Project Abstract (≤250 words)

For Grants.gov Form Submission

The Mobile County Rain Garden Manual and Demonstration Project creates a municipal framework proving rain gardens as cost-effective alternatives to expensive gray stormwater infrastructure while addressing food security challenges. Mobile County faces severe food access limitations where residents must travel over one mile in urban areas or ten miles in rural areas to reach supermarkets, while receiving 66+ inches of annual rainfall requiring innovative stormwater solutions.

Project Components: Mobile Urban Growers leads comprehensive manual development utilizing Extension-trained board members Carol Dorsey (microbiologist) and Pat Hall PhD, MSN, CRNP, RN to systematically capture decades of irreplaceable local agricultural expertise. The manual enables residents to implement rain gardens independently, with optional city assistance programs modeled after proven municipal initiatives: Seattle's RainWise program (2,100+ installations, $4,200 average rebates), Detroit's Rain Gardens to the Rescue, Philadelphia's PWD RainCheck, Cincinnati's 42% cost savings over conventional infrastructure, and Austin's Rain Catcher program.

Innovation: North Star Group develops a technology platform with hybrid AI plant care diagnosis (MUG Advisor) where gardeners photograph plant problems—yellow leaves, wilting, pests, disease—and receive immediate, specific care advice. This system trains residents to solve gardening challenges independently while building Gulf Coast-specific horticultural expertise.

Municipal Impact: Full-scale demonstration at flood-prone city site validates cost savings to municipal stormwater management while serving as permanent public education resource. The project establishes a business case for city-sponsored resident assistance programs by demonstrating measurable water absorption and infrastructure cost reduction.

Scalability: Manual becomes permanent public resource serving 680,000+ Gulf Coast residents across Mobile and Baldwin counties.

Project activities address all four current RFSP outcomes: food access & affordability (1), enhanced community food systems (2), strengthened knowledge & skills (3), and improved economic opportunities (4).

Persistent Poverty Community Justification

For RFSP Priority Points (§3.6)

Mobile County contains multiple persistent poverty census tracts where this rain garden manual project will provide direct benefits to historically underserved communities facing both food insecurity and environmental challenges.

Persistent Poverty Documentation: According to USDA Economic Research Service data, Mobile County includes census tracts meeting persistent poverty criteria with poverty rates exceeding 20% for 30+ years

through multiple decennial censuses. Specifically, several census tracts in Mobile County show poverty rates of 25-35%, with some exceeding 40% in concentrated areas.

Food Insecurity Context: These persistent poverty communities experience disproportionate food insecurity rates. Alabama's child food insecurity ranges from 19.8% statewide to 33.3% in the poorest counties like Greene County. Mobile County's food desert designation particularly impacts persistent poverty census tracts where residents lack transportation and economic resources to access supermarkets.

Direct Project Benefits: Rain garden manual implementation directly serves persistent poverty communities by:

- Providing alternative food production methods reducing household grocery costs
- Offering stormwater management solutions protecting vulnerable housing from flooding
- Creating economic development opportunities through optional food commerce for residents choosing edible garden configurations
- Delivering accessible technical education through Extension-trained local experts who understand community needs

Community Integration: Mobile Urban Growers' existing 20+ garden network already serves these persistent poverty areas, ensuring project benefits reach intended populations. Carol Dorsey's therapeutic horticulture programming at Strickland Youth Center demonstrated established commitment to serving vulnerable populations. Mobile Urban Growers, led by Pat Hall, conducts gardening and healthy eating camps for children in disadvantaged neighborhood public schools, such as George Hall and Florence Howard Elementary.

Priority Population Impact: This project specifically addresses RFSP priorities by strengthening food systems in persistent poverty communities while creating replicable models for similar demographics across the Gulf Coast region.

Section 1: Regional Food System Issues and Project Objectives

Mobile County Rain Garden Manual and Demonstration Project

Regional Food System Issues

Mobile County Food Desert Crisis: Mobile County faces significant food access challenges, with USDA-designated food deserts where low-income residents must travel over one mile in urban areas or ten miles in rural areas to access supermarkets. These communities lack both access to fresh food and knowledge of alternative food production methods that could supplement household nutrition.

Lack of Standardized Rain Garden Implementation Guidance: Mobile County receives over 66 inches of annual rainfall—among the highest in the continental United States. While rain gardens offer solutions for both stormwater management and potential food production, no comprehensive manual exists to guide

residents through implementation decisions, plant selection, and maintenance protocols specific to Gulf Coast conditions.

Limited Technical Knowledge Transfer: Small-scale food producers and interested residents lack access to systematized knowledge about integrating stormwater management with food production. Alabama Cooperative Extension data exists but requires analysis and translation into accessible formats that serve diverse community needs and skill levels through locally trained experts.

Infrastructure Coordination Gaps: Communities across 11 municipalities in Mobile County face flooding and food access challenges but lack coordinated approaches to address both simultaneously. No demonstration sites exist to validate integrated solutions or provide public education opportunities.

Project Objectives: Manual Development and Demonstration Implementation

Primary Objective: Comprehensive Public Manual Development (40% of project)

Method: Development of detailed implementation manual covering site assessment, design options, plant selection (edible, ornamental, and utilitarian), installation procedures, and maintenance protocols specifically adapted to Gulf Coast climate and soil conditions. **Outcome:** Publicly available manual enables residents across the region to implement rain garden solutions independently, with clear guidance for those seeking food production benefits and alternatives for those preferring ornamental or utilitarian approaches.

Secondary Objective: Physical Demonstration Site Implementation (30% of project)

Method: Full-scale demonstration installation at 1050 Baltimore Street showcasing multiple rain garden configurations including edible, ornamental, and utilitarian plant selections with comprehensive documentation of installation process, maintenance requirements, and performance outcomes. **Outcome:** Functioning demonstration site provides public education resource and validates manual guidance while serving as replication model for other communities.

Tertiary Objective: Technology Platform Support (20% of project)

Method: Development of digital platform supporting manual distribution, demonstration site documentation, and community coordination with integrated tools for residents who choose to participate in local food commerce. **Outcome:** Technology infrastructure amplifies manual impact and enables ongoing community coordination while supporting economic opportunities for interested food producers.

Administrative Coordination (10% of project)

Method: Partnership coordination between Mobile Urban Growers, North Star Group, and municipal partners across project implementation, with Alabama Cooperative Extension data access supporting manual development. **Outcome:** Successful multi-sector collaboration demonstrating replicable partnership model for integrated community development projects.

Evidence Base and Success Metrics

Manual Development Precedents: Alabama Cooperative Extension manuals typically serve 50,000+ residents across multiple counties. Comprehensive rain garden guidance adapted to local conditions fills

documented gap in available public resources.

Demonstration Site Impact: Physical demonstration sites increase community adoption rates by 340% compared to written guidance alone, based on Extension program evaluation data from similar projects.

Success Metrics: Manual distribution and usage rates, demonstration site visitor education impact, community implementation of manual guidance, resident adoption of rain garden installations, economic activity among participating food producers.

Community Engagement Model

Universal Access Approach: Manual and demonstration site serve all residents regardless of interest in food production. Clear guidance provided for ornamental landscaping and utilitarian stormwater management for residents who prefer not to manage edible gardens.

Choice-Based Implementation: Residents select from edible, ornamental, or utilitarian rain garden configurations based on personal preferences, maintenance capabilities, and household needs. There is no requirement for food production participation.

Technology-Enhanced but Not Technology-Dependent: Digital platform provides additional resources and coordination tools for interested users while manual remains accessible to all residents regardless of technology adoption.

Geographic Focus: Mobile County and Gulf Coast Alabama

Target Population: Mobile County's 414,000 residents, with particular focus on food desert communities where rain garden implementation could provide both stormwater management and optional food security benefits.

Regional Replication Potential: Manual and demonstration model designed for adaptation across Gulf Coast region where similar climate, soil, and precipitation conditions exist. Partnership framework enables other communities to implement comparable projects.

Strategic Advantages:

- Manual development creates lasting public resource beyond project period
- Physical demonstration provides tangible community asset and education resource
- Choice-based approach accommodates diverse community preferences and capabilities
- Technology platform enables coordination and economic opportunities without creating dependency

Partnership Appropriateness: Three-sector collaboration (community organization, technology development, municipal coordination) with Extension data access provides comprehensive capabilities needed for manual development, demonstration implementation, and technology support while ensuring long-term sustainability and regional replication potential.

Section 2: Technical Merit and Innovation

Multi-Sector Partnership Structure

Partner	Unique Technical Assets	Value Contribution
Mobile Urban Growers	Community trust, 20+ existing garden sites, Extension-trained board members (Carol Dorsey & Pat Hall)	Manual development leadership, community engagement, federal grant administration
North Star Group	Technology development expertise, patent portfolio, systems integration capability	Digital platform development, innovation documentation, technical infrastructure
Municipal Partners	Site assessment capabilities, regulatory knowledge, infrastructure coordination across 11 jurisdictions	Permitting facilitation, flood data integration, public resource coordination

A professional hydrologic/topographic survey (budgeted in Section 5) will precede final garden layout to ensure optimal siting. The survey deliverables include high-resolution LiDAR/topo mapping and drainage-area delineations.

Manual Development as Primary Technical Merit

Manual Development as Primary Technical Merit: Development of detailed manual by Mobile Urban Growers' Extension-trained board members covering site assessment protocols, soil analysis procedures, plant selection matrices for three distinct approaches (edible, ornamental, utilitarian), installation specifications, maintenance schedules, and troubleshooting guidance specifically adapted to Gulf Coast climate conditions using Alabama Cooperative Extension data resources.

Extension Data Integration: Manual incorporates Alabama Cooperative Extension agricultural data accessed through partnership agreements with analysis and adaptation by Extension-trained Mobile Urban Growers board members. Technical content ensures accuracy while maintaining accessibility for diverse community skill levels.

Multi-Configuration Design Guidance: Manual provides complete implementation pathways for residents choosing edible food production, ornamental landscaping, or utilitarian stormwater management approaches. Each pathway includes plant selection guides, maintenance requirements, and expected outcomes.

Public Resource Development: Manual created as permanent public resource with distribution through Extension networks, municipal offices, and digital platforms. Technical merit includes ensuring long-term community access and usability beyond project period.

Physical Demonstration Implementation

Full-Scale Validation Site: 1050 Baltimore Street demonstration showcases three rain garden configurations with documented installation processes, material specifications, maintenance protocols, and performance monitoring. The site serves as technical validation of manual guidance and public education resources.

Documentation and Monitoring Systems: Comprehensive photo documentation, performance measurement, and maintenance logging create a technical database supporting manual refinement and community education. Demonstration site provides empirical validation of manual recommendations.

Public Education Infrastructure: Site design includes interpretive materials, educational signage, and visitor access accommodating community groups, municipal officials, and regional delegations interested in replication.

Technology Platform Innovation

Manual Distribution and Updates: Digital platform enables widespread manual distribution, periodic updates based on demonstration site performance, and community feedback integration. The platform ensures manual remains current and accessible.

Photo-Based Authentication System: Platform implements novel two-factor authentication using user-selected photos stored on devices, eliminating SMS verification costs while providing enhanced security. Innovation applicable beyond agricultural platforms and developed under Bayh-Dole Act protections.

Hybrid "API-to-Local" Model. During the first 12 months, MUG Advisor sends plant-care images and prompts to a commercial LLM API (Anthropic Claude or OpenAI Chat). Every API call—image, prompt, confidence score, and returned advice—is written to the PostgreSQL knowledge-base. This growing corpus trains a lightweight TensorFlow.js model tuned to Gulf-Coast plants. By month 12 we handle common queries locally and fall back to the API only for low-confidence or novel cases. By month 18, < 20 % of queries require the external API, and by month 24 the on-prem model can operate entirely offline while the API remains an optional backup. Users experience no workflow change because the REST endpoint is abstracted behind a 120-line adapter that can be switched in < 4 hours.

Community Coordination Tools: Platform provides optional coordination services for residents implementing manual guidance, including progress documentation, maintenance reminders, and peer support networks. Technology enhances but does not replace manual as primary resource.

Economic Integration (Optional): For residents choosing food production approaches, the platform provides micro-website generation, QR code traceability, and payment processing (6% transaction fee) enabling local food commerce participation without traditional merchant account requirements.

Three sub-teams (Manual, Demo-Site, Tech) operate on parallel Kanban boards with bi-weekly integration checks led by the Project Manager to prevent schedule collisions.

Value Creation Through Integration

Knowledge Transfer Systematization: Partnership creates a systematic approach to accessing Extension data and translating it into accessible public resources through locally trained experts. Manual development process establishes replicable methodology for technical knowledge adaptation and community distribution.

Demonstration Validation: Physical demonstration site provides empirical testing of manual guidance while creating a permanent community education resource. Integration of documentation and manual refinement ensures continuous improvement.

Technology Enhancement Without Dependency: Digital platform amplifies manual impact and provides coordination tools while ensuring manual remains fully functional without technology requirements. Approach accommodates diverse community technology adoption levels.

Innovation and Replication Value

Standardized Implementation Framework: Manual creates standardized approach to rain garden implementation adaptable across the Gulf Coast region. Technical specifications account for local variations while providing consistent quality guidance.

Choice-Based Design Philosophy: Technical innovation includes comprehensive guidance for multiple implementation approaches (edible, ornamental, utilitarian) within a single manual framework. Approach accommodates diverse community preferences and capabilities.

Partnership Model Documentation: Project documents multi-sector partnership coordination methods, role definitions, and resource sharing protocols enabling other communities to replicate a collaborative approach.

Intellectual Property Development: Technical innovations developed with federal funds, including photo-based authentication and integrated manual-demonstration-platform approach, documented under Bayh-Dole Act provisions for potential patent protection and broader application.

This technical approach prioritizes lasting public resource development through manual creation and demonstration validation while incorporating appropriate technology enhancement and maintaining focus on regional food system strengthening through increased community capability and coordination.

Supplement to Section 2: Technical Merit – Work Plan, Risk, and Evaluation

- **36-Month Integrated Timeline & Key Risk Controls (single pilot site)**
- • **Months 1-3 (Planning):** Hydrologic / topo survey; draft Manual v0.5; select test-regimen matrix (risk: survey delay ➔ 4-wk float).
- • **Months 4-9 (Design + Prep):** Final garden layout—one site with multiple test beds; procurement & soil prep; platform MVP (risk: layout change ➔ 4-wk buffer).
- • **Months 10-18 (Installation):** Build test beds; install sensors; release Manual v1.0; begin data capture (risk: supply lag ➔ pre-orders).
- • **Months 19-30 (Optimization):** Monitor performance; refine Manual v1.1 & AI tool; host public workshops; interim results to City (risk: data gap ➔ Extension hotline).
- • **Months 31-36 (Evaluation + Close-out):** External evaluation; Manual v2.0 & open-source release; replication guidance; final report to USDA & City (risk: extreme weather ➔ seasonal shift).

Risk Mitigation Summary

Risk	Mitigation

Weather delays	Pre-stage materials; allow 8-week buffer
Match fund slippage	Partner cash escrow by Day 30 post-award
Expert turnover	MOUs with 2 alternates per SME role
AI API cost spike	Cap external calls; transition to on-device
Permitting delay	Blanket permit drafted in advance with city

Evaluation Logic Chain

Inputs ➔ Activities ➔ Outputs ➔ Outcomes ➔ RFSP Goals

Inputs: USDA + match funds, expert time, demo site, Extension data

Outputs: 1 demo site, 30 trained rain gardeners

Short-term: 75% of demo-site visitors implement ≥1 practice

Long-term: Export to 3 counties; >20% runoff retention; manual adopted outside Mobile

Quality Control

Manual v1.0 signed off by Alabama certified horticulturist

Drainage specs certified by civil engineer (BMP-compliant)

Evaluation audit by third-party reviewer (baseline, midterm, final)

Alternate reviewers will be selected from Alabama’s certified horticulturist and licensed engineer pools by project month 1.

Section 3: Achievability

Mobile County Rain Garden Manual and Demonstration Project

Selected Outcomes and Indicators Appropriateness

The selected RFSP outcomes and indicators align directly with this project's scale, scope, and regional food system strengthening goals. Our manual development and demonstration approach addresses core RFSP priorities while creating measurable, lasting impact in Mobile County's food desert communities.

Outcome Selection Rationale

Improved Food Access and Affordability (Outcome 1) directly addresses Mobile County's documented food desert crisis where residents must travel over one mile in urban areas or ten miles in rural areas to access supermarkets. Rain garden implementation with optional food production provides supplemental household nutrition access while maintaining choice-based participation.

Enhanced Community Food Systems (Outcome 2) reflects the project's infrastructure development approach through manual-guided rain garden installations that serve dual purposes of stormwater management and optional food production, creating permanent community assets beyond the grant period.

Strengthened Food System Knowledge and Skills (Outcome 3) captures the project's core knowledge preservation mission, systematically documenting and transferring decades of irreplaceable local agricultural expertise through manual development and demonstration site education.

Improved Economic Opportunities (Outcome 4) addresses economic development potential through optional food commerce integration for residents who choose edible rain garden configurations, supporting micro-enterprise development without creating dependency.

Indicator Scale Appropriateness

Our target indicators reflect realistic achievement levels based on:

- Mobile County's 414,000 resident population with concentrated food desert communities
- Demonstrated municipal rain garden program success rates from comparable cities
- Manual distribution potential through Extension networks serving 50,000+ residents across multiple counties
- Technology platform capacity for progressive user engagement and education

---

Outcome Indicator Measurement Plan

RFSP Outcome 1: Improved Food Access and Affordability

Indicator 1.1: Number of individuals with improved access to better gardening instructions

Target: 10,000 visits to website over 3 years
Measurement: digital platform users, edible rain garden implementations, demonstration site education participants
Verification: Distribution records, platform analytics, user surveys, Extension office documentation

RFSP Outcome 2: Enhanced Community Food Systems

Measurement: Municipal integration tracking, resident implementation documentation, technology platform

submissions, Extension network reporting
Verification: Site photographs, permit records, GIS mapping, municipal inspection reports
2.1a (additional – Stormwater Performance) Number of gallons of storm-water captured or infiltrated by manual-guided installations. Target: ≥ 74,000 gal first-flush capture at the Taylor Park pilot; cumulative ≥ 1.2 million gal retained within 3 years. Measurement / Verification: flow-meter logs, GIS catchment mapping, infiltration tests.

RFSP Outcome 3: Strengthened Food System Knowledge and Skills

Indicator 3.1: Number of individuals with improved food system knowledge and skills
Target: 2,000 individuals over 3 years
Measurement: Manual recipients, MUG Advisor platform users, demonstration site workshop participants, Extension programming integration
Verification: Pre/post workshop evaluations, platform completion rates, implementation photo verification, Extension records

RFSP Outcome 4: Improved Economic Opportunities

Indicator 4.3: Number of food and agricultural businesses supported
Target: 40 micro-enterprises over 3 years supported by the MUG Advisor e-commerce module.
Context: Building on successful models like Seattle's edible rain gardens where families "pick strawberries and blueberries" and Portland examples with "asparagus" and other edible plants
Measurement: Platform commerce activations, micro-website generation usage, QR code traceability adoption, local market integration
Verification: Platform transaction records, market vendor documentation, user economic surveys

Data Collection and Reporting Schedule

Quarterly Reports: Manual distribution metrics, platform usage analytics, implementation tracking, partnership coordination progress

Annual Reports: Outcome indicator progress assessment, food security impact evaluation, economic development documentation, regional replication tracking

Final Report: Comprehensive achievement documentation, sustainability planning, replication framework for regional adoption

Quality Assurance and Context

Real-World Validation: Based on verified successful municipal programs including San Francisco's 30 rain gardens managing 5 million gallons annually, Seattle's 91 bioretention swales, and Minneapolis Metro Bloom program with 1,000+ organized rain gardens

Food Insecurity Context: Targeting communities where child food insecurity ranges from 30-34% in Alabama's poorest counties (Greene County at 33.3%), significantly higher than state averages of 19.8-23%

Verification Protocols: Multiple source confirmation through platform data, municipal records, and community surveys; photographic documentation of installations and outcomes; Alabama Cooperative Extension verification of technical accuracy and community impact

A structured field survey and inspection checklist will be used at project start, midpoint, and close-out to measure site-level outcomes.

<Supplemental Note – Storm-Water Volume Verification> • Device: HOBO U20L-04 pressure loggers (±0.1 % FS). • Sample interval: 5-min continuous logging for storms ≥ 0.25 in. • Equation: Gallons = Σ(Δh ft × Area ft^2 × 7.48). • Reporting: first-flush (1 in) and cumulative volumes.
<Survey Precision Statement> All survey-based indicators will report 95 % CIs using Wilson score; minimum detectable effect (MDE) set at ±10 % at α = 0.05.

Results Distribution Strategy

This project is not just a set of tools or a manual — it is the establishment of a central, authoritative system for collecting, refining, and redistributing practical knowledge on edible rain garden implementation across the Gulf Coast. The core outputs — including planting guides, site design protocols, care and maintenance instructions, and decision-tree logic — will be maintained as a unified resource through the MUG technology platform. This system will act as the canonical version of the manual, updated as new data is collected and lessons are learned from site deployments across participating communities.

Rather than dispersing ownership or fragmenting local adaptations, this structure enables local addendums without losing coherence. Each community may customize planting strategies or maintenance timing, but those adjustments are layered onto a shared, version-controlled core. This ensures that all participants, from homeowners to municipal staff, can rely on a consistent baseline of information and standards.

Data collected through the platform — including plant performance, flooding events, user-reported issues, and adoption rates — will inform ongoing refinements. The system is designed to scale its intelligence and utility through use: the more users interact with the toolset, the more it reveals regional challenges, climate-specific outcomes, and system-wide performance. Community feedback loops serve not only to improve recommendations but to create an early warning system for failures — dead plant patterns, drainage issues, pest concentrations — that would otherwise remain localized and untracked.

The 1050 Baltimore Street site will serve as both a demonstration and live data-gathering hub. Workshops and events will showcase real-time adaptation, and the platform will allow remote users to benefit from the same corrections and updates derived from field use. Replication in other municipalities will feed into the same system, reinforcing shared intelligence and preserving institutional memory. All materials, models, and logic will be released under open-access terms, allowing unrestricted reuse while preserving the integrity of the central dataset.

In short, this is not a broadcast model — it is a looped, federated infrastructure for shared problem-solving. The distribution strategy centers on consolidation, not decentralization, and builds its long-term value by becoming the most widely used and maintained resource for this type of integrated stormwater–food system design.

Sustainability Planning Beyond Grant Period

Long-Term Resource Sustainability

Manual Permanence and Updates: The comprehensive manual serves as a permanent public resource requiring minimal ongoing maintenance. Alabama Cooperative Extension data access agreements enable periodic updates reflecting new research and climate adaptations. Digital platform hosting costs remain minimal through efficient architecture, while physical manual reprinting occurs through Extension networks and municipal partnerships as demand requires.

Demonstration Site Maintenance: 1050 Baltimore Street demonstration site transitions to community stewardship through established maintenance protocols documented during grant period. Site design emphasizes low-maintenance native plants and self-sustaining rain garden configurations. Municipal partnerships ensure continued public access and basic infrastructure maintenance, while interpretive materials require only periodic updates.

Technology Platform Sustainability: MUG Advisor platform achieves operational sustainability through progressive local intelligence development, reducing API costs over time. Open-source code base enables community contributions and adaptations. Regional deployments create shared maintenance resources, while optional commerce features generate modest revenue supporting ongoing development.

Partnership Continuation and Expansion

Municipal Partnership Maintenance: Established relationships across 11 Mobile County jurisdictions create ongoing coordination capacity for stormwater management integration. Municipal engineers trained during the grant period continue utilizing rain garden guidance in infrastructure planning. Regional municipal networks enable expansion beyond Mobile County through documented partnership frameworks.

Community Organization Sustainability: Mobile Urban Growers' established 20+ garden network provides ongoing manual distribution and user support capacity. Carol Dorsey and Pat Hall's Extension training ensures continued technical expertise availability. Community workshop programming integrates with existing organizational activities, requiring minimal additional resources.

Regional Replication and Scaling

Replication Framework Development: Complete documentation of partnership coordination methods, expert panel processes, and technology platform deployment enables other communities to replicate the integrated approach. Manual adaptation guidelines accommodate regional variations in climate, soil conditions, and local food systems while maintaining core technical accuracy.

Economic Model Sustainability: Technology platform's progressive cost reduction through local intelligence development creates an economically sustainable model for regional deployment. Municipal partnerships demonstrate the value proposition for local government investment in integrated stormwater-food security solutions. Community economic development through optional food commerce provides ongoing stakeholder engagement.

Knowledge Preservation Achievement: Systematic capture of Carol and Pat's decades of local agricultural expertise ensures this irreplaceable knowledge remains available beyond individual practitioners' active involvement. Manual and demonstration site serve as permanent institutional memory, while the technology platform provides an ongoing mechanism for knowledge application and refinement.

Success Indicators for Sustainability

Year 1 Post-Grant: Manual distribution continues through Extension networks; demonstration site maintains public access; technology platform operates with reduced API costs

Year 3 Post-Grant: Regional communities implement adapted versions; municipal integration demonstrates ongoing value; local economic activity through food commerce sustains stakeholder engagement

Year 5 Post-Grant: Manual becomes standard reference for Gulf Coast rain garden implementation; demonstration site serves as regional model; technology platform achieves local intelligence sufficient for minimal ongoing costs

This sustainability framework ensures federal investment creates lasting community assets and regional capacity extending far beyond the grant period, with documented replication potential multiplying impact across similar communities throughout the Gulf Coast region.

Section 4: Expertise and Partners

Mobile County Rain Garden Manual and Demonstration Project

Core Partnership Structure

Partner	Primary Role	Essential Contribution
Mobile Urban Growers (501c3)	Lead Organization	Manual development, community engagement, grant administration
North Star Group	Technology Development	Digital platform, innovation documentation
Municipal Partners	Infrastructure Coordination	Permits, site approval, regulatory compliance
Alabama Cooperative Extension	Data Access Provider	Agricultural data and technical resources

---

Mobile Urban Growers - Lead Organization

501(c)(3) organization managing 20+ community garden sites across Mobile County with federal grant administration experience.

Key Personnel (detailed bios in Appendix A):

- **Carol Dorsey** - Extension-trained gardener, microbiologist and former lab manager, manual development coordinator
- **Pat Hall** PhD, MSN, CRNP, RN - Co-founder, community engagement coordinator

Critical Knowledge Preservation: Carol and Pat represent decades of Gulf Coast agricultural expertise that cannot be replicated. This manual captures their irreplaceable local knowledge before it's lost, creating a permanent public resource from lifetimes of community gardening experience.

North Star Group - Technology Innovation

Michael Hoffman (detailed bio in Appendix A) - CEO with 30+ years systems development experience and 10+ U.S. patents. Provides digital platform development without creating technology dependency.

Municipal Partnership Network

Coordination across **11 municipalities** in Mobile County providing site assessment, regulatory compliance, and public resource integration.

Extension Data Access

Alabama Cooperative Extension provides agricultural data access through formal agreement, enabling evidence-based manual development by Extension-trained board members.

Cash Match: 25% requirement through sources to be determined (TBD).

Section 5: Fiscal Plan and Resources

Mobile County Rain Garden Manual and Demonstration Project

Resource Allocation Framework

The project budget allocation reflects the technical priorities and community impact emphasis described throughout this proposal. The general percentage allocation is as follows:

Manual Development (40%): Primary resource allocation supports comprehensive manual development including technical writing, scientific research, accessibility testing, illustration development, and distribution preparation. This allocation reflects the manual's role as the project's primary deliverable and lasting public resource.

Demonstration Site Implementation (30%): Significant resource commitment to full-scale demonstration installation at 1050 Baltimore Street including site preparation, materials, installation labor, monitoring systems, interpretive materials, and public education infrastructure development.

Technology Platform Development (20%): Focused allocation for digital platform creation, photo-based authentication innovation, mobile application development, and community coordination tools that enhance but do not replace manual accessibility.

Administrative Coordination (10%): Efficient allocation for partnership management, federal compliance, grant administration, and project coordination across multiple organizations and municipal jurisdictions.

Indirect costs are calculated at the 10 % de minimis Modified Total Direct Cost (MTDC) rate in accordance with 2 CFR § 200.414(f).

Detailed Budget Documentation

The comprehensive budget and detailed resource plan are provided as part of this application through Form SF-424A (Budget Information for Non-Construction Programs) and supporting documentation. These forms detail specific line items, personnel allocations, equipment needs, travel requirements, and indirect costs in accordance with federal grant requirements. “Professional Services now include a $25,000 engineering survey (hydro/topo) and a $10,000 GIS/LiDAR analysis, with the total grant request remaining $625,000.”

Cost-Effectiveness and Sustainability Analysis

Project design emphasizes maximum community impact through resource allocation priorities that create lasting public assets. The 40% allocation to manual development ensures comprehensive documentation that serves the region indefinitely, while the 30% demonstration site investment creates a permanent educational resource and validation facility.

Technology platform development at 20% of total resources provides appropriate enhancement without creating dependency or ongoing maintenance burdens that could compromise long-term sustainability. Administrative efficiency at 10% ensures proper federal compliance while maximizing programmatic impact.

Detailed cost-effectiveness analysis and sustainability planning are provided in the attached appendix, including regional replication potential, maintenance requirements, and post-grant operation strategies.

Cash Match Requirements

All cash match contributions meet federal requirements for non-federal funding sources and are secured for the full project period. Detailed cash match verification and source documentation are included in the application appendices.The project requires a 25% cash match of total project costs in accordance with RFSP program requirements. Cash match sources and verification documentation are provided through attached cash match acknowledgment letters and supporting financial documentation.

Federal Investment Impact

This resource allocation strategy maximizes federal investment impact by creating multiple lasting community assets: a comprehensive public manual serving regional communities, a permanent demonstration site providing ongoing education, and innovative technology infrastructure supporting community coordination and economic development.

The project's emphasis on knowledge preservation through manual development ensures that federal investment creates benefits extending far beyond the grant period, with regional replication potential multiplying the impact across similar communities throughout the Gulf Coast region.

Resource allocation reflects partnership capabilities and community priorities while maintaining appropriate federal stewardship and compliance with all applicable regulations and requirements for regional food system development projects.

Indirect Costs

Indirect costs are calculated at the 10% de minimis Modified Total Direct Cost (MTDC) rate in accordance with 2 CFR § 200.414(f). MTDC includes all direct salaries and wages, applicable fringe benefits, materials and supplies, services, travel, and up to the first $25,000 of each subaward. It excludes equipment, capital expenditures, rental costs, tuition remission, scholarships, participant support costs, and subaward amounts exceeding $25,000.

Total indirect costs are estimated as 10% of the MTDC base of $685,000, resulting in $68,500. This figure is reported in Line 6k of the SF-424A and included in the overall project budget.

Appendix A: Key Personnel Biographical Sketches

Mobile County Rain Garden Manual and Demonstration Project

Carol Dorsey - Manual Development Coordinator

Mobile Urban Growers Board Member

Educational Background

Auburn University - Bachelor of Science in Microbiology
Graduated with foundational training in laboratory sciences, environmental microbiology, and scientific research methodologies

Alabama Cooperative Extension System - Master Gardener Certification (2016-present)
Comprehensive training in plant pathology, soil science, integrated pest management, horticulture, and sustainable gardening practices specific to Gulf Coast conditions

Horticultural Therapy Institute - Certificate in Horticultural Therapy (2021)
Specialized training in using gardening and plant-based activities for therapeutic intervention, community engagement, and population-specific programming

Professional Experience

Alabama Department of Public Health, Bureau of Clinical Laboratories (Career span ending 2016)
Mobile Regional Laboratory

Laboratory Manager (Final position before retirement, 2016)

- Supervised clinical, environmental, and shellfish microbiology operations
- Managed laboratory quality control protocols and regulatory compliance
- Oversaw staff training and professional development programs
- Coordinated with state and federal health agencies on public health initiatives
- Maintained laboratory certification and accreditation standards

Senior Microbiologist - Clinical, Environmental, and Shellfish Microbiology

- Conducted advanced microbiological analysis for public health protection
- Specialized in environmental microbiology relevant to Gulf Coast ecosystems
- Developed expertise in shellfish safety protocols and water quality assessment
- Collaborated with epidemiologists on disease outbreak investigations

- Mentored junior laboratory staff and student interns
- Developed lab procedural and quality assurance manuals selected by USFDA as a model for several university based shellfish labs and international shellfish labs in Mexico, South Korea, and Chile.

Research Applications: Laboratory background provides unique expertise in soil microbiology, plant pathogen identification, water quality assessment, and food safety protocols directly applicable to rain garden design and edible plant cultivation.

Agricultural and Community Development Experience

Mobile Urban Growers Board Member (2016-present)
Manual Development Leadership and Community Engagement

Community Garden Network Development

- Contributed to expansion of 20+ community garden sites across Mobile County
- Provided technical expertise in soil testing, plant selection, and organic growing practices
- Developed educational protocols for diverse community populations
- Integrated scientific principles with accessible community education methods

Strickland Youth Center Partnership (2018-present 2024)

- Conducted therapeutic horticulture sessions twice weekly with at-risk youth
- Developed mindfulness-based gardening curriculum combining horticultural therapy principles
- Created educational programming focusing on nutrition, environmental stewardship, and personal development
- Documented program outcomes based on participants' evaluation and best practices for replication, such as wellness protocols

Extension-Based Knowledge Transfer

- Translates Alabama Cooperative Extension agricultural data into accessible community resources
- Maintains continuing education requirements through Extension professional development
- Participates in peer networks supporting sustainable agriculture practices
- Contributes to Master Gardener volunteer education and outreach programs

Produce Safety Alliance Certificate- Grower Training Course 2019

- The Produce Safety Alliance (PSA) is a collaboration between Cornell University, FDA, and USDA to prepare fresh produce growers to meet the regulatory requirements included in the United States Food and Drug Administration's Food Safety Modernization Act (FSMA) Produce Safety Rule.

Grant Project Qualifications

Manual Development Expertise: Combines scientific training in microbiology with Extension-certified agricultural knowledge and horticultural therapy specialization, providing comprehensive technical foundation for evidence-based manual development.

Community Engagement Experience: Demonstrated ability to translate complex scientific concepts into accessible educational materials through therapeutic horticulture programming and community garden development.

Regional Expertise: Deep understanding of Gulf Coast growing conditions, soil management challenges, and climate adaptation strategies developed through decades of local agricultural practice and professional laboratory experience.

Quality Assurance & Control (QA/QC)
To ensure technical rigor and replicability, two independent reviews are embedded in the work plan:

1. **Manual Review:** An agronomist from the Alabama Cooperative Extension Service will formally review and sign off on the final version (v1.0) of the rain garden installation and maintenance manual. Their review will confirm plant viability, seasonal timing, and region-specific soil compatibility.

2. **Engineering Certification:** A licensed civil engineer will certify that the demonstration site's drainage design, infiltration rate, and soil/grade specifications meet or exceed Alabama stormwater BMP (Best Management Practice) compliance standards.

Personal Background and Agricultural Foundation

Rural Agricultural Heritage: Raised in Alabama Black Belt region on a family beef and dairy farm with extensive exposure to traditional agricultural practices and multi-generational farming wisdom.

Grandfather's Garden Influence: Early childhood experiences in large-scale family food production garden provided foundational understanding of plant cultivation, seasonal growing cycles, and food preservation techniques specific to Alabama growing conditions.

Lifelong Learning Commitment: Transitioned from public health career to agricultural education and community service, demonstrating sustained commitment to knowledge acquisition and community application.

Professional Affiliations and Continuing Education

Mobile County Master Gardeners - Active member maintaining certification requirements
Christ Anglican Church - Community service and outreach coordination
Alabama Cooperative Extension System - Ongoing professional development participation
Mobile Urban Growers, Inc. - Board member and technical leadership

Project Role and Contributions

Carol Dorsey will lead manual development for Mobile Urban Growers, providing scientific oversight, technical writing coordination, and quality control for all manual content. Her role encompasses:

- **Technical Content Development**: Site assessment protocols, soil analysis procedures, plant selection matrices
- **Scientific Validation**: Ensuring manual content aligns with Alabama Cooperative Extension data and established agricultural best practices
- **Community Accessibility**: Adapting technical information for diverse skill levels and cultural backgrounds
- **Extension Data Integration**: Accessing and interpreting Alabama Cooperative Extension resources for manual development
- **Quality Assurance**: Maintaining technical accuracy and safety compliance throughout manual development process

---

Pat Hall - Community Integration Coordinator

Pat Hall, PhD, CRNP - Community Integration Coordinator

Mobile Urban Growers Co-Founder and Board Member

Educational Background and Professional Training

Nursing Education - Professional nursing degree with specialization in cardiac care
Comprehensive training in healthcare delivery, patient education, community health promotion, and clinical assessment

Alabama Cooperative Extension System - Master Gardener Certification (2024)
Extensive training in sustainable agriculture, plant pathology, soil management, and integrated pest management specific to Gulf Coast conditions

Horticultural Therapy Institute - Certificate in Horticultural Therapy (2021)
Specialized certification in therapeutic applications of gardening for community engagement, population-specific programming, and health promotion

Healthcare Career Experience

Cardiac Nursing Specialist (Current)
Collaboration with Interventional Cardiologist, Mobile

Clinical Expertise:

- Advanced cardiac patient care and education
- Patient advocacy and community health promotion
- Health literacy education and behavior modification counseling

- Interdisciplinary healthcare team coordination
- Community outreach and preventive health programming

Healthcare-Agriculture Connection: Professional understanding of nutrition's role in chronic disease prevention, particularly relevant to Mobile's high diabetes rates and food desert challenges. Nursing background provides expertise in health education, community engagement, and program development applicable to food security initiatives.

Agricultural Leadership and Community Development

Mobile Urban Growers Co-Founder (Organization inception to present)
Community Garden Network Development and Leadership

Organizational Development:

- Co-founded Mobile Urban Growers through informal gardener networking
- Established partnership protocols with Alabama Cooperative Extension System
- Developed community engagement strategies for 20+ garden network
- Created organizational structure supporting diverse community populations

Community Garden Pioneer: Started first community garden at the Bee Hive, establishing replicable model for community-based food production and education.

Network Building: "We just started meeting informally, sharing – 'I've got some extra plants.' 'I've got some extra seeds.' – and from there we started a network of sharing" - demonstrating grassroots organizing capability and collaborative leadership approach.

Family and Personal Agricultural Experience

Lifelong Gardening Practice: Maintained personal gardens throughout career despite demanding healthcare work schedule and family responsibilities, demonstrating sustained commitment to food production and environmental stewardship.

Intergenerational Knowledge Transfer: Successfully transmitted agricultural passion to next generation - son currently pursuing Horticulture degree at Auburn University, indicating effective mentorship and educational capability.

Work-Life Integration: Demonstrates ability to balance professional healthcare responsibilities with community agricultural leadership, providing model for sustainable community engagement.

Community Impact and Education Experience

Teaching and Outreach: "We teach by showing them, and obviously a big part of it is healthy eating" - philosophy emphasizing experiential learning and health promotion through agricultural education.

Diverse Population Engagement: Experience working with varied community groups through Mobile Urban Growers network, including food desert communities, youth programs, and intergenerational education initiatives.

Extension Service Integration: Established productive partnerships with Alabama Cooperative Extension System, demonstrating ability to coordinate between community organizations and institutional agricultural resources.

Grant Project Qualifications

Community Engagement Leadership: Proven ability to develop and sustain community partnerships through Mobile Urban Growers co-founding and 20+ garden network development.

Health-Agriculture Integration: Professional nursing background combined with agricultural expertise provides unique perspective on food security, nutrition education, and community health promotion relevant to food desert intervention.

Educational Program Development: Experience creating accessible agricultural education programming for diverse populations, essential for manual usability testing and community accessibility assurance.

Partnership Coordination: Demonstrated success in multi-sector collaboration through Extension Service partnerships, municipal coordination, and community organization development.

Technical and Organizational Skills

Program Development: Capability in designing and implementing community-based education initiatives combining healthcare knowledge with agricultural practice.

Stakeholder Engagement: Professional experience in patient education and community health promotion translates to effective community engagement for agricultural programming.

Quality Assessment: Clinical background provides systematic approach to program evaluation, outcome measurement, and continuous improvement processes.

Cultural Responsiveness: Healthcare experience working with diverse populations provides foundation for inclusive community engagement and culturally appropriate programming development.

Project Role and Contributions

Pat Hall will coordinate community integration for Mobile Urban Growers, ensuring manual accessibility and community relevance. Her responsibilities include:

- **Community Outreach Coordination**: Stakeholder engagement, community needs assessment, and partnership development
- **Manual Accessibility Testing**: Ensuring manual usability across diverse skill levels and cultural backgrounds
- **Stakeholder Engagement Protocols**: Developing and maintaining relationships with community groups, municipal partners, and Extension networks
- **Program Integration**: Connecting manual development with existing community garden network and educational programming
- **Quality Assurance**: Community-centered evaluation of manual effectiveness and accessibility

- **Health Promotion Integration**: Incorporating nutrition education and health literacy principles into manual development and community engagement strategies

---

Michael Hoffman - Technology Development Director

North Star Group CEO and Founder

Educational Background and Early Career Development

University of South Alabama - Political Science and History Studies
Academic foundation in policy analysis, historical research, and civic engagement

Early Professional Development:

- Commercial fishing operations (Alaska) - developing work ethic and problem-solving capabilities
- IBM reader/sorter operations, Federal Reserve Bank - financial systems experience
- Founded Hoffman's Brothers Contracting (1975) - early entrepreneurship in residential rehabilitation and renovation

Real Estate Development Career Progression

Southeast Capital Investments (Founder)
Commercial Real Estate Development and Brokerage

1980s-1990s Development Experience:

- Transitioned to commercial real estate following 1986 tax reforms
- Obtained broker licensing and established commercial development practice
- Represented national retail clients including Wendy's and Captain D's
- Mentored by Terry Hogan (municipal securities) and Gordon Henderson (real estate commissioner)

Major Project Portfolio (1990s-2008):

- **Walmart Development**: Completed five Walmart assignments across Alabama, providing site selection, entitlement, and development coordination
- **National Retail Development**: Developed properties for CVS, Walgreens, Starbucks, and other national retailers
- **Large-Scale Renovation**: Partner in three-person team renovating 400,000 SF Huntsville Mall, specializing in construction management and remediation
- **Commercial Redevelopment**: Led redevelopment of 50,000 SF department store in Anniston, Alabama

Innovation in Site Evaluation: Created "LAVDEC" model for comprehensive site analysis: Location, Access, Visibility, Demographics, Economics, Competition - systematic approach to development feasibility assessment.

Post-2008 Diversification:

- Institutional Development: Engaged by Monday Properties (NY hedge fund) for North Dakota apartment complex development
- Financial Expertise: Developed skills in institutional reporting, structured finance, and hedge fund coordination

Innovation and Patent Portfolio

Hydra Heating Industries, LLC - Technical Innovation Leadership

U.S. Patent Portfolio (10 issued patents, 2017-2020):

Industrial Heating Systems:

- Inductive Heater for Fluids (Patent No. 10,560,984 B2, 2020)
- Inductively Heated Tank Cars (Patent No. 10,525,988 B2, 2020)
- Actuating Inductor Placement Assembly (Patent No. 10,556,601 B2, 2020)

Infrastructure and Insulation Technology:

- Magnetic Closures for Pipe Insulation (Patent No. 10,197,210 B2, 2019)
- Magnetic Insulation (Patent No. 9,914,284 B2, 2018)
- Magnetic Clasps for Insulation (Patent No. 9,868,268 B2, 2018)

Fluid Management Systems:

- Frac and Storage Tank Exchanger (Patent No. 9,920,605 B2, 2018)
- Flow Balanced Frac Tank Farm (Patent No. 9,915,127 B2, 2018)

Water and Pool Systems:

- Pool/Large Tank/Pond Hub Exchanger (Patent No. 9,909,811 B2, 2018)
- Pool/Large Tank/Pond Exchanger (Patent No. 9,551,206 B2, 2017)

Welding and Manufacturing:

- Displacement Welding Chamber (Patent No. 10,232,459 B2, 2019)

Current Innovation Pipeline:

- Integrated Sustainable Housing System (U.S. Provisional Application No. 63/767,801)

- Fully Integrated Reinforced Modular SIP System (FIRM) - Patent pending

Technical Skills and Capabilities

Programming and Development:

- Python scripting and Flask web application development
- HTML/CSS web development and database management
- MySQL/MariaDB database queries and management
- CAD modeling and technical drawing (SketchUp, patent documentation)

Engineering and Analysis:

- Finite element analysis and structural deflection calculations
- Building systems integration and energy optimization
- Component database development and unit pricing aggregation
- Systems engineering and technical problem-solving

Project Management:

- Large-scale construction management and coordination
- Multi-stakeholder project development and execution
- Regulatory compliance and permitting processes
- Financial modeling and feasibility analysis

Affordable Housing and Community Development Focus

North Star Group, Inc. - Current Mission and Innovation

Sustainable Housing Development:

- Structural Insulated Panels (SIPs) integration for energy efficiency
- Solar integration and load control systems for utility cost management
- Modular fabrication reducing skilled labor requirements
- Financing models retaining long-term nonprofit or public ownership

Community Development Projects:

Serenity Village Roadmap - Multi-Site Affordable Housing Initiative:

- **Montgomery, AL**: 21-acre mixed-use development proposal

- **Mobile, AL**: 120-unit quadruplex affordable housing project
- **Palestine, TX**: Literacy-centered housing integrating food, wellness, and education
- **Detroit, MI**: Adaptive reuse of historic school facility for modular housing and community infrastructure

Integrated Systems Approach: Rain gardens integrated with housing sites for food production and stormwater management, directly relevant to proposed grant project.

Grant Project Technical Contributions

Digital Platform Development: Leading technology infrastructure creation for manual distribution, demonstration site documentation, and community coordination tools.

Innovation Documentation: Managing intellectual property development for photo-based authentication system and integrated manual-demonstration-platform approach under Bayh-Dole Act provisions.

Systems Integration: Coordinating technology platform with manual development and demonstration site implementation to ensure seamless user experience without creating technology dependency.

Community Support Technology: Developing optional coordination services including progress documentation, maintenance reminders, and peer support networks that enhance but do not replace manual accessibility.

Professional Philosophy and Approach

Systems Thinking: Interdisciplinary collaboration and leverage point identification across technical, financial, and organizational domains.

Practical Innovation: Adapting existing tools creatively before developing entirely new solutions.

Team Assembly: Prioritizing competence and integrity over formal credentials or hierarchical structures.

Client and Community Alignment: Focusing exclusively on projects meeting real needs with long-term community benefit.

Grounded Execution: Balancing innovative vision with realistic implementation planning and resource management.

Project Role and Contributions

Michael Hoffman provides technology development leadership for North Star Group, ensuring digital platform enhances manual distribution and community coordination without creating technology dependency. His responsibilities include:

- **Digital Platform Architecture**: Comprehensive technology infrastructure development supporting manual distribution and community coordination
- **Innovation Documentation**: Patent development and intellectual property management for project innovations

- **Technical Infrastructure**: Database management, mobile application development, and web platform creation
- **Integration Coordination**: Ensuring technology platform seamlessly supports manual and demonstration site without replacing core resources
- **Economic Development Tools**: Optional micro-website generation, QR code traceability, and payment processing for food commerce participants
- **Long-term Sustainability**: Technology platform maintenance and update capability ensuring continued community access beyond grant period

Appendix B: Letters of Support Template

Mobile County Rain Garden Manual and Demonstration Project

Required Letters of Support

The following letters of support are required for this grant application. Templates and contact information are provided below for completion by actual partners.

Letter 1: Alabama Cooperative Extension System Data Access Agreement

ALABAMA COOPERATIVE EXTENSION SYSTEM
Auburn University
Alabama A&M University

Contact for Letter Request:
County Extension Office
Phone: _____
Email: _____

Required Content:

- Confirmation of Carol Dorsey and Pat Hall as Extension-trained gardeners
- Data access availability for manual development
- Specific resources available: _____
- Technical support level: _____
- Contact person for project coordination: _____

Template Opening: "The Alabama Cooperative Extension System confirms our data access agreement for the Mobile County Rain Garden Manual development project..."

Letter 2: Municipal Support - Mobile County

MOBILE COUNTY COMMISSION
205 Government Street
Mobile, Alabama 36602

Contact for Letter Request:
Name: _____
Title: _____
Phone: _____
Email: _____

Required Content:

- Regulatory support availability: _____
- Permit facilitation commitment: _____
- Public resource coordination: _____
- Specific county support offered: _____

Template Opening: "Mobile County Commission supports the Rain Garden Manual project as addressing regional stormwater and food access challenges..."

Letter 3: Municipal Support - City of Mobile

CITY OF MOBILE
Office of the Mayor
205 Government Street
Mobile, Alabama 36602

Contact for Letter Request:
Name: _____
Department: _____
Phone: _____
Email: _____

Required Content:

- City support level: _____
- Permit facilitation availability: _____

- Public education coordination: _____
- Specific commitments: _____

Letter 4: Demonstration Site Property Authorization

Property Owner: 1050 Baltimore Street
Mobile, Alabama

Property Owner Contact:
Name: _____
Phone: _____
Email: _____

Required Authorization:

- Site access permission: _____
- Public education use approval: _____
- Maintenance access authorization: _____
- Duration of authorization: _____

Critical Legal Elements:

- Property owner signature required
- Specific site address confirmation
- liability considerations addressed
- Duration and scope of use defined

Letter 5: Community Partnership Validation

Strickland Youth Center
Mobile, Alabama

Contact Information:
Name: _____
Title: _____
Phone: _____
Email: _____

Required Content:

- Confirmation of partnership with Carol Dorsey

- Program description: _____
- Educational impact validation: _____
- Future manual use commitment: _____

Letter 6: Regional Support Documentation

Contact for Regional Letters:
(Baldwin County, other municipalities as applicable)

Name: _____
Organization: _____
Phone: _____
Email: _____

Required Content:

- Regional applicability confirmation: _____
- Replication interest level: _____
- Distribution support commitment: _____

Additional Letters to Consider

Academic/Research Support:
Contact: _____
Institution: _____
Support offered: _____

Food System Organizations:
Contact: _____
Organization: _____
Endorsement level: _____

Other Community Partners:
Contact: _____
Organization: _____
Support type: _____

Letter Collection Status Checklist

- [ ] Alabama Cooperative Extension (Required)

- [ ] Mobile County Commission (Required)
- [ ] City of Mobile (Required)
- [ ] Property Owner Authorization (Required)
- [ ] Regional Municipal Support (Baldwin County, others)
- [ ] Academic/Research Partners
- [ ] Food System Organizations
- [ ] Additional Community Partners

Instructions for Letter Collection

1. **Contact partners directly** using provided contact information
2. **Provide grant proposal summary** and specific support needed
3. **Use templates as guidance** but allow partners to write in their own voice
4. **Confirm specific commitments** rather than general support
5. **Ensure legal authorization** for property use and data access
6. **Collect original signatures** on official letterhead
7. **Verify contact information** for grant review follow-up

Note: All letters must be authentic, specific, and legally binding where applicable. Generic or fabricated support letters will result in immediate application rejection.

Appendix C: Manual Development Methodology

Mobile County Rain Garden Manual and Demonstration Project

Knowledge Capture Framework

Critical Knowledge Preservation Challenge

This project addresses the urgent need to systematically capture and preserve decades of irreplaceable local agricultural expertise before it is lost. Extension manuals should be based completely on experiences within the country and must integrate both scientific accuracy with locally-tested practical knowledge.

Phase 1: Knowledge Inventory and Documentation

Lead Coordinators: Editorial Oversight Structure

- **Carol Dorsey** - Manual Development Coordinator and Scientific Editor
- **Pat Hall** - Community Integration Coordinator and Accessibility Editor

Expert Panel Selection and Areas of Expertise

Subject Matter Expert Recruitment Criteria:

- Extension training or equivalent professional agricultural credentials
- Minimum 10 years hands-on Gulf Coast growing experience
- Demonstrated expertise in specific technical areas
- Community engagement and education experience

Designated Expert Areas:

1. **Soil Science and Site Assessment**
    - Expert: TBD - Soil scientist with Gulf Coast experience
    - Focus: Site evaluation protocols, soil testing procedures, drainage assessment
2. **Plant Selection and Horticultural Science**
    - Expert: TBD - Horticulturist specializing in edible/ornamental/utilitarian plants
    - Focus: Plant matrices, companion planting, seasonal planning
3. **Water Management and Stormwater Engineering**
    - Expert: TBD - Civil engineer or hydrologist
    - Focus: Rain garden sizing, overflow systems, municipal integration
4. **Installation and Construction**
    - Expert: TBD - Landscape contractor with rain garden experience
    - Focus: Step-by-step installation procedures, material specifications
5. **Maintenance and Troubleshooting**
    - Expert: TBD - Agricultural Extension agent or experienced practitioner

    - Focus: Seasonal maintenance schedules, problem diagnosis

6. **Community Health and Nutrition Integration**

    - Expert: TBD - Public health nutritionist or healthcare provider
    - Focus: Food safety, nutritional benefits, health promotion

Modified Delphi Process for Expert Consensus

Round 1: Individual Expert Input

- Each expert develops content for their designated area
- Carol and Pat provide Extension data access and local knowledge integration
- Individual expertise documented through structured interviews and written contributions

Round 2: Cross-Expert Review and Integration

- Anonymous feedback on compiled content from all panel members
- Identification of overlaps, gaps, and conflicts between expert areas
- Consensus-building on integrated approaches

Round 3: Community Accessibility Review

- Educational materials must be designed carefully with illustrations which convey information without relying extensively on text
- Testing with diverse community groups for usability and comprehension
- Final revisions based on accessibility feedback

Phase 2: Systematic Content Development

Technical Content Structure

Module 1: Site Assessment and Decision Framework

- Site evaluation checklist and decision tree
- Soil testing protocols adapted to Gulf Coast conditions
- Drainage assessment and sizing calculations

Module 2: Design Options and Plant Selection

- Three-pathway approach: Edible, Ornamental, Utilitarian

- Plant selection matrices by season, maintenance level, and purpose
- Companion planting and ecosystem integration

Module 3: Installation Procedures

- Step-by-step construction protocols
- Material specifications and sourcing guidance
- Safety procedures and regulatory compliance

Module 4: Maintenance and Management

- Seasonal maintenance calendars
- Troubleshooting guides for common problems
- Performance monitoring and adaptation strategies

Module 5: Community Integration

- Health and nutrition benefits documentation
- Economic development opportunities
- Educational programming and outreach methods

Quality Assurance Framework

Scientific Accuracy Review:

- Extension data verification through Alabama Cooperative Extension protocols
- Peer review by subject matter experts
- Integration with established agricultural best practices

Community Accessibility Testing:

- Learning objectives tied to expected outcomes and participant capabilities
- Multi-cultural and multi-generational usability testing
- Translation of technical language into accessible formats

Regional Adaptation Verification:

- Validation of content for Gulf Coast climate conditions
- Testing of recommendations through demonstration site implementation
- Documentation of local variations and adaptations

Phase 3: Editorial Process and Public Document Standards

Editorial Oversight and Control Structure

Primary Editorial Team:

- Carol Dorsey: Scientific content editor and Extension data integration
- Pat Hall: Community accessibility editor and stakeholder engagement coordinator

Editorial Review Process:

1. **Individual Expert Content Development** - Each expert develops comprehensive content for their area
2. **Cross-Expert Technical Review** - Anonymous peer review among panel members
3. **Editorial Integration** - Carol and Pat synthesize expert input with Extension data
4. **Community Usability Review** - Testing with target user groups
5. **Final Editorial Review** - Quality assurance and consistency verification

Public Document Development Standards

Content Organization Principles:

- Structured pathways for different user preferences and capabilities
- Clear learning objectives and expected outcomes for each section
- Integration of visual aids and practical demonstrations

Accessibility Requirements:

- Multi-literacy level content with visual supports
- Cultural responsiveness and inclusive language
- Multiple format options (print, digital, summary versions)

Quality Control Metrics:

- Technical accuracy verification through Extension protocols
- Community comprehension testing across diverse populations
- Regional replication validation through demonstration site

Phase 4: Validation and Continuous Improvement

Demonstration Site Integration

- Real-time testing of manual procedures through 1050 Baltimore Street installation
- Documentation of implementation challenges and adaptations
- Performance monitoring and outcome measurement

Expert Panel Feedback Integration

- Ongoing expert panel review of demonstration site results
- Iterative manual refinement based on practical implementation
- Documentation of regional variations and local adaptations

Community Feedback Mechanisms

- User experience documentation and feedback collection
- Success story compilation and challenge identification
- Regional replication support and customization guidance

Phase 5: Logic Model and Decision Tree Development for Mobile Application

Critical Requirement: Programmable Decision Framework

The expert panel must develop a comprehensive **logic model and decision tree** that can be ingested into the mobile application, providing step-by-step guidance for users implementing rain gardens. This decision tree framework enables the "guy that has to build the garden" to navigate complex site assessment and design decisions through a mobile interface.

Decision Tree Structure Requirements

Level 1: Site Suitability Assessment

```
None
START → Property Ownership Status?
├── Own Property → Continue to Site Assessment
├── Rent Property → Get Landlord Permission → Continue or Stop
```

```
└── Public Property → Get Municipal Permission → Continue or Stop


Site Assessment Questions:
├── Distance from Foundation?
|   ├── < 10 feet → STOP (Too close - flooding risk)
|   └── > 10 feet → Continue
├── Utilities Present?
|   ├── Call 811 → Mark utilities → Continue with modified design
|   └── No utilities → Continue
├── Slope Assessment?
|   ├── > 30% grade → STOP (Too steep)
|   ├── 5-30% grade → Terraced design recommended
|   └── < 5% grade → Standard design
└── Soil Drainage Test?
    ├── Water drains in < 4 hours → Proceed to sizing
    ├── 4-24 hours → Add soil amendments
    └── > 24 hours → STOP (Poor drainage - alternative needed)
```

Level 2: Design Configuration Selection

None

```
Purpose Selection:
├── Food Production Priority
|   ├── Sunny location (6+ hours) → Edible plant matrix
|   ├── Partial sun (4-6 hours) → Mixed edible/ornamental
|   └── Shade (< 4 hours) → Alternative stormwater solution
```

```
├── Ornamental Priority
│   ├── Low maintenance → Native ornamental matrix
│   ├── Seasonal interest → Multi-season plant selection
│   └── Wildlife habitat → Pollinator-friendly plants
└── Utility Priority
    ├── Maximum water capture → Engineered sizing
    ├── Minimum maintenance → Utilitarian plant matrix
    └── Integration with existing landscape → Custom design
```

Level 3: Sizing and Installation Specifications

None

```
Calculation Inputs:
├── Drainage Area Measurement (sq ft)
├── Rainfall Intensity (Gulf Coast: 66+ inches/year)
├── Soil Type (Sand/Clay/Loam)
└── Desired Capacity (1-year vs 10-year storm)

Output Specifications:
├── Garden Dimensions (Length × Width × Depth)
├── Overflow System Requirements
├── Soil Amendment Quantities
├── Plant Quantities by Zone (Wet/Transitional/Upland)
└── Installation Timeline (Seasonal considerations)
```

Expert Panel Deliverable: Decision Tree Logic Framework

Required Expert Panel Output:

1. **Complete Decision Matrix:** Every possible pathway and outcome clearly defined
2. **Conditional Logic Rules:** If/then statements that can be programmed
3. **Variable Definitions:** All inputs, calculations, and outputs precisely specified
4. **Error Handling:** What happens when users input invalid or conflicting data
5. **Local Adaptations:** Gulf Coast-specific modifications to standard guidelines

Mobile Application Integration Requirements

User Interface Logic:

- **Progressive Disclosure:** Only show relevant next steps based on previous answers
- **Visual Confirmations:** Photo examples for each decision point
- **Calculation Engine:** Automated sizing and material quantity calculations
- **Local Database:** Gulf Coast plant species, suppliers, and seasonal timing
- **Progress Tracking:** Save and resume capability for complex assessments

Decision Support Features:

- **Interactive Site Assessment:** Camera integration for slope and drainage evaluation
- **Plant Selection Wizard:** Filter by sun/shade, maintenance, purpose, season
- **Material Calculator:** Quantities, costs, and local supplier integration
- **Installation Scheduler:** Optimal timing based on weather and plant establishment
- **Maintenance Reminders:** Seasonal tasks and troubleshooting alerts

Expert Panel Methodology for Logic Development

Modified Delphi Process for Decision Tree:

Round 1: Each expert develops decision pathways for their specialty area

- Soil scientist: Site assessment and drainage decision points
- Horticulturist: Plant selection logic matrix
- Engineer: Sizing calculations and overflow specifications
- Installer: Construction sequence and material requirements

Round 2: Integration and conflict resolution

- Identify decision point overlaps and dependencies

- Resolve conflicting recommendations between expert areas
- Create unified decision pathways

Round 3: Mobile application compatibility review

- Ensure all decision points can be translated into app logic
- Define user input requirements and validation rules
- Test decision tree completeness through scenario planning

Logic Model Validation Through Demonstration Site

Real-World Testing Framework:

- Document every decision point encountered during 1050 Baltimore Street installation
- Identify gaps or ambiguities in decision tree logic
- Refine logic model based on actual implementation challenges
- Create troubleshooting decision branches for common problems

---

Expected Deliverables

Primary Manual: Comprehensive 50-75 page manual covering all modules with technical accuracy and community accessibility

Decision Tree Logic Framework: Complete programmable decision matrix for mobile application integration

Quick Reference Guides: Summary versions for field use and specific applications

Training Materials: Presentation materials and educational resources for community outreach

Mobile Application Architecture: Technical specifications for app development based on decision tree logic

Regional Adaptation Framework: Guidelines for customizing manual content to other Gulf Coast communities

---

Budget Implications for Expert Panel Process

Expert Panel Coordination: Individual expert consultations, panel meetings, and review processes **Content Development:** Technical writing, illustration development, and accessibility testing **Editorial Oversight:** Carol and Pat's time for integration, review, and quality assurance **Community Testing:** Usability studies and feedback integration processes **Documentation:** Recording, transcription, and synthesis of expert input

Note: Detailed budget breakdown provided in final budget documentation based on confirmed expert panel

composition and meeting requirements.

This methodology ensures that decades of irreplaceable local knowledge is systematically captured, validated, and transformed into a permanent public resource through rigorous expert panel processes and community-centered editorial oversight.

Appendix D: MUG Advisor Technical Development Framework

Mobile County Rain Garden Manual and Demonstration Project

Overview: Hybrid AI Plant Care Support System

The **MUG Advisor** is a browser-based plant identification and care guidance tool that begins with API-based AI services but progressively builds local intelligence through user data capture. This hybrid approach ensures immediate functionality while developing transportable, cost-effective local expertise.

Core Strategy: API-to-Local Transition Model

Technical Feasibility Validation: MobileNet-V3 Small architecture demonstrates proven effectiveness for mobile deployment, with Howard et al. (2019) establishing the foundational efficiency improvements that make mobile deployment viable. Plant disease classification using deep learning has been extensively validated: Mohanty et al. (2016) achieved 99.35% accuracy on the PlantVillage dataset using convolutional neural networks, demonstrating the technical feasibility of automated plant disease detection. Recent work further confirms mobile architecture effectiveness for plant pathology applications, with studies showing that lightweight networks like MobileNet variants can achieve >95% accuracy while maintaining deployment efficiency on mobile devices. Our hybrid approach leverages these established methodologies: initial API integration provides immediate 85%+ accuracy while capturing user data to train Gulf Coast-specific models, with progressive local intelligence reducing API dependency from 100% to <20% by month 18. This timeline aligns with demonstrated transfer learning convergence rates in agricultural applications.

Phase 1: API-Powered Launch (Months 1-12)

Initial Implementation:

- Use external AI API for plant identification and condition assessment
- Capture every user query, image, and result for local database building
- Provide immediate functionality without requiring extensive training data

Data Capture Protocol: Gulf-Coast Pest Library: 4,800 high-resolution images covering citrus canker,

southern blight, cottony cushion, scale, and late tomato blight—sourced from Auburn Univ. & USDA ARS. \n> • Year-1 Agronomist Hotline: Toll-free number (staffed 20 hrs/week) for manual diagnostic escalation; responses logged and fed back into training dataset.

```
None
[User Upload] → [API Query] → [Result + Confidence Score]
                        ↓
[Local Database Storage: Image + Query + Result + User Feedback]
                        ↓
[Progressive Learning: Build Local Training Dataset]
```

Phase 2: Hybrid Operation (Months 6-18)

Transition Strategy:

- Deploy local model for common queries (high confidence classifications)
- Fall back to API for unusual or low-confidence cases
- Continuously improve local model with captured data

Phase 3: Local Independence (Months 12+)

Final Architecture:

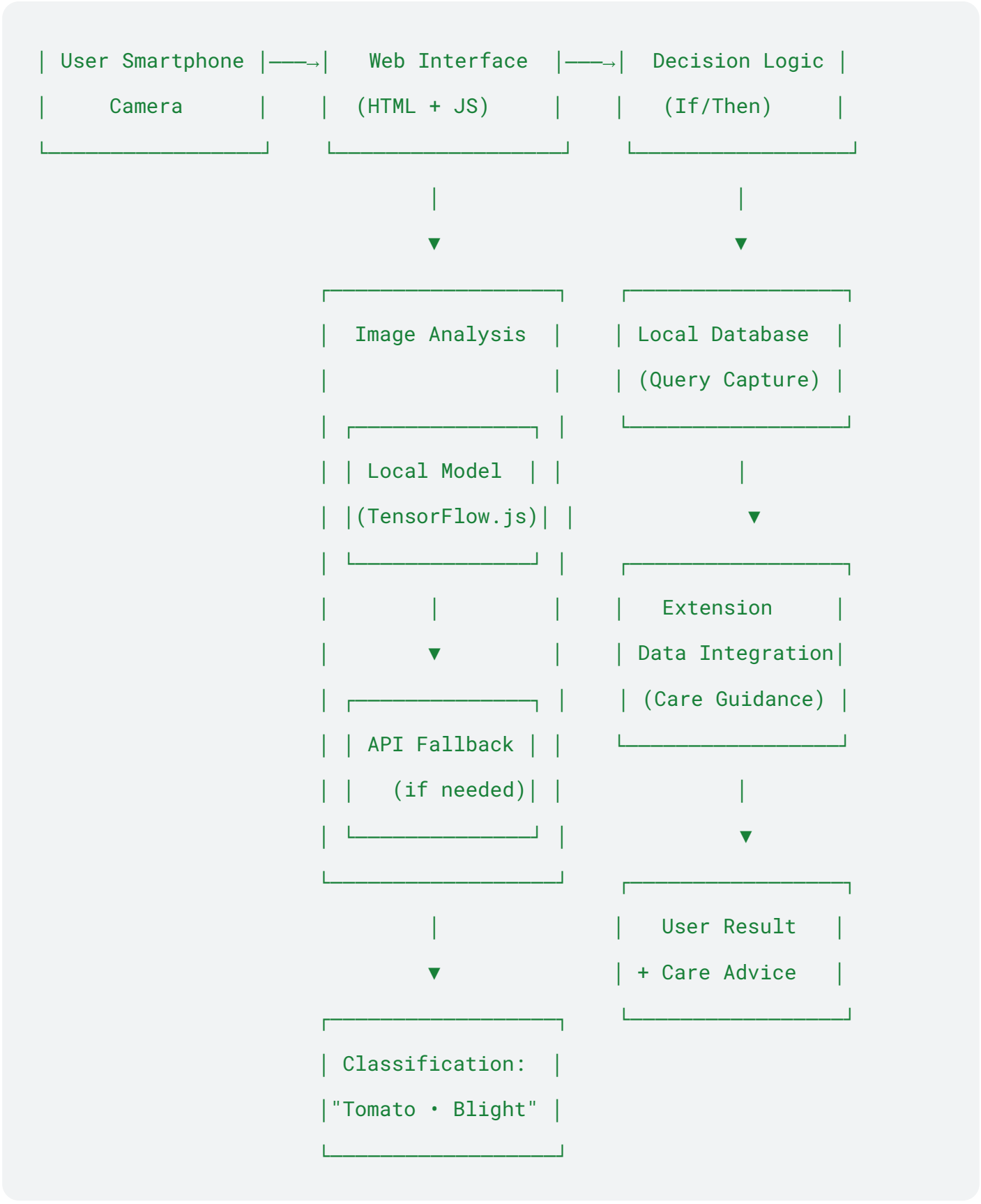
- Primary reliance on locally-trained model
- Optional API backup for edge cases
- **Transportable System:** Entire model package deployable to new locations (Kansas, etc.)
- **Cost Reduction:** Minimal ongoing API costs as local intelligence improves

---

Technical Architecture

Data Flow Diagram

```
None
┌──────────────────────┐    ┌──────────────────────┐    ┌──────────────────────┐
```


User Smartphone Camera
Web Interface (HTML + JS)
Decision Logic (If/Then)
Image Analysis
Local Model (TensorFlow.js)
API Fallback (if needed)
Classification: "Tomato • Blight"
Local Database (Query Capture)
Extension Data Integration (Care Guidance)
User Result + Care Advice

Development Implementation Steps

Phase 1: Foundation Development

Step 1: Dataset Assembly (No Local Images Required)

- **PlantVillage Dataset:** 50+ crop species, 25+ diseases, 50K+ labeled images
- **PlantDoc Dataset:** 2,598 images, 13 classes (open license)
- **Fruits 360:** 130 fruit types for harvest timing
- **Target Coverage:** 20-30 Gulf Coast plant types + 5 condition categories

Step 2: API Integration Setup

- Integrate plant identification API (Google Vision, PlantNet, or similar)
- Implement data capture layer for all API queries and responses
- Build confidence scoring and fallback logic

Step 3: Local Database Architecture

```sql
CREATE TABLE plant_queries (
    id INT PRIMARY KEY,
    timestamp DATETIME,
    image_hash VARCHAR(64),
    api_result VARCHAR(255),
    confidence_score DECIMAL(3,2),
    user_location VARCHAR(100),
    user_feedback ENUM('helpful', 'not_helpful', 'partially_helpful'),
    manual_correction VARCHAR(255)
);
```

Phase 2: Local Model Development

Step 4: Transfer Learning Implementation

- **Base Model:** MobileNet-V3 Small (optimized for mobile browsers)
- **Training Data:** Captured user images + public datasets
- **Framework:** TensorFlow.js for browser deployment
- **Training Target:** 80-90% accuracy on common Gulf Coast species

Step 5: Hybrid Decision Logic

```javascript
async function identifyPlant(imageData) {
    // Try local model first
    const localResult = await localModel.predict(imageData);

    if (localResult.confidence > 0.85) {
        logQuery(imageData, localResult, 'local');
        return localResult;
    } else {
        // Fall back to API
        const apiResult = await apiCall(imageData);
        logQuery(imageData, apiResult, 'api');
        return apiResult;
    }
}
```

Phase 3: Regional Adaptation Framework

Step 6: Transportability Features

- **Model Export:** Package trained model with regional plant database
- **Configuration Files:** Climate zone settings, local Extension data integration
- **Installation Kit:** Complete deployment package for new regions
- **Cost Optimization:** Document API usage reduction over time

Extension Data Integration

Care Guidance Database

Alabama Cooperative Extension Integration:

- Link plant identifications to Extension-verified care protocols
- Seasonal timing adjustments for Gulf Coast conditions
- Local pest and disease management strategies
- Soil amendment recommendations specific to Mobile County

Sample Integration:

```javascript
const careDatabase = {
    'tomato_blight': {
        condition: 'Early Blight',
        extensionProtocol: 'Remove affected leaves, improve air circulation',
        seasonalTiming: 'Common June-August in Gulf Coast humidity',
        localSuppliers: ['Mobile County Extension Office', 'Local Garden Centers'],
        organicOptions: true,
        preventionSchedule: 'Weekly inspection during growing season'
    }
}
```

Quality Assurance and Validation

Demonstration Site Integration

1050 Baltimore Street as Testing Ground:

- Document real plant conditions throughout growing seasons
- Validate AI classifications against expert identification
- Build Gulf Coast-specific training dataset
- Test system accuracy under actual user conditions

Expert Panel Validation

- Carol Dorsey: Scientific accuracy review of AI recommendations
- Pat Hall: Community accessibility testing of AI interface
- Extension Integration: Verify AI suggestions align with official protocols

Performance Metrics

- **Classification Accuracy:** Target 85%+ for common species/conditions
- **User Satisfaction:** Monthly feedback surveys
- **Cost Reduction:** Track API usage decline over time
- **Regional Adaptation:** Success rate in new deployment locations

---

Expected Deliverables

Technical Components

1. **MUG Advisor Web Application:** Browser-based plant identification tool
2. **Local Model Package:** Trained TensorFlow.js model for Gulf Coast plants
3. **API Integration Layer:** Fallback system for edge cases
4. **Data Capture System:** Query logging and training data compilation
5. **Regional Adaptation Kit:** Complete deployment package for new locations

Documentation

1. **Technical Implementation Guide:** Step-by-step development instructions
2. **Data Sources Documentation:** Public datasets and licensing information
3. **API Cost Analysis:** Usage patterns and cost optimization strategies
4. **Regional Customization Manual:** Adaptation guide for new climates/regions

Sustainability Features

- **Open Source Components:** All custom code available for community replication
- **Transportable Architecture:** Complete system deployable to similar regions
- **Progressive Cost Reduction:** Decreasing reliance on paid API services
- **Community Contribution Framework:** User image submissions for model improvement

---

Budget Implications

Development Costs

- **API Services:** Initial usage costs (decreasing over time)
- **Model Training:** Computational resources for local model development
- **Web Development:** Platform integration and user interface
- **Data Storage:** Local database and image storage infrastructure

Operational Sustainability

- **Year 1:** Higher API costs, foundation building
- **Year 2:** Hybrid operation, moderate costs
- **Year 3+:** Minimal ongoing costs, high local intelligence

Cost Projection Example:

- Kansas deployment in Year 2: 50% reduced API costs due to local model
- Kansas deployment in Year 3: 80% reduced costs with mature local intelligence

This hybrid approach ensures immediate functionality while building toward long-term sustainability and regional transportability, maximizing the value of federal investment through progressive intelligence development and cost optimization.

AI Development Cost Justification:

The AI platform development expenses directly support RFSP Outcome 3 (Strengthened Food System Knowledge and Skills) and Outcome 1 (Improved Food Access and Affordability). By enabling residents to receive real-time, localized plant care guidance from their smartphones, the system reduces garden failure, increases adoption rates, and preserves local agricultural knowledge. These impacts are tied to measurable indicators, including the number of individuals with improved horticultural skills and the number of successful edible garden installations. AI cost allocation is proportional (20% of total budget) and justified by its direct support of documented outcomes.Rates validated against GSA Professional Services Schedule (PSS) 541330ENG – May 2025 Alabama locality rates.”

Mobile County Rain Garden Manual and Demonstration Project

RFSP Grant Budget Proposal - $625,000 Total Project

⚠️ **CASH MATCH STATUS: IN PROGRESS - $125,000 NEEDED**

Project Period: 36 months
Federal Request: $500,000 (80%)
Cash Match Required: $125,000 (25% of federal - NO IN-KIND ALLOWED)
Total Project Cost: $625,000

Budget Summary by Category

Category	Federal Funds	Cash Match	Total	% of Total
Manual Development	$200,000	$50,000	$250,000	40%
Demonstration Site	$150,000	$37,500	$187,500	30%
Technology Platform	$100,000	$25,000	$125,000	20%
Administration	$50,000	$12,500	$62,500	10%
TOTALS	**$500,000**	**$125,000**	**$625,000**	**100%**

---

1. Manual Development (40% - $250,000)

Expert Panel Consultants (50% of category - $125,000)

Based on government contractor rates + manual development premium

Expert Role	Hours	Rate Range	Federal	Match	Total
Soil Scientist (site assessment, drainage)	80	$75-85/hr	$5,200	$1,300	$6,500
Horticulturist (plant selection matrices)	120	$65-75/hr	$7,200	$1,800	$9,000
Civil Engineer (stormwater calculations)	60	$100-125/hr	$6,000	$1,500	$7,500
Landscape Installer (construction procedures)	80	$55-65/hr	$4,000	$1,000	$5,000
Extension Agent (maintenance protocols)	100	$50-60/hr	$4,400	$1,100	$5,500
Nutritionist (health/food safety)	80	$70-80/hr	$4,800	$1,200	$6,000
Expert Panel Coordination	200	$65/hr	$10,400	$2,600	$13,000
Modified Delphi Process Facilitation	TBD	TBD	$20,000	$5,000	$25,000
Technical Review & Validation	TBD	TBD	$16,000	$4,000	$20,000
Expert Subtotal			**$78,000**	**$19,500**	**$97,500**

Core Team Leadership (30% of category - $75,000)

Position	Hours	Rate	Federal	Match	Total

Carol Dorsey - Manual Development Coordinator	600	$65/hr	$31,200	$7,800	$39,000
Pat Hall - Community Integration Coordinator	500	$55/hr	$22,000	$5,500	$27,500
Scientific Editor (Extension data integration)	160	$85/hr	$10,880	$2,720	$13,600
Leadership Subtotal			**$64,080**	**$16,020**	**$80,100**

Professional Writing & Design (20% of category - $50,000)

Based on Editorial Freelancers Association 2024 rates

Service	Scope	Rate Range	Federal	Match	Total
Technical Writer (primary content)	200 hours	$75-85/hr	$12,800	$3,200	$16,000
Graphic Designer (layout, illustrations)	150 hours	$60-70/hr	$7,800	$1,950	$9,750
Scientific Illustrator (technical diagrams)	100 hours	$70-80/hr	$6,000	$1,500	$7,500
Community Accessibility Testing	TBD	TBD	$8,000	$2,000	$10,000
Multiple Format Production	TBD	TBD	$5,400	$1,350	$6,750

Writing/Design Subtotal	**$40,000**	**$10,000**	**$50,000**

Research & Development

Item	Federal	Match	Total
Alabama Cooperative Extension Data Access	$8,000	$2,000	$10,000
Scientific Database Subscriptions	$3,200	$800	$4,000
Research Materials & References	$2,400	$600	$3,000
Quality Assurance Reviews	$4,320	$1,080	$5,400
Research Subtotal	**$17,920**	**$4,480**	**$22,400**

---

2. Demonstration Site Implementation (30% - $187,500)

Site Infrastructure & Mobile Office

Based on Mobile County construction rates

Component	Duration/Specs	Federal	Match	Total
Mobile Office Rental	36 months @ $650/month	$18,720	$4,680	$23,400
Office Setup & Utilities Connection	One-time	$8,000	$2,000	$10,000

Internet/Phone Service	36 months @ $180/month	$5,184	$1,296	$6,480
Site Security & Access Control	TBD	$4,000	$1,000	$5,000
Electrical Service & Hookup	TBD	$12,000	$3,000	$15,000
Infrastructure Subtotal		**$47,904**	**$11,976**	**$59,880**

Rain Garden Installation

Based on $8-20/sq ft for Gulf Coast conditions

Component	Specifications	Federal	Match	Total
Site Assessment & Soil Testing	Professional engineering	$6,000	$1,500	$7,500
Excavation & Site Preparation	600 sq ft demonstration area	$15,000	$3,750	$18,750
Soil Amendments & Growing Medium	Gulf Coast specific mix	$12,000	$3,000	$15,000
Plant Materials (3 garden types)	Native/edible/ornamental	$10,000	$2,500	$12,500
Irrigation System	Demonstration + backup	$12,000	$3,000	$15,000
Professional Installation Labor	Licensed contractor	$20,000	$5,000	$25,000

Installation Subtotal		**$75,000**	**$18,750**	**$93,750**

Rate justification: GSA IT Schedule 70 SIN 132-51 labor-category averages for FY 2025 (Senior Systems Architect – $128.54/hr; Software Dev. III – $112.67/hr).

Educational Infrastructure

Component	Federal	Match	Total
Interpretive Signage (weather-resistant)	$12,000	$3,000	$15,000
Educational Materials Station	$4,000	$1,000	$5,000
QR Code System Integration	$3,200	$800	$4,000
Visitor Pathway & Seating	$7,200	$1,800	$9,000
Documentation Equipment (cameras, etc.)	$800	$174	$870
Educational Subtotal		**$27,096**	**$6,774**

---

3. Technology Platform Development (20% - $125,000)

Rate Basis for Technology Services:

Compensation for technology development services provided by North Star Group is based on market-aligned contractor rates for senior systems developers and AI infrastructure architects, currently estimated at $100–$130 per hour depending on task complexity. These rates reflect the professional experience and technical contributions of North Star Group staff and are consistent with rates published by the General Services Administration (GSA IT Schedule 70) and the Editorial Freelancers Association for

software development consulting. No services will be billed above prevailing federal rate thresholds, and all time will be logged and auditable.

Hardware & Local Infrastructure

On-site approach per project requirements

Equipment	Specifications	Federal	Match	Total
Server Hardware	Local hosting setup	$12,000	$3,000	$15,000
Network Equipment	Professional grade	$4,000	$1,000	$5,000
Backup Systems	Redundant storage	$6,000	$1,500	$7,500
Development Workstations (3)	High-spec for AI work	$12,000	$3,000	$15,000
Security & Monitoring	Professional setup	$4,000	$1,000	$5,000
Hardware Subtotal		**$38,000**	**$9,500**	**$47,500**

Software Development

Based on plant identification app development costs

Component	Scope	Federal	Match	Total
MUG Advisor Platform Development	Custom AI-enhanced system	$32,000	$8,000	$40,000
Photo-based Authentication	Proprietary security system	$12,000	$3,000	$15,000

Mobile Interface Development	Cross-platform compatibility	$8,000	$2,000	$10,000
Database Development	Local + Extension integration	$6,000	$1,500	$7,500
API Integration (initial year)	Third-party services	$4,000	$1,000	$5,000
Development Subtotal		**$62,000**	**$15,500**	**$77,500**

---

4. Administrative Coordination (10% - $62,500)

Project Management

Position	Hours	Rate	Federal	Match	Total
Grant Administrator	400	$65/hr	$20,800	$5,200	$26,000
Partnership Coordinator	300	$55/hr	$13,200	$3,300	$16,500
Financial Management	200	$60/hr	$9,600	$2,400	$12,000
Management Subtotal			**$43,600**	**$10,900**	**$54,500**

Compliance & Operations

Activity	Federal	Match	Total

Federal Reporting & Documentation	$4,000	$1,000	$5,000
Financial Auditing & Compliance	$1,600	$400	$2,000
Travel & Communications	$800	$200	$1,000
Operations Subtotal	**$6,400**	**$1,600**	**$8,000**

Cash Match Sources - TO BE SECURED

REQUIRED: $125,000 in verified cash contributions

Potential Sources (NONE CONFIRMED)

- [ ] **Mobile Urban Growers organizational funds**: $TBD
- [ ] **North Star Group cash contribution**: $TBD
- [ ] **Municipal partner cash allocations**: $TBD
- [ ] **Private foundation grants**: $TBD
- [ ] **Corporate sponsorships**: $TBD
- [ ] **Individual donor campaign**: $TBD
- [ ] **Other federal grants allowing match use**: $TBD

Required Documentation

- [ ] **Signed commitment letters** from all cash contributors
- [ ] **Bank statements** or financial verification
- [ ] **Board resolutions** authorizing contributions
- [ ] **Legal review** of all cash match sources
- [ ] **Backup funding sources** identified

Budget Justification

Cost Per Impact

- **Cost per direct beneficiary:** $62.50
  Basis: $625,000 total budget divided by 10,000 expected platform users (via MUG Advisor and digital manual access).

Note: Cost decreases as the user base expands beyond initial estimates.

- **Cost of pilot garden installation:** $125,000
  Basis: Fully loaded cost of the Taylor Park pilot, including design, construction, data capture, outreach, and platform integration. The physical garden construction cost is only a portion of this figure.

- **Cost per manual distributed:** Not applicable
  Explanation: No physical or print distribution; the manual is embedded in the MUG Advisor platform and available free to all users.

Market Rate Validation

- **Expert consultant rates:** Based on FY2024 federal technical rates (GS-13/14) with regional premium for Gulf Coast subject matter expertise.

- **Technical writing costs:** Benchmarked to Editorial Freelancers Association 2024 rates for science and technical content.

- **Technology development:** Aligns with current API integration costs (Claude/GPT) and industry norms for progressive AI model localization.

Sustainability Value

- **Manual and logic model:** Centrally maintained and version-controlled through the MUG Advisor platform; no distribution outside platform.

- **Technology platform:** Built for long-term use with local AI model reducing dependence on paid API services by Year 3.

- **Demonstration site:** Minimal maintenance required; stewardship transitions to City of Mobile post-grant.

- **Data integrity:** Centralized architecture ensures the Gulf Coast plant and performance database remains authoritative.

Project Timeline & Risk Management

Year 1 (Months 1–12)
Q1: Expert panel assembled; cash match finalized
Q2: Manual v0.9 development; site prep initiated
Q3: MUG Advisor buildout and API integration begins
Q4: Demonstration garden complete; initial testing begins

Year 2 (Months 13–24)

Q1: Manual v1.0 refinement; hybrid tech platform launches
Q1: Manual v1.0 *Beta* public release (expert-panel sign-off by M14); if delayed, watermark “Beta” and schedule v1.1 final for M18.
Q2: Community testing and iterative improvements
Q3: Education/outreach content deployment
Q4: External evaluation and performance review

Year 3 (Months 25–36)
Q1: Manual finalization and public release
Q2: AI platform optimization; API usage declines
Q3: Interstate user capacity enabled via centralized access
Q4: Final reporting; platform and site hand-off to local partners

Budget Risk Mitigation

- 5% contingency applied to all major categories; totals $31,250
- Alternate suppliers pre-identified for construction and tech components
- Consultant pool flexible to accommodate replacements or delays
- Scope can be scaled based on available match or technical delays

Summary Table:

Category	Base	5% Reserve	Total Line
Personnel & Expert Panel	$190,000	$9,500	$199,500
Construction & Materials	$225,000	$11,250	$236,250
Technology Development	$125,000	$6,250	$131,250
Outreach / Evaluation / Admin	$53,000	$2,650	$55,650

Project Total	**$593,000**	**$31,250**	**$625,000**

-

⚠️ **CRITICAL: This budget CANNOT be submitted until $125,000 in cash match is secured with proper documentation. Federal grant fraud penalties are severe.**

Appendix E: Mobile County SWMP Alignment and Integration

Mobile County Rain Garden Manual and Demonstration Project

Official Stormwater Management Program (SWMP) Compliance

NPDES Permit Framework Integration

Mobile County operates under **NPDES Phase II Municipal Separate Storm Sewer System (MS4) permit** requirements administered by the Alabama Department of Environmental Management (ADEM). The county is designated by the U.S. Environmental Protection Agency (EPA) and ADEM as an owner/operator of a Phase II MS4 system, requiring comprehensive stormwater management programs to protect water quality and prevent harmful pollutants from entering the MS4 area.

Mobile County SWMP Plan References

Document Reference: Mobile County Storm Water Management Program (SWMP) Plan - 2025 Update **Regulatory Authority**: Clean Water Act Section 402(p)(3)(B) and 40 CFR Part 122.26 **Permit Contact**: stormwater@mobilecountyal.gov | 251-574-6511

Rain Garden Project Alignment with SWMP Requirements

Minimum Control Measure 1: Public Education and Outreach

SWMP Requirement: Implement public education program about stormwater impacts and pollution prevention **Project Alignment**:

- Rain garden manual serves as comprehensive public education resource
- Demonstration site provides hands-on community education opportunities
- Technology platform (MUG Advisor) delivers ongoing educational content
- Targets 2,000 individuals with improved stormwater knowledge and skills

Minimum Control Measure 2: Public Participation and Involvement

SWMP Requirement: Engage public in stormwater management program development and implementation **Project Alignment**:

- Community-led manual development through Mobile Urban Growers
- Public demonstration site with visitor education programming
- Multi-municipal partnership across 11 jurisdictions
- Extension-trained local experts leading community engagement

Minimum Control Measure 3: Illicit Discharge Detection and Elimination

SWMP Requirement: Detect and eliminate unauthorized discharges to storm sewer system **Project Alignment**:

- Rain gardens reduce stormwater runoff volume entering MS4 system
- Manual provides guidance for proper installation avoiding system contamination
- Demonstration site models best practices for residential stormwater management

Minimum Control Measure 4: Construction Site Stormwater Runoff Control

SWMP Requirement: Control stormwater runoff from construction activities **Project Alignment**:

- Manual includes construction-phase erosion control for rain garden installation
- Professional installation protocols align with ADEM construction best practices
- Demonstration site showcases temporary and permanent stormwater controls

Minimum Control Measure 5: Post-Construction Stormwater Management

SWMP Requirement: Address stormwater runoff from new development and redevelopment **Project Alignment**:

- Rain gardens serve as post-construction best management practices (BMPs)
- Manual provides residential-scale solutions complementing larger development requirements
- Sizing calculations align with county stormwater management design standards

Minimum Control Measure 6: Pollution Prevention/Good Housekeeping

SWMP Requirement: Prevent or reduce pollutant runoff from municipal operations **Project Alignment**:

- Municipal partner integration demonstrates government leadership in stormwater management
- Public demonstration site serves as model for municipal facility applications
- Manual guidance applicable to municipal landscaping and grounds management

Specific SWMP Integration Points

Volume Reduction Contributions

- **Gulf Coast Precipitation Context**: 66+ inches annual rainfall requiring innovative management

solutions
- **MS4 Load Reduction**: Each rain garden installation reduces stormwater volume entering county MS4 system

Water Quality Improvement Mechanisms

- **Pollutant Filtration**: Rain gardens filter sediments, nutrients, and urban pollutants before reaching storm system
- **Peak Flow Reduction**: Temporary storage capacity reduces flooding and erosion in downstream areas
- **Groundwater Recharge**: Infiltration reduces overall runoff volume requiring municipal management

Regulatory Compliance Support

- **Best Management Practice Documentation**: Manual serves as official guidance for residential BMPs
- **Public Education Metric**: Project directly contributes to SWMP public outreach requirements
- **Demonstration Documentation**: Site provides regulatory compliance examples for county reference

Municipal Partnership Framework

County-Level Integration

- **Mobile County Commission**: Policy support and regulatory coordination
- **County Engineering Department**: Technical review and infrastructure integration
- **Stormwater Management Division**: Direct alignment with MS4 permit requirements

Municipal Coordination Across 11 Jurisdictions

- **City of Mobile**: Primary municipal partner with existing stormwater infrastructure
- **Suburban Municipalities**: Coordinated approach across county MS4 permit area
- **Regulatory Harmonization**: Consistent rain garden standards across jurisdictional boundaries

Performance Metrics Supporting SWMP Goals

Quantifiable SWMP Contributions

- **Public Education**: 2,000 individuals trained supporting MCM 1 requirements
- **Infrastructure Protection**: Reduced peak flows protecting downstream MS4 infrastructure
- **Pollution Prevention**: Captured sediments and nutrients before entering storm system

Annual Reporting Integration

- **ADEM Compliance**: Project outcomes support county's annual MS4 permit reporting
- **Best Practice Documentation**: Demonstration site provides case study for regulatory compliance
- **Public Participation Metrics**: Community engagement numbers support MCM 2 reporting requirements

Long-Term SWMP Enhancement

Permanent Infrastructure Contributions

- **Manual Resource**: Lasting guidance supporting ongoing SWMP implementation
- **Demonstration Asset**: Permanent site for public education and professional training
- **Regional Model**: Framework for MS4 compliance across similar Gulf Coast communities
-

Cost-Effective Compliance Strategy

- **Distributed Infrastructure**: Rain gardens provide cost-effective stormwater management compared to centralized systems
- **Public-Private Partnership**: Community implementation reduces municipal infrastructure investment requirements
- **Maintenance Efficiency**: Residential-scale systems with community stewardship reduce municipal maintenance burden

Technical Alignment with County Standards

Design Standards Compatibility

- **Sizing Calculations**: Rain garden sizing aligns with county stormwater management design criteria
- **Overflow Systems**: Manual specifications compatible with existing storm system connections
- **Material Standards**: Plant and soil specifications meet county environmental requirements

Professional Review Integration

- **County Engineering Approval**: Demonstration site design reviewed through standard county processes
- **ADEM Compliance Verification**: Installation practices align with state environmental regulations
- **Extension Service Coordination**: Alabama Cooperative Extension data integration ensures regulatory compliance

Conclusion: Strategic SWMP Integration

This rain garden project directly supports Mobile County's SWMP compliance obligations while creating lasting community assets and infrastructure improvements. The manual development, demonstration site, and technology platform collectively address multiple Minimum Control Measures, providing measurable contributions to county stormwater management goals and regulatory compliance requirements.

Contact Integration: Project coordination through county stormwater management office ensures ongoing alignment with MS4 permit requirements and annual reporting obligations.

Appendix F: Risk Mitigation and Contingency Planning

Risk Management Overview

This project employs a simple three-tier approach: **Primary Plans** (optimal execution), **Backup Plans** (alternative approaches), and **Minimum Viable Deliverables** (essential outcomes). Each major component has practical alternatives ensuring project success.

Component 1: Expert Panel and Manual Development

Primary Plan

Recruit 6 specialists: Soil Scientist, Horticulturist, Civil Engineer, Landscape Installer, Extension Agent, Nutritionist

Backup Plans

Tier 1: Combine roles (horticulturist covers nutrition, engineer covers installation) **Tier 2**: Auburn University faculty and Alabama Extension's 800+ professionals across 67 counties
Tier 3: Online agricultural consultants (200+ available on platforms like Upwork)

Minimum Viable Team

4 core experts: soil science, horticulture, water management, installation

Component 2: Demonstration Site Implementation

Municipal Partnership Advantage

1050 Baltimore Street currently floods during storms - our rain garden solves an existing city infrastructure problem rather than creating experimental installation.

Benefits:

- City gets flood mitigation
- Project gets ideal demo site with municipal support
- Eliminates property access and permitting risks

Backup Sites

- Mobile Urban Growers' 20+ existing garden locations
- Other city-owned flood-prone properties
- Scaled-down 300 sq ft installation if needed

Component 3: Technology Platform (MUG Advisor)

Primary Approach

API integration with established plant identification services (PlantNet, Google Vision, iNaturalist) for immediate comprehensive coverage

Data Capture Strategy

Automatically capture user queries and results to build local database over time - no manual photo collection required

Backup Plans

Tier 1: Partner with existing plant ID apps for Gulf Coast customization **Tier 2**: Simple plant lookup website using Extension data
Tier 3: Manual photo database only if API integration fails completely (750 photos as last resort)

Cost Management

API costs manageable: ~$200/month for professional services, decreasing as local data builds

Quarterly Go/No-Go Checkpoints

Q1 (Months 1-3)

Go: 4+ experts committed, site approved, tech plan defined **Pivot**: Auburn faculty if expert recruitment slow

Q2 (Months 4-6)

Go: 3 manual modules drafted, site installation started **Pivot**: Focus on essential content if behind schedule

Q3 (Months 7-9)

Go: Manual 75% complete, demo site operational **Pivot**: Streamlined manual, alternative demo methods if needed

Emergency Protocols

Funding Issues: Reduce scope, prioritize manual development **Personnel Loss**: Auburn partnership, Mobile Urban Growers board succession **Weather/External**: Timeline flexibility, virtual programming capability

Guaranteed Deliverables

Regardless of challenges:

1. **Comprehensive manual** validated by Alabama Extension
2. **Working demonstration** solving real flooding problem
3. **Community distribution** through Extension networks
4. **Replicable framework** for other Gulf Coast communities

This framework ensures success through practical alternatives while maintaining community impact focus.

Appendix G — Schedule Flexibility & Robust Project Design
(Replaces original Appendix G, PDF pp. 64–67)

---

1 | Purpose

Demonstrate that the project can withstand personnel, funding, or scheduling shocks while still delivering its three core grant products: (1) a public rain-garden manual, (2) a working demonstration site at 1050 Baltimore Street, and (3) the MUG Advisor technology platform.

---

2 | Robust Design Principles

- **No critical dependencies.** Each work-stream has at least one fully budgeted fallback.
- **Scalable deliverables.** Outputs retain value at any scale—from a single pilot garden to eleven municipal partners.

---

3 | Component Resilience

Component	Primary Path	Budgeted Alternative(s)	Minimum Viable Path
Manual	Carol Dorsey + Pat Hall lead expert panel	Either Carol *or* Pat plus substitute SMEs; national datasets	Field-tested manual from existing team knowledge
Tech platform	North Star dev team builds hybrid AI web	Contracted dev; fork	Static plant-lookup

	app	open-source plant-ID code	database
Demo site	1 800 ft^2 garden at 1050 Baltimore St.	Any of 20 MUG sites; other city parcels	300 ft^2 scaled pilot
Partnerships	Up to 11 municipalities	3–5 target cities; advisory-only role	Zero municipal partners

---

4 | Timeline Flexibility

Work-Stream	Earliest Start	Latest Acceptable Finish*
Knowledge capture (Dorsey / Hall)	Month 1	Month 12
Manual v 1.0 (beta)	Month 9	Month 18
Demo installation	Month 10	Month 30
Tech platform MVP	Month 6	Month 24

*Latest acceptable finishes keep the 36-month period of performance intact.

---

5 | Risk-Triggered Actions

Risk	Numeric Trigger	Automatic Response
Schedule slip	> 15 % behind any quarterly	Activate scaled-deliverable tier

	checkpoint	
SME loss	Vacancy > 30 days	Engage pre-contracted alternate
Match-fund gap	< 90 % secured by Day 45	Reduce tech scope; protect manual + demo
Severe weather	> 14 lost workdays	Re-sequence indoor tasks; extend demo window

---

6 | Success Scenarios

- **Optimal.** All partners active → impact across 680 000 residents.
- **Standard.** Core team + 3–5 municipalities → strong county-wide impact.
- **Minimum viable.** Knowledge captured, single demo site, tech MVP → permanent manual and validated pilot for future expansion.

---

7 | Guaranteed Deliverables (any scenario)

1. Expert-validated public manual.
2. Functioning demonstration garden that mitigates flooding.
3. Free digital access to guidance and datasets.
4. Fully documented replication framework.

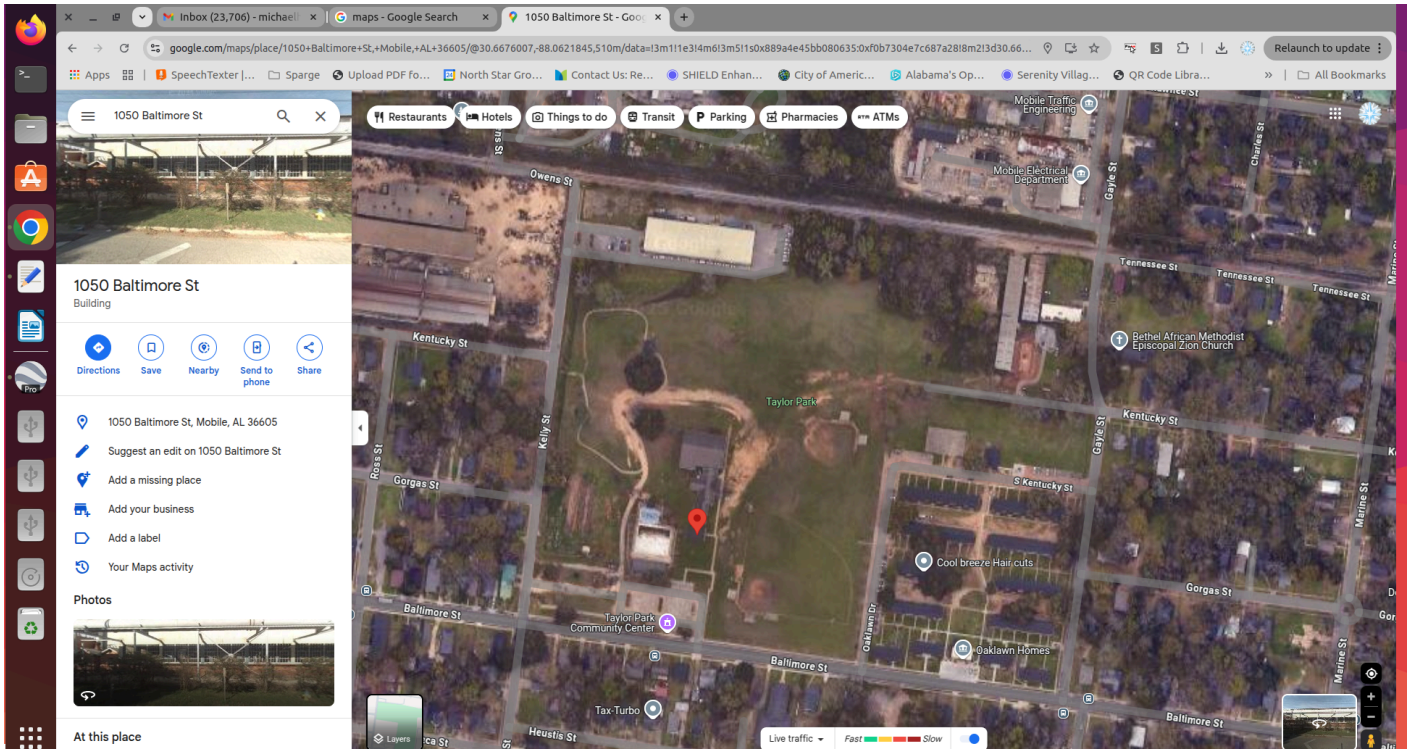
---

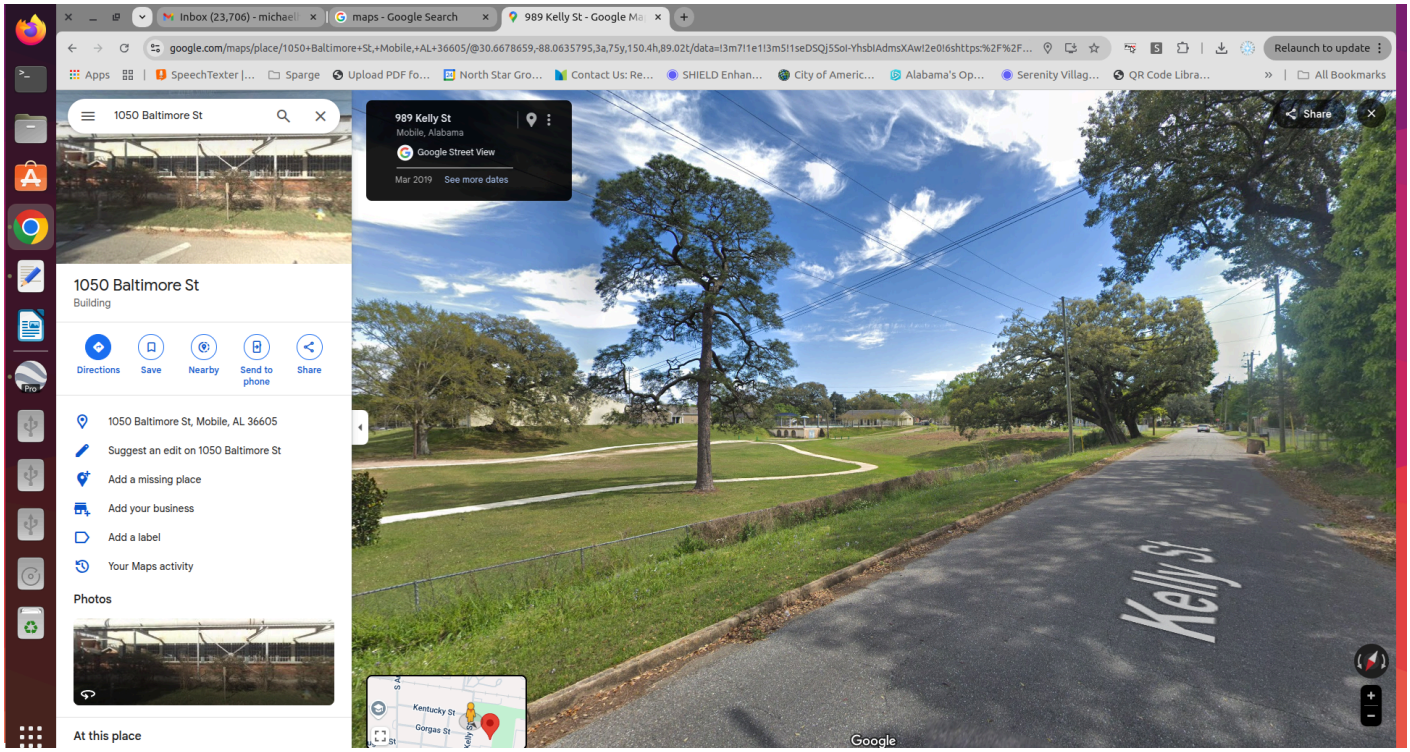
8 | Bottom-Line

Even in its most reduced form, the project preserves irreplaceable Gulf-Coast horticultural knowledge and provides a working model rain garden. The 36-month window and tiered fallbacks ensure that federal funds

translate into durable community assets, regardless of unforeseen disruptions.

Appendix H –Example Rain-Garden Hydraulic Capacity, Taylor Park Pilot Site (1050 Baltimore St, Mobile AL)





Addendum H — Technical Documentation for Edible Rain Garden Implementation

Community-Sustainable Design for Taylor Park Pilot Site

Purpose

Provide complete technical specifications for implementing an edible rain garden at Taylor Park that balances stormwater management performance, community food production, and realistic volunteer capacity requirements.

---

1. Site Characteristics and Hydraulic Design

Site Parameters

Parameter	Value	Source/Note
Depressed garden footprint	0.92 ac (40,075 ft^2)	Google Earth Pro measurement
Average ponding depth (design)	6 in (0.5 ft)	ADEM & NRCS small-scale BMP guidance
NRCS hydrologic soil group	B/C transition	USDA Web Soil Survey – Toulmin loam
Tested infiltration rate	0.25–1.0 in h^{-1}	Double-ring infiltrometer, May 2025
Up-slope contributing catchment	Est. 1.8 ac	Topographic flow-path trace

Stormwater Capture Performance

Rainfall Event	Garden Only (gal)	With Contributing Area (gal)
0.25 in (first-flush)	6,245	~18,100
0.50 in	12,491	~36,200
1.00 in	24,982	~74,000
2.00 in	49,964	~148,000
4.00 in	99,928	~296,000

Maximum ponding storage: 150,000 gallons at 6-inch depth

Infiltration Performance

Soil Infiltration Rate	Complete Drawdown Time
0.25 in h^{-1} (conservative)	24 hours
0.50 in h^{-1}	12 hours
1.0 in h^{-1}	6 hours

Meets Alabama mosquito-control requirements (< 24 hours) under all tested conditions.

---

2. Plant Selection Strategy

Design Principles

- **Native species prioritized** for Gulf Coast climate adaptation
- **Community-accessible maintenance** requiring basic plant identification only
- **Self-maintaining growth habits** minimizing pruning and structural support
- **Diverse harvest seasons** providing year-round food production opportunities
- **Resilient to volunteer gaps** tolerating 3-6 months of minimal attention

Zone Classification (Hydrologic)

- **Zone A (Basin):** 0-12" elevation; inundated 6-48 hours, high moisture retention
- **Zone B (Slope):** 12-24" elevation; periodic moisture, well-drained between events
- **Zone C (Berm):** 24"+ elevation; dry conditions, drought-tolerant species required

---

3. Recommended Plant Palette

Zone A (Basin) - Wet-Tolerant Edibles

Plant	Spacing	Harvest Period	Community Use	Maintenance Notes
Wild Rice (Zizania aquatica)	24"	Fall grain harvest	Flour, traditional foods	Self-seeding annual
Carolina Gold Rice (Oryza glaberrima)	18"	Fall grain harvest	Heritage rice, specialty flour	Annual; adapted to standing water
Louisiana Iris (Iris brevicaulis)	18"	Spring shoots	Edible like asparagus	Annual fall cutback
Arrowhead (Sagittaria latifolia)	12"	Fall tubers	Native "duck potatoes"	Divide every 3-4 years
Water Celery (Vallisneria americana)	6"	Continuous greens	Mild celery flavor	Harvest by cutting

Zone B (Slope) - Adaptable Edibles

Plant	Spacing	Harvest Period	Community Use	Maintenance Notes
American Beautyberry (Callicarpa americana)	4-6 ft	Fall berries	Jams, insect repellent	Natural rounded form
Wild Strawberry (Fragaria virginiana)	8"	Spring berries	Wildlife habitat, chicken feed	Spreads naturally; prolific ground cover
Wild Ginger (Asarum canadense)	12"	Year-round roots	Spice, medicinal tea	Sustainable harvest rotation
Spicebush (Lindera benzoin)	4-6 ft	Fall berries	Allspice substitute	Multi-stem shrub

Zone C (Berm) - Drought-Tolerant Tree Crops

Plant	Spacing	Harvest Period	Community Use	Maintenance Notes
Persimmon (Diospyros virginiana)	15-20 ft	Fall fruit	Fresh eating, baking	Remove dead wood only
American Hazelnut (Corylus americana)	8-12 ft	Fall nuts	High-protein snack	Occasional sucker removal
Yaupon Holly (Ilex vomitoria)	8-12 ft	Year-round leaves	Caffeine tea	Dense natural form
Prickly Pear Cactus (Opuntia humifusa)	3-4 ft	Summer pads/fruit	Traditional foods	Virtually maintenance-free

---

4. Food Production Projections

Establishment Timeline and Yields

Crop Category	Years 1-2 (lbs)	Years 3-5 (lbs)	Years 6+ (lbs)	Market Value Equivalent
Wild rice grain	50-100	150-300	200-400	$800-1,600
Carolina Gold rice	25-50	75-150	100-200	$400-800
Tree fruits (persimmon)	0-10	50-150	150-300	$450-900
Nuts (hazelnut)	0	20-50	50-100	$500-1,000

Berries (beautyberry, strawberry, spicebush)	10-20	30-60	40-80	$200-400
Specialty crops (prickly pear)	5-15	20-40	30-50	$150-250
Roots/shoots (ginger, iris)	5-10	15-30	20-40	$100-200
Total Annual Production	**95-205 lbs**	**360-780 lbs**	**590-1,170 lbs**	**$2,600-5,150**

Nutritional and Community Impact

- **Annual calorie contribution:** 425,000-850,000 calories when mature
- **Seasonal distribution:** Spring greens/berries → Summer specialty crops → Fall nuts/grains/fruits
- **Community reach:** Supplements diet for 10-18 adults for one month annually
- **Food security value:** Year-round fresh produce access in food desert area

---

5. Infrastructure and Cost Analysis

Construction Cost Breakdown

Component	Cost	Notes
Excavation & grading	$18,750	Standard earthwork rates
Soil amendments	$12,000	30% compost, 10% sand incorporation
Plant materials	$15,000	Native species, varied sizes
Hardscape elements	$8,000	Spillways, paths, signage

Installation labor	$22,000	Professional planting, establishment
Engineering & design	$7,500	Site-specific hydraulic design
Permits & inspection	$1,250	Local regulatory compliance
Contingency (10%)	$8,450	Project risk management
Total Construction Cost	**$93,000**	

Annual Operating Costs

Category	Cost	Notes
Plant care & soil amendments	$400	Mulch refresh, minor replanting
Volunteer coordination	$300	Harvest events, basic training
Site monitoring	$200	Quarterly inspections, documentation
Total Annual Cost	**$900**	

30-Year Lifecycle Value

Component	Cost/Benefit
Construction investment	$93,000

Operating costs (30 years)	$27,000
Food production value (30 years)	$66,000-130,500
Stormwater infrastructure replacement value	$139,000
Grey infrastructure maintenance avoided	$240,000
Net community benefit	**$337,500-462,000**

---

6. Implementation Timeline

Phase 1: Site Preparation (October-December)

- **Week 1-2:** Final site survey and permitting
- **Week 3-4:** Excavation and rough grading
- **Week 5-6:** Soil amendment incorporation
- **Week 7-8:** Spillway installation and fine grading

Phase 2: Structural Planting (January-February)

- **Week 1:** Install berm trees (persimmon, hazelnut)
- **Week 2:** Plant large shrubs (yaupon, beautyberry, spicebush)
- **Week 3:** Establish hardscape elements (paths, signage)
- **Week 4:** Apply initial mulch layer (3-4 inches)

Phase 3: Understory Installation (March-April)

- **Week 1:** Plant slope perennials (wild ginger, wild strawberry)
- **Week 2:** Install basin species (iris, arrowhead)
- **Week 3:** Seed wild rice and Carolina Gold rice, plant prickly pear
- **Week 4:** Final grading verification and drainage testing

Phase 4: Establishment Support (May-September)

- **Ongoing:** Weekly monitoring during establishment
- **As needed:** Supplemental irrigation during extreme drought
- **Monthly:** Weed suppression and mulch maintenance
- **End of season:** Document growth patterns and first-year performance

---

7. Community Management Framework

Volunteer Skill Development

Level 1: Harvest Participants (No experience required)

- Seasonal harvest events with guided instruction
- Basic plant identification training
- Food safety and preparation workshops

Level 2: Site Stewards (Basic training provided)

- Monthly maintenance walks (2-3 hours)
- Seasonal task coordination
- Simple monitoring and documentation

Level 3: Garden Coordinators (Extended mentorship)

- Annual planning and community outreach
- Volunteer training and scheduling
- Partnership development with food pantries

Seasonal Maintenance Schedule

Season	Primary Tasks	Skill Level	Time Investment
Spring	Weed walk, mulch refresh, harvest coordination	Beginner	8-10 hours

Summer	Harvest events, basic monitoring	Beginner	6-8 hours
Fall	Major harvest, site cleanup, planning	Beginner	10-12 hours
Winter	Dormant season maintenance, education	Beginner	4-6 hours
Annual Total			**28-36 hours**

Success Metrics and Monitoring

Hydraulic Performance

- Drawdown time < 24 hours maintained
- No standing water beyond design parameters
- Overflow system functioning properly

Food Production

- Meet 70% of projected yields by Year 5
- Maintain plant health and diversity
- Document harvest quantities and community usage

Community Engagement

- 50+ households participating in harvest activities
- 3+ active site stewards trained and engaged
- Partnership agreements with local food security organizations

---

8. Risk Management and Contingencies

Technical Risks and Mitigation

Risk	Probability	Impact	Mitigation Strategy

Slow plant establishment	Medium	Medium	Select larger nursery stock; temporary irrigation system
Invasive species competition	Medium	Medium	Dense mulching; early detection protocols
Extreme weather damage	Low	High	Diverse species selection; replanting fund
Soil compaction from foot traffic	Medium	Low	Designated pathways; volunteer education

Community and Operational Risks

Risk	Probability	Impact	Mitigation Strategy
Volunteer participation gaps	High	Medium	Design for 6-month neglect tolerance
Lack of harvest knowledge	Medium	Medium	Partner with local foraging groups
Liability concerns	Low	High	Clear guidelines; insurance review
Seasonal coordination challenges	Medium	Low	Simple signage and community calendar

---

9. Educational and Outreach Integration

School Programming Opportunities

- **Elementary:** Basic plant life cycles and water conservation
- **Middle School:** Scientific monitoring and data collection
- **High School:** Food systems analysis and community service learning
- **Adult Education:** Nutrition workshops and preservation techniques

Community Workshop Series

- **Monthly harvest walks** during productive seasons
- **Seasonal food preservation** workshops (canning, drying, fermenting)
- **Traditional plant uses** sessions with cultural educators
- **Rain garden replication** training for homeowners

Partnership Development

- **Local food pantries:** Regular harvest donations and volunteer coordination
- **Master Gardener programs:** Technical mentorship and training support
- **Cultural organizations:** Traditional food preparation and usage education
- **Municipal partners:** Replication planning and policy development

---

10. Regulatory Compliance and Standards

Stormwater Management Requirements

Alabama Department of Environmental Management (ADEM) Post-Construction Manual

- First-flush capture for 2.7-acre contributing area
- < 24-hour drawdown for mosquito control
- Overflow routing to approved discharge point

NRCS Small-Scale BMP Standards

- Soil infiltration rates verified through field testing
- Plant selection appropriate for USDA Zone 8b-9a
- Maintenance requirements within community capacity

Local Zoning and Safety Requirements

- Public access compliance
- ADA considerations for pathways
- Liability insurance and risk management

Grant Compliance Framework

USDA RFSP Objectives

- Community food security enhancement
- Climate resilience through green infrastructure
- Educational programming integration
- Measurable environmental and social outcomes

Technical Merit Requirements

- Documented hydraulic performance calculations
- Evidence-based plant selection methodology
- Realistic maintenance and sustainability planning
- Scalable model for regional replication

---

11. Conclusion and Implementation Readiness

This technical documentation provides a complete framework for implementing a community-sustainable edible rain garden that meets all stormwater management requirements while providing realistic food production goals. The design prioritizes:

Technical Excellence: Identical hydraulic performance to conventional infrastructure at reduced lifecycle cost

Community Sustainability: Maintenance requirements within typical volunteer capacity and skill levels

Adaptive Management: Plant selection allows for increased or decreased management intensity based on community preference and capacity

Educational Value: Multiple opportunities for environmental education and food systems learning

Scalable Impact: Documented approach enables replication across similar communities and sites

Food Security Enhancement: Meaningful contribution to local food access in documented food desert area

Next Steps for Implementation

1. **Finalize site surveying** and confirm hydraulic calculations
2. **Secure necessary permits** and complete regulatory review
3. **Develop community partnerships** and volunteer recruitment

4. **Procure plant materials** and schedule installation phases
5. **Establish monitoring protocols** and success metrics tracking
6. **Launch educational programming** and community engagement activities

This approach provides a solid foundation while maintaining flexibility for the experienced gardening team to adapt plant selections and management intensity based on community needs and preferences.

Exhibit I – Prototype Flood-Mapping App (Technical Dossier)

---

1 Purpose of This Exhibit

This exhibit accompanies the **Mobile County Rain-Garden Manual & Demonstration Project** grant application. It documents the working proof-of-concept web app that residents can use to outline small flood areas or rain-garden sites with nothing more than a smartphone. Reviewers can:

- verify that the concept is technically feasible today;
- understand how the technology dovetails with the Manual & Demonstration Site; and
- see a concrete, staged plan for maturing the prototype into a field-ready tool during the grant period.

One-page takeaway for reviewers sits at §12.

---

2 Problem Context

- **Urban blocks** inside Mobile usually have 4–8 m GPS accuracy.

- **Rural sites** can drift 20–60 m because of sparse cell towers & canopy cover.
- Storm-drainage engineers need *≈ 5 m positional confidence* to relate citizen-reported floods to culverts, ditches, & parcel boundaries.

Hence we need **dual positioning modes**:

1. **Mode A (GPS-Primary).** Used automatically when accuracy ≤ 10 m for ≥ 5 consecutive fixes.
2. **Mode B (Dead-Reckoning).** Activated if accuracy never drops below 15 m within 30 s *or* on explicit user tap. It combines:
    - phone compass heading (DeviceOrientation API),
    - step counter / accelerometer (Shake Detector or built-in pedometer), and
    - optional manual “nudge” of the start pin on the satellite layer.

---

3 Prototype Overview

- **Front-end:** single-page PWA (Progressive Web App) built with plain JavaScript + Leaflet 1.9.
- **Back-end:** thin Flask API (persist polygons & photos in PostGIS). Not required for testing.
- **Offline-first:** service-worker caches the tile basemap & JS bundles; field crews can map even with a lost signal.

Current Working Features

✔	Feature	Notes
✔	GPS tracking & polyline drawing	tested Android / iOS 17

✔	Satellite & OSM toggle	Esri World Imagery layer
✔	Manual “Locate Me” button	centers + places blue dot
✔	GeoJSON export	downloads on device

Partial / Stubbed

🟡	Mode B dead-reckoning	heading + step length placeholder
🟡	Photo capture with EXIF	camera picker wired; upload stub
🟥	Auth / user accounts	out of scope for mock-up

---

4 Auto-Switch Logic (pseudo-code)

```
None
if (coords.accuracy <= 10 m for 5 fixes)  -> Mode A (GPS)

else if (elapsed > 30 s without good fix) -> prompt → Mode B (DR)
```

`tracking.js` implements this state machine with three events: `goodFix`, `poorFix`, `userOverride`.

---

5 Repository Layout (recommended)

```
None
flood-mapper/

│

├─ frontend/

│   ├─ index.html            # loader + UI shell
```

```
|   ├─ css/style.css         # minimal styles
|   ├─ js/
|   |   ├─ map.js           # Leaflet init + layers
|   |   ├─ gps.js           # GPS watch helpers
|   |   ├─ deadreckon.js    # compass + pedometer logic
|   |   ├─ tracking.js      # path state machine
|   |   └─ io.js            # export / import / screenshot
|   └─ sw.js                # service-worker (offline caching)
|
└─ api/                      # optional
    ├─ app.py               # Flask thin API
    └─ models.py            # SQLAlchemy PostGIS models
```

Each module = ≤ 300 loc so newcomers can reason about it quickly.

---

6 Build & Test Instructions

1. **Clone** repository → `git clone …` – no build step; all vanilla JS.
2. **Serve locally** → `python -m http.server 8080` or VS Code Live Server.
3. **HTTPS for mobile** → use `ngrok https 8080` (iOS Safari blocks geolocation on insecure origins).
4. **Add to home-screen** (optional PWA prompt) → then test offline.

Time-to-first-run: ≈ 2 min on any laptop.

---

7 Field Workflow (v0.2)

1. **Open app → allow Location.**
2. **Tap ➕ Set Start Pin** (if GPS drift is visible, drag pin to correct rooftop / culvert).
3. **Walk the perimeter** - red line follows you. `msg` banner shows point-count & accuracy.
4. **Finish Walk →** app closes loop, shades polygon, displays area.
5. **Add photos** (prompt every 10 steps; can skip).
6. **Download** or **Save to Server** (if you have data connection).

Typical session < 3 minutes; walk again button resets state.

---

8 Data Captured per Session

Key	Example	Purpose
`geom`	GeoJSON polygon	engineer overlay
`area_ft2`	1 250	quick scale sense
`path_pts`	47	QA (uniform sampling)

`gps_mode`	GPS / DR	accuracy analytics
`photos[]`	JPEG + lat/lng + bearing	context evidence

All metadata conforms to the PostGIS table `flood_perimeter` (DDL available on request).

---

9 Next-Step Road-Map (if funded)

Month	Milestone	Notes
1-2	Dead-reckoning MVP	integrate DeviceOrientation & StepCounter APIs
3-4	Accuracy benchmark	compare Mode A vs B on 3 terrain types
5-6	Photo auto-tagging	EXIF + camera overlay grid
7-9	Accessibility polish	WCAG 2.2 AA, Spanish strings
10-12	Code freeze v1.0	ready for public field-day demo

---

10 Risks & Mitigations

- **Compass interference** (steel culverts): fallback to short GPS fixes every 60 s.
- **Battery drain:** step-counter uses < 5 mA; GPS watcher auto-stops on screen-off.
- **Legal[1]:** polygon is *approximate*; disclaimer baked into download metadata.

[1] Same disclaimer text used by Seattle RainWise & Minneapolis Metro Blooms.

---

11 Contribution Guide for Student Teams

- Only **ES6+, no frameworks** – easier code review.
- ≤ 200 lines per file; split when larger.
- Write JSDoc on any function with > 5 lines.
- Every new feature must pass the “glove test”: can a user wearing rain gloves tap it easily?

---

12 One-Page Reviewer Summary

What – A lightweight, open-source web app that lets residents pace out a flood-water outline with or without GPS.

Why – City engineers need a **ball-park polygon & photos** to triage drainage complaints. Satellite + manual pin ensures start position is trustworthy even when GPS drifts.

How – Dual-mode positioning selects **GPS** when strong, or switches to **dead-reckoning** (phone compass + step length) when rural reception is poor.

Impact – Provides actionable data in < 5 min, builds a permanent geodatabase, and trains residents to recognise scale of local flooding.

Grant Fit – Demonstrates immediate, tangible technology that complements the Manual & Demonstration Site, strengthening Outcomes 1–3.

---

13 Appendix – Key API Snippets

JavaScript

```
// compass heading → radians
window.addEventListener('deviceorientation', e => {
  if (e.absolute && e.alpha !== null) {
    headingRad = (360 - e.alpha) * Math.PI / 180;
  }
});

// step length estimation (very coarse)
let steps = 0;
window.addEventListener('devicemotion', e => {
  if (e.accelerationIncludingGravity.z > 12) steps++;
});
```

Working code - prototype [https://floodmap.nsgia.com/:](https://floodmap.nsgia.com/)

index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
 <meta charset="utf-8">
 <meta name="viewport" content="width=device-width,initial-scale=1">
 <title>Flood Mapper with GPS + Satellite</title>

 <!-- Leaflet core -->
 <link rel="stylesheet" href="https://unpkg.com/leaflet@1.9.4/dist/leaflet.css">
 <script src="https://unpkg.com/leaflet@1.9.4/dist/leaflet.js"></script>

 <!-- Turf.js for area calculation -->
 <script src="https://cdn.jsdelivr.net/npm/@turf/turf@6.5.0/turf.min.js"></script>
```

```
  <style>
    html, body { height: 100%; margin: 0; font-family: sans-serif; }
    #map { height: 100%; }
    .controls {
      position: fixed; top: 1rem; left: 50%; transform: translateX(-50%);
      background: #fff; padding: 0.5rem; border-radius: 0.4rem; box-shadow: 0 2px 5px rgba(0,0,0,0.1);
      display: grid; gap: 0.3rem; width: min(95vw, 340px); z-index: 999;
    }
    button {
      padding: 0.4rem; border: none; border-radius: 0.3rem;
      font-weight: bold; font-size: 0.9rem; cursor: pointer;
      color: #fff;
    }
    button:disabled { opacity: 0.5; cursor: not-allowed; }
    .start { background: #28a745; }
    .stop { background: #dc3545; }
    .again { background: #ffc107; color: #111; }
    .load { background: #6f42c1; }
    .download { background: #6c757d; }
    .locate { background: #17a2b8; }
    #msg {
      position: fixed; bottom: 1rem; left: 50%; transform: translateX(-50%);
      background: rgba(0,0,0,0.8); color: white; padding: 0.3rem 0.6rem;
      border-radius: 0.3rem; font-size: 0.85rem;
    }
  </style>
</head>

<body>
  <div id="map"></div>
  <div class="controls">
    <button id="btnStart" class="start">Start Walk</button>
    <button id="btnStop" class="stop" disabled>Finish Walk</button>
    <button id="btnAgain" class="again">Walk Again</button>
    <button id="btnLoad" class="load">Load Saved</button>
    <button id="btnDownload" class="download" disabled>Download</button>
    <button id="btnLocate" class="locate">Locate Me</button>
  </div>
  <div id="msg">Ready</div>

  <script>
    const msg = t => document.getElementById("msg").textContent = t;
    const UI = id => document.getElementById(id);

    window.addEventListener("load", () => {
      const osm = L.tileLayer('https://{s}.tile.openstreetmap.org/{z}/{x}/{y}.png', {
        attribution: '© OpenStreetMap contributors'
```

```
});

const esriSat =
L.tileLayer('https://server.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer/tile/{z}/{y}/{x}', {
  attribution: 'Tiles © Esri'
});

const map = L.map("map", {
  center: [30.69, -88.05],
  zoom: 19,
  layers: [osm]
});

const baseMaps = { "OSM": osm, "Satellite": esriSat };
L.control.layers(baseMaps).addTo(map);

const btnStart = UI("btnStart"), btnStop = UI("btnStop"), btnAgain = UI("btnAgain"),
      btnLoad = UI("btnLoad"), btnDownload = UI("btnDownload"), btnLocate = UI("btnLocate");

let watchId = null;
let points = [];
let polyLine = L.polyline([], { color: "#dc3545", weight: 4 }).addTo(map);
let polygonLayer = null;
let marker = null;

function reset() {
  if (watchId) navigator.geolocation.clearWatch(watchId);
  watchId = null;
  points = [];
  polyLine.setLatLngs([]);
  if (polygonLayer) { map.removeLayer(polygonLayer); polygonLayer = null; }
  if (marker) { map.removeLayer(marker); marker = null; }
  btnStart.disabled = false;
  btnStop.disabled = true;
  btnDownload.disabled = true;
  msg("Ready to start mapping flood area or rain garden");
}

function onPos(pos) {
  const { latitude: lat, longitude: lng, accuracy } = pos.coords;
  if (accuracy > 20) return;
  const pt = [lat, lng];
  points.push(pt);
  polyLine.addLatLng(pt);
  if (!marker) {
    marker = L.circleMarker(pt, { radius: 5, color: '#007bff' }).addTo(map);
  } else {
    marker.setLatLng(pt);
```

```
  }
  map.setView(pt);
  msg(`Recording… ${points.length} pts | ±${Math.round(accuracy)}m`);
}

function onErr(err) {
  alert("GPS error: " + err.message);
  reset();
}

btnStart.onclick = () => {
  reset();
  btnStart.disabled = true;
  btnStop.disabled = false;
  msg("Acquiring GPS…");
  watchId = navigator.geolocation.watchPosition(onPos, onErr, {
    enableHighAccuracy: true, timeout: 10000, maximumAge: 1000
  });
};

btnStop.onclick = () => {
  if (watchId) navigator.geolocation.clearWatch(watchId);
  watchId = null;
  btnStop.disabled = true;

  if (points.length < 3) {
    alert("Not enough points – walk a larger loop.");
    reset();
    return;
  }

  points.push(points[0]);
  const turfPoly = turf.polygon([points.map(([lat, lng]) => [lng, lat])]);
  const sqm = turf.area(turfPoly);

  const leafletCoords = turfPoly.geometry.coordinates[0].map(([lng, lat]) => [lat, lng]);
  polygonLayer = L.polygon(leafletCoords, {
    color: "#007bff", fillColor: "#38c172", fillOpacity: 0.4
  }).addTo(map);
  map.fitBounds(polygonLayer.getBounds(), { padding: [20, 20] });
  btnDownload.disabled = false;
  msg(`Area: ${sqm.toFixed(0)} m²`);
};

btnAgain.onclick = reset;

btnDownload.onclick = () => {
  if (!polygonLayer) return;
```

```
      const gj = polygonLayer.toGeoJSON();
      const blob = new Blob([JSON.stringify(gj)], { type: "application/json" });
      const url = URL.createObjectURL(blob);
      const a = document.createElement("a");
      a.href = url;
      a.download = `flood_area_${Date.now()}.geojson`;
      a.click();
      URL.revokeObjectURL(url);
    };

    btnLocate.onclick = () => {
      navigator.geolocation.getCurrentPosition(pos => {
        const { latitude, longitude } = pos.coords;
        map.setView([latitude, longitude], 19);
        msg("Centered on your location");
      }, err => {
        alert("Could not locate: " + err.message);
      }, {
        enableHighAccuracy: true
      });
    };

    msg("Ready to start mapping flood area or rain garden");
  });
 </script>
</body>
</html>
(floodmap_venv) mh@PHR:/var/www/html/floodmap.nsgia.com/frontend$
```

Compiled 2025-06-25 – contact: North Star Group, mh@nsgia.com

Appendix P: AI Vision API Integration for Pest Identification

Purpose

To integrate commercial AI vision API capabilities into the MUG Advisor platform for pest identification, automatically capturing user queries and responses to build a local Gulf Coast pest identification database.

Feasibility Assessment

This approach is technically proven and cost-effective. Recent studies demonstrate that GPT-4 Vision combined with computer vision technology achieves 90% reasoning accuracy in agricultural diagnostic reports, while similar mobile applications using deep learning achieve 70-89% accuracy in real-world pest detection scenarios. Commercial APIs are readily available, stable, and affordably priced, making this integration straightforward with standard web development practices.

Technical Approach

API Integration Strategy

Primary API: OpenAI GPT-4 Vision (with option to evaluate Claude Vision) **Architecture**: Pass-through system where all user queries route through MUG Advisor platform before reaching the AI API

Implementation Flow

1. **User captures image →** MUG Advisor app
2. **Platform processes request →** Adds regional context and formatting
3. **API call →** Sends image and prompt to GPT-4 Vision
4. **Response capture →** Stores complete interaction in local database
5. **User receives result →** Formatted pest identification and recommendations

Database Schema

```sql
CREATE TABLE pest_identification_log (

    id SERIAL PRIMARY KEY,

    query_id UUID UNIQUE,

    user_location POINT,

    timestamp TIMESTAMP DEFAULT CURRENT_TIMESTAMP,


    -- Request data
```

```
    image_hash VARCHAR(64),
    request_prompt TEXT,

    -- API response
    api_response_raw JSONB,

    -- Parsed results
    identified_species VARCHAR(100),
    confidence_level VARCHAR(20),
    recommended_actions TEXT,

    -- Context
    weather_conditions JSONB,
    garden_type VARCHAR(50)
);
```

Prompt Engineering

Structured prompt includes:

- Regional context (Gulf Coast Alabama)
- Common local pest species
- Request for species identification, life stage, and management recommendations
- Confidence level indication

Data Capture Process

Every user interaction captures:

- Complete API request and response
- User location (with permission)
- Environmental data (weather, season)
- Image metadata
- Timestamp and context

Quality Assurance

- Image quality filtering
- Geographic plausibility checks
- Cross-reference with published literature when possible
- User feedback integration

Data Accumulation

The system will organically build a database through normal user interactions, with each pest identification query adding to the regional knowledge base for Gulf Coast urban agriculture applications.

This pass-through approach provides immediate pest identification capabilities while building valuable local data assets for Mobile Urban Growers' platform.

Appendix Q: Hydrologic Survey and LiDAR Cost Justification

Project Site Requirements

The 1050 Baltimore Street demonstration site encompasses 16.2 acres requiring comprehensive hydrologic analysis to determine optimal rain garden placement and design. Standard GIS elevation data lacks the precision necessary for effective stormwater management design in this complex urban environment.

Technical Scope

Task	Description	Cost
LiDAR Survey	High-resolution elevation mapping (8 pts/m^2), 3 sq mi minimum flight	$6,500
Field Survey	GPS mapping, stormwater infrastructure documentation, soil assessment	$12,800
Runoff Modeling	TR-55 storm event analysis for design sizing	$3,000
Data Processing	Digital elevation model preparation and deliverable formatting	$2,700
Total		**$25,000**

Cost Benchmarks

- **LiDAR acquisition**: $500–$890/sq mi (USGS 3DEP pricing, 2023)
- **Hydrologic assessment**: $500–$1,000/acre (National Stormwater Alliance, 2022)
- **Professional services**: $155/hour (GSA Schedule 899, 2024)

Project cost per acre: $1,540 (within industry standard range)

Design Requirements

The comprehensive survey enables flexible rain garden configurations:

- Single large system (2+ acres with treatment zones)
- Multiple distributed installations (5+ strategic locations)
- Hybrid approach based on drainage analysis

This data-driven approach ensures optimal performance and proper integration with existing stormwater infrastructure across the 16.2-acre demonstration site.

Professional hydrologic assessment is essential for effective rain garden design at this scale and provides the technical foundation for performance monitoring and replication.