Response to Reviewer Comment 1 | EGUSPHERE-2023-2097

"**Long-term legacy of phytoremediation on plant succession and soil microbial communities in petroleum-contaminated sub-Arctic soils"**

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We would like to thank the reviewer for their thoughtful re-review of our manuscript. The original reviewer comments are written in black *and our reply in* ***blue and italics****.*

I recommend accepting the article as the authors have satisfactorily addressed my previous comments and suggestions. There are a few minor details that could still enhance the article, but overall, the revisions meet the required standards. Below, I detail my responses to the authors' modifications:

Script Accessibility: The addition of a GitHub repository for the scripts used in the analyses is commendable. This significantly enhances the study's transparency and reproducibility.

Pyrosequencing Data Clarification: The authors provided a justification for the relevance of pyrosequencing, supported by a reference to a comparative study demonstrating its comparability to newer NGS technologies. The inclusion of specific literature references strengthens the manuscript. However, discussing a broader range of studies could provide stronger support for the continued use of pyrosequencing.

Thank you for your detailed re-examination of the manuscript. We appreciate the need for stronger support for the use of this outdated technology and have added more information to the methods section to clarify potential issues associated with the use of pyrosequencing and added more examples from the literature of studies that rely on pyrosequencing to advance the understanding of environmental microbial communities (lines 173-177, in the revised manuscript). We would like to be clear that by presenting pyrosequencing data we are not advocating for the continued use of pyrosequencing in the generation of new data, but that data generated by older technologies can continue to hold value for the field of microbial ecology as long as readers and researchers understand the limitations of data generated by these older methods.

Enhanced Figure Visualization: The effort to include color and shape variations in most figures improves readability and data interpretation. It is recommended that Figures 2 and 3 also receive these updates to maintain consistency across all figures and enhance the overall accessibility of the visual data.

Thank you for this suggestion, we had added the colour and shapes scheme to figures 2 and 3 to aid in data interpretation and maintain consistent coloration throughout the manuscript.

Comparison of Concentrations: The updated presentation of Total Petroleum Hydrocarbons (TPH) data and its comparison with findings from other studies enrich the discussion, adding value to the manuscript.

The manuscript has significantly improved with these revisions. The introduction now has a clearer focus, and the discussion section more effectively details the microbiome taxa identified. Additionally, the methods section has been enhanced with a comprehensive description of the processes used to enumerate diesel-degrading microorganisms. These improvements collectively bolster the manuscript's scientific rigor and its contribution to the field.