To: Planning Board, Board of Selectmen, Kristine Trierweiler, Frank Gervasio, Brittney Franklin, Sara Raposa

Cc: Todd Trehubenko

From: Medfield Energy Committee

Subject: MEC response to the Preliminary Geothermal Feasibility Study by McPhail Associates, November 30, 2022

The purpose of this memo is to provide the Medfield Energy Committee's response to this study's conclusion that a geothermal district heating system is not feasible at the Medfield State Hospital.

In short, we believe that this conclusion is premature, given that the study is "preliminary" and that significant factors were not analyzed in detail. Most importantly, since McPhail Associates is a geotechnical engineering company, their preliminary study did not provide a lifecycle cost analysis of this system, though they alluded to financial advantages that we believe would show this system to be the best financial decision for Trinity and most cost-effective system for future residents.

To provide a more detailed response, we have grouped the factors they cite in their conclusion into two groups: technical and financial

Technical Factors

McPhail cited two technical factors weighing against the project:

1. Insufficient space to accommodate the number of bore holes required to serve all buildings
2. Challenges with installing the necessary piping network, specifically: "Installation of this piping is likely to encounter numerous active and abandoned below-grade structures and utilities, some of which likely contain ACM." (p. 10)

In addition, in their cover letter, Trinity ruled out the option of single-building geothermal systems citing increased complexity of maintenance and operations with two different systems on the campus.

We believe this analysis is incomplete. McPhail limited their bore hole placements to areas within the parcel that will be transferred to Trinity upon closure of the sale. The report fails to suggest that Trinity work with the town to obtain permission to locate boreholes outside this parcel. Since the town is allowing Trinity to locate a significant size parking lot outside the parcel (the Water Tower area), the report should have raised this possibility. A parking lot is a highly visible use of the land out of keeping with the historic character of the site while, after drilling, the boreholes will not be seen and would eliminate the need for outdoor units at each building. This would enable the geothermal system to serve all buildings, eliminating the concerns about operational and maintenance complexity of multiple systems.

One of the factors that make a geothermal system practical for this site is the fact that new water, sewer, and electric service that must be installed. The geothermal piping network will most likely be co-located in the same trench with these utilities. Installing these new utilities will already encounter the "active and abandoned below grade structures" and the addition of the geothermal piping network should result in minimal, if any, additional work if planned and engineered in conjunction with these new utilities.

In addition, we would like clarification about a statement on page 2 “that a new network of chilled water and steam pipes would lead from Building 10 to the 27 individual buildings.” Geothermal systems are not used to produce steam so this comment is unclear. Further, on page 4 McPhail states “Closed-loop systems circulate a water-antifreeze solution in a continuous closed piping loop through the mechanical equipment (heat pumps or heat exchangers) and return the water antifreeze solution to the well field.” Closed loop systems are the most commonly used today and we believe this would likely be the design of a system at MSH.

Financial Factors

The higher initial cost of installing a geothermal system is noted as a disadvantage and quantified. However, the advantages McPhail cites in operating, maintenance, and longevity are not quantified in lifecycle cost analysis. MEC believes this analysis would show a strong financial return on the initial costs.

McPhail rightly points out that geothermal systems have a higher upfront cost due to the drilling, piping network, and associated equipment and they estimate this cost at slightly over $7 million, about 90% of this cost being for drilling.

We believe this analysis is incomplete because:

1. McPhail, while acknowledging that incentives are likely available, did not provide specifics, instead recommending that Trinity consult an expert (page 3). We concur that this is an important step before any final decision about the viability of this concept. For example, while final guidance regarding the Inflation Reduction Act has not yet been published (but is expected this month), it is likely this project would qualify for a 30% tax credit and those tax credits will likely be transferable. This reduces Trinity’s cost and gives them access to substantial percentage of the capital needed for this project. In addition, MassSave offers an incentive of $2000 per ton of cooling capacity in their residential incentive program. At the estimate of 698 tons, the MassSave incentive could amount to $1.4 million dollars. Between these two incentives, the $7 million dollar estimate is reduced to $3.5 million.
2. McPhail rightly notes that geothermal systems are more energy efficient than air source equipment and provide “Less fluctuation in annual operating costs”. Trinity would benefit from lower operating costs and more predictability in those costs. A quick way to ballpark these savings is to look at the coefficient of performance of air source systems which are typically 2 – 2.5 on a seasonal basis compared to 4 – 5 for geothermal systems. This suggests savings of roughly 50% on electricity. New Bridge on the Charles in Dedham, which has been operating a geothermal system since 2006, reports that they have experienced this level of savings.
3. Further, McPhail states on page 3 that geothermal systems require less maintenance, have no outdoor equipment, and have greater longevity, stating, “three (3) replacements [of outdoor equipment] will be required before the loop warranty expires.” Each replacement cycle for outdoor air source equipment (potentially one unit per apartment or 334 pieces of equipment) is likely to cost millions of dollars.
4. Lifecycle analysis will likely show geothermal to be more profitable for Trinity. Taken together, the net cost of the project after incentives, plus the lower operating, maintenance, and replacement capital expenditure costs indicate the likelihood of a strong financial payback for

the investment in a geothermal system. We believe this merits a rigorous financial analysis before a final decision is made.

5. McPhail's estimated drilling cost of $21,500 per bore hole, may be too high. In an August 29, 2022 call that MEC facilitated between Trinity and several Eversource representatives concerning Eversource's Framingham district geothermal pilot, Eric Bosworth, the project manager, cited drilling cost of $15,000 per bore hole. At this cost, the overall project cost would drop to just over $5 million gross, $3.5 million after the 30% IRA tax credit, and $2.1 million after the MassSave incentive.

Other considerations

Some additional concerns were mentioned in passing in the McPhail report and Trinity's cover letter but we believe they can be addressed in ways that don't weigh against the geothermal system:

- Potential delays: MEC has advocated for the geothermal district system early and often to help Trinity avoid any potential delays. If the system is planned an engineered alongside the new utility systems, scheduling should be manageable.
- Capital needs: Trinity notes its focus on "strategies to secure funding for the extraordinary site costs for hazardous materials and infrastructure." One strategy MEC has mentioned in the past is to outsource the geothermal district system to firms that specialize in them. These firms provide the capital, engineering and construction services and potentially the ongoing operational management. This approach would remove the capital for this system from Trinity's books, much like they are planning to do for any solar panel installations. We have provided lists of these firms to Trinity in the past and will be happy to provide them again.

Considerations for the Planning Board and Town of Medfield

We believe that we have demonstrated that the financial case is potentially beneficial to Trinity and to the long term success of the development that it justifies further analysis. We believe a geothermal district system also offers benefits to the town in achieving our objectives for the redevelopment of the property and other long-term goals.

- Affordability for future residents: the lower costs of the geothermal system will benefit future residents in either lower utility bills (if units are metered separately) or lower rents if utilities are included.
- Preservation of the character of Medfield State Hospital: As noted there is no outdoor equipment with a geothermal district system and, as a result, the system is virtually silent. Air source heat pumps will likely require multiple outdoor units for each building which have both visual and noise impact on the property.
- Achieving Massachusetts and town climate goals: This is likely the largest development Medfield will see between now and 2050 and so minimizing its carbon emissions is critical to achieving net zero emissions by that date. The higher efficiency and lower electricity use of the geothermal system will result in substantially lower emissions in the short term, and ultimately be net zero emissions as the grid evolves to 100% renewable energy.

Conclusion

The financial case alone justifies further analysis of a geothermal district system at Medfield State Hospital. The additional benefits to the town and future residents provide further reason to explore this option and work to make it a reality.

Respectfully submitted,

Medfield Energy Committee

Jim Nail, Co-Chair