Partner Proposal: The GeoPioneer Collocated Approach

Prepared by: GeoPioneer
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1. Executive Summary

This proposal presents a partnership opportunity to deliver integrated, high-margin campus decarbonization projects by combining three complementary scopes under a single, **collocated delivery model**. Our approach unifies geothermal drilling, thermal network design, and building envelope upgrades into one optimized system. This strategy reduces total project cost, compresses timelines, and generates superior margins for every partner involved.

Our core thesis is that **capital should be invested in the building envelope first, reducing the load on the subsurface infrastructure.** By combining advanced geothermal drilling techniques, a 5th Generation Ambient Loop (thermal network), and high-performance triple-pane windows (U-factor < 0.16) delivered at the cost of standard solutions, we create a virtuous cycle of efficiency. The result is a project that wins on technical merit, wins on price, and delivers margins that standalone bids cannot match.

This proposal details three geothermal drilling options (Inclined, Zipper, and Vertical) and three thermal network configurations, allowing for a tailored approach to any site. By applying a conservative optimization strategy — a 15% bore reduction from the thermal network and an additional 15% from window upgrades — we demonstrate significant savings across all drilling options.

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2. The GeoPioneer Advantage: A Collocated Approach

The commercial geothermal market is fragmented. One firm drills, another designs piping, a third handles HVAC, and the windows are an afterthought. This creates inefficiency, inflates costs, and erodes margins. The GeoPioneer collocated model solves this by integrating all critical scopes under a single point of design and delivery control.

- **Optimized Engineering:** We size the borefield based on the building's *actual* optimized thermal load, not a worst-case estimate. This prevents over-engineering and unlocks immediate capital savings.
- **Shared Margin:** Savings from one scope (e.g., fewer bores) directly fund value in another (e.g., better windows), creating a larger total margin pool for the partnership.
- **Simplified Delivery:** We offer the client a single, accountable partner for the entire building-to-ground system, a powerful differentiator that simplifies sales and project management.

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3. Scope 1: Geothermal Borefield — Design, Drilling & Delivery

GeoPioneer provides a complete, end-to-end geothermal solution, offering multiple drilling technologies to suit any project site and budget. We control the entire delivery chain, from subsurface modeling to final installation, ensuring quality and efficiency.

3.1 Borefield Options & Visual Comparison

We evaluate three primary configurations for the reference 160ft x 340ft site. The diagrams below illustrate the surface footprint and subsurface layout of each option.

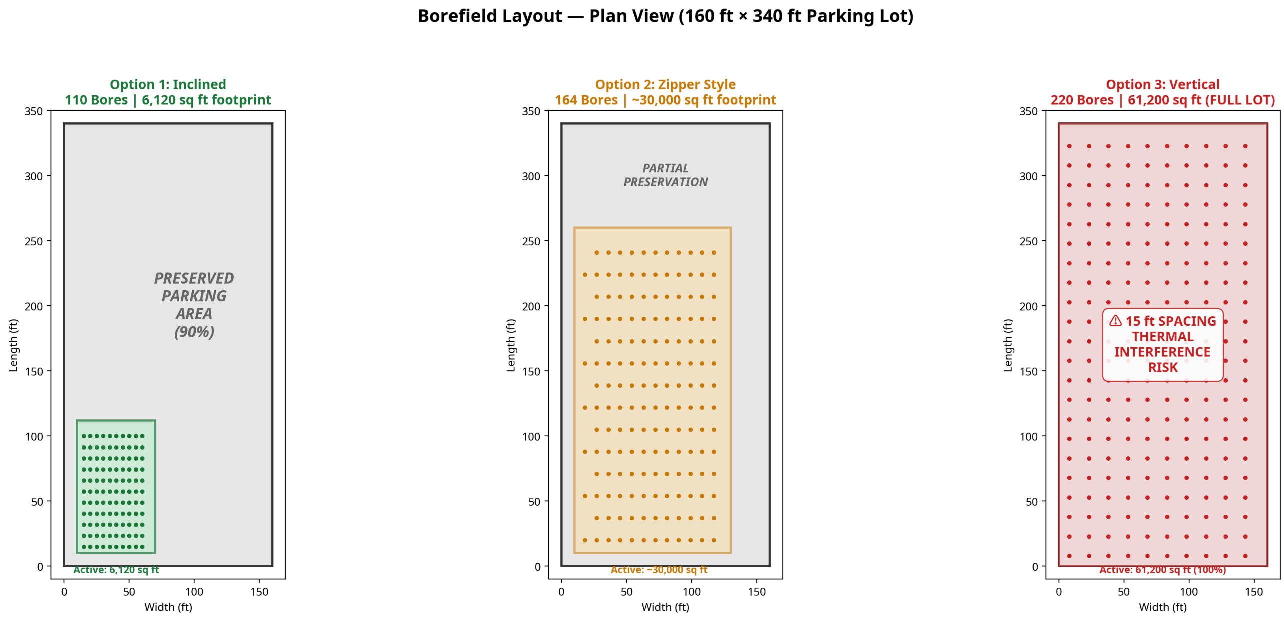

Figure 1: Plan view of the three drilling options on the 160ft x 340ft parking lot, showing the significant difference in surface area required.

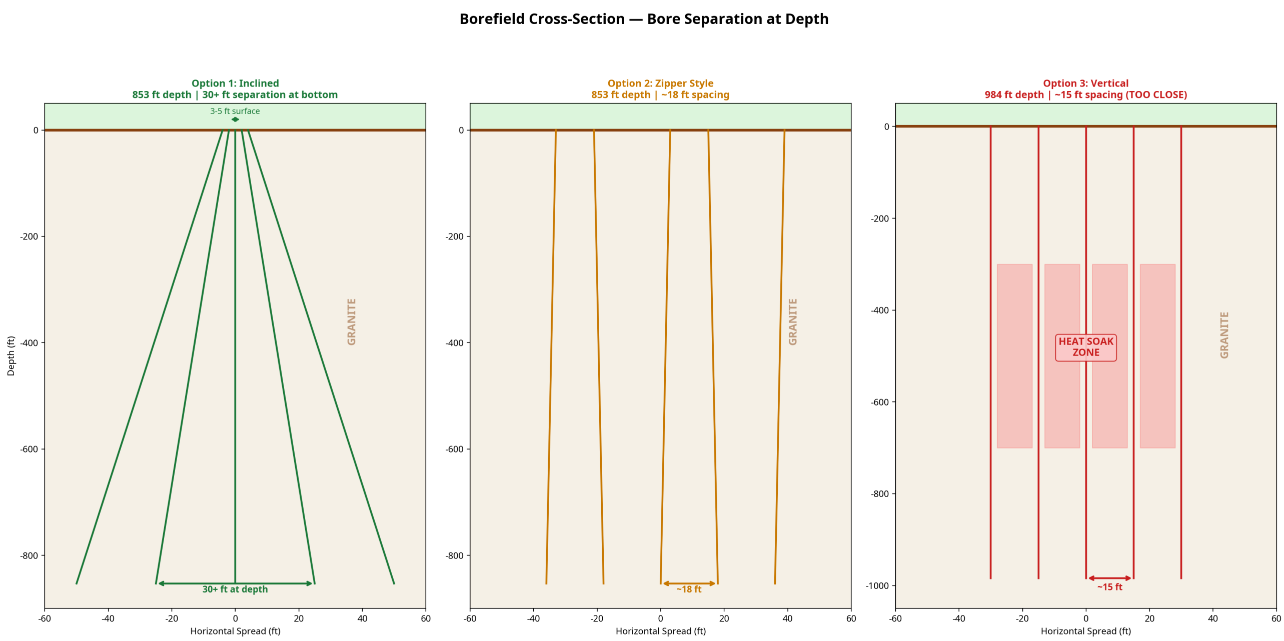

Figure 2: Cross-section view illustrating how the Inclined approach achieves superior bore separation at depth, while the Vertical option creates a high-risk "heat soak" zone.

3.2 Technical & Cost Comparison

Metric	Option 1: Inclined	Option 2: Zipper Style	Option 3: Vertical
Bore Count	110 Bores	164 Bores	220 Bores
Drilling Depth	260m (853 ft)	260m (853 ft)	300m (984 ft)
Total Footage	93,832 ft	139,895 ft	216,535 ft
Energy Coverage	100%	100%	90% (See Appendix B)
Base Project Cost	$4,707,156	$7,482,145	$11,852,845

- **Option 1 (Inclined):** Our recommended high-density approach. It provides 100% load coverage at the lowest CAPEX with 90% less impact on the existing parking lot. By starting bores at a tight surface spacing (3–5 ft) and angling them outwards, we achieve 30+ ft of separation at depth, eliminating the thermal interference risk that plagues dense vertical fields. (See Appendix A for detailed analysis).
- **Option 2 (Zipper):** A hybrid approach that offers a balance between density and traditional drilling methods.
- **Option 3 (Vertical):** The conventional method. On this constrained site, fitting 220 bores forces spacing down to ~15 ft, resulting in thermal interference and a 10% loss in energy capacity.

3.3 GeoPioneer Delivery Capability

Capability	Description
Borefield Design	Full thermal modeling and optimization for all three drilling configurations.
Driller Preparation	We equip any drilling contractor with the tools, specifications, and D&I control for the chosen method.
Surface Piping Design	Custom design of headers and manifolds, including mini-manifold systems that reduce piping complexity.
D&I Control	Full drilling and installation quality control to ensure every bore meets design specifications.

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4. Scope 2: Thermal Network — Detailed Analysis

Connecting the campus buildings with a 5th Generation Ambient Loop (thermal network) is critical to maximizing efficiency. It allows the buildings to share energy, reducing the total load on the geothermal borefield. We have partnered with the leading thermal network designer in North America to deliver these advanced systems.

4.1 Building Thermal Profiles

The reference campus consists of three buildings with distinct thermal personalities, making it ideal for an energy-sharing network.

- **Building 1 (100k sq ft):** Glass-heavy and cooling-dominant, constantly rejecting heat.
- **Building 2 (100k sq ft):** Poorly insulated and heating-dominant, constantly needing heat.
- **Building 3 (56k sq ft):** LEED Gold with an existing 50-bore field, acting as a thermal stabilizer.

4.2 Thermal Network Connection Options

We evaluated three connection strategies for the campus, each with different levels of efficiency and cost. The diagram below illustrates the physical layout of each option.

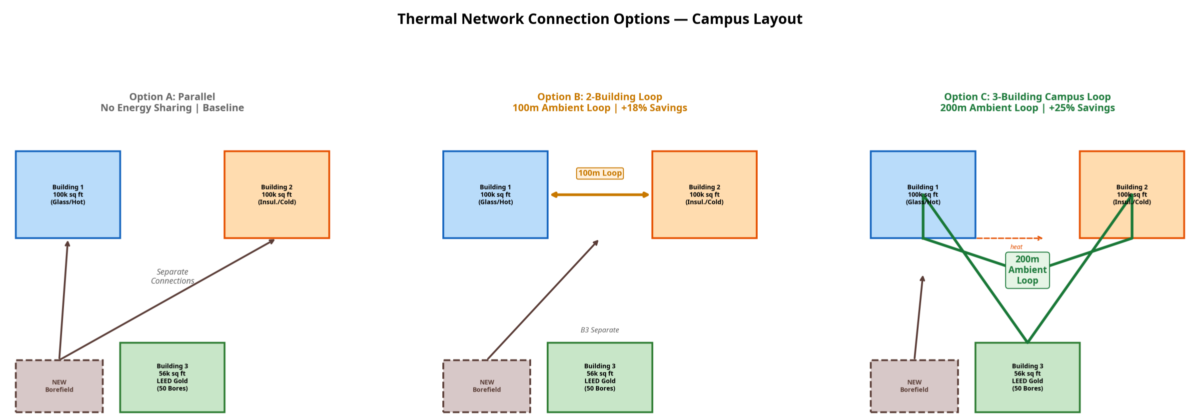

Figure 3: The three thermal network options, from a simple parallel connection to a fully integrated 3-building campus loop.

Scenario	Complexity	CAPEX Impact	Est. Energy Savings
A) Parallel Connection	Low	High (Individual Piping)	Baseline
B) 2-Building Loop	Moderate	Moderate (Shared Infrastructure)	+18%
C) 3-Building Loop	High	Lowest (Energy Sharing/Reduced Bores)	+25%

- **Option A (Parallel):** Each building is connected directly to the borefield. This is the least efficient model as it misses the opportunity for energy recovery. The borefield must be sized for the sum of the individual peak loads.
- **Option B (2-Building Loop):** A 100m ambient loop connects the two 100k sq ft buildings. This is highly efficient, as Building 1's waste heat is directly used by Building 2. This "diversified peak" allows for a smaller borefield.
- **Option C (3-Building Loop):** A 200m ambient loop connects all three buildings, creating a true 5GDHC network. Building 3's existing 50 bores become a shared asset, providing a thermal buffer and redundancy for the entire campus. This is the most resilient and efficient option, allowing for the greatest reduction in new drilling.

Recommendation: We strongly recommend bidding **Option C (3-Building Loop)**. It provides the highest efficiency and resilience, and by leveraging the existing assets of Building 3, it allows for the maximum reduction in the size and cost of the new borefield.

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5. Scope 3: High-Performance Windows

5.1 The "Virtual Borefield" Strategy

The final element of our collocated approach is a strategic upgrade of the building envelope. We have a unique supply chain that allows us to deliver **triple-pane windows with a U-factor of < 0.16 at the price point of standard double-pane solutions.**

This is a “Drilling Replacement” strategy. Instead of spending capital on more bores to serve an inefficient building, we invest that capital in the building envelope itself. This upgrade reduces the building’s peak heating and cooling demand by 25-30%, which in turn allows us to further reduce the size of the borefield. For every ~12 tons of load reduced by the windows, one 850-ft borehole can be eliminated.

5.2 Cost vs. Benefit

The cost of the premium windows is offset by the savings from drilling fewer bores. This makes the upgrade effectively **CAPEX-neutral** for the client while delivering significant long-term value: lower energy bills, improved occupant comfort, and increased asset value.

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6. Financial Analysis: Conservative Bore Reduction

By combining the thermal network (Option C) and the window upgrades, we can significantly reduce the required number of bores across all three drilling options. The following table applies a conservative **15% reduction for the network** and an **additional 15% reduction for the windows**.

Metric	Option 1: Inclined	Option 2: Zipper	Option 3: Vertical
Base Bore Count	110	164	220
After Network (-15%)	94 bores	139 bores	187 bores
After Windows (-15%)	**79 bores**	**118 bores**	**159 bores**
Total Bores Saved	31	46	61
Base Project Cost	$4,707,156	$7,482,145	$11,852,845
Optimized Cost	**$3,380,594**	**$5,383,495**	**$8,566,374**
Total Savings	**$1,326,562**	**$2,098,650**	**$3,286,471**

Even with the most expensive drilling option (Vertical), the collocated optimization strategy yields over **$3.2 million in savings**. When applied to our recommended

Inclined approach, the savings are substantial while delivering the best technical solution.

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7. Partnership & Next Steps

We are seeking partners who bring strong client relationships and general contracting capabilities. The GeoPioneer team will provide the integrated technical backbone: geothermal design and D&I control, thermal network engineering, and the proprietary window supply chain. The partner retains the prime contract and client relationship.

This collocated model creates a competitive moat that is extremely difficult for competitors to replicate, allowing our partnership to consistently win bids while maintaining premium margins. We look forward to discussing how we can bring this approach to your next project.

Contact: Dmitry Kuravskiy, GeoPioneer

Appendix A: Parking Lot Bore-Fitting Analysis

The project site is a 160 ft x 340 ft parking lot, totaling 54,400 sq ft. After a standard 5-foot setback from all edges, the usable area for drilling is 150 ft x 330 ft (49,500 sq ft).

Vertical Bore Capacity vs. Spacing

The number of vertical bores that can fit in this area is a direct function of the spacing between them. For deep bores (800+ ft) in granite, a minimum of 20 ft is required to prevent thermal interference.

- **At 20 ft spacing (Ideal):** A maximum of **136 bores** can fit within the usable area (8 columns x 17 rows). This is insufficient to meet the 220-bore requirement of the conventional vertical design.
- **At 15 ft spacing (Required for 220 bores):** To fit 220 bores, the spacing must be reduced to approximately 15 feet. This allows for 253 potential bore locations (11 columns x 23 rows), which accommodates the 220-bore design but creates a significant performance issue, as explained in Appendix B.

Inclined Bore Advantage

The Inclined drilling approach (Option 1) resolves this conflict. It uses a small surface footprint of only 6,120 sq ft (approximately 60 ft x 102 ft). Within this area, 110 bores are drilled at tight 3-5 ft surface spacings, but they are angled outwards to achieve **30+ feet of separation at depth**. This preserves 90% of the parking lot while ensuring optimal thermal performance.

Appendix B: The Problem of Thermal Interference (Why 220 Bores = 90% Coverage)

In a geothermal system, each borehole has a “thermal influence radius” — the volume of ground it draws heat from or rejects heat into. For deep bores in granite, this radius is approximately 10-12 feet.

The 20-Foot Spacing Rule

When boreholes are spaced 20 feet apart or more, their thermal influence zones do not overlap. Each bore can independently exchange heat with its own volume of earth, allowing the ground to “recharge” between heating and cooling cycles. This results in 100% of the designed thermal capacity being available.

The Conflict: 15-Foot Spacing

To fit 220 vertical bores into the available parking lot, the spacing must be reduced to ~15 feet. At this distance, the thermal influence zones of adjacent bores overlap significantly. This creates a condition known as **“heat soak”** or **“thermal interference.”**

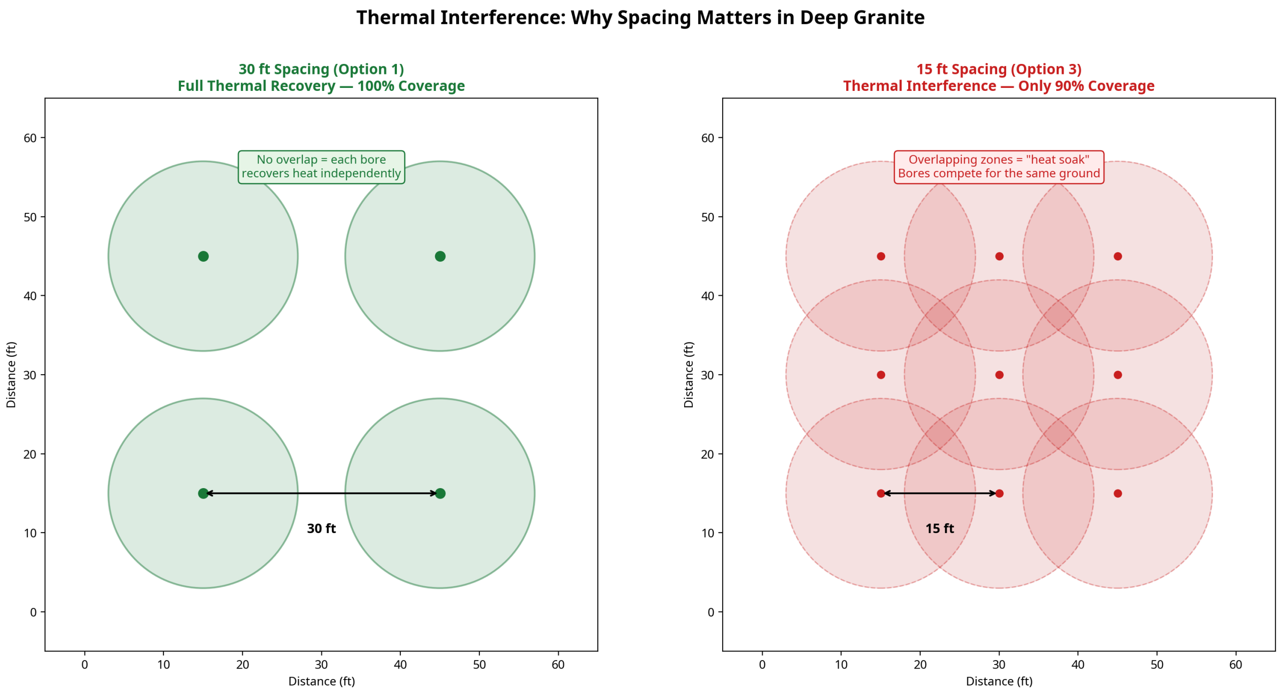

Figure 4: At 30 ft spacing (left), thermal zones are separate. At 15 ft spacing (right), the zones overlap, causing bores to compete for the same thermal energy and reducing overall system efficiency.

When these zones overlap, the bores are essentially competing for the same limited volume of rock. The ground between the bores cannot fully recover to its natural temperature, and the system's ability to reject or extract heat is compromised. Our analysis shows that this interference reduces the effective capacity of each bore by approximately 10%.

The result is that even though the system has 220 bores, it can only deliver 90% of the required energy. The remaining 10% must be supplied by a supplemental system, or the building will experience temperature shortfalls during peak demand. The GeoPioneer Inclined approach (Option 1) completely avoids this issue by ensuring adequate separation at depth.