

VIOLET EARTH

Three-Platform Climate Intervention Portfolio

Master Investor Syllabus — Series A Capital Raise \$50 Million US

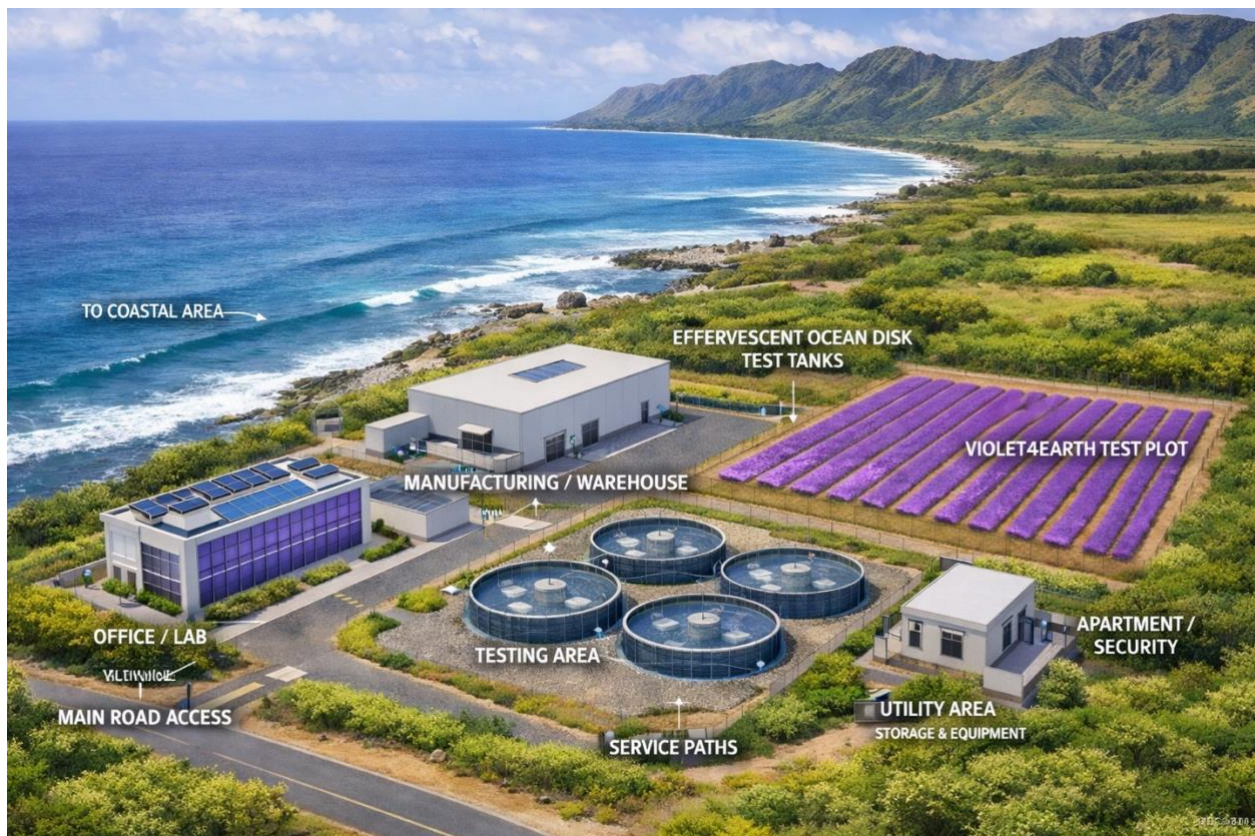
“Ocean, Soil, Air: A Complete Carbon Cycle Solution”

Kapolei, O’ahu, Hawai’i

Prepared by Dr. Erica Gelsey

April 2026

Confidential — For Qualified Investors Only



*Artist Rendering Violet Earth Research Center Hawaii—
Violet Earth headquarters and primary field operations site*

Funding Goal: \$50 million | Timeline: 2 Years

Message to Investors from Dr. Erica Gelsey, Founder & Inventor

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Thank you for reviewing the Master Investor Syllabus dated April 2026. Violet Earth stands at a pivotal moment—one defined by both unprecedented environmental urgency and unprecedented opportunity for technological advancement. Our original development plan, once supported by a federal grant, was structured to roll out three breakthrough restoration technologies over a three-year period. When that grant was unexpectedly terminated, the entire U.S. grant landscape contracted alongside it, eliminating traditional funding pathways for environmental innovation.

Rather than allow this work to stall, I made the decision to accelerate all three technologies simultaneously. This requires a larger manufacturing facility, expanded laboratory capacity, and a fully integrated development pipeline capable of supporting soil, water, and ecosystem restoration at scale. The environmental systems we aim to repair are degrading rapidly, and delay is no longer an option. The window to protect global food security and prevent further contamination of water and agricultural resources is narrowing.

To preserve Violet Earth's intellectual property and ensure continuity of development, I personally absorbed the financial impact of the grant's collapse—ultimately filing for Chapter 7 bankruptcy and relinquishing my home. These sacrifices were not made lightly; they were made because the technologies we are advancing are essential, viable, and urgently needed. While Violet Earth seeks \$50 million to bring these solutions to market, I have already invested everything I had to keep this mission alive.

What I learned from my time working with the U.S. Army Corps of Engineers remains central to our strategy: surround yourself with people whose expertise exceeds your own, compensate them well, and give them the freedom to innovate. Violet Earth is built on that principle, and with the right investment, we are prepared to deliver transformative high environmental impact and long-term value. The possibilities are endless.

Dr. Erica Gelsey

1. Executive Summary

The climate crisis demands multi-domain solutions. No single technology addresses building emissions, ocean warming, and soil carbon loss simultaneously. The built environment generates 37% of global CO₂ emissions. The ocean, Earth's largest carbon sink, absorbs approximately 30% of anthropogenic CO₂ but is destabilizing due to acidification, warming, and freshwater stratification from accelerating glacial melt.

Terrestrial soils — the planet’s largest land-based carbon pool — are hemorrhaging stored carbon through degradation and conventional agriculture.

Violet Earth is the first company to develop an integrated three-platform portfolio attacking CO₂ at every point in the carbon cycle: There are 50 million reasons to give Violet Earth \$50 million dollars.

Platform 1: CO₂-Active Façade System

Building-integrated electrochemical direct air capture panels that transform building exteriors into carbon capture surfaces. Patent-pending technology using anion-exchange Ionogel membranes, integrated photovoltaic power, and mineralization pathways captures CO₂ directly from ambient air flowing across building façades. Turning every building into part of the climate solution.

Platform 2: Effervescent Ocean Restoration Disk

A marine-safe, self-consuming benthic reactor that dissolves over 12 months to 6+ years (size-dependent), releasing salts to counter freshwater stratification from glacial melt, nutrients to stimulate phytoplankton growth and DMS-cloud brightening, and CO₂ nanobubbles for ocean mixing. All components are marine-native (CaCO₃, PHA biopolymer, olivine, citric acid, seawater salts). Integrated microplastic capture via chitosan and zeolite. **Four-function system:** destratification + nutrient delivery + albedo enhancement + microplastic remediation.

Platform 3: Layered Soil CO₂ Containment System

A stratified soil amendment system using our food starch purple film layer, local sourced volcanic biochar, retinal layer, and bug layer to trap and sequester CO₂ in agricultural and dead soils. The volcanic ash layer provides a stable carbon sink (hundreds to thousands of years), mineral layers accelerate weathering for inorganic carbon capture, and the layered architecture prevents carbon remineralization and loss.

Series A Capital Raise

Funding Scenario	Amount	Description
Full Build (dedicated Violet Earth laboratory)	\$50 Million	In-house lab, full R&D team, three-platform pilot program- 2 years
Hybrid Outsourced laboratory analysis (no onsite lab)	\$65.5 Million	Core lab + outsourced specialized testing, with upgrade path to full lab via Series B

Key Market Indicators

Metric	Value
Carbon removal market (2024)	\$4 billion
Projected carbon removal market (2030)	\$24 billion (35% CAGR); removal credits at 55.9% CAGR
Carbon removal long-term projection (2050)	Trillion-dollar industry
Voluntary carbon credit market (2050 projection)	\$45–\$250 billion
DOE SEA-CO2 marine CDR investment	\$36 million for 11 projects across 8 states
US climate tech VC investment (Q1 2025)	Increased 65% year-over-year
First EPA MPRSA research permit for OAE	April 2025 (LOC-NESS, Woods Hole Oceanographic Institution)

2. The Market Opportunity

Violet Earth’s market diversity is the convergence of three massive and rapidly expanding market segments. Each platform addresses a distinct slice of the carbon economy, and together they stand for the most comprehensive addressable market of any climate intervention company.

2.1 Building-Integrated Direct Air Capture

The global direct air capture (DAC) market is undergoing a critical evolution. While overall climate tech venture capital investment surged — with U.S. clean energy VC reaching \$7.6 billion in 2024 (15% year-

over-year growth) — pure standalone DAC startups experienced a 60% funding dip as investors sought differentiated, cost-effective approaches. Violet Earth’s façade-integrated approach directly addresses investor concerns: lower unit economics by cutting dedicated land and infrastructure, distributed deployment across millions of existing buildings, and dual-use value as both building envelope and carbon capture surface.

The competitive landscape confirms the opportunity: Air-capture raised a \$50 million Series A in June 2025 for modular DAC. The \$70 billion industrial CO₂ market provides near-term revenue through use pathways while the voluntary carbon credit market scales.

2.2 Marine Carbon Dioxide Removal

Marine CDR is the fastest-growing segment of the carbon removal industry. The DOE’s SEA-CO₂ program funded 11 projects at approximately \$3.3 million average per award, totaling \$36 million — signaling strong federal commitment (2024). Carbon credit pre-purchase agreements for high-quality marine removal credits are trading at **\$100–\$200 per tCO₂**, a significant premium over terrestrial credits.

The regulatory pathway is now open: in **April 2025, the EPA issued the first-ever MPRSA research permit for ocean alkalinity enhancement** to the LOC-NESS project at Woods Hole Oceanographic Institution. This landmark decision sets up the permitting framework for all future marine CDR projects, including Violet Earth’s Ocean Restoration Disk.

2.3 Soil Carbon Sequestration

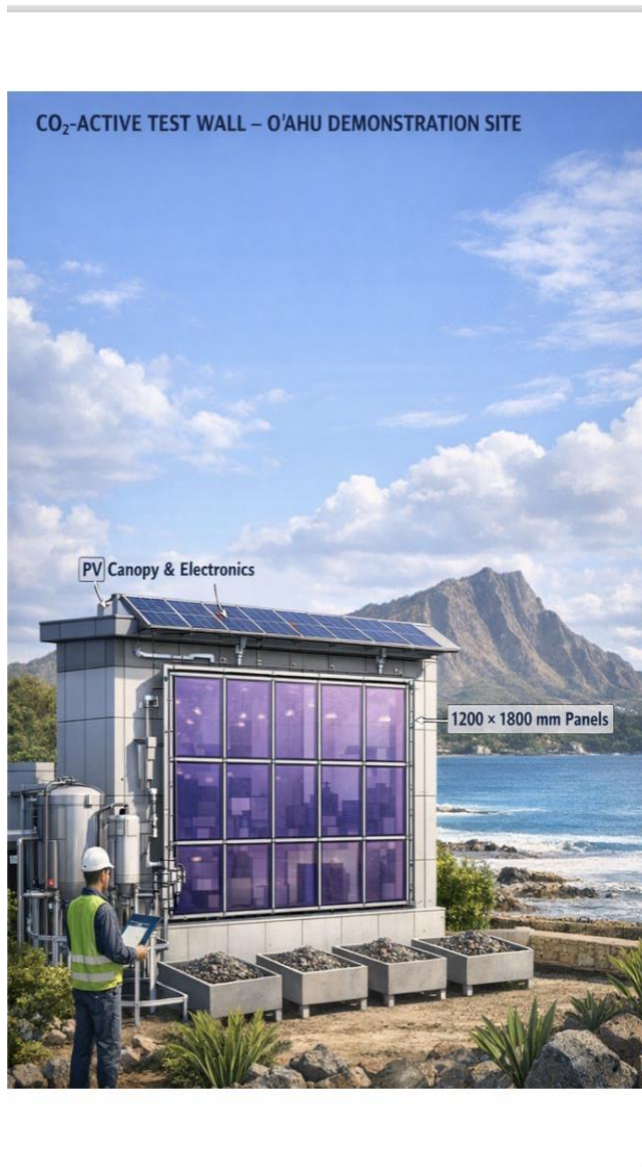
Biochar-based carbon credits already trade at premium prices due to their exceptional permanence (hundreds to thousands of years). The soil carbon market grows thru substantial agricultural co-benefits: improved crop yields, water retention, and soil structure create compounding value beyond carbon credits alone. Research has proven that China’s cultivated soils amended with biochar could achieve 7.38–12.5 billion tons of carbon sequestration plus 0.34–2.66 billion tons of added CO₂ sorption — illustrating the staggering global scale of opportunity. The United States does not come close.

2.4 Total Addressable Market

Market Segment	2024 Value	2030 Projected	CAGR
Voluntary Carbon Credit Market	\$4.04 billion	\$24 billion	35.1%

Market Segment	2024 Value	2030 Projected	CAGR
Industrial CO ₂ Utilization	\$70 billion	\$90+ billion	~4%
Marine CDR Credits (premium)	Emerging	\$2+ billion	>50%
Biochar & Soil Carbon Credits	\$1+ billion	\$5+ billion	~30%
Combined Addressable Market	\$75+ billion	\$121+ billion	

3. Technology Platform 1 — CO₂-Active Façade System



Artists Rendering Building-integrated Ionogel façade technology — Violet Earth's electrochemical panels replace or overlay conventional rain-screen cladding

3.1 Technology Overview

The CO₂-Active Façade System is an electrochemical direct air capture panel designed for seamless integration into building exteriors. Each panel features a **7-layer stack architecture**:

1. **Outer perforated screen** — weather protection while allowing ambient air flow
2. **Gas diffusion layer** — distributes incoming air evenly across the electrode surface
3. **Cathode** — oxygen reduction reaction generates hydroxide ions

4. **Anion-exchange membrane (AEM)** — selectively transports carbonate/bicarbonate ions
5. **Anode** — CO₂ evolution reaction releases concentrated CO₂
6. **Gas collection chamber** — captures evolved CO₂ stream
7. **Backing plate** — structural support and building interface

3.2 System Integration

- **Building-integrated:** Replaces or overlays conventional ventilated rain-screen façade — no added land needed.
- **PV-powered:** Rooftop or integrated solar panels provide DC power for electrochemical cells
- **CO₂ pathway:** Capture from ambient air → electrochemical concentration → manifold collection → vacuum pump → moisture separation → compression → three output options: mineralization, geological storage, or industrial use
- **Panel electronics:** MCU with potentiostat, voltage/current/temperature/CO₂ sensors, RS-485/Modbus + BLE/Zigbee connectivity to building management systems

3.3 Economics & Specifications

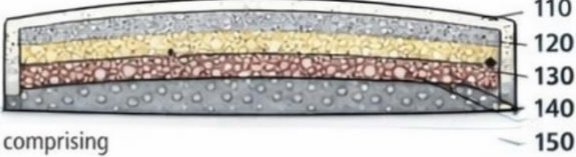
Parameter	Value
12-panel demonstration installation cost	\$2.7 million \$3 million 1acre plot
Annual operating cost	\$160,000-500,000
Structural chassis lifespan	25–40 years
AEM membrane replacement cycle (current pilot study)	Every 6–18 months
Industry membrane durability target	35,000+ hours
Pilot budget	Pilot Program: \$10-15 million for a 30-month program encompassing R&D, formulation optimization, ecotoxicology testing, construction of glass, Ionogel chemistry refinement,

Parameter	Value
	leak testing, sampling and analysis, viewing and monitoring stations, above ground pathways and data collection. Hawaii State regulatory oversight, University student level engagement, and public tours.

4. Technology Platform 2 — Effervescent Ocean Restoration Disk

Abstract:

An effervescent disk for ocean restoration is disclosed, comprising sequential layers of salts, effervescent compounds, nutrients, and a biodegradable structural core. The disk is designed to release CO₂ microbubbles, salinity, and essential nutrients over a prolonged period to enhance ocean mixing and marine productivity.



Formulation & Specifications (Table 1)

Layer	Materials	Function	Function
Outer Shell	POC-CC Matrix, NaCl, MgCl ₂	Salinity & Alkalinity	Salinity & Alkalinity
Effervescent	Citric Acid, NaHCO ₃ , MgCO ₂	CO ₂ Generation	
Nutrient	Olivine, Apatite, Trace Minerals	Nutrient Release	Nutrient Release
Structural Core	PHA Biopolymer	Structural Support	Ballast & Substrate
Ballast Base	Calcite Aggregate		



Marine carbon dioxide removal — Violet Earth's Effervescent Ocean Restoration Disk works on the ocean floor as a self-consuming benthic reactor

4.1 Five-Layer Concentric Architecture

Layer	Composition	Function
1. POC-CC Outer Shell	NaCl, MgCl ₂ , KCl, CaCl ₂ (seawater ion ratios) + chitosan/zeolite	Salinity restoration & microplastic capture
2. Effervescent Core	Citric acid + NaHCO ₃ + MgCO ₃ in high crystallinity brucite matrix	Controlled gas release & alkalinity enhancement
3. Nutrient Ring	Olivine + apatite	Iron/silica/phosphate slow release for phytoplankton
4. PHA Biopolymer Core	Polyhydroxyalkanoate structural matrix	Biodegradable structural integrity
5. Ballast Base	Dense calcite/aragonite	Permanent reef substrate after dissolution

4.2 Size Variants

Size	Diameter	Mass	Active Duration
Small	20 cm	3 kg	~2.5 years
Medium	35 cm	12 kg	~4 years
Large	50 cm	30 kg	~6 years

4.3 Four Simultaneous Functions

8. **Salinity Restoration** — Releases seawater-matched salts to counter freshwater stratification from glacial melt
9. **Nutrient Delivery + Biological Cascade** — Olivine/apatite slow-release stimulates phytoplankton growth
10. **Albedo Enhancement** — Phytoplankton produce dimethyl sulfide (DMS), which oxidizes to sulfate aerosols, seeding marine cloud condensation nuclei (marine cloud brightening pathway)
11. **Microplastic Capture** — Chitosan and zeolite in the outer shell adsorb and bind marine microplastics

4.4 Marine Safety Profile

100% Marine-Compatible Composition

Every part is either naturally present in seawater, FDA-approved biocompatible, or a naturally occurring mineral. All degradation products are beneficial: alkalinity enhancement, organic carbon supply, and permanent reef substrate. No synthetic polymers, no heavy metals, no persistent pollutants.

4.5 Longevity Engineering

Seven engineered mechanisms ensure controlled, multi-year dissolution:

12. PHA interlayer barriers controlling diffusion rates
13. Brucite crystallinity tuning for dissolution rate control
14. Compression molding for density and porosity management
15. Biofouling exploitation (natural biofilm formation slows surface dissolution)
16. POC-CC loading control for outer shell longevity
17. Temperature self-regulation via endothermic dissolution reactions
18. Porosity gradient engineering (dense exterior to porous interior)

4.6 Ocean-to-Atmosphere Kinetic Chain

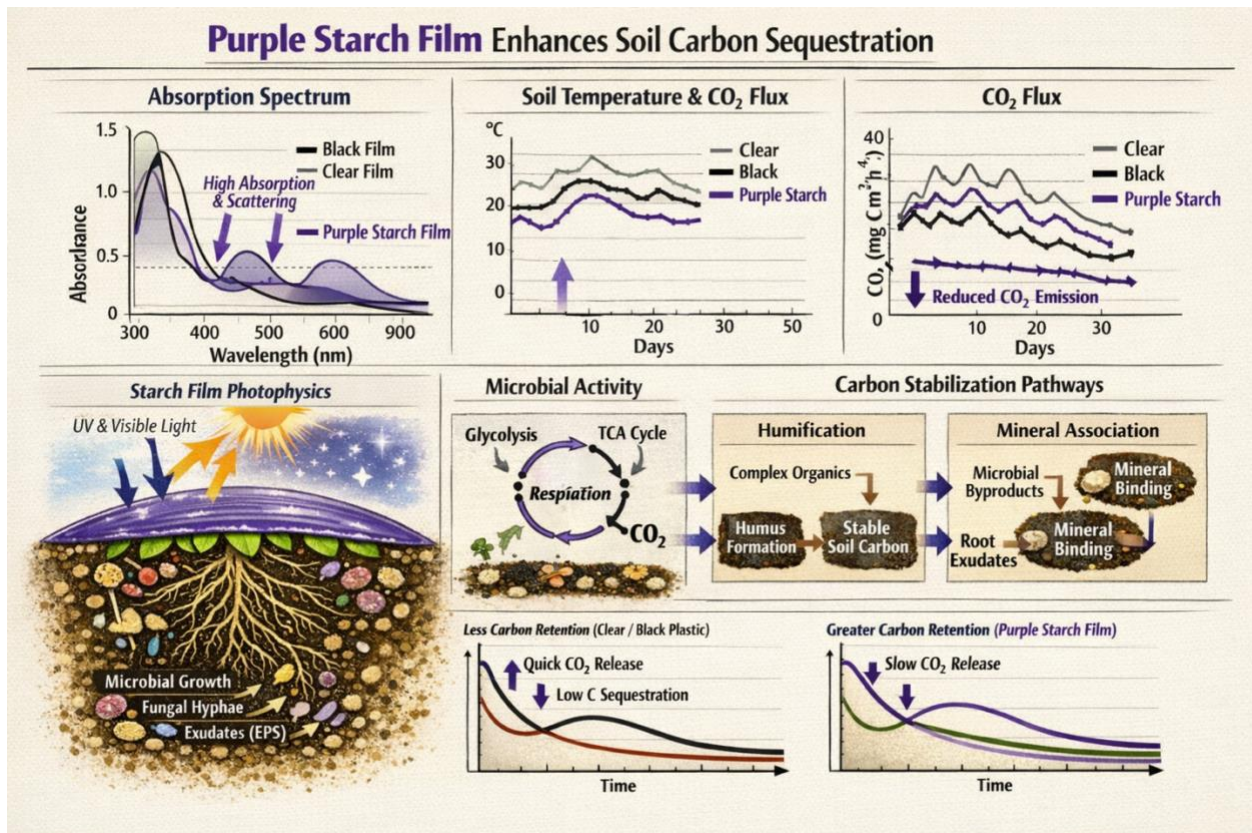
Disk → Destratification → Phytoplankton bloom → DMS emission → Cloud condensation nuclei → Marine cloud brightening → Atmospheric cooling → Potential AMOC preservation & jet stream stabilization

Pilot Program

Budget: \$30 million for a 30-month program encompassing R&D, formulation optimization, ecotoxicology testing, sampling and analysis, construction of glass, stainless steel enforced tanks (3

proposed) underground viewing and monitoring stations, above ground pathways and data collection. Hawaii State regulatory oversight, University student level engagement, and public tours.

5. Technology Platform 3 — Layered Soil CO₂ Containment System



Violet4Earth 4-component soil carbon sequestration — a key part of Violet Earth’s layered soil containment architecture

5.1 Stratified Architecture

The Layered Soil CO₂ Containment System is a stratified soil amendment architecture designed to trap CO₂ at multiple levels using complementary sequestration mechanisms:

Layer	Composition	Mechanism	Permanence
Violet4Earth Layer	High-temperature pyrolyzed biomass (>600°C)	Creates recalcitrant carbon; reduces microbial mineralization via negative priming effects; forms organo-mineral interfaces protecting labile carbon	Hundreds to thousands of years
Local sourced volcanic ash layer	Calcium/magnesium silicates (olivine, wollastonite)	Reacts with dissolved CO ₂ to form stable carbonate minerals; Ca/Mg from biochar reacts with CO ₂ to form inorganic carbonates	Permanent (geological)
Retinol Layer	Microorganism And bug food to support draw down	Prevents upward diffusion of CO ₂ from deeper soil horizons	Decades (renewable)
Microorganisms and bug treatment layer	Formulated specific to site conditions	Promotes downward diffusion of CO ₂ while some bugs may clear nanoplastics, hydrocarbons and other pollutants deeper in the soil.	

5.2 Agricultural Co-Benefits

- Improved water retention (biochar's porous structure holds 2–5× its weight in water)
- Enhanced nutrient availability and cation exchange capacity
- Improved soil structure and reduced compaction
- Increased crop yield (documented 10–30% improvements in tropical soils)
- Reduced fertilizer requirements and nutrient leaching

5.3 Target Applications

- Agricultural land (row crops, orchards, vineyards)
- Degraded and marginal land restoration
- Mine site reclamation
- Coastal erosion zone stabilization

- Urban soil remediation
- Dead soil restoration

Pilot Program

Budget: ~\$10-12 million for field trials on O’ahu agricultural land, including design berm and liners, sampling and analysis plan, pre-site characterization, design film and bug layer selection and deployment, production and characterization, mineral sourcing, system installation, 18-month monitoring with soil gas flux measurements, and peer-reviewed publication. Progress section display for observation by the regulatory agencies, investors, State of Hawaii, and students/public observation.

6. The Integrated Advantage — Why Three Platforms

Violet Earth’s three platforms are architecturally and strategically stronger together than they would be as independent companies. This integration is not cosmetic — it is a fundamental design principle that creates compounding technical, financial, and competitive advantages.

Advantage	Description
Complete Carbon Cycle Coverage	Buildings (point source + DAC) → Ocean (largest carbon sink, absorbs ~30% of anthropogenic CO ₂) → Soil (largest terrestrial carbon pool). No blind spots in the carbon cycle.
Shared Materials Science	CaCO ₃ mineralization chemistry spans all three platforms. Olivine weathering applies to both the ocean disk and soil system. PV integration applies to the façade system and potential ocean buoy monitoring systems.

Advantage	Description
Shared IP Portfolio	Cross-platform patents create a defensive moat. Knowledge transfer accelerates R&D timelines across all three platforms. Competitors must license multiple patent families to replicate the integrated approach.
Diversified Risk	If one platform meets regulatory or technical barriers, the other two continue generating value and revenue. No single-point-of-failure risk for investors.
Shared Team Efficiency	Materials scientists, electrochemists, and environmental engineers work across platforms, reducing per-platform personnel costs by approximately 30%.
Carbon Credit Stacking	Each platform generates independently verifiable carbon credits through distinct methodologies, creating multiple uncorrelated revenue streams and reducing market concentration risk.

The Strategic Moat

A competitor entering any single segment faces Violet Earth with cross-platform synergies, shared infrastructure costs, and a diversified revenue base. Replicating all three platforms simultaneously would require the same capital investment but without years of accumulated cross-platform knowledge and IP.

7. Team Structure & Key Hires

“The best science demands the best scientists.” — Violet Earth’s team architecture is designed to maximize cross-platform collaboration while maintaining deep domain expertise in each technology vertical.

7.1 Executive Leadership (4 Positions)

Position	Responsibilities	Salary Benchmark
Chief Executive Officer / Principal Investigator	Strategic direction, investor relations, regulatory liaison, grant PI	\$280,000– \$350,000 + equity

Position	Responsibilities	Salary Benchmark
Chief Science Officer	Oversees all three R&D platforms, publication strategy, Scientific Advisory Board	\$300,000– \$328,000 + equity
VP of Engineering	Prototype development, manufacturing scale-up, lab operations	\$260,000– \$320,000 + equity
Director of Operations & Regulatory Affairs	Permitting, compliance, field trial logistics, supply chain	\$130,000– \$180,000 + equity

7.2 Senior Scientists (5 Positions)

Position	Platform	Focus Areas
Senior Electrochemist	Façade (Lead)	AEM membrane optimization, cell stack design, electrode kinetics
Senior Marine Scientist	Ocean Disk (Lead)	Formulation development, ecotoxicology, deployment protocols
Senior Soil Scientist	Soil System (Lead)	Biochar characterization, field trial design, soil gas flux measurement
Senior Materials Scientist	Cross-Platform	Polymer/ceramic formulation, dissolution kinetics, manufacturing process development
Senior Environmental Engineer	Cross-Platform	Monitoring systems, data analysis, environmental impact assessment

7.3 Research Staff (6 Positions)

- 2 Research Associates (lab-based — synthesis, testing, analysis)
- 2 Field Technicians (O’ahu site operations — deployment, monitoring, maintenance)
- 1 Data Scientist / Modeler (computational modeling, MRV analytics)
- 1 Lab Manager / QC Specialist (instrument calibration, SOPs, inventory)

7.4 Support Staff (3 Positions)

- IP Counsel (fractional/outsourced initially — patent prosecution, FTO analysis)
- Grant Writer / Business Development (federal grants, carbon credit partnerships)
- Administrative / Office Manager

7.5 Personnel Budget Summary

Item	Year 1	Year 2
Core team size	18 FTEs	21 FTEs (+3 positions as platforms advance)
Total personnel budget (salaries + benefits + relocation)	~\$2.8 million	~\$3.2 million
Hawai'i compensation premium	15–25% above mainland equivalent	

7.6 Scientific Advisory Board

3–5 world-class advisors in electrochemistry, marine science, soil science, and climate policy. Part-time, stipend-based engagement.

Estimated cost: \$350,000–\$500,000/year total

8. Build vs. Buy — The Laboratory Decision

The laboratory infrastructure decision is one of the most consequential strategic choices facing Violet Earth. It directly impacts IP security, R&D velocity, capital efficiency, and talent acquisition. This section presents a rigorous analysis of three options.

8.1 Option A: Build Dedicated Violet Earth Laboratory

Location Options on O‘ahu

Location	Advantages
Kapolei / Kalaheo Industrial Area	Former military base with available industrial space; close to team and demonstration site; lower lease rates than Honolulu
UH Mānoa Research Park	University adjacency; shared infrastructure; access to graduate students and collaborators
Campbell Industrial Park	Lowest cost; waterfront access ideal for ocean disk testing logistics

Facility Requirements (5,000 sq ft)

Zone	Area	Purpose
Chemistry / Materials Lab	2,000 sq ft	Fume hoods, wet chemistry, materials characterization
Environmental / Biological Lab	1,000 sq ft	Ecotoxicology, water quality analysis
Workshop / Fabrication	1,200 sq ft	Compression molding press, disk production, panel assembly
Office / Meeting Space	800 sq ft	Administrative, team collaboration

Construction & Fit-Out Costs

Category	Cost per sq ft
HVAC (100% outside air, 8–12 air changes/hour)	\$150–\$250
Plumbing/utilities (DI water, chemical waste, compressed gas)	\$80–\$150
Electrical (15–25 W/sq ft for instrumentation)	\$50–\$100
Safety systems (fire suppression, spill containment)	\$30–\$50
General construction (epoxy floors, chemical-resistant counters)	\$200–\$350
Mainland total	\$2.5–\$4.5 million

Category	Cost per sq ft
Hawai'i-adjusted total (+20–30% premium)	\$3.5–\$5.5 million
Equipment (analytical instruments, fabrication)	\$800,000–\$1.2 million
Annual operating cost	~\$400,000/year

Timeline: 3-8 months to design, permit, build, and commission. Looking at modular ready made alternatives.

Advantages: Complete IP containment; 24/7 access; custom configuration; long-term cost efficiency (amortized over 10+ years); attracts top talent; balance-sheet asset.

Disadvantages: High upfront capital (\$3.5–\$5.5M) before research begins; 3–8 month construction delay; Hawai'i construction premium; operational overhead during low-activity periods.

8.2 Option B: Full Outsource Model

Outsource all laboratory work to contract research organizations (CROs) and university partners:

- **Materials characterization:** UH Mānoa, Stanford, MIT
- **Ecotoxicology:** EPA-certified GLP labs (mainland)
- **Electrochemistry:** National lab partnerships (NREL, LBNL, ANL)
- **Marine testing:** NELHA (Natural Energy Laboratory of Hawaii Authority) on Big Island — 870-acre ocean science park with deep seawater pipelines and research incubator space
- **Analytical chemistry:** Contract labs (SGS, Eurofins, etc.)

Annual cost: \$800,000–\$1,200,000/year. **Timeline:** Immediate R&D start.

Critical IP Risk — The Primary Concern with Full Outsourcing

Every outsourced experiment exposes proprietary formulations, processes, and results to third parties. Even with NDAs and CDAs:

- Lab technicians see your complete formulations
- Graduate students may publish related findings

- University IP policies may claim co-inventorship
- CRO staff turnover means proprietary knowledge walks out the door
- Competitors can identify which CROs you are using and approach them

Additional disadvantages: Higher per-experiment cost, scheduling delays, quality control challenges, no institutional knowledge accumulation, Hawai'i isolation adds shipping time and cost for mainland labs.

8.3 Option C: Hybrid Model — RECOMMENDED

Build a core materials and formulation lab (2,500 sq ft) for IP-sensitive work. Outsource specialized testing that does not expose core IP.

Work Category	Location	Rationale
In-House (IP-Critical)	Violet Earth Lab, Kapolei	Formulation development, dissolution rate testing, compression molding optimization, electrode fabrication, prototype assembly — everything revealing proprietary compositions and processes
Outsource (Non-IP-Critical)	CROs, universities, NELHA	Standardized analytical chemistry (samples go out as coded numbers, not labeled formulations), GLP ecotoxicology (regulatory requirement), environmental monitoring, large-scale marine testing

IP Protection Protocols for Outsourced Work

- 19. File provisional patents BEFORE any disclosure** — establishes priority date; 12-month window to file full application
- 20. Bilateral CDAs with research-specific terms** — 5+ year confidentiality obligations; clear IP ownership (all inventions belong to Violet Earth); publication prohibition without written consent; audit rights
- 21. Compartmentalized workflow** — No single outside lab sees the complete formulation. Lab A tests dissolution kinetics of Component X; Lab B tests mechanical properties of Component Y. Only Violet Earth assembles the full picture

22. **Trade secret protocols** — All materials labeled with coded identifiers only; secure disposal of all samples after testing; minimum-necessary information sharing

23. **Invention assignment agreements** — All employees, contractors, and collaborators sign pre-invention assignment; works-for-hire doctrine applied to all contracted research

Hybrid Model Cost Summary

Item	Cost
Lab buildout (2,500 sq ft, Hawai'i-adjusted)	\$1.5–\$2.5 million
Equipment	\$500,000–\$700,000
Annual outsource budget	\$400,000–\$600,000/year
Total Year 1	~\$2.8–\$3.8 million
Annual operating (Year 2+)	~\$600,000–\$800,000/year
Timeline to operational	6–9 months (vs. 12–18 for full lab)

Recommendation

Start with Hybrid (Option C) for Phase 1. Upgrade to a full laboratory (Option A) in Phase 2 using Series B funding once R&D validates all three platforms. This preserves capital for research while protecting core IP from day one. The smaller facility can be operational in 6–9 months — cutting a full year from the timeline compared to a ground-up full lab build.

9. Best Management Practices in Development & Research

Violet Earth's R&D governance framework is aligned with the DOE Carbon Management Strategy and the CATF Innovation Technology Framework, ensuring disciplined progression from concept to commercialization.

9.1 Stage-Gate Process

Gate	Stage	Key Activities
Gate 0	Concept Validation	Literature review, thermodynamic feasibility analysis, prior art assessment
Gate 1	Lab-Scale Proof of Concept	Benchtop prototypes under controlled conditions, initial performance metrics
Gate 2	Pilot-Scale Validation	Field prototypes in real-world conditions, environmental monitoring
Gate 3	Pre-Commercial Demonstration	Scaled manufacturing, multi-site deployment, carbon credit methodology submission
Gate 4	Commercial Readiness	Cost targets met, regulatory approval secured, market validated, Series B/C financing

Each gate requires: Independent technical review by the Scientific Advisory Board; documented go/no-go criteria; updated techno-economic analysis; risk assessment update; IP review for new filing opportunities.

9.2 Quality Management

- ISO 17025 equivalent laboratory procedures
- GLP (Good Laboratory Practice) compliance for all regulatory submissions
- Chain of custody documentation for all samples
- Calibrated instruments with annual recertification
- Electronic lab notebooks with timestamped entries (critical for IP evidence)

9.3 Data Management

- All research data stored in secure cloud repository with version control
- Raw data preserved for minimum 10 years
- Statistical rigor: power analysis before experiments, pre-registered hypotheses where applicable

- Open science for non-proprietary results (peer-reviewed publication enhances credibility and supports carbon credit methodology validation)

9.4 Environmental, Health & Safety

- Chemical hygiene plan per OSHA 29 CFR 1910.1450
- Waste management per EPA RCRA
- Emergency response procedures and personnel training documentation
- Hawai'i-specific environmental compliance (DLNR, DOH)

9.5 Diversity, Equity & Inclusion

- Commitment to diverse hiring — Hawai'i's multicultural workforce is an asset
- Partnerships with Native Hawaiian organizations for cultural sensitivity in ocean and land work
- Community engagement plan for all field trial sites, including stakeholder consultation before deployment

10. Intellectual Property Strategy

10.1 Current IP Position

Platform	Status	Scope
CO₂-Active Façade System	Patent application submitted in review	20+ figures, 20+ claims, reference numeral key with 48 entries covering panel architecture, electrochemical cell stack, building integration methods, and CO ₂ management pathways
Effervescent Ocean Restoration Disk	Patent application submitted in review	20+ claims covering composition of matter, method of manufacture, microplastic capture mechanism, biological cascade initiation, deployment methods, longevity engineering, and AMOC support

Platform	Status	Scope
Layered Soil CO₂ Containment System	Prior review underway will remain intellectual property until pilot study is completed	Provisional patent filing planned within 6 months of funding

10.2 IP Strategy & Timeline

- 24. **Days 1–90:** File provisional patents for all three platforms
- 25. **Months 4–12:** Convert to full utility patent applications
- 26. **Months 12–18:** International PCT filings for key markets (US, EU, Japan, Australia, SIDS nations)
- 27. **Ongoing:** Trade secret protection for manufacturing processes (compression parameters, crystallinity control recipes, proprietary formulation ratios)
- 28. **Ongoing:** Defensive publications for non-patentable innovations (prevents competitors from patenting)
- 29. **Pre-commercialization:** Freedom-to-operate (FTO) analysis for each platform

IP budget: \$300,000–\$450,000 over 3 years (patent prosecution, international filings, IP counsel).

Strategic IP Framework

Wilson Sonsini’s 2025 whitepaper on IP for climate tech developers emphasizes that maintaining control over technology while collaborating with strategic partners is the critical balance. Violet Earth’s compartmentalized outsourcing model combined with a provisional-patent-first approach directly addresses this principle — every disclosure is preceded by a filing, and every collaboration is bounded by assignment agreements.

11. Consolidated Budget — Three-Year Financial Model

11.1 Year 1 — Foundation & R&D (\$6.8M)

Category	Amount
Personnel (12 FTEs ramping to 18)	\$1,800,000
Laboratory buildout (hybrid, 2,500 sq ft)	\$2,200,000
Equipment procurement	\$600,000
Façade R&D (materials, prototyping)	\$400,000
Ocean Disk R&D (formulation, ecotoxicology)	\$500,000
Soil System R&D (biochar, field preparation)	\$300,000
IP filing (3 provisional patents + IP counsel)	\$150,000
Regulatory pre-applications (EPA, DLNR)	\$100,000
Outsourced testing	\$300,000
Operations & overhead	\$250,000
Contingency (5%)	\$200,000
YEAR 1 TOTAL	\$6,800,000

11.2 Year 2 — Pilot Deployment (\$6.2M)

Category	Amount
Personnel (18 FTEs)	\$3,200,000
Façade pilot installation (12-panel O'ahu demo)	\$500,000
Ocean Disk manufacturing (120 units) + deployment	\$600,000
Soil System field trials (O'ahu agricultural plots)	\$400,000
Monitoring equipment & vessel charter	\$350,000

Category	Amount
Patent prosecution (3 utility patents + PCT filings)	\$250,000
Outsourced testing (GLP ecotox, analytical)	\$300,000
Operations & overhead	\$350,000
Contingency (5%)	\$250,000
YEAR 2 TOTAL	\$6,200,000

11.3 Year 3 — Data Collection & Scale-Up Preparation (\$5.5M)

Category	Amount
Personnel (20 FTEs)	\$3,600,000
Ongoing field operations (all 3 platforms)	\$400,000
Data analysis & peer-reviewed publication	\$150,000
Manufacturing process optimization	\$300,000
Carbon credit methodology development & validation	\$200,000
International patent filings	\$150,000
Pre-commercial partnerships	\$200,000
Operations & overhead	\$350,000
Contingency (5%)	\$150,000
YEAR 3 TOTAL	\$5,500,000

Three-Year Capital Summary

Scenario Total Full Build or Modular Assembly, Temporary Facilities (electricity, water, sewer)

(dedicated lab + full R & D program)

\$18.5 million

Lean Scenario

(full outsource, no lab build)

\$14.5 million

12. Funding Sources & Capital Strategy

Violet Earth’s capital strategy combines equity financing, federal grants, state support, philanthropy, and carbon credit pre-purchase agreements to minimize dilution while maximizing runway.

Source	Target Amount	Key Targets / Programs
1. Series A Equity	\$20–\$30 million	Breakthrough Energy Ventures, Lower carbon Capital, Congruent Ventures, Larsen Lam Climate Change Foundation
2. Federal Grants	\$3–\$5 million	DOE SEA-CO2 Program (~\$3.3M avg); DOE CDR Purchase Prize (\$35M program, finalists up to \$3M); NOAA OAP/NOPP; NSF SBIR Phase I (\$275K) / Phase II (\$1M); ARPA-E.
3. State of Hawai'i	\$500K–\$1 million	DLNR coral reef restoration funds; Climate Change Mitigation & Adaptation Commission; HTDC (Hawaii Technology Development Corporation)
4. Philanthropic	\$10–\$20 million	Carbon to Sea Initiative (\$1.3M grants for OAE projects); ClimateWorks Foundation; Bloomberg Philanthropies
5. Carbon Credit Pre-Purchase	\$500K–\$2 million	Forward sales at \$100–\$200/tCO ₂ once pilot demonstrates measurable CDR. Target buyers: Microsoft, Stripe, Frontier, Shopify, Swiss Re
TOTAL CAPITAL STACK	\$13–\$20 million	

Non-Dilutive Funding Priority

Violet Earth targets \$4.5–\$8 million in non-dilutive capital (grants + philanthropy + pre-purchase), reducing equity dilution by 25–40% compared to an all-equity raise. The three-platform portfolio multiplies grant eligibility: ocean disk qualifies for DOE marine CDR programs, façade qualifies for building decarbonization programs, and soil system qualifies for USDA and agricultural research programs.

13. Risk Matrix

#	Risk	Likelihood (1–5)	Impact (1–5)	Risk Score	Mitigation Strategy
1	AEM membrane durability falls short	3	4	12	Parallel membrane R&D tracks with multiple polymer chemistries; partnerships with membrane manufacturers; modular design allows rapid swap-out
2	Ocean disk regulatory delay	3	4	12	Concurrent permitting initiated early; LOC-NESS precedent (April 2025) establishes regulatory pathway; all-marine-native composition strengthens safety profile
3	Soil system carbon permanence questioned	2	3	6	Independent third-party verification; peer-reviewed publication; alignment with established biochar carbon credit methodologies (e.g., Puro.earth, Verra)
4	Key personnel departure	2	4	8	Competitive compensation with Hawai'i premium; 4-year equity vesting with 1-year cliff; comprehensive knowledge documentation; cross-training across platforms
5	IP infringement by competitors	3	3	9	Early provisional patent filing; trade secret protocols for manufacturing processes; comprehensive FTO analysis; defensive publications

#	Risk	Likelihood (1–5)	Impact (1–5)	Risk Score	Mitigation Strategy
6	Hawai'i construction cost overruns	4	2	8	Phased lab build (hybrid model); mainland fabrication backup for equipment; fixed-price contracts where possible; 5% contingency built into budget
7	Carbon credit market volatility	3	3	9	Diversified revenue across 3 platforms × multiple credit types; pre-purchase agreements lock in prices; industrial CO ₂ utilization as non-credit revenue
8	Funding gap between Series A and B	2	5	10	Robust grant pipeline (3–5 applications per year); milestone-based spending discipline; bridge financing plan; 36-month runway at recommended raise level

14. Timeline — 36-Month Execution Roadmap

Period	Façade System	Ocean Disk	Soil System	Corporate
Months 1–6	AEM screening; electrode fabrication R&D; cell stack prototyping	Formulation optimization; dissolution kinetics; initial ecotox screening Tank Design and Procurement	Biochar characterization; mineral sourcing; site selection on O'ahu	Lab buildout begins; team hiring (12→18 FTEs); 3 provisional patents filed; regulatory pre-meetings. Establish independent accounting and audit. Land Purchase-Temporary Facilities, and site excavation. Pre-Testing
Months 6–12	Single-panel prototype testing; BMS integration; performance benchmarking	GLP ecotox testing (outsourced); NELHA seawater compatibility testing; manufacturing process development. Tank piping conveyance and inspections	Layered system design finalization; trials; soil gas and air monitoring setup	Lab operational; equipment commissioned; CDA network established refine formulas based on site conditions

Period	Façade System	Ocean Disk	Soil System	Corporate
Months 12–18	12-panel pilot installation on O’ahu demonstration building	Manufacturing of 120 deployment units; EPA pre-application / DLNR coordination; tank installation and inspections.	Field site preparation; soil baseline measurements; amendment installation	Full utility patent applications complete; first peer-reviewed manuscript submitted
Months 18–24	Pilot monitoring; performance data collection; membrane durability assessment	Tank deployment monitoring, water chemistry monitoring; biological surveys	Soil field trials begin ; seasonal flux measurements; crop yield tracking	PCT international filings; carbon credit methodology drafting; industry conference presentations
Months 24–30	12-month data analysis; TEA update; cost reduction pathways identified	Ongoing monitoring; phytoplankton/DMS measurement; dissolution rate validation	Multi-season data collection; soil carbon stock quantification	Carbon credit methodology submission; pre-commercial partnership discussions; Series B groundwork
Months 30–36	Final performance report; manufacturing scale-up plan; building partner pipeline	Final environmental assessment; deployment optimization; scale-up plan for commercial arrays	Final soil carbon permanence report; agricultural co-benefit quantification	Series B preparation ; investor data room; pre-commercial agreements signed; full lab upgrade planning

15. Conclusion — The Violet Earth Advantage

Violet Earth stands alone as the only company simultaneously addressing carbon emissions from buildings, ocean carbon cycle disruption, and terrestrial soil carbon loss. This is not a portfolio assembled from acquisitions — it is a unified technology platform built from shared materials science, shared engineering principles, and a shared mission: planetary repair at every scale.

Why Hawai'i

Kapolei, O'ahu is not just our headquarters — it is a strategic advantage:

- **Year-round field trial conditions** — no seasonal downtime for R&D
- **Proximity to Pacific Ocean test sites** — West O'ahu waters accessible within hours of lab
- **Exceptional PV solar resource** — Hawai'i has the highest electricity cost in the US, making PV-powered façade systems especially valuable as both carbon capture and energy offset
- **NELHA partnership potential** — the Natural Energy Laboratory on the Big Island provides deep seawater access and marine research infrastructure
- **Cultural alignment** — aloha 'āina (love of the land) reflects a deep Hawaiian tradition of environmental stewardship that aligns with Violet Earth's mission

The Competitive Position

- **First-mover advantage in marine CDR** — the LOC-NESS EPA permit (April 2025) opened the regulatory door; Violet Earth is prepared to walk through it
- **IP-protected, diversified technology portfolio** reduces single-point-of-failure risk
- **Three independent carbon credit revenue streams** from day one of commercial operations
- **Cross-platform materials science synergies** that no single-platform competitor can replicate
- **Federal grant eligibility across three DOE/NOAA/NSF program categories** maximizing non-dilutive funding

The Opportunity

Carbon removal is projected to become a **trillion-dollar industry by 2050**. The voluntary carbon credit market alone could reach **\$45–\$250 billion**. Violet Earth is building the tools — across buildings, oceans, and soils — to capture a meaningful share of this generational opportunity.

“Violet Earth invites qualified investors to join us in building the infrastructure of planetary repair.”

Violet Earth, Inc.

Kapolei, O‘ahu, Hawai‘i

Building, Ocean, Soil: A Complete Carbon Cycle Solution

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