for the PFA's cost in a single avoided failure event.
- **EMI Hardening & The Hoffman Enclosure:** Pump houses are notoriously noisy environments due to high-voltage lines and Variable Frequency Drives (VFDs). We utilize NEMA 4X Hoffman enclosures with internal EMI shielding to protect the high-speed Cortex-M7 processor from electromagnetic interference. Without this shielding, the analog signals from the depth sounder would suffer from "ghosting" or noise-induced errors.
- **Autonomous "Reflex" Actuation:** The Omron 30A relay is wired directly into the pump's "Remote Stop" or "E-Stop" circuit. This allows the FarmSense network to execute an autonomous shutdown if the PMT (Pivot Tracking Module) detects a span stall or if the line pressure transducer ($70) detects a catastrophic pipe burst. This "Reflex" logic minimizes soil erosion and wasted water by stopping the source the second a fault is detected.

3. Deployment Totals & Compliance (Subdistrict 1)

The installation of the PFA requires high-voltage electrical expertise and careful hydrological calibration to ensure the sensors are seated correctly within the well casing.

- **Hardware Subtotal:** $960,000
  - *Reflects bulk procurement for 1,280 units, including the "Blackout Buffer" LiFePO4 battery system.*
- **Electrical Conduit & Fittings:** $64,000
  - *Covers all rigid steel and liquid-tight conduit, grounding rods, and weather-proof fittings required to bring the PFA up to NEC (National Electrical Code) standards.*
- **Electrician Labor (Install):** $224,000
  - **The "Safety First" Protocol:** Installation is calculated at 4 hours per unit. This includes the high-voltage tie-in to the motor starter, the "plumbing-in" of the line pressure sensor, and the delicate "drop" of the 300ft sounder cable. The rate factors in the requirement for Licensed Journeyman Electricians for all pump-house tie-ins to ensure liability protection and insurance compliance.

PFA TOTAL PROJECT COST: $1,248,000

Note: The PFA is the primary interface for "Credit Generation" in water-saving programs. Its accuracy and tamper-proof mounting are vital for farmers participating in voluntary fallowing or pumping reduction incentives.