Procurement Ledger: Regional Superstation (RSS)

Role: Regional Cortex | **Quantity:** 1 Unit | **Location:** Monte Vista Hub

The Regional Superstation (RSS) is the "Cortex" of the FarmSense network for Subdistrict 1. It serves three primary functions: high-performance edge computing (The Zo Engine), regional data vaulting, and the tactical staging ground for the 15,000+ unit "Blitz" deployment. This document provides a granular procurement breakdown and a detailed operational justification for the $212,000 regional investment, emphasizing its role within a decentralized, fault-tolerant mesh.

1. Granular Hardware & Component Costs

Category	Component Description	Supplier	Part # / Type	Cost
Structure	40' High-Cube Container (R-14)	Western	40HC-Mod	$18,000
Climate	Mini-Split HVAC (Low Ambient)	Mitsubishi	Hyper-Heat	$4,500
Compute	Zo Kriging Cluster (Threadripper)	Puget Systems	Custom-Workstation	$22,000
Storage	Oracle Vault (50TB NVMe Array)	WD Gold	SN850-x10	$12,500
Network	Starlink Business + Fiber ONT	SpaceX	Starlink-Biz	$3,500
Power	1.2kW Ground Solar + 800Ah Bat	Renogy	1.2kW-OffGrid	$14,000
Power	5kW Dual-Fuel Backup Gen	Honda	EU7000iS	$5,500
Fleet	4WD Heavy Duty UTV (Outfitted)	Polaris	Ranger-HD	$28,500
Trailer	12' Mobile Lab + Auger Rig	Proprietary	Custom-Fab	$15,000
Inventory	20' Rental Container (3-mo Blitz)	MobileMini	Rental	$1,500
Lab Tools	Sled JIGs, Scopes, ESD Benches	Tektronix	MDO-Series	$10,000
TOTAL	**Total Facility CAPEX**			**$135,000.00**

2. Redundancy & Decentralized Architecture

While the RSS is a "Superstation," it does not exist in isolation. Its reliability is derived from a triple-layered redundancy strategy that ensures data integrity even during catastrophic regional events.

- **Decentralized Peering (The Mesh):** Each RSS is a node in a regional mesh. If the Monte Vista RSS compute cluster goes offline, the "Worksheets" and raw data streams are automatically rerouted via long-range point-to-point (PtP) wireless links to the nearest neighboring RSS (e.g., Saguache or Alamosa hubs). This peer-to-peer failover ensures that the "Zo Scientist" logic continues to process soil variability maps without interruption.
- **Cloud-Hybrid Sync (The Oracle Shadow):** The RSS acts as a high-speed local cache for "Oracle" (the data library). Every 15 minutes, the RSS pushes encrypted, compressed deltas of the regional water ledger to a secure cloud-based "Shadow Vault." If a physical RSS is destroyed (fire, theft, etc.), a new unit can be "rehydrated" with the full historical record from the cloud in less than 4 hours.
- **Tri-Path Backhaul:** Connectivity is maintained through three simultaneous paths:
  1. **Primary:** High-speed Fiber ONT (where available).
  2. **Secondary:** Starlink Business (Low-latency satellite).
  3. **Tertiary:** 900MHz Mesh backhaul to neighboring hubs. *This ensures that even if a backhoe cuts a fiber line, the RSS stays connected to both the field sensors and the central Oracle library.*

3. Engineering & Strategic Justification

- **The "Cortex" Compute Cluster ($22,000):** To execute the high-resolution Kriging algorithms required for Subdistrict 1, we utilize a Puget Systems custom workstation featuring an AMD Threadripper PRO 64-core processor. This "Regional Cortex" processes raw data from 1,280 VFA nodes and 15,600 LRZ scouts. By processing at the edge (the RSS) rather than exclusively in the cloud, we reduce latency for "Actuations"—allowing the system to shut off a center pivot in seconds rather than minutes.
- **The Oracle Vault (50TB NVMe):** Data integrity is paramount for legal defensibility in Water Court. We utilize WD Gold Enterprise-class NVMe drives in a RAID-10 configuration. This "Vault" provides 50TB of usable space with 1.5 million hours MTBF, ensuring every minute of pump activity is stored with zero-loss redundancy. This storage layer utilizes a **Zero-Trust Data Verification** protocol, where every incoming sensor packet is cryptographically signed at the source (VFA/PFA) and verified at the RSS before being committed to the ledger.
- **Cyber-Physical Defense:** The RSS is protected against both digital and physical threats. The Verkada AI security suite ($15,000) monitors the physical perimeter, while the internal

network is segmented by an industrial-grade firewall. In the event of a detected cyber-intrusion, the RSS can enter "Air-Gap Mode," severing external internet connections while continuing to collect and store field data locally via the wireless mesh.

4. Logistics: The Monte Vista Epicenter

The RSS is more than a server room; it is the **Monte Vista Logistics Epicenter**, the heart of the "Blitz" deployment methodology.

- **Tactical Mobility & The "Blitz" Rig:** The $15,000 Custom-Fab Trailer is a mobile laboratory and hydraulic auger station. During the 60-day installation window, this rig allows field technicians to perform "Sled Swaps" and hardware diagnostics on the move. The trailer carries its own 2.5kWh battery buffer, allowing the auger and diagnostic tools to run all day without idling the UTV, reducing the carbon footprint of the deployment.
- **Inventory Management:** The 20' Rental Container serves as a "Ready-Rack" for the 15,600 LRZ units. This allows the RSS to maintain a just-in-time (JIT) supply chain, where sensors are calibrated, GPS-tagged, and "burned-in" at the RSS lab benches before being loaded onto the UTVs for daily field placement.

5. Deployment Totals & Operational Overhead

- **Infrastructure Total:** $135,000 (Includes R-14 spray-foam insulation for -40°F stability).
- **Fencing & Security (Verkada):** $15,000 (AI cameras for intrusion detection and license plate recognition).
- **Software Implementation:** $50,000 (Zo Engine deployment, Starlink Priority integration, and the creation of the Subdistrict 1 "Digital Twin" dashboard).
- **O&M Year 1 (Fuel/Propane):** $12,000 (Fleet fuel for the Blitz and propane reserves for the 5kW Honda backup generator).

RSS TOTAL PROJECT COST: $212,000

Note: The RSS architecture transitions the FarmSense network from a hub-and-spoke model to a resilient, decentralized mesh. By combining local high-performance compute with peer-to-peer failover and cloud-shadowing, the regional water record becomes virtually indestructible and legally irrefutable.