BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION OF NAVIGATOR HEARTLAND GREENWAY, LLC FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE HEARTLAND GREENWAY PIPELINE IN SOUTH DAKOTA	**HP22-002** **INTERVENOR** **RICK BONANDER &** **TAMARA FORD** **INITIAL PRE-FILED TESTIMONY IN OPPOSITION TO NAVIGATOR'S APPLICATION**

Q: Please state your name and whether or not you are a formal intervenor in these proceedings.

A: We are Rick Bonander & Tamara Ford and are formal intervenor in these proceedings.

Q: Do you either personally own or lease land or are you a fiduciary for any entity that owns or leases land or real property in South Dakota, that you believe would be negatively affected by the proposed Navigator hazardous CO2 pipeline (hereafter "proposed hazardous pipeline")?

A: Yes. Navigator send us a letter notifying us about this project. We do not know for sure if we are directly affected or just near by their proposed route.

Q: For the land that would be affected and impacted by the proposed hazardous pipeline give the Commissioners a sense how long the land has been in your family and a little history of the land and its importance to you.

A: This land has been in our family for many generations. The spot we built our home has been a place we have visited since we were kids. It has always been a quiet place of peace and reflection for us to retreat to. That is why we decided to build our retirement home on this property, to be a place for us to gather with friends and family. A place to build memories with our grandchildren. This particular location

is exactly 2 miles east of where my father grew up, so in addition to holding generational meaning to our family.

Q: Have you depended on the income from your land to support your livelihood or the livelihood of your family?

A: Yes.

Q: Please describe your property.

A: Our land is in Valley Springs, SD. We own several acres on either side of Beaver Creek. There is farm ground, pasture and our home. This is also home to wildlife including a nesting pair of bald eagles, deer, coyotes and a huge variety of birds, including herons, cranes and pheasants. We do have other building eligibilities for this land as well. The creek is also home to a variety of fish and reptiles including turtles.

Q: Describe for the Commission the negative impacts and difficulties not only operationally and financially but potentially safety wise as well that you have relative to your land's features as we discussed above.

A: If the PUC approves Navigator's proposed route, they therefore authorize Navigator's proposed easements across our land as well as force upon us all the terms of Navigator's easement forever. These potential actions by the PUC would have a permanent – forever – negative effect and impact on our land as well as our financial future, and on the economy of our county and State. The proposed route and easements would Of course I am worried about human safety for myself, my family and my neighbors if this pipeline were to rupture. But I am also worried about the impact of construction on the wildlife and the beauty of this area. The eagles have only been back to this area for a few years. The pheasant population is also growing. Construction would be detrimental to these birds. (Also I know that there are regulations when it comes to construction near a bald eagle habitat.) Destroying the area would have a huge financial impact on the value of this land. If someday our children wanted to build on the property or if we choose to sell when we move to the nursing home (many years from now if the CO2 doesn't kill us first)

the value will be limited. We are only 20 minutes from downtown Sioux Falls, 10-15 minutes from veterans Parkway and the Dawley Farms area. As the city continues to grow, the land in our area will become more valuable for development. There have been several new expensive homes built along the Navigator route in the last few years. This has the potential to destroy what could eventually be a high-end home neighborhood.

Q: What is your understanding of the Public Utilities Commission's (PUC) role related to this proposed hazardous pipeline?

A: Based on information provided in a PUC document entitled "South Dakota Public Utilities Commission Information Guide to Siting Pipelines" which is included here as **Attachment No. 2**, and my participation in these matters, I understand the PUC has the power to approve or deny Navigator's Permit Application. If approved by the PUC, Navigator would be able to route and site its proposed hazardous pipeline on, under, through, over, and across my land in question here and conduct any pre-construction, construction, and post-construction activities they deem necessary at any time it wants without my permission. If the PUC were to approve the Application and the route approved crossed any portion of my land, I would then be subject to an Easement agreement which restricts what I can do on my land and how I, and my tenants, and invited persons, and all future generations can conduct ourselves on the land – forever. An approval by the PUC is the trigger for Navigator to condemn my land using eminent domain powers to which I am opposed. So, the PUC has in its hands whether or not me and all future generations who seek to use and develop and work the land in question as we see fit will be unwillingly subjected to unwanted and restrictive permanent easements preventing us from doing so and subjecting us to liability and risk. The PUC's actions, if approval of the Application, would also negatively impact our economic future forever. The PUC has my and this lands entire future in its hands.

Q: Have you heard or read claims that PUC has nothing to do with easements or condemnation or similar claims?

A: Yes, and that is logically and practically an incorrect assertion. Can you have a pipeline route without easements? The answer is no – a pipeline route is simply a series of connected easements – that what a route is. If and only if the PUC approves this hazardous pipeline will my land and my and all future owners, tenants and visitors to my land be affected my pipeline easements, access easements, work space easements, and all the limitations and restriction and dangers and risk associated with those easements and what this proposed hazardous pipeline company and its future owners can do on my land and prevent me from doing on my land. No PUC approval means no unwanted easements and no unwanted property right transfer from my to the hazardous pipeline company. You cannot sperate what the PUC is doing in this proceeding with the taking of my property rights. PUC approval is a vote by this Commission that it is okay for my property rights to be taken and forever affected against my will and for the benefit of the proposed hazardous pipeline and its wealthy investors.

Q: And what about the condemnation piece – the PUC claims it has nothing to do with condemnation have you heard that?

A: I have heard that claim but again, same logic as above – no PUC approval means there is no project and no economic incentive to attempt to use eminent domain powers to condemn my land and my property rights. Only if the hazardous pipeline wanted to intimidate and scare me or send me a "message" or if they were so confident that this process is a rubber stamp for them would they start condemnation actions before the PUC officially approved the route. But even if they would start condemnation prematurely, they would not go through the entire process and trial and the ultimate final taking of my rights unless the PUC approved their Application, so no PUC approval means no ultimate taking of my property rights and ability to use my land now and in the future as I see fit.

Q: What should the PUC consider when assessing how the proposed hazardous pipeline will directly affect your land and property rights?

A: You have to review their proposed Pipeline Right-of-Way and Easement Agreement (herein referred to as the "Easement Agreement") with a fine-tooth comb. This is the document that is part and parcel of a PUC Application approval. A pipeline route but a continuance link of Easements. It is important to me that the PUC review this document in detail, understand the implications, and then consider all the implications relative to my land and property and how it is being used now and thinking into the future – forever – of how a PUC approval would therefore affect my land and my family. A true and accurate copy of an exemplar South Dakota Navigator "Pipeline Right-of-Way and Easement Agreement" is included here as **Attachment No. 3**. Navigator has not offered me terms different from those shown in Attachment No. 3.

Q: Please walk through the Easement Agreement and highlight your major concerns so the Commission can understand how their approval of Navigator's Application would affect you forever.

A: Well, the first question and concern I have is the company that would have perpetual rights in my land is identified as Navigator Heartland Greenway, LLC, a Delaware limited liability company with its principal office in Dallas, Texas.[1] I have tried to determine who owns this LLC and what its assets are but I can't figure it out and I am very concerned that the PUC could force this LLC upon me and no one knows who is behind the LLC curtain. If I am forced against my will to have a co-owner of my land in the way of a perpetual easement against my land to do as they see fit within the easement language, then I want to know exactly who I am dealing with and the PUC should require the LLC to reveal its owners and investors and if those owners and investors are also entities the PUC should require transparency at every level of ownership so we ultimately know the real people behind this private company. Also, this LLC is very new. When looking it up on the Delaware Secretary of State website it states the LLC was formed on August 13, 2021.

[1] See page 1 of the Easement

Q: What is your next concern?

A: Navigator claims in their Easement that the location of their desired easement on my land is a "location of which has been agreed to"[2] by Navigator and me as landowner, but that is not true and they have not indicated a final location so even if I wanted to agree to this, which I do not, I could not. The PUC should require Navigator to identify the final location of their desired easement.

Q: What is your next concern?

A: Navigator states in their Easement that the "Permitted Uses" they can put my land to without my say so include their ability to unilaterally "to construct, install, maintain, operate, replace, abandon in place, inspect, patrol, protect, test, repair, reconstruct, alter, relocate, remove, and any and all related uses thereto…"[3] It appears this includes about everything and there are no time limitations or restrictions or notice requirements as to any of these activities. Should the PUC approve this hazardous pipeline, which it should not, it should require reasonable limitations as to when these activities can be performed, for how long, and should be required to notify landowner well in advance of any such activity or entry onto landowner's land. Further, Navigator's desired right to "abandon in place" their hazardous pipeline on my land must not be allowed. Should the PUC approve this hazardous pipeline, which it should not, it should require Navigator, at landowner's sole request, to remove the pipeline. If a landowner does not request this or if Navigator and a particular landowner reach agreement and financial terms allowing the hazardous pipeline to remain, that should be up to each landowner. There is no provision for Landowner compensation for such abandonment nor any right for the Landowner to demand removal. Such unilateral powers would negatively affect Landowners property are not conducive to the protection of property rights or economic interest.

Q: What is your next concern?

[2] *Id.*
[3] *Id.*

A: If the PUC were to approve this Application, which it should not, in addition to locating a hazardous pipeline on my land Navigator reserves the sole right to also locate "one (1) or more fiber optic cables"[4] on my land. The PUC should limit this and limit the use to which such fiber optic cables can utilized for and to the extent possible allow landowners to benefit from such fiber optic cables.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, in addition to locating a hazardous pipeline on my land Navigator reserves the sole right to also locate upon my land any amount of "incident facilities, equipment and appurtenances including but not limited to above or below, test stations, power and communication equipment, markers, signage, and cathodic protection devices, and other necessary appurtenances to transport, measure, and control the flow of carbon dioxide and associated substances…"[5] This is far too vague and wide ranging, again no limitations and these roving rights Navigator would claim subject me and my property to significant restrictions as their rights dominate mine and this will prevent me and future owners and users of my land from improving and developing the land in the ordinary course. These restrictions have negative economic impacts now and into the future. I will not be able to increase the value and usable features on my land and will not do so in fear of having to remove in such desired improvements or be subject to Navigator's claims my desires interfere with their Easement rights. The less I can improve my land, the less valuable it is, the less real property and personal property tax is generated and the more South Dakota is harmed. Additionally, what does "and associated substances mean? I thought this was a CO2 pipeline only. If the PUC were to approve this Application, which it should not, it must limit what can be transported in this hazardous pipeline.

Q: What is your next concern?

[4] *Id.*
[5] *Id.*

A: If the PUC were to approve this Application, which it should not, in addition to locating a hazardous pipeline on my land Navigator reserves the sole right to also locate upon my land and use temporary construction areas and additional temporary workspaces areas. There is no limitation on how large these can be and there is no limitation on what "temporary"[6] means. How long is temporary? How long would Navigator be able to argue "temporary" is all the while prohibiting me from using my land how I see fit. I am also forced to spend more time and money away from what I want to be doing in order to prove and document to Navigator's sole satisfaction evidence and "documented damages" they caused. This is another negative factor and further burden of this unwanted hazardous pipeline.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, Navigator further infringes on my rights forever as they seize from me all "rights and benefits necessary or convenient for the full enjoyment or use of the rights [of Navigator] herein granted, including but without limiting the same, the free, non-exclusive right of ingress and egress over, across, and within the Easement, together with a free, non-exclusive right of ingress and egress to and from said Easement upon and over the Property, including private roads."[7] One of the many problems with this is that they define "Property" as my entire parcel – not just their desired easement area. So, if the PUC approves their Application, which it should not, Navigator would take a forever right to travel anywhere it desires on my entire Property – not just within the Easement area. This ability to have free reign on a landowners' entire property reduces the value of the property and chills my desire to economically improve my property which again is a detriment not only to me but to the entire State in lost tax revenue.

Q: What is your next concern?

[6] See paragraph #1 of the Easement
[7] See paragraph #2 of the Easement

A: If the PUC were to approve this Application, which it should not, Navigator further infringes on my rights forever as they have the right whenever they so choose at their "sole discretion, to cut all trees and undergrowth and remove other obstructions"[8] that in any way they deem to interfere with any of the many Permitted Uses they have as discussed previously above.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, Navigator further infringes on my rights forever as they have the right to remove any improvements, whether above or below ground, installed by me on the Easement after the date that Navigator acquires possession of the Easement. So, again directly negatively affecting my ability to use my land as I see fit and chilling any motivation I would have to further develop my land and install improvements. This hurst the tax base and value of my land and hurts the State's economy.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, I am prohibited from using my land for agricultural and pasturage purposes if they are in anyway "inconsistent with the [Navigator's] purposes set forth in this Pipeline Right-of-Way and Easement Agreement"[9] and will not "interfere with the use of the Easement…" What does this mean? If Navigator where to bury its proposed hazardous pipeline only five (5) feet below the surface then I can't use any equipment with tires five (5) feet in diameter or larger in my operations for fear if I would sink the tires could come in contact with the pipeline. Preventing my ability to stay competitive and utilize larger equipment to work my land negatively impacts me by not allowing me to be efficient as possible and reduces my profitability. There is no reason for me to keep buying the newest and latest equipment which hurts local businesses. All of this is a negative impact on the State's economy.

Q: What is your next concern?

[8] *Id.*
[9] See paragraph #3 of the Easement

A: If the PUC were to approve this Application, which it should not, I am prohibited from and cannot do any all of the following activities anywhere in the Easement area at any time and forever: "impound water upon the Easement, change the ground elevation or grade of the Easement, or construct or permit to be constructed any well, building, structure, improvement or obstruction, or plant any trees or shrubs that grow higher than 15 feet tall or have trunks larger than 3 inches in diameter at five feet upon the Easement or remove soil or change the grade or slope"[10] which would in any way interfere with Navigator's rights. These prohibitions make my land less usable, less versatile, and less valuable. This has a negative impact on me and the entire State.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, I can only construct, reconstruct, and maintain roads or drives only at a forty-five (45) degrees angle to the Pipeline but not along nor within the Easement and I can only do this if Navigator lets me – which they don't have to do.[11] This represents further restrictions negatively affecting how I can and will choose to use my land and limits the uses and development and therefore value of my land and hurts me economically and the entire State.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, I can only construct and/or install "water, sewer, gas, electric, cable TV, telephone or other utility lines over and across (but not along and within) the Easement at any angle of not less than forty-five (45) degrees and no more than one hundred thirty-five (135) degrees to the Pipeline" if Navigator allows me to – which they don't have to – and only if in Navigator's "protective requirements are met" by me at my sole expense and time investment. This represents further restrictions negatively affecting how I

[10] *Id.*
[11] See paragraph #4 of the Easement

can and will choose to use my land and limits the uses and development and therefore value of my land and hurts me economically and the entire State.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, Navigator has the sole ability to force me to cure or fix any issue that they in their sole capacity deem a breach of any of the restrictions and handcuffs the seek to place on me – and worse yet, I have to "promptly cure such breach at GRANTOR's [my] expense"[12] unless Navigator already cured the breach in which case it can force me to pay for the cost of everything they did. This type of unilateral power and unilateral cost shifting to me the landowner, is a detrimental economic effect to me and thereby the entire State.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, Navigator has the sole and "absolute right to assign, sell, lease, mortgage or otherwise transfer this Agreement in whole or in part…"[13] If Navigator exercises any of these rights and some unknown and unwanted party becomes the owner of the Easement on and pipeline and equipment on my land, not only do I have no say-so, Navigator "shall have no liability or obligation as to events occurring after the date of a permitted assignment, with all such potential liability or obligation for future events terminating…" If the PUC were to approve this Application, which it should not, it must require any new entity that would become owner or operator of this hazardous pipeline to first apply for and be granted permission to take this project over from Navigator. Assignment to any unknown person, company, or government could have terrible impacts upon all of South Dakota depending upon who may buy it and I don't know of any safeguards in place for us or the State to veto or have any say so in who may own, operate, or be responsible for this pipeline in the future. This concerns me because it would allow my easement to be transferred or sold to

[12] See paragraph #2 of the Easement
[13] See paragraph #6 of the Easement

someone or some company or country or who knows what that I don't know and who we may not want to do business with.

Q: What is the next concern you have with the Easement language?

A: Undefined terms leave a lot of room for confusion. What does the phrase "where rock is encountered"[14] mean and why does Navigator solely get to determine whether or not this phrase is triggered. This phrase could be used to justify installing the pipeline less than sixty (60) inches beneath the surface. The ability to use this provision to locate the pipeline at a depth that could negatively affect Landowners property are not conducive to the protection of property rights. A shallow pipeline is much more likely to become a danger and liability in the future given farming operations and buried irrigation lines and other factors common to the current typical agricultural uses of the land in question impacted by Navigator's proposed pipeline route.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, then I will not be able to recover for any damages caused by Navigator during its clearing of "any trees, undergrowth, brush and other obstructions"[15] because Navigator has determined in advance it will "not be liable for the damages caused by the clearing for the same from the easement(s)…" This is a negative economic impact on me and my land. I have no recourse for damage caused by Navigator in these instances. My time and money spent addressing such damages is time I can't get back and money that I would not spend elsewhere in South Dakota's economy.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, then I have no liability protection and am directly exposed to liability as Navigator offers no indemnification or hold harmless protections to me for what damages or injury

[14] See paragraph #9 of the Easement
[15] See paragraph #11 of the Easement

occur on my Property outside of the specific Easement areas.[16] This is true because, as discussed above, if the PUC approves this Application, then Navigator has a blanket right to access my entire Property and is not limited to the Easements. Also, Navigator can allege either I or any person whom is on my property is negligent or partially negligent and I could be subjected to damages claims that would bankrupt me. Navigator also shifts potential liability to me for any of my negligent acts that may occur in the Easement areas.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, then I am exposed for significant personal liability for any damages due to the existence of and potential release or rupture or spill from the hazardous pipeline.[17] I have reviewed my insurance policies and coverage for my property and obtained information from my insurance company. I have learned that my insurance policies have what is known as a "pollution exclusion" and that I would have no insurance coverage should any damage or injury be caused by a carbon dioxide release from the hazardous pipeline as carbon dioxide is considered a "pollutant" under my policy. I have considered this scenario: "If a hazardous pipeline transporting carbon dioxide is placed upon my land, and either I or someone I have invited onto my land is determined to be responsible for some damage to the pipeline or responsible for an event that caused some damage to the pipeline, and then CO2 escapes and injuries a person, or livestock, or property either on my own property or on my neighbors – do any of my insurance policies I have provide me a lawyer for a defense AND provide me insurance coverage to pay for the damage/injuries?" In considering these questions I have determined not only does my policy not afford me a lawyer and not afford me a legal defense that I also have no coverage for such a scenario, nor can I purchase coverage or an insurance rider. I would be completely unprotected and exposed to liability, and I would have to pay for my defense out of my own pocket

[16] See paragraph #12 of the Easement
[17] See paragraph #12 and #13 of the Easement

and personally pay for and damages ultimately attributed to me. This is unacceptable. The PUC must deny this project for these reasons alone. The PUC cannot put landowners out in the cold to defend ourselves without any assistance. I should never have these kinds of risks due to the presence of a hazardous pipeline I do not want. If the PUC were to approve this Application, which it should not, it must require Navigator to be solely responsible for any injuries or damages of any kind either directly or indirectly caused by any release of CO2 from their pipeline other than those caused by criminal acts of the landowners. The PUC must also require Navigator to add each and every landowner and their tenants as additional insureds on all Navigator liability insurance policies.

Q: Do you have any other concerns about this liability issues?

A: When evaluating the impact on property rights implicated by Navigator's Indemnity provision, you must consider the potentially extremely expensive fight a Landowner would have over this question of whether or not damage was an act of negligence. Putting this kind of potential liability upon the Landowner is incredibly problematic and is detrimental to the protection of property rights. I don't think this unilateral power which I can't do anything about as the landowner is in the best economic interest of the land in question or the State of South Dakota for landowners to be treated that way.

Q: **Is there any specific event or example you are aware of that makes this concern more real for you?**

A: Yes, one need not look further than a November 3, 2015, lawsuit filed against Nemaha County, Nebraska landowner farmers who accidently/negligently struck two Magellan Midstream Partners, LP pipelines, one used to transport a mixture of gasoline and jet fuel and a second used to transport diesel fuel. Magellan alleged **negligence** and sued the Nebraska farmer for $4,151,148.69. A true and accurate copy of the Federal Court Complaint is here as **Attachment No. 4.** The ability of a large company like Navigator, or whoever buys their pipeline once they cash out to be able to sue me or place blame on me because they choose to put something on

my land against my will is in no way in the public interest and is a reason this Application must be denied.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, then Navigator has "the right to discharge or redeem for GRANTOR [landowner], in whole or in part, any mortgage, tax or other lien on said Property…"[18] if I were to default on my mortgage. Navigator should not have this right, and the PUC should reject their Application on this basis alone. Navigator should have no right to get involved in my financial affairs or those between myself and my bank or lender.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, then Navigator forces landowner to deal directly with its tenant regarding any compensation landowner negotiates for any Easement or any damages landowner receives in terms of allocating any such payments between landowner and tenant. This guarantees that landowner will never be made whole by Navigator for such damages as landowner and tenant have different interests and should each independently be compensated by Navigator for such damages. Landowner should not be made to be the agent of Navigator to deal separately with claims its tenant may be entitled to bring for compensation.[19]

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, then Navigator forces landowner relinquish and waive any "claims, now and in the future, which challenges the validity of the Easement or this Agreement or that seek additional compensation relating to the grant of the Easement."[20] So, even if the Easement or any portion of it is deemed unlawful, I can take any action and am not entitled to any further compensation regarding the Easement.

[18] See paragraph #16 of the Easement
[19] See paragraph #17 of the Easement
[20] See paragraph #18 of the Easement

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, it is essentially approving a roving right for Navigator to locate its hazardous pipeline anywhere on my land. On Exhibit A of the Easement[21] it talks about "proposed length" "proposed acreage" and states the Exhibit A is "[F]or informational purposes only." It is not a plat or a survey. So, I am in the dark – as is the PUC – of what it would be approving given there is no "final" route to approve. The PUC should deny the Application on this basis alone. It is not fair for Navigator to have a roving right across my entire property or any length, size, and location of easements on my land it desires.

Q: What is your understanding of the significance of the Easement as proposed by Navigator?

A: My understanding is that this is the document that will govern all of the rights and obligations and duties as well as the limitations of what I can and cannot do and how I and any future landowner and any person I invite to come onto my property must behave as well as what Navigator is and is not responsible for and how they can use my land forever. This is why the PUC cannot pretend the Easement is anything other front and center in these proceedings. No court no judge no jury can change the terms of the Easement, only the PUC now can consider what Navigator wants to force upon all of the land at issue in these proceedings and consider those effects in terms of the factors the PUC is to consider when evaluating Navigator's Application.

Q: You have discussed a number of concerns of how you would be negatively impacted by the terms and restrictions in the Easement alone should the PUC grant Navigator's Application, do you think those negative effects go beyond just you as directly affected landowner?

A: Yes, while myself, my family, future generations, and my land would all be directly and negatively impacted it doesn't stop there. Just like Navigator wants to claim

[21] See Attachment No. 1 - Exhibit A of the Easement

there is a multiplier effect economically by the spending during construction and increased consumption by the workers or others in South Dakota, the flip side is that the negative impacts on me and my land are forever – the easement is forever and therefore any restrictions or limits or outright bans on my and any future landowners' ability to use their land as they see fit, and to improve or develop their land is a direct and ongoing negative economic impact locally on smally business that are not getting contracted to do work or certain projects, I believe the value of my land decreases should this hazardous pipeline and associated Easement terms cast a cloud over my land forever, and I intend to protest my valuations and seek a reduction in property tax which will negatively affect that State – and Navigator is not making this up. They will pay no real property taxes on any of the Easements obtained. My state also suffers due to the ripple effect of less development, expansion, and property improvement. This project has no net benefits – it is a net negative on the State.

Q. Do you have additional concerns how you would be negatively affected should the PUC approve this Application?

A: Yes, I didn't mention the compensation piece. Navigator proposes to pay me one time only for the Easements. They do not propose recurring annual or quarterly payments. They make my land a liability when it was previously an asset. If this was forced upon us, we should be paid a royalty of some percentage of the annual profits and value generated by Navigator and its investors. They can't earn dollar number one without my land and the land of others and we should be compensated much differently than they propose. It is not fair to the landowner, the county, or the State. It is not fair to the landowner because they want to have my land forever for use as they see fit so they can make a daily profit from their customers. If I was to lease ground from my neighbor I would typically pay twice a year every year as long as they granted me the rights to use their land. That only makes sense – that is fair. If I was going to rent a house in town I would typically pay monthly, every month until I gave up my right to use that house. By Navigator getting out on the

cheap and paying once in today's dollars that is monthly, bi-annual, or at least an annual loss in tax revenue collection on the money I would be paid and then pay taxes on and contribute to this state and this country. It is money I would be putting back into my local community both spending and stimulating the local economy and generating more economic activity right here. Instead Navigator's shareholders keep all that money and it never finds its way to South Dakota.

Q: Do you think it is in the public interest of South Dakota to not be one-hundred percent clear on exactly who could become the owner of over hundreds of miles of South Dakota land?

A: No.

Q: Do you think it is in the public interest of South Dakota to not be one-hundred percent clear on exactly who will be operating and responsible for hundreds of miles of hazardous pipeline underneath and through South Dakota land?

A: No.

Q: Do you think that type of uncertainty and lack of control over a major piece of infrastructure crossing South Dakota is in the public interest?

A: No, certainly not, in fact, just the opposite.

Q: Does it makes sense to you that PUC approval of the Application would lead to a perpetual Easement affecting you and your land?

A: I am unaware of any data proving there is a perpetual supply of carbon dioxide and the irony is we are supposed to produce less carbon dioxide and curb those activities more each year so one of the purposes of this project renders it by definition very limited in time and not something that a permanent easement should be available. Nowhere in Navigator's application does it even attempt to argue let alone prove there is a perpetual necessity for this hazardous pipeline or to transport CO2 to Illinois. My understanding of energy infrastructure like wind towers is they have a decommission plan and actually take the towers down when they become obsolete or no longer needed. Nothing manmade lasts forever. My land however will, and I want my family or future South Dakota families to have that land as undisturbed as

possible and it is not in my interest or the public interest of South Dakota to be forced to give up perpetual and permanent rights in the land for this specific kind of pipeline project. It is also not prudent to authorize a forever interference on my property so Navigator can chase twelve (12) years of tax credits.

Q: Do you have any other concerns about the Easement language that you can think of that is important for the PUC to know at this time?

A: Generally such unilateral restrictions and limitations on my rights is not conducive to the protection of property rights or my economic interest. I reserve the right to discuss any additional concerns that I think of at the time of live testimony during the Hearing.

Q: Based upon what you have shared with the Commission above regarding Navigator's proposed Easement terms and agreement, do you believe those to be reasonable or just, under the circumstances of the pipeline's impact upon you and your land?

A: No, I do not believe those terms to be reasonable or just for the reasons that we discussed previously.

Q: As the owner of the land in question and as the person who knows it better than anyone else, do you believe that Navigator offered you just, or fair, compensation for all of what they proposed to take from you so that their hazardous pipeline could be located across your property?

A: No, I do not. Not at any time has Navigator, in my opinion, made a fair or just offer for all the potential impacts and effects and the rights that I'm giving up, and what we will be prevented from doing in the future and how their pipeline would impact my property forever and ever.

Q: Has Navigator ever contacted you and specifically asked you if you thought their proposed location of their proposed pipeline across your land was in your best interest?

A: No, they have not.

Q: Has Navigator ever contacted you and specifically asked you if you thought their proposed location of their proposed pipeline across your land was in the public interest of the State of South Dakota or for public use?

A: No, they have not.

Q: Are you familiar with the Fifth Amendment to the U.S. Constitution and the Takings Clause and the corollary in the South Dakota Constitution?

A: Yes, I am.

Q: What is your understanding as those relate to taking of an American citizens property?

A: My understanding is that, according to the United States Constitution and South Dakota's Constitution, that if the government is going to take land for public use, then in that case, or by taking for public use, it can only occur if the private landowner is compensated justly, or fairly.

Q: What is your understanding of the PUC's framework for decision making relative to this proposed hazardous pipeline?

A: **Attachment No. 2** includes four (4) main elements of proof that Navigator has the sole burden to prove as summarized here: a) that Navigator will comply with all applicable laws and rules; b) that no aspect of Navigator's proposed hazardous pipeline will pose a threat of serious injury to: the environment, or to the social condition of current inhabitants or expected inhabitants in the siting area, or to the economic condition of current inhabitants or expected inhabitants in the siting area; c) that no aspect of Navigator's proposed hazardous pipeline will substantially impair the health, safety, or welfare of the inhabitants; and d) that no aspect of Navigator's proposed hazardous pipeline will unduly interfere with the orderly development of the region – with special consideration given to the views and positions of the governing bodies of affected local units of government.

Q: What is your testimony regarding whether or not Navigator will comply with all appliable laws and rules?

A: That is impossible for the PUC to know and therefore it can't find in Navigator's favor on that element. This type of analysis can only be based on what Navigator claims it will do and given they have already admitted to failing to follow the law regarding their failure to timely and sufficiently notify all required persons affected by their Application and proposed route, the evidence available weighs against this element being able to be satisfied. Further, South Dakota counties have passed moratoria, ordinances, and regulations related to hazardous pipeline setbacks and other issues and Navigator has not yet committed to following those applicable laws and rules and until they do, the PUC must deny their Application for failure to meet their burden of proof as to this element.

Q: Do you believe any aspect of Navigator's proposed hazardous pipeline will pose a threat of serious injury to the environment?

A: Yes, I do. There are many aspects of the proposed hazardous pipeline that pose threat of serious injury to the environment. I adopt and incorporate here all such concerns of all other witnesses. There are many such environmental concerns and I also adopt and share those as incorporated here and found in **Attachment No. 5,** It's Time to End Carbon Capture of Climate Policy**; Attachment No. 6.** The facts, opinions, and arguments referenced here by no means include all such threats posed but highlight some of the many.

Q: Do you believe any aspect of Navigator's proposed hazardous pipeline will pose a threat of serious injury to the social condition of current inhabitants or expected inhabitants in the siting area, if yes, why?

A: Yes. The proposed Navigator pipeline will pose a threat of serious injury to current future and social conditions, for the following reasons.

The proposed project's finances and commercial foundation are dependent for ongoing commercial viability on the federal 26 U.S.C. § 45Q carbon capture tax credit program, which I will refer to as the 45Q Program. This dependency creates a risk to South Dakota's social conditions. The purpose of the 45Q program is to reduce carbon emissions as a means to mitigate climate change. It was originally

established by Congress in 2008 with a maximum tax credit benefit of $20 per metric ton of carbon captured and sequestered. In 2018, Congress increased this value to $50 per metric ton. In 2022, Congress further increased the value to up to $85 per metric ton as part of the Inflation Reduction Act. The 45Q Program tax credits are available for the first twelve years of a capture facility's operation, but the program has no limit on the total amount of tax credit claims by taxpayers or the tons of carbon dioxide sequestered. Thus, the 45Q program does not limit the number of capture, transportation, and sequestration projects it may support. Further, these tax credits are essentially transferrable and the Inflation Reduction Act allows certain entities to claim them as a cash benefit paid by the U.S. Treasury, in certain circumstances converting this tax credit into a federal grant.

The Navigator Project was proposed in 2021 when the 45Q tax credit for sequestered carbon stood at $50 per metric ton. Then, in 2022, the tax credit was increased to $85 per metric ton. At a tax credit rate of $85 per metric ton, and given the Navigator pipeline system's ultimate capacity of 15 million metric tons per year, the emitters of carbon dioxide that are contracted with Navigator could receive up to $1.275 billion in federal tax credits per year, or $15.3 billion over twelve years. This federal tax benefit would provide essentially all of the revenue needed to pay for construction of the proposed project as well as Navigator's ongoing transportation and sequestration services. That is, the proposed Navigator Project is financially entirely dependent on the ongoing existence of the federal 45Q Program.

The Navigator Project does not appear to have any other current government subsidies or market-based support sufficient to support its financial viability. Navigator claims that its contracted ethanol plants may benefit from the low carbon fuel credits currently available in California, as well as possible similar programs that may be established in other states. However, the value of these low carbon credits is highly variable and dependent on supply of and demand for such

credits. The more entities that lower their carbon score, the less valuable the credits become. The carbon dioxide emitters that are connected to the Navigator system may be able to benefit from low carbon fuel credits to some degree, but by themselves such credits would likely not support the construction and ongoing operation of the proposed project. Low carbon fuel credits existed before Congress increased the value of the 45Q tax credits to levels that made the proposed project financially viable, indicating that the low carbon fuel credits by themselves were not sufficient to support development of regional carbon capture pipelines systems. Thus, low carbon fuel standard programs, now and in the future, are unlikely to provide sufficient financial benefits to justify the construction and ongoing operation of Navigator's proposed pipelines.

Another possible commercial foundation for the Navigator system is use of captured carbon dioxide in enhanced oil recovery operations. For example, carbon dioxide has been captured at the Arkalon and Bonanza ethanol plants in Kansas, since 2009 and 2013, respectively and transported to enhanced oil recovery operations 15 miles to Oklahoma and 90 miles to Texas, respectively. However, these existing ethanol carbon capture and enhanced oil recovery projects have always been dependent on the 45Q Program and are much smaller scale projects. Moreover, enhanced oil using supercritical carbon dioxide has existed since the 1970s, but has not generated sufficient revenue by itself to support the cost of constructing carbon capture facilities and transporting anthropogenic carbon dioxide long distances to enhanced oil recovery operations. If enhanced oil recovery had been sufficiently profitable without federal subsidies to support anthropogenic carbon capture, then the carbon capture industry would have grown without the need for federal tax credits. Therefore, it is very unlikely that use of the captured carbon dioxide for enhanced oil recovery would by itself support the costs of constructing and operating the proposed project.

In addition, there is a commercial market for limited amounts of carbon dioxide for use in industrial and retail settings, but the total demand of such commercial markets

is very small relative to the capacity of the Navigator Project, and existing demand is met via existing carbon dioxide production facilities. Commercial demand for carbon dioxide is simply too small to support infrastructure on the scale of the proposed project.

Neither the low carbon fuel credits, enhanced oil recovery, nor other existing commercial uses of carbon dioxide are likely to provide sufficient revenue to support development of carbon capture systems on a scale of the Navigator Project. Thus, the Navigator Project's current and future financial viability is entirely dependent on the continuation of the 45Q Program.

This dependency creates substantial long-term risks to the financial security of South Dakota's ethanol and corn industries. First, unlike other federal agricultural programs that subsidize South Dakota's otherwise market-based agricultural economy, the market for captured carbon dioxide is based for all practical purposes entirely based on the 45Q Program. The 45Q Program does not subsidize an existing market-based industry; it creates an entirely new industry, namely the carbon dioxide sequestration industry, which collects a pollutant and disposes of it. The 45Q Program converts a liability (carbon dioxide) into an asset. Absent the 45Q program, the carbon dioxide sequestration industry would not exist to the extent necessary to support construction and operation of Navigator Project. While it is true that construction of the Navigator Project would create a new revenue stream in the form of tax credits for ethanol plant investors, it is also true that this revenue stream would be entirely dependent on the continued existence of the 45Q Program, that in turn would depend on the financial health of the federal government and ongoing political support for the 45Q Program. As federal budget deficits increase, political pressure to limit federal expenditures will likely also increase, putting at risk funding programs deemed unnecessary or politically vulnerable, such as the 45Q Program.

Navigator's application states that, "[t]he Heartland Greenway System will facilitate significant CO_2 emissions reductions that will allow industry and governments in

the project footprint to meet their carbon reduction goals." Navigator, however, does not identify any provision in South Dakota state law or local ordinances that mention or even recognize the existence of climate change, much less impose carbon reduction goals. Thus, the policy purpose for the Navigator Project, which is climate change mitigation, is not in accordance with South Dakota law and does not advance state policy objectives. South Dakota's governments do not agree that climate change exists and have not adopted policies to mitigate it. Yet, Navigator seeks South Dakota government approval for its project, the sole purpose of which is to mitigate climate change. Approval of the Navigator Project advances a policy objective with which the State of South Dakota does not agree.

Moreover, there are no federal mandates that South Dakota must approve the Navigator Project or any other carbon capture climate change mitigation project. Federal law does not require South Dakota to support carbon capture and storage. It is possible that future federal air quality regulations may make carbon capture one option for addressing carbon dioxide emissions, but the promulgation of such possible rule is at best years in the future, subject to litigation, subject to rejection by future federal administrations aligned with South Dakota's position on climate change policy, and therefore entirely speculative. The Commission cannot approve the proposed project based on a claim that federal mandates require approval of the proposed project, because such mandates do not currently exist and may never exist. While the federal government currently has climate change policy objectives, it has not required development of carbon capture projects, but rather created tax credits that encourage but do not mandate such development. Participation in the 45Q Program is voluntary. Therefore, the federal government has left decisions on the merits of carbon capture projects to the judgment of state governments, which are free to support or reject any particular project or the carbon capture industry as a whole.

Given the State of South Dakota's rejection of the need for climate change mitigation and its freedom to accept or reject carbon capture development, a

Commission approval of Navigator's proposed project would likely be seen by many South Dakotans as an extreme example of hypocritical government action. As such, Commission approval of the Navigator Project would result in substantial reputational damage to and a loss of citizen trust and faith in the Commission and South Dakota's state government in general. Since faith in government institutions is part of the bedrock of American society, such damage would constitute "a threat of serious injury . . . to the social . . . condition of inhabitants or expected inhabitants in the siting area," as well as within all of South Dakota.

The Navigator Project also creates a threat of serious injury to the social conditions in South Dakota due to excessive state and local dependency on a politically unstable federal funding program. The threat of anthropogenic climate change is the subject of considerable political controversy within the United States and South Dakota. The future commercial viability of the 45Q Program and the Navigator Project is entirely dependent on ongoing federal political support for climate change mitigation in general and the 45Q Program in particular. A change in federal leadership that agrees with the State of South Dakota's position on climate change could result in future congressional and administrative actions to reduce or even eliminate the 45Q Program. Further, the ongoing viability of the 45Q Program is dependent on the financial health of the federal government, including the fiscal impacts of the ever-growing federal budget deficit. Given that the 45Q Program includes no cap on federal financial outlays, it will increase the federal deficit potentially by tens or even hundreds of billions of dollars annually, depending on how fast it grows. In the event of a severe economic downturn or a federal government default on its loans, Congress could reduce or entirely eliminate the 45Q Program, prior statutory commitments notwithstanding. Thus, the commercial foundation for the Navigator Project is built on a political foundation that is too unstable to justify making South Dakota's corn and ethanol industries dependent on it.

In the event that the 45Q Program falls out of favor, the commercial foundation for the Navigator Project could disappear quickly, causing it to precipitously cease operation, in which case South Dakota's corn and ethanol industries would face a potentially existential financial shock that could significantly disrupt South Dakota's agricultural industries, many rural communities, and the state's overall economic wellbeing. Further, landowners would be saddled with paying for the cost of abandoned pipeline mitigation. It is one thing for South Dakota to accept federal subsidies for production of agricultural commodities for which there will always be demand. It is an entirely different thing to base a substantial part of South Dakota's farm economy on an entirely new federally created non-market-based industry that captures a waste product for which there will never be significant commercial demand. There is a risk to tying South Dakota's market-based agricultural economy to politically and fiscally unstable federal largess. Construction of the Navigator Project would make its contracted ethanol producers and the farmers that provide them with corn overly dependent on a politically unstable federally created artificial market for carbon dioxide. A demise of this market, for either political or fiscal reasons, would severely damage the State's agricultural economy and disrupt rural communities throughout South Dakota. Such community disruption would constitute "a threat of serious injury . . . to the social . . . condition of inhabitants or expected inhabitants in the siting area," as well as within all of South Dakota.

While the promised financial benefits of the Navigator Project appear to be tempting, their acceptance would come at a cost and create a threat of serious injury to the political and social fabric of the State of South Dakota.

Further, I adopt and incorporate the opinions found in **Attachment No. 7** and those **found in Attachment No. 8.**

Q: Do you believe any aspect of Navigator's proposed hazardous pipeline will pose a threat of serious injury to the economic condition of current inhabitants or expected inhabitants in the siting area, if yes why?

A: In addition to those already discussed, based upon my experience and all the information obtained throughout this process and simple common sense the answer is yes – this hazardous pipeline does pose a threat of serious injury in this way. There are many such economic concerns. If the PUC approves this Application I will likely not invest in and develop my property as I would have without the affects of such a hazardous pipeline. The fact I can't purchase insurance to cover me and my property against certain claims and allegations and the fact whether or not I am alleged to be liable for or to have contributed to a leak or rupture event rests in the hands of Navigator's insurance defense attorneys should they seek to spread their risk of liability on to me, it is likely I and others will not use the easement area and surrounding areas to their highest and best use given the less activity in that area means the less likely we could be blamed for something relative to the pipeline or supporting equipment.

I share the concerns of Marvin Lugert and Loren Staroba about future fertility of the land and compaction and yield loss and loss in productivity not just in years one through three post-construction, but forever. As discussed by Mr. Lugert and Mr. Staroba, they have experienced continual yield loss for 20 to 45 years post-pipeline construction. All the claims and glossy brochures about how great the unknown contractors and workers who have the responsibility of screening the topsoil and other important aspects is just talk.

I adopt and share those as incorporated here and found in **Attachment No. 9,** related to soil compaction and reduced yields – and that was a study funded by a major pipeline player**.** I also incorporate the conclusions and findings in **Attachment No. 10**.

The facts, opinions, and arguments referenced here by no means include all such economic threats posed but highlight some of the many. The overall chill on development, expansion, and freedom to do as you choose on and with your land are all significant economic detriments that occur only if the PUC approves this Application.

Q: Do you believe any aspect of Navigator's proposed hazardous pipeline will substantially impair the health, the safety, or the welfare of the inhabitants, if yes why?

A: In addition to what we have already discussed, yes, this proposed hazardous pipeline would substantially impair the health and the safety and the welfare of inhabitants. There are many such substantial impairment concerns and I adopt and share those as incorporated here and found in **Attachment No. 11.** The facts, opinions, and arguments referenced here by no means include all such threats posed but highlight some of the many. I further adopt the testimony of Dr. Schettler and Carolyn Raffensperger.

Q: Do you believe any aspect of Navigator's proposed hazardous pipeline will unduly interfere with the orderly development of the region, if yes, why?

A: Yes, I incorporate my answers above here. Adding a hazardous and dangerous pipeline to the region and taking peoples rights away while telling them what they can and can't do is a direct undue interference with the orderly development of each affected parcel, the surrounding parcels, and thereby the region.

Q: What is your understanding regarding the views and positions of the governing bodies of affected local units of government in and around the proposed siting and corridor area?

A: I am aware of many local boards who continue to exercise their rightful local power to enact intelligent land use restrictions in ordinances and through setback requirements. Many counties are not in favor of this project. Others have enacted Moratoria pending further advances in federal law and guidance on the subject and pending further study. It would be irresponsible for the PUC to approve this Application until all counties have weighed in and complete their local ordinances related to CO2 pipelines.

Q: What is it that you are requesting the PUC Commissioners do in regards to Navigator's Application for its proposed hazardous pipeline across South Dakota?

A: I am respectfully and humbly requesting that the Commissioners think far beyond a temporary job spike that this project may bring to a few counties and beyond the relatively small amount of taxes this proposed foreign pipeline would possibly generate. Instead think about the perpetual and forever impacts of this pipeline as it would have on the landowners specifically, first and foremost, but also thereby upon the entire state of South Dakota. This project is not in the best interest for the state of South Dakota. When you look at all the negative effects that will be in place forever versus limited benefits if any, this proposed hazardous pipeline should not be approved.

Q: Does <u>Attachment No. 12</u> here contain other documents you are competent to speak about that you wish to be part of your testimony that you can discuss in more detail as needed at the Hearing?

A: Yes.

Q: Do you believe the PUC should approve Navigator's Application to locate its proposed hazardous CO2 pipeline, on, under, across, over, and through the land in question?

A: No. they should not for all of the reasons expressed herein. However, if the PUC was to approve the Application then it should force Navigator to move the route along property boundaries and away from structures and any sensitive land features. Navigator hasn't constructed an inch of this pipeline and they can and should re-route if approved.

Q: Are all of your statements in your testimony provided above true and accurate as of the date you signed this document to the best of your knowledge?

A: Yes, they are.

Q: Have you fully expressed each and every opinion, concern, or fact you would like the PUC Commissioners to consider in their review of Navigator's Application?

A: No, I have not. I have shared that which I can think of as of the date I signed this document below, but other things may come to me or my memory may be refreshed

and I will add and address those things at the time of the Hearing and address any additional items at that time as is necessary. Additionally, I have not had an adequate amount of time to receive and review all of Navigator's answers to our discovery and the discovery of others, so it was impossible to competently and completely react to that in my testimony here and I reserve the right to also address anything related to discovery that has not yet concluded as of the date I signed this document below. Lastly, certain documents requested have not yet been produced by Navigator and therefore I may have additional thoughts on those I will also share at the hearing as needed.

Q: Thank you, I have no further questions at this time and reserve the right to ask you additional questions at time of the Hearing in this matter.

/s/ Rick Bonander & Tamara Ford

Rick Bonander & Tamara Ford

Attachment No. 2

South Dakota Public Utilities Commission Information Guide to Siting Pipelines

This guide is intended to offer a simple overview of the Public Utilities Commission's process in making a decision to approve or deny the construction of pipeline facilities specific to South Dakota Codified Laws Chapter 49-41B (www.sdlegislature.gov/Statutes/Codified_Laws) and South Dakota Administrative Rules Chapter 20:10:22 (www.sdlegislature.gov/Rules/RulesList). This guide is informational and does not address all situations, variations and exceptions in the pipeline siting process and proceedings of the PUC.

PUC Authority

The South Dakota Legislature gave the PUC authority to issue permits for certain pipelines. South Dakota pipelines within the commission's siting jurisdiction include those designed to transport coal, gas, liquid hydrocarbons, liquid hydrocarbon products, or carbon dioxide, for example. In considering applications, the commission's primary duty is to ensure the location, construction and operation of the pipeline will produce minimal adverse effects on the environment and the citizens. The commission determines these factors based on definitions, standards and references specified in South Dakota Codified Laws and Administrative Rules. In pipeline siting cases, the commission has one year from the date of application to make a decision.

> The commission strives to issue a reasoned decision and conditions, where appropriate, that uphold the law and discourage a potentially expensive and lengthy appeal process.

In rendering its decision, the commission may grant the permit, deny the permit, or grant the permit with terms, conditions or modifications of the construction, operation or maintenance as the commission finds appropriate and legally within its jurisdiction. The commission does not have authority to change the route or location of a project. The decision of the commission can be appealed to the circuit court and, ultimately, to the South Dakota Supreme Court.

The PUC is not involved in the easement acquisition process that occurs between applicants and landowners. Likewise, the PUC does not have a role in the eminent domain process, which is handled in the circuit court system. Landowners with concerns about these issues should seek advice from their personal attorney.

Applicant Responsibility

The applicant that seeks the PUC's approval must show its proposed project:

- will comply with all applicable laws and rules;
- will not pose a threat of serious injury to the environment nor to the social or economic condition of inhabitants or expected inhabitants in the siting area;
- will not substantially impair the health, safety or welfare of the inhabitants; and
- will not unduly interfere with the orderly development of the region with due consideration having been given to the views of the governing bodies of affected local units of government.

PUC Staff Role

PUC staff members assigned to work on a pipeline siting case will typically include one attorney and multiple analysts. Staff attorneys have educational and practical experience in administrative law, trial procedure and business management principles. Staff analysts have expertise in engineering, research and economics. Some of the work the staff does involves reviewing data and evidence submitted by the applicant and intervenors, requesting and analyzing opinions from experts, and questioning the parties. The staff considers this information relative to state laws and rules and presents recommendations to the Public Utilities Commissioners.

Public Involvement

South Dakotans have a variety of ways to stay informed and involved. Read more on back.

South Dakota Public Utilities Commission
500 E. Capitol Ave., Pierre, SD 57501
605-773-3201; 1-800-332-1782
www.puc.sd.gov; puc@state.sd.us

09/2022

Review the electronic docket. A docket is the continually updated collection of documents filed with the commission for a particular case. Dockets are accessible under the Commission Actions tab on the PUC website, www.puc.sd.gov. Dockets are labeled to correspond with their type and filing date. For example, the Navigator Heartland Greenway Carbon Dioxide Pipeline docket is HP22-002; HP for hydrocarbon and carbon dioxide pipeline, 22 for the year 2022 and 002 to indicate it was the second hydrocarbon and carbon dioxide pipeline docket filed with the commission in 2022.

Attend a public input meeting. The PUC will hold a public input meeting or meetings on a pipeline siting case, with 30 days notice, as physically close as practical to the proposed route. At the meeting, the applicant describes its project and the public may ask questions and offer comment. Commissioners and staff attend this public meeting.

Submit comments. Members of the public are encouraged to submit written comments about an active siting case to the PUC. These ***informal*** public comments are reviewed and considered by the PUC commissioners and staff. Comments should include the docket number or siting project name, commenter's full name, mailing address, e-mail address and phone number. These comments should be emailed to puc@state.sd.us or mailed or hand-delivered to PUC, 500 E. Capitol Ave., Pierre, SD 57501. Comments are posted in the "Comments" section of the docket within a reasonable time after having been received. The commenter's name, city and state will be posted along with their comment. Comments received from businesses, organizations or other commercial entities (on letterhead, for example) will include the full contact information for such.

Please follow these guidelines when submitting written comments to the PUC:

- For comments sent by email, the maximum file size is 10 MB. If you have questions, please contact South Dakota PUC staff at 605-773-3201 (Monday – Friday, 8 a.m. – 5 p.m. Central Time).
- For comments sent by U.S. mail or hand delivered, no more than twenty (20) 8.5" x 11" pages, including attachments and support materials, should be submitted with a comment. Sheets with printing on both sides are counted as two pages.
- A reference document, article or other attachment not written by the person commenting should clearly identify the source of the content. The inclusion of any copyrighted material without accompanying proof of the commenter's explicit right to redistribute that material will result in the material being rejected.
- In instances where individual comments are deemed to be a duplicate or near duplicate copies of a mass message campaign, the PUC will post only a representative sample and list the name, city and state of the commenter.
- Comments containing threatening language or profanity will be rejected.
- Multimedia submissions such as audio and video files will not be accepted as written comments.
- Electronic links will not be accepted.

Become an intervenor. Individuals who wish to be formal parties in a siting case may apply to the commission for intervenor status. Intervention deadline is clearly indicated within the docket. Intervention is appropriate for people who intend to actively participate in the case through legal motions, discovery (requests for facts or documents), the written preparation and presentation of actual evidence, and in-person participation in a formal hearing. Intervenors are legally obligated to respond to discovery from other parties and to submit to cross-examination at a formal hearing. Individuals seeking only to follow the progress of a siting case or to offer comments for the PUC's consideration need not become intervenors.

Communicate on record. Verbal communication between a commissioner and a person with an interest in a matter before the commission that does not occur in a public forum or as part of the official record should be avoided. Those who communicate in writing with a commissioner about an open or imminent docket matter should understand that their comments will become part of the official record and subject to review by all parties and the public. Likewise, comments made at a PUC public proceeding or submitted to the commission relative to a docket matter become part of the record, open to review by all parties and the public. Because commissioners have a decision-making role in docket matters, any discussion with a commissioner about an open or imminent docket must take place in an open forum, such as a public meeting, with notice given to all parties.

Attachment No. 3

This document was prepared by and return to:
Navigator Heartland Greenway LLC
Right-of-Way Department
2626 Cole Ave., Suite 900
Dallas, Texas 75204
Phone: (214) 880-6000

HGS-SD-MO-XXXXX

PIPELINE RIGHT-OF-WAY AND EASEMENT AGREEMENT

For and in consideration of Ten Dollars ($10.00) in hand paid and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the undersigned landowner(s)

hereinafter called GRANTOR, whether one or more), does hereby GRANT, BARGAIN, SELL, WARRANT and CONVEY to **Navigator Heartland Greenway LLC,** a Delaware limited liability company with its principal offices in Dallas, Texas, having a mailing address of 2626 Cole Avenue, Suite 900, Dallas, Texas, 75204 its successors and assigns (hereinafter called GRANTEE), a pipeline right-of-way and easement along a route ("Easement"), the location of which has been agreed to by the parties herein (the location of the pipeline, as constructed, to evidence such agreed route), to construct, install, maintain, operate, replace, abandon in place, inspect, patrol, protect, test, repair, reconstruct, alter, relocate, remove, and any and all related uses thereto (the "Permitted Uses") up to, but no more than one (1) pipeline and one (1) or more fiber optic cables alongside such pipeline, together with incident facilities, equipment and appurtenances including but not limited to above or below, test stations, power and communication equipment, markers, signage, and cathodic protection devices, and other necessary appurtenances to transport, measure, and control the flow of carbon dioxide and associated substances (all of the above-described equipment and facilities being hereinafter referred to collectively as the "Pipeline"), whether in liquid or gas form that can be transported by pipeline on, over, under, through, across and along the strip(s) of land described and depicted as the Easement in Exhibit "A" attached hereto , such Easement crossing the following described land (hereinafter referred to as the "Property") located in the County of State of South Dakota, To wit:

The North Half (N 1/2) of the North Half (N 1/2) of the Northwest (NW 1/4) also described as the north _____ acres, of Section _____, Township _____ North, Range _____ West of the 5th P.M., _____ County, South Dakota (the "Property")

1. **TEMPORARY CONSTRUCTION EASEMENT AND ADDITIONAL TEMPORARY WORKSPACE:** During the initial construction and testing of the Pipeline, GRANTEE may utilize additional land adjacent to the Easement described and depicted on Exhibit "A" as the Temporary Construction Easement(s) (hereinafter referred to as a "Temporary Construction Easement(s)"). If the route of the Pipeline to be constructed hereunder should cross any terrain, roads, railroads, creeks, rivers or other waterways located on the Property, or other places requiring extra working space, GRANTEE shall have the right of temporary access to additional working space which may be necessary for the construction of the Pipeline ("Additional Temporary Workspace(s)"), in which event GRANTEE shall pay GRANTOR for all actual, documented damages suffered by GRANTOR due to GRANTEE's use of the Additional Temporary Workspace(s).

2. **GRANTEE RIGHTS AND BENEFIT:** GRANTEE shall have rights and benefits necessary or convenient for the full enjoyment or use of the rights herein granted, including but without limiting the same, the free, non-exclusive right of ingress and egress over, across, and within the Easement, together with a free, non-exclusive right of ingress and egress to and from said Easement upon and over the Property, including private roads. GRANTEE shall have the right from time to time, and at GRANTEE's sole discretion, to cut all trees and undergrowth and remove other obstructions that may injure, endanger, or interfere with the Permitted Uses for the Pipeline. GRANTEE agrees to make reasonable repairs of any damages to gates or roads caused by its use. GRANTEE shall have the right to remove any improvements, whether above or below ground, installed by GRANTOR on the Easement after the date that GRANTEE acquires possession of the Easement without liability to GRANTOR for damages. In the event of a breach by GRANTOR of paragraphs 3, 4 or 5, GRANTEE shall notify GRANTOR and GRANTOR shall promptly cure such breach at GRANTOR's expense; provided GRANTEE may cure the breach itself, at GRANTOR's expense (GRANTEE to be reimbursed on notice from GRANTEE), in the event GRANTOR either fails to promptly cure such breach or an immediate cure is reasonably necessary, as determined by GRANTEE, for the safety of persons or property, including the safe operation of the Pipeline.

3. **RETAINED RIGHTS:** GRANTOR may continue to use the surface of the Easement for agricultural, pasturage, open space, set-back, density, or other purposes (including the right to build cross fences on, over and across the land as near as to a ninety (90) degree angle to the Pipeline as possible), that are not inconsistent with the purposes set forth in this Pipeline Right-of-Way and Easement Agreement ("Agreement"), are not otherwise prohibited by applicable law, and that will not cause a safety hazard or interfere with the use of the Easement by

GRANTEE or any of the rights herein granted (the "Retained Rights"); provided, however, that GRANTOR shall not impound water upon the Easement, change the ground elevation or grade of the Easement, or construct or permit to be constructed any well, building, structure, improvement or obstruction, or plant any trees or shrubs that grow higher than 15 feet tall or have trunks larger than 3 inches in diameter at five feet upon the Easement or remove soil or change the grade or slope, which would interfere with GRANTEE'S exercise of the rights hereby conveyed, including access to the Easement, and the safe operation of the Pipeline. GRANTOR agrees that it will not interfere in any manner with the purposes for which the Easement, Temporary Construction Easement or Additional Temporary Workspace under this Agreement are conveyed.

4. **STREETS AND ROADWAYS:** GRANTOR is permitted, after review and approval by GRANTEE, not to be unreasonably withheld, to construct, reconstruct or maintain streets, roads or drives, road ditches, drainage ditches and utilities at an angle of not less than forty-five (45) degrees to the Pipeline, over and across (but not along and within) the Easement which do not damage, destroy or alter the operation of the Pipeline.

5. **UTILITIES:** GRANTOR may construct and/or install, upon GRANTEE'S review and approval, not to be unreasonably withheld, water, sewer, gas, electric, cable TV, telephone or other utility lines over and across (but not along and within) the Easement at any angle of not less than forty-five (45) degrees and no more than one hundred thirty-five (135) degrees to the Pipeline, provided that all of GRANTEE'S required and applicable spacings, including depth separation limits and other protective requirements are met by GRANTOR.

6. **ASSIGNMENT:** GRANTEE shall have the absolute right to assign, sell, lease, mortgage or otherwise transfer this Agreement in whole or in part and may be exercised by the GRANTEE herein and its respective successors and/or assigns either jointly or separately. An assignor shall have no liability or obligation as to events occurring after the date of a permitted assignment, with all such potential liability or obligation for future events terminating upon the assignment of assignor's rights in and to this Agreement to the assignee.

7. **FENCES:** GRANTEE shall have the right to remove all fences from the Easement, the Temporary Construction Easement(s), and Additional Temporary Workspace(s) as required for purposes of construction, maintenance or repair the Pipeline. Prior to cutting any fence, GRANTEE shall brace the existing fence on both sides of the removed section adequately and in such manner that there should be no slacking of the wires. While constructing through fenced areas, GRANTEE shall install gap fences or deterrent to keep cattle or livestock from crossing one fenced pasture to another. GRANTEE may install gate(s) along the fence line that is not a property boundary line where the fence(s) crosses the Easement, Temporary Construction Easement(s) or Additional Temporary Workspace(s). Likewise, GRANTEE may install a gate or gates in the fence line that marks the common

boundary between GRANTOR and adjoining owner(s). Any gate installed by GRANTEE shall be a farm gate consisting of one (1) gate sixteen (16) feet in width. All gates used by GRANTEE in connection with operations under this Agreement shall be kept locked at all times, except when passing through same. GRANTEE will also cause new fencing to be constructed across the Easement areas where there is existing fencing that has been damaged or destroyed. Such new fencing shall be of materially the same type as previously existed. GRANTOR shall allow GRANTEE to install its own lock if GRANTEE so chooses, provided that the method of locking the gates allows both GRANTOR and GRANTEE to use its/his/her own key or lock to open the gate without further assistance.

8. **CLEANUP AND RESTORATION:** GRANTEE shall remove all trash created by Grantee from the Property in accordance with applicable law. GRANTEE shall clear all other organic debris from the Property that is cut by Grantee by burning, cutting, stacking, blading and/or burying in accordance with applicable law. The method of disposal of said debris, whether one or more method, shall be selected by GRANTEE. Upon completion of GRANTEE'S installation, maintenance, or repair of the Pipeline within any portion of the Easement, GRANTEE shall restore the surface of the Easement, Temporary Construction Easement(s) and Additional Temporary Workspace(s) affected by the installation and construction of the Pipeline.

9. **DEPTH OF PIPELINE:** GRANTEE agrees to bury the Pipeline so that the top of the pipe lies at least sixty inches (60") below the surface when constructed/installed so as not to interfere with normal cultivation of the land, except at those locations where rock is encountered, the Pipeline may be buried at a lesser depth. GRANTOR agrees to not disturb, alter, or interfere with the depth of cover over the Pipeline. The foregoing requirement shall not apply to (a) vent pipes, location markers, and aboveground corrosion control equipment and/or (b) such other aboveground structures, installations, equipment, or apparatus authorized herein.

10. **MARKING:** After the completion and installation of the Pipeline, GRANTEE agrees to mark the locations of the Pipeline with permanent above ground markers to be located adjacent to fence or property lines if reasonably practicable and in conformance with laws, or as may otherwise be required in accordance with applicable state or federal regulations and to register the location of the Pipeline with the appropriate one-call agency.

11. **DAMAGES:** It is understood and agreed that the consideration herein paid for the Easement, Temporary Construction Easement(s) or Additional Temporary Workspace(s) includes payment for usual and customary damages incurred in the initial construction of the Pipeline, including those for growing crops, timber, fences, buildings or other improvements of GRANTOR on the Easement, Temporary Construction Easement(s) or Additional Temporary Workspace(s) resulting from the exercise of the rights herein granted during initial construction of the Pipeline (the "Initial Damages"). With respect to GRANTEE'S exercise of

any rights herein granted following the completion of initial construction, or to the extent GRANTOR's actual documented crop loss damages from the initial construction exceed those compensated for in GRANTOR's payment for Initial Damages, GRANTEE shall cause reasonable payment to be made for actual damages to the Property, crops, drain tiles, and fences of GRANTOR directly resulting from such activities; provided, however, as noted also in Section 2, GRANTEE shall have the right from time to time to clear the easement(s) of any trees, undergrowth, brush and other obstructions located on or overhanging the easement(s) and shall not be liable for damages caused by the clearing of the same from the easement(s) (the "Clearing Damages").

12. **INDEMNITY:** GRANTEE hereby agrees to indemnify and hold GRANTOR harmless from and against any claim or liability or loss from personal injury or property damage resulting from or arising out of the use of the Easement, Temporary Construction Easement(s) and Additional Temporary Workspace(s) by GRANTEE, its servants, agents or invitees, excepting, however, (a) the Initial Damages and the Clearing Damages, and (b) such claims, liabilities or damages as may be due to or caused by the negligence or willful acts of GRANTOR, or its servants, agents or invitees.

13. **INSURANCE.** Prior to GRANTEE's exercise of its rights pursuant to Section 2, and at all times thereafter until Grantee abandons or terminates its rights under the Agreement, GRANTEE shall carry the following insurance at all times. GRANTEE or any person or entity acting on GRANTEE'S behalf is on or about the Easement or acting pursuant to this Agreement, to the extent then available in the specified form, or comparable insurance on a substitute form:

(a) *Workers' Compensation and Employer's Liability Insurance.* Workers' Compensation with statutory limits in accordance with state and federal law; Employer's Liability minimum $1,000,000 limit each occurrence.

(b) *Commercial General Liability ("CGL") and Umbrella Liability Insurance.* GRANTEE shall maintain commercial general liability insurance and commercial umbrella insurance with an aggregate limit of not less than $10,000,000 and $5,000,000 each occurrence. CGL insurance shall cover liability arising from premises, operations, products-completed operations, personal injury and advertising injury, and liability assumed under an insured contract including the tort liability of another assumed in a business contract. As allowed by state law, GRANTEE shall obtain coverage for liability arising from sudden and accidental pollution, explosion, collapse, and underground property damage.

(c) *Business Auto and Umbrella Liability Insurance.* GRANTEE shall maintain business auto liability, and, if necessary commercial umbrella liability insurance with a limit of not less than $2,000,000.00 each accident. Such insurance shall cover liability arising out of any auto including owned, hired, and non-owned autos.

GRANTEE shall cause certificates of insurance evidencing the above coverage to be provided to GRANTOR upon reasonable request. All insurance requirements may be met by a combination of primary and excess insurance policies.

14. **RUN WITH THE LAND:** It is understood and agreed that this Agreement, the easement(s) and all rights, privileges, and obligations created herein shall be covenants running with the land in perpetuity and shall inure to the benefit of and be binding and obligatory upon the legal representatives, heirs, executors, administrators, devisees, legatees, successors, and assigns of the parties hereto.

15. **EXHIBITS:** GRANTEE may record this Agreement with a sketch as Exhibit "A" generally depicting the location of the Easement and the route of the Pipeline across the Property. Following the completion of the construction of the Pipeline, GRANTEE may unilaterally, without the execution thereof or further consent of GRANTOR, prepare, execute, and record a Correction of Pipeline Right-of-Way and Easement Agreement containing amended Exhibit "A" (as-built), showing the location of the Pipeline placed on the Property by GRANTEE, following actual construction, that reflects the survey of the center line of the Pipeline as built, and any such amended Easement description shall be included within and constitute the Easement granted by GRANTOR herein. The Correction of Easement and Right-of-Way Agreement shall be recorded in the official public records of this County to correct the description contained in the original Agreement.

16. **REPRESENTATIONS BY GRANTOR; COMPLIANCE WITH TAX CODE:** GRANTOR represents and warrants that GRANTOR is the owner in fee simple of the Property, subject only to outstanding mortgages, if any, now of record, and in the event of default by GRANTOR, GRANTEE shall have the right to discharge or redeem for GRANTOR, in whole or in part, any mortgage, tax or other lien on said Property and thereupon be subrogated to such lien and rights incident thereto. GRANTOR covenants that GRANTOR has the right to convey the Easement and that GRANTOR shall execute such further assurances thereof as may be required. The Internal Revenue Code provides that a GRANTEE of a real property interest in this county must withhold tax if the GRANTOR is a foreign person. Each GRANTOR hereby certifies under oath and subject to penalties of perjury that he/she/it is not a foreign person, foreign corporation, foreign trust, or foreign estate, for purposes of Internal Revenue Code compliance.

17. **TENANCIES:** In the event the Property is subject to a lease to any tenant for farming, ranching or any other purposes, unless GRANTOR and GRANTEE by separate binding agreement agree to allocate funds to said tenant, GRANTOR shall be solely responsible for making settlement with any such tenant or lessee for any share of the compensation paid for the granting of the Easement, Temporary Construction Easement(s) and Additional Temporary Workspace(s) or for any share of the damages that GRANTEE is otherwise required hereunder to pay, so that GRANTEE shall never be required to deal with or pay compensation to any such lessee or tenant, and GRANTEE may deal exclusively with GRANTOR.

18. **GOVERNING LAW:** This Agreement shall be interpreted and enforced in accordance with the laws of the state where the Property is located. If any part, term or provisions of this Agreement is, by a court of competent jurisdiction or regulatory authority having jurisdiction over the real property over, under and across which the Easement is located, held to be illegal, void, or unenforceable, or to be in conflict with the law of that jurisdiction, the validity of the remaining provisions or portion hereof shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if this Agreement did not contain the particular part, term, or provision to be held invalid. GRANTOR waives any claims, now and in the future, which challenges the validity of the Easement or this Agreement or that seek additional compensation relating to the grant of the Easement.

19. **SIGNED IN COUNTERPARTS:** This Agreement may be signed in counterparts and all such counterparts shall be deemed as originals and binding upon each party executing any counterpart and upon their respective heirs, personal representatives, successors, and assigns. Similarly, facsimile or e-mail signatures shall be deemed as an original signature by the enforcing party.

20. **ENTIRE AGREEMENT:** This Agreement together with exhibits incorporated herein by reference, if any, and, if applicable, the binding agreement on allocation of funds to GRANTOR's tenant(s) agreed by the parties to this Agreement, embodies the whole agreement of the parties. There are no promises, terms, condition, or obligations other than those contained herein; and this Agreement shall supersede all previous communications, representations, or agreements, either verbal or written, between the parties. Notwithstanding the foregoing, (a) if the Parties have executed a Right of Entry and Option Agreement ("Option Agreement") contemporaneously with this Agreement, such Option Agreement shall remain effective and not be superseded by this Agreement until such date as this Agreement is recorded in the Office of the Recorder of Deeds of the above referenced county, following which the Option Agreement shall terminate and (b) the calculation of estimated Initial Damages separately agreed by GRANTOR and GRANTEE may be used for purposes of Section 11.

21. **NOTICES:** All notices required or permitted to be given under this Agreement shall be in writing and shall be considered sufficiently given if delivered to the specified address by (a) hand, courier, or overnight delivery service or (b) certified or registered mail, return receipt requested:

If to GRANTOR(s):

A notice shall be effective upon the other party's receipt of the notice. Either party may specify a different address for delivery of notices by written notice to the other party as provided herein.

TO HAVE AND TO HOLD unto the said GRANTEE, its successors, and assigns, for so long as said Easement is used by or is useful to GRANTEE, its successors, and assigns, with ingress to and egress from said premises for the Permitted Uses. However, GRANTEE shall have

the right to abandon and terminate all or any part of the rights granted herein, by filing a release of same in the county records.

(The remainder of this page intentionally left blank)

IN TESTIMONY WHEREOF, GRANTOR has executed this conveyance this day of , 202_.

GRANTOR:

_____

SIGN HERE

STATE OF _____)
:SS
COUNTY OF _____)

On this the day of _____ ___, 20 , before me personally appeared _____, known to me to be the person(s) who is/are described in, and who executed the within instrument and acknowledged to me that he/she/they executed the same.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____

Notari

Notary Public - ___

My Commission Expires:
(seal)

IN TESTIMONY WHEREOF, GRANTEE has executed this conveyance this ___ day of _____, 202_.

GRANTEE:

NAVIGATOR HEARTLAND GREENWAY LLC

By: _____

Name: _____

Title: _____

STATE OF _____)
: SS
COUNTY OF_____)

On this the _____ day of _____, 202_, before me personally appeared _____, known to me to be the _____ of Navigator Heartland Greenway LLC, the limited liability company that is described in and that executed the within instrument and acknowledged to me that such limited liability company executed the same.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____
Notary Public - _____

My Commission Expires: _____
(seal)

Attachment No. 4

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEBRASKA

ZURICH AMERICAN INSURANCE COMPANY, a New York Corporation, Plaintiff, v. RICHARD ANDREW, JANE ANDREW, LUKE ANDREW, and BRYCE ANDREW, Defendants.	)	CASE NO. _____ **COMPLAINT**

COMES NOW Plaintiff, Zurich American Insurance Company ("Plaintiff"), a New York Corporation, and for its causes of action against Defendants, states and alleges as follows:

PARTIES

1. Plaintiff is a corporation organized and existing under the laws of the State of New York, with its principle place of business located at 1400 American Lane, Schaumburg, Illinois.

2. Defendant, Richard Andrew, is a citizen of the State of Nebraska.

3. Defendant, Jane Andrew, is a citizen of the State of Nebraska.

4. Defendant, Luke Andrew, is a citizen of the State of Nebraska.

5. Defendant, Bryce Andrew, is a citizen of the State of Nebraska.

JURISDICTION AND VENUE

6. Venue is proper in this judicial district under 28 U.S.C. § 1391(a) because Defendants reside in this district, and a substantial portion of the events or omissions giving rise to Plaintiff's claims occurred in this district.

7. This Court has jurisdiction over this matter pursuant to 28 U.S.C. § 1332(a) because the amount in controversy exceeds $75,000.00, exclusive of interest and costs, and because diversity of citizenship exists with respect to Plaintiff and all Defendants.

GENERAL ALLEGATIONS

8. At all times material to this action, Defendants were agents of each other and were acting within the course and scope of their agency relationships, and the negligence of any Defendant is imputed to all Defendants.

9. At all times material to this action, Defendants were engaged in a joint venture and were acting within the course and scope of the joint venture at the time of the event described below.

10. At all times material to this action, Defendants were engaged in a partnership, were carrying on a business for profit, shared profits of the business, and were acting within the course and scope of the partnership at the time of the event described below.

11. At all relevant times, Defendants Luke Andrew and Bryce Andrew were the lessees of property located in the East ½ of the Southwest ¼, Section 15, Township 4, Range 15 (the "Property"), Nemaha County, Nebraska, and were engaged in commercial farming operations for the benefit of all named Defendants in this action.

12. On or about December 10, 2011, Defendants Luke Andrew and Bryce Andrew were engaged in excavation activities on the Property, including the clearing of various vegetation near the northernmost property line of the Property.

13. The excavation was in the area of two pipelines owned and operated by Magellan Midstream Partners, LP ("Magellan"), including a 12" pipeline used to transport a mixture of gasoline and jet fuel as well as an 8" pipeline ("the Pipelines") used to transport diesel fuel.

14. At all times relevant to this action, Magellan owned a right-of-way and easement on the Property in the areas where the pipelines ran and Defendants had actual and constructive knowledge of the right-of-way and easement.

15. At all times relevant to this action, Defendants had actual and constructive notice of the pipelines on the Property and had notice that Magellan owned and operated such pipelines.

16. On or about December 10, 2011, while engaged in excavation activities, Defendants Luke Andrew and Bryce Andrew struck the pipeline, causing the release of approximately 2,167 barrels of mixed gasoline and jet fuel from the 12" pipeline and approximately 643 barrels of diesel fuel from the 8" pipeline onto the Property (The line strikes will hereinafter be referred to as "the Release").

17. As a result of the line strikes and release, Magellan was required by state and federal

law to engage in cleanup and remediation activities related to the Release.

18. At the time of the Release, Magellan was the named insured on a policy of insurance, Policy No. EPC 669256201 ("the Policy"), issued by Plaintiff.

19. Plaintiff has made payment on behalf of Magellan under the Policy and has a contractual and equitable right of subrogation and is subrogated to Magellan's rights of recovery against Defendants for amounts paid on its behalf.

FIRST CLAIM: NEGLIGENCE

20. Paragraphs 1-20 of this Complaint are incorporated as if fully set forth herein.

21. Defendants owed a duty to perform their work on the Property and within the right-of-way and easement owned and operated by Magellan in a reasonable manner, to use reasonable care in constructing improvements on the Property, to comply with the statutory requirements of Neb. Rev. Stat. § 76-2301 et seq., the One Call Notification System ("OCNS"), and to protect the Pipelines on the Property from damage during Defendants' work on the Property.

22. Defendants negligently struck the Pipelines while performing excavation work on the Property.

23. Defendants were negligent in the following particulars:

a. Defendants failed to perform their work on the Property within the right-of-way and easement in a reasonable manner;

b. Defendants failed to use reasonable care in their work on the Property and the Pipelines' right-of-way and easement;

c. Defendants failed to comply with the statutory requirements of the OCNS;

d. Defendants failed to notify Magellan of Defendants' intent to excavate on December 10, 2011 in and over the right-of-way and easement on the Property;

e. Defendants failed to give Magellan the opportunity to exercise its rights under the OCNS.

24. As a direct and proximate result of Defendants' negligence, Plaintiff has paid $3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

25. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling $1,106,893.50.

26. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its first claim in an amount in excess of $4,151,148.69 for Defendants' negligent strike of the Pipelines.

SECOND CLAIM: TRESPASS

27. Paragraphs 1-29 of this Complaint are incorporated as if fully set forth herein.

28. Magellan owned and occupied a valid right-of-way and easement in and to the area of the Property where the Pipelines were located at the time of the Release.

29. Defendants physically invaded Magellan's rights within and to the right-of-way and easement where the Pipelines were located at the time of the Release.

30. Defendants had no right, lawful authority, or express or implied invitation, permission, or license to enter upon and disturb Magellan's rights and interests in and to the right-of-way and easement where Magellan's pipelines were located at the time of the Release.

31. Magellan's interest in and to the right-of-way and easement of the Pipelines were injured during the course of Defendants' trespass.

32. As a result of Defendants' trespass, Plaintiff has paid $3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

33. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling $1,106,893.50.

34. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its second claim in an amount in excess of $4,151,148.69.

WHEREFORE Plaintiff hereby prays for a judgment of this Court in its favor and against Defendants for its damages in an amount to be proven at trial, pre-judgment and post-judgment interest, its costs incurred in prosecuting this action, and such other reasonable sums as this Court deems just and equitable.

JURY DEMAND

Plaintiff, pursuant to Fed. R. Civ. P. 38 and Local Rule 40.1(b) demands a trial by jury on all issues so triable in Omaha, Nebraska.

ZURICH AMERICAN INSURANCE COMPANY,
Plaintiff,

By: /s/ Albert M. Engles

ENGLES, KETCHAM, OLSON, & KEITH, P.C.
1350 Woodmen Tower
1700 Farnam Street
Omaha, Nebraska 68102
(402) 348-0900
(402) 348-0904 (Facsimile)
Albert M. Engles, #11194
Dan H. Ketcham, #18930
Michael L. Moran, #24042
James C. Boesen, #24862

Attachment No. 5

It's Time to End Carbon Capture of Climate Policy

An Open Letter to US and Canadian Leaders

On behalf of our millions of members and supporters across the United States and Canada, we call on policymakers to recognize that carbon capture and storage (CCS) is not a climate solution. It is a dangerous distraction driven by the same big polluters who created the climate emergency.

CCS is unnecessary. Renewable energy sources like solar and wind are cheaper and cleaner than fossil fuels. CCS just makes dirty energy more expensive and more energy-intensive.

CCS does not work. CCS projects have systematically overpromised and underdelivered. Despite the billions of taxpayer dollars wasted on CCS to date, the technology has not made a dent in CO2 emissions.

CCS will do little to reduce industrial emissions. Deploying CCS at scale is not economically viable for most heavy-emitting industries, such as plastic or chemical manufacturing. It diverts resources from available and scalable alternatives such as replacing fossil fuels with clean renewable energy sources to supply power and heat, and reusing inputs to reduce the production of virgin material.

CCS makes dirty energy even more dangerous for frontline communities. Facilities equipped with carbon capture technology have to burn more fossil fuel to get the same energy output, resulting in increased emissions of toxic and hazardous pollutants, like fine particulates (PM2.5).

CCS imposes even more risks on communities from CO2 pipelines and storage. Transporting, injecting, and storing CO2 presents new environmental, health, and safety hazards in communities targeted for CCS infrastructure. Pipelines can leak or rupture, and injection can contaminate water sources. These risks fall disproportionately on Black, Brown, Indigenous, and low-income communities, further entrenching a bleak history of environmental racism.

Most CCS benefits polluters. Nearly 80% of captured carbon is used to pump more oil out of the ground through "enhanced oil recovery." Polluting industries are using the myth of CCS to justify business-as-usual operations that are dangerous for the climate and communities. Pumping even more public funds into new CCS subsidies for fossil fuel and petrochemical industries will just prop up unsustainable business models.

We don't need to *fix* fossil fuels; we need to *ditch* them. Instead of capturing carbon to pump it back underground, we should keep fossil fuels in the ground in the first place. And instead of bankrolling CCS, public funds should be boosting sustainable, job-creating solutions to the climate crisis, for fossil-dependent workers and communities: phasing out oil, gas, and coal; investing in energy efficiency and non-combustion renewable energy sources; and protecting forests and other ecosystems that naturally capture and store carbon.

It's time for decision-makers to abandon the dirty, dangerous myth of CCS. We call on you to:

Stop subsidizing CCS. Stop permitting CCS. Stop using CCS to justify climate inaction. And don't pretend you're a climate leader if CCS is part of your climate plan.

198 methods
2 Degrees Northampton
350 Bay Area Action
350 Brooklyn
350 Butte County
350 Central Mass
350 Colorado
350 Conejo / San Fernando Valley
350 Corvallis
350 Eugene
350 Hawaii
350 Juneau
350 Kishwaukee
350 Maine
350 Massachusetts
350 Merced
350 Montana
350 New Hampshire
350 New Orleans
350 NYC
350 Sacramento
350 Seattle
350 Spokane
350 Tacoma
350 Triangle
350 Wenatchee
350.org
A Community Voice
Action Center on Race & the Economy
ActionAid USA
Advocates for Springfield
AFGE Local 704
Alabama Interfaith Power & Light
Alberta Liability Disclosure Project
Algalita
Alliance for a Green Economy
Alliance for Affordable Energy
Amazon Watch
American Environmental Health Studies Project
American Family Voices
American Indian Movement Southern California
Animals Are Sentient Beings
Animas Valley Institute
Anthropocene Alliance
Atchafalaya Basinkeeper
Athens County's Future Action Network
Atlantic Coast Conference Climate Justice Coalition
Ban Single-Use Plastics
Below 2ºC
Ben & Jerry's
Berks Gas Truth
Better Path Coalition
Beyond Plastics
Biofuelwatch
Black Mesa Trust
Black Voters Matter Fund
Bold Alliance
Breathe Project
British Columbia Hydro Ratepayers Association
Bronx Climate Justice North
Buckeye Environmental Network
Bucks County Concerned Citizens Against the Pipelines
Bucks Environmental Action
Businesses for a Livable Climate
California Businesses for a Livable Climate
California Democratic Party Environmental Caucus
California River Watch
California Safe Schools
Call to Action Colorado
Canadian Association of Physicians for the Environment
Canadian Environmental Law Association
Canadian Health Association for Sustainability & Equity
Canadian Unitarians for Social Justice
Canadian Voice of Women for Peace
Canadians for Tax Fairness
Cape Downwinders
Carrie Dickerson Foundation
Catholic Divestment Network
CatholicNetwork US
Catskill Mountainkeeper
Center for Biological Diversity
Center for Climate Integrity
Center for Coalfield Justice
Center for Environmental Health
Center for Environmentally Recycled Building Alternatives
Center for International Environmental Law
Center on Race, Poverty & the Environment
Chicago Area Peace Action
Choctawhatchee Riverkeeper
Church Women United in New York State
Citizen Power
Citizens Action Coalition
Citizens Awareness Network
Citizens' Resistance at Fermi 2
Ciudadanos Del Karso
Clean Air Action Network of Glens Falls
Clean Air Now
Clean Energy Action
Clean Energy Now Texas
Climate Action Now Western Mass
Climate Action Powell River
Climate Action Rhode Island / 350 Rhode Island
Climate Emergency Unit
Climate Hawks Vote
Climate Justice Alliance
Climate Justice Montreal
Climate Justice Ottawa
Climate Reality Project New Orleans
ClimateFast
Coal River Mountain Watch
Coalition Against Death Alley
Coalition Against Pilgrim Pipeline New Jersey
Coalition for a Nuclear Free Great Lakes
Coalition for Outreach, Policy, Education
Colorado Businesses for a Livable Climate
Colorado Small Business Coalition
Columbus Community Bill of Rights
Comite Pro Uno
Committee for Human Rights in Latin America
Common Ground Community Trust
Community Action Works
Community Church of New York
Community Climate Council
Comox Valley Council of Canadians
Concerned Citizens for Nuclear Safety
Concerned Citizens of Saint John
Concerned Health Professionals of New York
Concerned Ohio River Residents
Conejo Climate Coalition
Congregation of Sisters of Saint Agnes
Conservation Congress
Conservation Council for Hawaii
Cool Effect
Cooperative Energy Futures
Corporate Accountability
Cottonwood Environmental Law Center
Council of Canadians / Le Conseil des Canadiens
Courage California
Courage Montreal
Curr Dynasty Creative
Damascus Citizens for Sustainability
DC Environmental Network
Deep Green Resistance New York
Deep South Center for Environmental Justice
Democratic Environmental Caucus of St. Bernard Parish
Descendants Project
Detroit Hamtramck Coalition for Advancing Healthy Environments
Dis Organization for Solar Power
Dogwood Alliance
Don't Gas the Meadowlands Coalition
Don't Waste Arizona
Don't Waste Michigan
Drawdown Bay Area
Earth Action
Earth Care
Earth Day Initiative
Earth Day Network
Earthworks
EcoEquity
EcoHealth Network
Ecologos Water Docs
Education, Economics, Environmental, Climate & Health Organization
Electric Auto Association of Central Coast California
Elgin Green Groups 350
Empower Our Future
Endangered Species Coalition
Environmental Defence Canada
Environmental Protection Information Center
Environmental Transformation Movement of Flint
Environmental Working Group
ENvironnement JEUnesse
Environnement Vert Plus
Équiterre
Extinction Rebellion New Brunswick
Extinction Rebellion New Orleans
Extinction Rebellion San Francisco Bay Area
Family Farm Defenders
Fenceline Watch
First Presbyterian Church of Brooklyn
First Unitarian Universalist Church of New Orleans
Five Calls Civic Action
Florida Student Power Network
Food & Water Watch
Food Shift
For Our Kids North Shore British Columbia
For Our Kids Toronto
Forest Unlimited
Fossil Free California
Fossil Fuel Divest Harvard
Fox Valley Citizens for Peace & Justice
FrackBusters New York
FracTracker Alliance
Franciscan Action Network
FreshWater Accountability Project
Fridays for Future Toronto
Friends of Buckingham
Friends of the Earth Canada
Friends of the Earth U.S.
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Grassroots Global Justice Alliance
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Great Plains Action Society
Greater Grand Rapids NAACP
Greater New Orleans Housing Alliance
Greater New Orleans Interfaith Climate Coalition
Green Education & Legal Fund
Green New Deal Virginia
Green Newton
Green Retirement
Green State Solutions
Greenaction for Health and Environmental Justice
GreenARMY
GreenFaith
GreenLatinos
Greenpeace USA
GreenRoots
Greenvest
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Harambee House
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Healthy Gulf
Heirs To Our Oceans
Homewise Realty
Hudson River Sloop Clearwater
Idle No More SoCal
In the Shadow of the Wolf
Indian Point Safe Energy Coalition
Indigenous Environmental Network
Indivisible CA-43
Indivisible Pittsfield
Inland Ocean Coalition
INOCHI / Women for Safe Energy
Institute for Agriculture and Trade Policy
Institute for Policy Studies Climate Policy Program
Interfaith Council for Peace & Justice
International Indigenous Youth Council Los Ángeles
International Marine Mammal Project
Iowa Citizens for Community Improvement
Ironbound Community Corporation
John Muir Project
Just Earth
Just Transition Alliance
Justice & Beyond
Klamath Forest Alliance
KyotoUSA
LaPlaca & Associates
Leadnow
Living Rivers
Local Environmental Action Demanded Agency
Long Beach 350
Long Island Progressive Coalition
Longmeadow Pipeline Awareness Group
Los Padres ForestWatch
Louisiana League of Conscious Voters
Lower 9th Ward Neighborhood Watch
Manhattan Project for a Nuclear-Free World
Maryland Legislative Coalition
Mass Peace Action
Massachusetts Forest Watch
Maternal & Child Health Access
Metro New York Catholic Climate Movement
Michigan Alliance for Justice in Climate
Michigan Environmental Justice Coalition
Michigan Interfaith Power & Light
Mid-Missouri Peaceworks
Milwaukee Riverkeeper
MiningWatch Canada
Mission Blue
Moral ReSources
Mothers Out Front
Mothers Out Front Tompkins
Movement Rights
MoveOn.org Hoboken
My Sea to Sky
Nassau Hiking & Outdoor Club
Nature Canada
Nature Rhythms
Network in Solidarity with the People of Guatemala
Network of Spiritual Progressives
Nevada Nuclear Waste Task Force
New Energy Economy
New Jersey State Industrial Union Council
New Mexico Environmental Law Center
New York / New Jersey Environmental Watch
New York Climate Action Group
New York Lawyers for the Public Interest
Ní Bháska Stand Collective
Nobody Leaves Mid-Hudson
North American Climate, Conservation, and Environment
North American Water Office
North Bronx Racial Justice
North Carolina Council of Churches
North Carolina Interfaith Power & Light
North Country Earth Action
North Range Concerned Citizens
Northern Michigan Environmental Action Council
Northridge Indivisible
No Waste Louisiana
Nuclear Information & Resource Service
Nuclear Watch South
NY-16 Indivisible
NYC Environmental Justice Alliance
Occupy Bergen County
Ocean Conservation Research
Ohio Valley Environmental Coalition
Oil & Gas Action Network
Oil Change International
On Behalf of Planet Earth
Organized Uplifting Resources & Strategies
Our Climate Education Fund
Our Revolution Minnesota
Our Santa Fe River
Parents for Climate
Partnership for Policy Integrity
Pax Christi USA New Orleans
Peak Plastic Foundation
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Pipe Line Awareness Network for the Northeast
Plastic Free Delaware
Plastic Pollution Coalition
PlasticFreeRestaurants.org
Plymouth Friends for Clean Water
Post Carbon Institute
Power Past Fracked Gas
Power Shift Network
Presentation Sisters
Preserve Montgomery County Virginia
Progressive Democrats of America
Public Citizen
Public Goods Institute
Publish What You Pay United States
Pueblo Action Alliance
Rachel Carson Council
Rainforest Action Network
Rapid Shift Network
Reconstructionist Rabbinical Association
RedTailed Hawk Collective
Redwood Justice Fund/ Prison Radio
Renewable Energy Long Island
Réseau Québécois sur l'Intégration Continentale
Resistance Action Tuesdays & Thursdays Pack
Resource Renewal Institute
Respecting Aboriginal Values & Environmental Needs
RESTORE: The North Woods
Rio Grande Valley Great Old Broads for Wilderness
RISE St. James
River Guardian Foundation
River Valley Organizing
Riverdale Jewish Earth Alliance
RootsAction
Safe Energy Rights Group
San Luis Obispo Mothers for Peace
Sane Energy Project
Santa Barbara Standing Rock Coalition
Santa Cruz Climate Action Network
Save Our Illinois Land
Save RGV from LNG
Save the Frogs!
Science & Environmental Health Network
Seniors For Climate Action Now!
Sequoia ForestKeeper
Seven Circles Foundation
Shenandoah Energy Services
Sierra Club Canada Foundation
Sierra Club Delta Chapter
Simcoe County Environmental Youth Alliance
Simcoe County Greenbelt Coalition
Sisters of Charity Federation
Sisters of Charity of New York
Snake River Alliance
Social Eco Education Los Angeles
Socially Responsible Agriculture Project
Society of Native Nations
Solidarity Info Service
Sonoma County Climate Activist Network
South Shore Audubon Society
Southeast Faith Leaders Network
SouthWings
Spirit of the Sun
Spottswoode Winery
Springfield Climate Justice Coalition
Stand.earth
Stop Fracking Long Beach
Stop SPOT & Texas Gulflink: Save Our Gulf Coast
Stop the Algonquin Pipeline Expansion
Sullivan Alliance for Sustainable Development
Sunflower Alliance
Sunrise Knoxville
Sunrise Movement New Orleans
Sustainable Belmont
Sustainable Medina County
Sustainable Orillia Youth Council
Syracuse Cultural Workers
TBL Communications
Texas Campaign for the Environment
Texas Environmental Justice Advocacy Services
Texas Grassroots Alliance
The Borneo Project
The Climate Center
The Climate Mobilization
The Climate Reality Project Canada
The Enviro Show
The Forest Foundation
The Freedom BLOC
The Future Left
The Green House Connection Center
The Last Beach Cleanup
The Last Plastic Straw
The Lilies Project
The River Project
The Wei
Three Mile Island Alert
Toledo Coalition for Safe Energy
Transition Sebastopol
Turtle Island Restoration Network
Unitarian Universalist Congregation of Binghamton Green Sanctuary
Unitarian Universalist Mass Action
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Unite North Metro Denver
United Church of Christ Environmental Justice Ministry
Utah Valley Earth Forum
Valley Watch
Verde
Veterans For Peace Climate Crisis & Militarism Project
Wall of Women
Wasatch Clean Air Coalition
Washington Physicians for Social Responsibility
Washtenaw350
Water and Air Team Charlevoix
Waterkeeper Alliance
Waterspirit
West Dryden Residents Against Pipeline
Western Organization of Resource Councils
Western Rural + Plains States Project
Western Watersheds Project
White Rabbit Grove RDNA
Wild Nature Institute
WildEarth Guardians
Wilderness Committee
Wildsight
Women Watch Afrika
Women's Earth and Climate Action Network
Women's Healthy Environments Network
Working Families Joliet
Young Democrats of America Environmental Caucus
Youth United for Climate Crisis Action
Youth Vs. Apocalypse
Zero Hour

This ad paid for by the Center for International Environmental Law, a not-for-profit organization that uses the power of law to protect the environment, promote human rights, and ensure a just and sustainable society. For a complete copy of the open letter to policymakers and to learn more about CCS visit: https://www.ciel.org/CarbonCaptureAndStorage

Attachment No. 6

BLOG POST

Over 500 Organizations Call on Policymakers to Reject Carbon Capture and Storage as a False Solution

On July 19th, over 500 organizations across the United States in Canada expressed **deep concerns about the US and Canadian governments' support for carbon capture and storage (CCS) and carbon capture, utilization, and storage (CCUS) technologies** in an open letter to policymakers in the United States and Canada**.** The letter s key messages and demands were published as full-page advertisements in The Washington Post (https://www.ciel.org/wp-content/uploads/2021/07/CCS-Ad_The-Washington-Post_FINAL.pdf) and Ottawa s Hill Times (https://www.ciel.org/wp-content/uploads/2021/07/CCS-Ad_The-Hill-Times_FINAL.pdf) newspapers.

Despite occupying center stage in the "net-zero" climate plans trumpeted by the United States and Canada at the Leaders Summit on Climate, government spending programs, and bills pending before Congress and Parliament, **carbon capture is not a climate solution**. On the contrary, investing in carbon capture delays the needed transition away from fossil fuels and other combustible energy sources. It poses significant new environmental, health, and safety risks, particularly to Black, Brown, and Indigenous communities already overburdened by industrial pollution, dispossession, and the impacts of climate change.

Upon the letter s release, leaders from several signatory organizations made the following statements:

Center for International Environmental Law

"CCS is life support for the fossil fuel industry — and a death sentence for the planet. We need to ditch fossil fuels, not 'fix them with technologies that are dangerous, costly, unproven at scale, and at odds with environmental justice. Rather than bankroll the buildout of massive and risky CCS infrastructure on top of polluting industries, policymakers should finance the future, by replacing fossil fuels with renewables and creating sustainable jobs." — ***Nikki Reisch, Director of the Climate & Energy Program***

Environmental Defence Canada

"Carbon capture is being used as a Trojan horse by oil and gas executives to continue, and even expand, fossil fuel production. It s a dangerous distraction driven by the same polluters who created the climate emergency. The Government of Canada should not use any kind of financial support or tax incentive to prop up false climate solutions that only serve to delay the necessary transition off of fossil fuels. Instead, we should be focused on real climate solutions including renewable energy and energy efficiency that are job-creating, safe, affordable and ready to be deployed." — ***Julia Levin, Senior Climate and Energy Program Manager***

Institute for Policy Studies

"Carbon capture is an unproven technology, and there s no certainty it will ever be economically feasible. It is downright dangerous to pin our hopes on such a speculative technology to address the dire climate emergency humanity already faces. The U.S. government should stop incentivizing this technology through the tax code, or funding a buildout of carbon capture infrastructure through the various infrastructure proposals under consideration." — ***Basav Sen, Climate Policy Director***

Global Witness

"It s simple: the world cannot meet its climate targets relying on carbon capture. The majority of CCS that exists is being used to extract more oil, ultimately driving more climate pollution. There is only one winner when it comes to these unproven and costly technologies: fossil fuel companies, who are trying to cash in on the climate emergency while being propped up with government handouts. The Biden administration must say enough is enough, and prioritize real climate solutions, good green jobs, and the health of our communities over the interests of polluters profits." — ***Zorka Milin, Senior Policy Advisor***

Gulf Coast Center for Law & Policy

“Industrial carbon capture utilization and storage is a false solution to this global climate crisis. Once again, Black, Indigenous and poor communities will be sacrificed just to ensure profit for polluting industries. We must reset our priorities to put people before profit. Let s choose to use this moment to put people to work toward a healthy, safe and equitable future.” — ***Colette Pichon Battle, Executive Director of the Gulf Coast Center for Law & Policy and National Lead for the Red, Black & Green New Deal at the Movement for Black Lives.***

Food & Water Watch

“Incentivizing carbon capture is simply throwing a lifeline to the fossil fuel industry, when we need to be throwing a lifeline to the planet. The US government has already spent billions of dollars on carbon capture to no end. Continuing to do so is throwing good money after bad; diverting resources that could be put to use actually confronting our climate crisis. We demand Congress to end support of carbon capture and invest in truly renewable energy.” — ***Mitch Jones, Policy Director***

Friends of the Earth, US

“Why are Senate Democrats putting Big Oil talking points into policy at the expense of frontline communities already overburdened with pollution?” said ***Sarah Lutz, Climate Campaigner***. “When it comes to CCS and the harms that would result from this polluter gimmick, the Administration should heed the recommendations from its own White House Environmental Justice Advisory Council.”

Partnership for Policy Integrity

“We can t burn our way out of the climate crisis. CCS technologies are being touted as a magic bullet for capturing the carbon from burning any kind of fuel – including woody biomass. This ignores the other harmful health and environmental impacts along every step of the fuel production chain, particularly in low-income communities of color where wood pellet production facilities and biomass power plants are disproportionately sited. There is a much better way of capturing carbon and effectively storing it while safeguarding the health of our communities – it s called letting our forests grow.” — ***Laura Haight, U.S. Policy Director***

Indigenous Environmental Network

“Driving up more funding for carbon capture technology is a subsidy for the fossil fuel industry. Oil, coal and gas will use these funds to build out more pipelines and concentrate fossil fuel pollution on already impacted Indigenous nations and environmental justice communities. Billions of dollars for carbon capture essentially redirects money away from renewable energy like solar and wind. We do not have time and money to waste on more questionable carbon capture infrastructure.” — ***Tom Goldtooth, Executive Director***

Center for Biological Diversity

“Promoting dangerous carbon capture and storage is just one more way a dying fossil fuel industry is trying to save itself at the expense of our climate and communities. We don t have time or money to waste on fossil fuel deception in a climate emergency. Instead of propping up dirty energy, we need to focus on proven clean energy solutions like solar and wind.” – ***Victoria Bogdan Tejeda, Staff Attorney***

Ohio Valley Environmental Coalition (OVEC)

“Carbon capture technology is still in the early stages of development and not at a scale necessary to curtail the climate crisis. It is being used by industry and governments as a diversion to avoid addressing the climate crisis in a timely way using proven green technology.” — ***Dr. Randi Pokladnik, volunteer***

GreenLatinos

“Carbon capture and storage (CCS) technologies are false solutions that perpetuate and exacerbate existing burdens for frontline communities. They enable the perpetuation of toxic emissions along with very real potential risks of environmental damage is a glaring red flag for lawmakers. For Latino/a/x and other disproportionately pollution burdened communities, continued investment in carbon capture technology and subsidies amounts to a continuation of a long history of environmental injustice. We call on Congress to stop investing in CCS and instead focus investments on energy efficiency and renewables that facilitate a transition to a lower carbon and pollution-free future.” — ***Lydia Cardona, Climate and Clean Air Program Manager***

New York Lawyers for the Public Interest

"The climate crisis is upon us, it s impacting every facet of our lives as well as taking far too many lives in its perilous process. Unfortunately, far too many of our lawmakers have become ensorcelled with profligate and unproven mechanisms to address the climate crisis including so-called carbon capture technology. These false solutions are the latest climate disinformation campaign by fossil fuel cartels and their political acolytes to beguile the people at a time when we need to scale up and scale out proven solutions rooted in frontline and Indigenous wisdom. Worse yet, these lawmakers, including Administrator McCarthy, are ignoring the voices and recommendations of leading Environmental Justice practitioners, including those who sit on the President s White House Environmental Justice Advisory Council, who have stated emphatically that they don t want these false solutions in their communities. It must, therefore, be stated lucidly that support for CCS is an exacerbation of environmental racism, an affront on Tribal/Indigenous sovereignty, and nothing more than a perverse lifeline to industries that profit off of death and calamity." — ***Anthony Rogers Wright, Director of Environmental Justice***

Climate Justice Alliance

"False promises abound as big business salivates over the money to be made in appearing to care about the climate crisis that they created. The push for Carbon Capture and Storage is just another example of corporate controlled mechanisms being promoted as solutions when they actually cause harm to communities and the planet and have not been proven to do what needs to be done to address climate change–reduce emissions at source. If the fossil fuel and gas industries really want to atone for their sins they should immediately abandon this market- based scheme and fund truly renewable and regenerative community controlled approaches to a Just Transition, not ones that sacrifice frontline communities, yet again."

Oil Change International

"Carbon capture and storage isn t just a colossal waste of money and an environmental justice disaster — it s a lifeline to the fossil fuel industry and politicians unwilling to stand up to Big Oil and Gas. The desperate focus on false solutions like CCS is a dangerous distraction from the critical work of ending fossil fuel subsidies and winding down the fossil fuel era with a just transition." — ***Collin Rees, Senior Campaigner***

Michigan Environmental Justice Coalition

"While low-income communities and communities of color face the brunt of the climate crisis, the U.S government is trying to provide subsidies and incentives for false solutions like Carbon Capture and Storage (CCS) projects. Detroit just experienced historic rainfall leaving many people with flooded basements, power and broadband outages, and water contamination. We need climate reparations and direct community investments in climate resilient infrastructure, not false solutions that benefit corporations and burden our communities. CCS allows the fossil fuel industry to continue polluting our neighborhoods while falsely claiming to be reducing greenhouse gas emissions. Michigan Environmental Justice Coalition stands for the health of people and the planet and against corporate greenwashing." — ***Juan Jhong-Chung, Policy Associate***

Waterkeeper Alliance

Carbon capture and storage is a pipe(line) dream for the fossil fuel industry. They would obtain further subsidies for polluting our air, water and communities and also get to greenwash their image," said Chris Wilke of Waterkeeper Alliance. "Not only is this unproven technology unlikely to lead to effective progress toward reducing carbon in the atmosphere, it also represents a false solution that risks squandering this important moment while we still have a real chance at staving off the worst impacts of climate change." — ***Chris Wilke, Global Advocacy Manager***

Catholic Network.US

"As Catholics we are pro-life for all life and are not for false solutions that send more money to fossil fuel companies and the wealthiest in the guise of CCS, which will be an expensive failure. The opportunity cost is too high." — ***Marie Venner, Chair***

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Tweets from @ciel_tweets

Center for International ...

Michigan ...

Attachment No. 7

Environmental Justice Organizations post Comments on Carbon Capture and Storage to the White House Council on Environmental Quality

- April 19, 2022

Brenda Mallory
Chairwoman, Council on Environmental Quality
730 Jackson Place, NW
Washington, DC 20503

Re: Request for Comments Council for Environmental Quality's "Carbon Capture, Utilization, and Sequestration Guidance," 87 Federal Register 8808 (February 16, 2022), Docket CEQ–2022–0001

18 April 2022

Dear Chair Mallory:

The Climate Justice Alliance (CJA) in coordination with Indigenous Environmental Network, Institute for Policy Studies, Grassroots Global Justice Alliance, Michigan Environmental Justice Coalition, and New York Lawyers for the Public Interest appreciate the opportunity to offer comments on the Council on Environmental Quality's, *Carbon Capture, Utilization, and Sequestration Guidance* Document ("Guidance Document").

These comments, led by environmental justice organizations, and supported by numerous ally organizations, highlight the serious concerns with the recently issued Guidance Document on carbon dioxide removal technologies that includes: carbon capture and sequestration/carbon capture utilization and storage (CCS and CCUS), direct air capture (DAC), and other related technologies.

Technological fixes such as CCS/CCUS will never address extraction-driven climate and ecological crises as long as fossil fuels continue to be extracted and burned, or put to other toxic uses such as hydrogen combustion or plastics production. Likewise, bioenergy with carbon capture and storage (BECCS) will never address the ecological crisis caused by destruction of forests for fuel. It should be noted that, currently, the only large-scale use of "captured" carbon dioxide is for enhanced oil recovery (EOR). Currently, 75 percent of carbon dioxide captured via industrial means is used to boost fossil fuel recovery, a fact that is profoundly overlooked in the Guidance Document.

From our perspective, the Guidance Document appears to act as a mechanism for fast-tracking the approval of massive CCS/CCUS and associated carbon dioxide permits in spite of significant opposition from the environmental justice community as well as the larger ecosystem of climate justice advocates. Even the timing of the Guidance Document's release seems concomitant with the Infrastructure Investment and Jobs Act (IIJA), which includes provisions that significantly undermine the National Environmental Policy Act (NEPA), which acts as a vanguard for environmental justice communities. In addition, IIJA diminishes the ability of communities to secure injunctions for harmful projects by expediting environmental reviews and increasing hurdles for communities to challenge projects in court.

President Biden declared it the policy of his administration to, "secure environmental justice and spur economic opportunity for disadvantaged communities that have been historically marginalized and overburdened by pollution and underinvestment…" However, this intention is not reflected in the Guidance Document or the process that led to its preparation. We, therefore, invite CEQ to consider our concerns and work more intentionally with Indigenous and environmental justice communities prior to the proliferation of CCS/CCUS technology and associated infrastructure in such a way that better aligns with the commitments made by President BIden, CEQ, and other federal agencies to prioritize environmental justice.

Background and Framing

The proliferation of CCS/CCUS and associated infrastructure will inevitably have a profound impact on environmental justice communities – in some instances it already has, as was the case in Yazoo County, Mississippi following the rupture and explosion of a carbon dioxide pipeline that left many injured. CCS/CCUS also contributes to worsened air quality by increasing lifecycle emissions of toxic air pollutants, disproportionately harming disadvantaged and other environmental justice communities. In addition to worsening existing sources of

pollution, CCS/CCUS has the potential to expose environmental justice communities to new, under-studied risks associated with the buildout of carbon dioxide pipelines, as was the case in the aforementioned Yazoo County, Mississippi incident.

We declare the entire concept of CCS/CCUS is antithetical to environmental justice principles. As such, any attempt to reconcile CCS/CCUS guidance in the context of environmental justice is an exercise in futility. Whereas CCS/CCUS is an "end of the pipe" solution that attempts to remove carbon dioxide after fossil fuels have been extracted, transported, processed, and burned, causing harm to communities and ecosystems at every stage. True environmental justice requires addressing the root causes of the problem by leaving fossil fuels in the ground and reducing emissions expeditiously.

Therefore, we call on CEQ to withdraw the Guidance Document, and undertake a better, more inclusive process that demonstrates and exercises transparency, participation, as well as the consent of environmental justice community members that leads to a new guidance document. Further, we request a longer comment period of at least 60 days, and an additional process that would give stakeholders more opportunities to give input on CEQ's guidance, including:

- Broader community engagement including direct outreach to frontlines and environmental justice communities, potential geographic hearings or listening sessions, etc;
- Development of further reports that go beyond CEQ's 2021 report to Congress, *Council on Environmental Quality Report to Congress on Carbon Capture, Utilization, and Sequestration* ("CEQ 2021"), to assess the potential harmful impacts of CCUS on disadvantaged and other environmental justice communities that should be completed before any final guidance is issued; and
- A recommendation by CEQ for the cessation of all CCS/CCUS permitting projects until the final guidance is developed with robust stakeholder engagement.

Further, we are extremely concerned, pursuant to the Consolidated Appropriations Act of 2021, CEQ has been tasked with establishing "not less than [two] task forces, which shall each cover a different geographical area with differing demographic, land use, or geological issues," for the purpose of facilitating the permitting and development of CCS projects. The law was enacted in December 2020 and gave CEQ 18 months to establish these task forces, which likely means that the process of establishing these task forces is close to completion. However, we, and numerous environmental advocates with whom we frequently work, have heard of no public announcements from CEQ whatsoever about which geographic regions they have selected, who the proposed members of the task forces are, nor any other relevant information.

We find this lack of transparency to be deeply concerning, and demand that CEQ immediately:

- Make public its plans for establishing these task forces;
- Prohibit the task forces from recommending permit processes for CCS/CCUS projects until environmental justice principles of transparency, consent, and participation are met to the satisfaction of the environmental justice community; and
- Provide meaningful opportunities for impacted communities in the selected geographic regions to engage and participate in the work of these task forces.

CEQ Failed to Undertake Meaningful Engagement with Indigenous and Environmental Justice Communities

Environmental justice movements arose in response to decades of disproportionate environmental harms experienced by Indigenous, Black, Latin(a/o), Asian, and other communities of the global majority, and the poor in the United States and worldwide resulting from centuries of slavery, colonization, and the promulgation of racist, sexist, and inequitable policies. In response to legacy environmental racism, environmental justice movements have developed key principles, such as the 1991 Principles of Environmental Justice, the 1996 Jemez Principles of Democratic Organizing, and various principles of Just Transition.

Unfortunately, CEQ failed to consider any of these principles or include consultation with Indigenous and environmental justice Peoples and organizations in its preparation of the Guidance Document. This is antithetical to Section 219 of President Biden's Executive Order (E.O) 14008, which, in part, stipulates, "Agencies shall make achieving environmental justice part of their missions by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts."

Additionally, the Guidance Document does not comply with mandated consultation policies with federally recognized Tribes pursuant to E.O. 13175. It is our assertion that CEQ and the Biden Administration should require Indigneous Peoples' consent, not just consultation, in accordance with the principle of Free Prior and Informed Consent for any decision impacting Indigenous Peoples, before any guidance on CCS/CCUS is issued to ensure meaningful consultation.

Furthermore, the process that led to the Guidance Document is inconsistent with CEQ's own "Guiding Principles for Meaningful Engagement" included as part of its 2016 Document, *Promising Practices for EJ Methodologies in NEPA Reviews.* Therein, CEQ recommends, "Meaningful engagement efforts with potentially affected minority populations, low-income populations, and other interested individuals, communities, and organizations are generally most effective and beneficial for agencies and communities when initiated early and conducted (as appropriate) throughout each step of the NEPA process."

The Guidance Document is inconsistent with public engagement recommendations and conclusions contained in CEQ 2021. For instance, the Guidance Document indicates the 2021 report was "… developed in response to the Congressional mandate to identify public engagement opportunities through existing laws, including under the National Environmental Policy Act of 1969." However, we find that the Guidance Document's assurances of consultation with environmental justice communities, and safeguards to prevent any harm to them, are specious. In fact, it can be argued that the entire process associated with the introduction of legislative priorities for carbon dioxide removal technologies has lacked inclusion and consent, since the views of environmental justice communities were not intentionally solicited, such as during a Congressional hearing for the Utilizing Significant Emissions with Innovative Technologies (USE IT) Act (which is included as part of Consolidated Appropriations Act of

2021), which, did not include a single representative of an environmental justice community or climate justice organization.

These and other recommendations to better engage with disadvantaged and other environmental justice communities were clearly absent from the process that led to the Guidance Document. Therefore, as previously mentioned, CEQ must undertake broader community engagement including direct outreach to frontline, Indigenous, and environmental justice communities through a series of public hearing opportunities that are accessible to concerned and other interested residents.

Guidance Documented Cites Selective Data That Fail to Document Past and Present CCS/CCUS Challenges

The Guidance Document is largely informed by key findings included as part of CEQ 2021, which includes a litany of inconsistencies, unfounded conclusions, and, in some cases, blatant inaccuracies. For instance, one of CEQ 2021's key findings asserts, "Key guidance documents and best practices have been developed by the Federal Government, industry, and non-governmental organizations to assist CCUS project developers in moving CCUS efforts forward responsibly and efficiently." However, CEQ failed to cite any of these sources in CEQ 2021 and they are largely unknown to the various environmental justice organizations we solicited to determine their familiarity with these "key guidance documents and best practices."

Additionally, CEQ 2021 claims, "The Federal Government has an existing regulatory framework that is rigorous and capable of managing permitting and review actions while protecting the environment, public health, and safety as CCUS projects move forward." Yet, as our comments will demonstrate, CEQ itself confirms there is, for instance, no federal agency that currently holds jurisdiction over carbon dioxide pipelines – they are largely regulated by the states. In short, the fact that the recommendations of the Guidance Document are informed by CEQ 2021 is concerning and should be addressed prior to finalization of any guidance for the permitting and regulation of CCS/CCUS and associated infrastructure.

CEQ claims there is "growing scientific consensus" CCUS technologies and permanent sequestration are likely needed to prevent the worst impacts of climate change but fails to provide any references to back up this claim. However, CEQ conveniently ignored the growing body of evidence proving that carbon removal methods have not demonstrated energy efficiency or efficacy. As an example, according to three leading climate scientists, reliance on technological carbon removal, and the underlying misleading concept of "net zero" emissions targets, create a false sense of complacency by holding onto the promise of non-existent or experimental technologies, which could mitigate greenhouse gas emissions in the distant future, reducing the impetus to make deep cuts in emissions today.

Furthermore, the Guidance Document omits consensus from numerous environmental justice organizations who contend that carbon removal technologies perpetuate harm and risk to environmental justice communities. In fact, President Biden's White House Environmental Justice Advisory Council (WHEJAC), which includes leaders of the environmental justice community, explicitly named CCS/CCUS as an example of the types of projects that will not benefit disadvantaged and other environmental justice communities. Additionally, national

climate justice base-building organizations such as CJA have unequivocally indicated their opposition to CCS/CCUS, as well more than 500 national and international organizations who recently called on lawmakers in the United States and Canada to, "reject carbon capture and storage (CCS) and Carbon Capture, Utilization, and Storage (CCUS) as dangerous distractions and to end the 'carbon capture of climate policy.'"

Omitting these resources from the Guidance Document could be seen as the federal government not acting objectively and signaling its preference for one technology over another. And, the fact that the IIJA earmarked an estimated $12.1 Billion for CCS/CCUS projects compared to less than $1 Billion for renewable energy projects compounds our concerns. This, despite the fact that over 80 percent of CCS/CCUS projects globally have been scuttled due to irreconcilable and exorbitant costs and/or the ineffectiveness of the technology altogether.

The Guidance Document makes no mention of the vast amount of taxpayer dollars spent on CCS/CCUS demonstration projects that never came to fruition. It's troubling that CEQ makes no mention of the report prepared by the Government Accountability Office (GAO) which reveals that all eight Department of Energy (DOE) funded CCS demonstration projects for coal fired power plants have either been withdrawn, terminated, or are no longer in operation. Even the Wall Street Journal declared that government funded CCS/CCUS initiatives have, "a dismal record," as part of a piece that also revealed the fact that there are neither federal requirements nor incentives that discourage corporations utilizing CCS/CCUS from releasing greenhouse gasses into the atmosphere.

For these reasons and more, CEQ must prepare additional reports that go beyond CEQ's 2021 report in an effort to assess costs to taxpayers for subsidizing this technology and potential harmful impacts of CCS/CCUS on disadvantaged and other environmental justice communities.

Guidance Document Contains Inconsistent Policy Conclusions That Could Result in Confusion and Litigation

CEQ must elucidate the extent to which federal agencies have jurisdiction over carbon dioxide (CO2) pipelines. The Guidance document and CEQ 2021 offer differing and, at times, ambivalent determinations. For instance, CEQ 2021 indicates, "no Federal entity is responsible for siting interstate CO2 pipelines across Federal and non-Federal lands. States establish the regulatory frameworks within their state boundaries, which include responsibility for siting and permitting intrastate pipelines as well as segments of interstate hazardous liquids pipelines within the state boundary." It goes on to say, "Because states and localities have distinct regulatory regimes, it may be more complex to move CCUS efforts forward in some jurisdictions than others." However, the Guidance document suggests, "Because multiple Federal and State agencies will be responsible for planning and permitting priority pipeline pathways, and in order to ensure that these actions are aligned with climate, economic, and public health objectives, CEQ will convene the relevant agencies to assess opportunities for improvement in carbon dioxide pipeline permitting."

CEQ must better stipulate which Federal, and which state agencies have jurisdiction over these pipelines. Moreover, since CO2 pipelines in most cases would be transporting gasses that will eventually be utilized for a wide range of products (such as fertilizer, EOR and other forms of

commerce), CEQ must indicate how CO2 transported via pipeline across state lines would be consistent with the Interstate Commerce Clause.

Regarding compliance with NEPA, the Guidance Document evokes the idea of Tiering via Programmatic Environmental Impact Statements (EIS) to increase the efficiency of the permitting processes for CCS/CCUS and associated infrastructure. This is a problematic approach when considering that analyses of larger regions may not necessarily accurately account for the baseline conditions of physical, socioeconomic, or cultural resources for a specific geography within a larger region. This is precisely why, 43 CFR § 46.140(b) stipulates, "To the extent that any relevant analysis in the broader NEPA document is not sufficiently comprehensive or adequate to support further decisions, the tiered NEPA document must explain this and provide any necessary analysis." Moreover, according to CEQ's 2014 document, *Effective Use of Programmatic NEPA Reviews (2014),* the agency, "finds it inappropriate to establish a presumption that substantive analysis is unnecessary or should be precluded in subsequent tiered documents." Furthermore, CEQ must ensure their recommendations for tiering are not viewed as segmenting – the breaking up of a larger project into smaller components, in order to avoid finding no significant impact of a project considered as a whole, which, pursuant to 40 CFR 1500 – 1508, is prohibited.

Utilizing Programmatic EISs also increases the risk for localized environmental justice impacts to be overlooked and unaccounted for. Broader analyses will not necessarily depict specific, localized environmental justice impacts of a proposed action that is part of a larger, regional proposal. In fact, it is common practice to identify an environmental justice community by comparing the socioeconomic demographics of a local geography to its surrounding area. As such, a larger project's demonstration of no impact in one area of a region is not necessarily representative of potential impacts for the entire region, or for local areas specifically. Inadequate analysis of environmental justice impacts would be inconsistent with Executive Order 12898 and could lead to litigation.

To these ends, CEQ should recommend that all CCS/CCUS projects require project-level EISs in lieu of programmatic EISs. Efficiency should never come at the expense of thorough analyses that investigate the full scope of potential impacts, especially to Indigenous and other environmental justice communities.

Conclusion

CCS/CCUS is an unproven, profligate technology scheme that's already cost taxpayers billions of dollars while putting Indigenous and other environmental justice communities at increased risk for disproportionate impacts including, but not limited to, exposure to toxic emissions and explosions due to ruptured and malfunctioning pipelines. The Guidance Document fails to address these issues or demonstrate the efficacy of CCS/CCUS as a true solution for reducing emissions. In fact in certain cases, such as the Quest Plant in Alberta, Canada, CCS/CCUS actually released more carbon dioxide than it sequestered.

Environmental justice organizations and advocates are gravely concerned that CEQ is hastily promoting an ineffective technology that will only allow the fossil fuel industry to continue emitting greenhouse gasses at a time when the science tells us we have less than a decade to

properly address the climate crisis. For environmental justice communities, where the vast majority of CCS/CCUS facilities would be located, the situation is even more dire and CEQ's Guidance Document provides little to no reassurances that impacts to these communities will be properly analyzed or mitigated.

CEQ must revisit the entire process that led to the Guidance Document and allow for a longer comment period of at least 60 days, as well as undertake an additional process that allows Indigenous and other environmental justice communities more opportunities for broader community engagement, direct outreach to environmental justice communities, and additional studies to assess the potential harmful impacts of CCS/CCUS.

We look forward to working with CEQ in an effort to assist the Biden Administration with living up to its environmental justice commitments as stipulated in EO 14008 and public statements made by the president and numerous representatives of federal agencies.

Sincerely,
Climate Justice Alliance
Grassroots Global Justice Alliance
Indigenous Environmental Network
Institute for Policy Studies Climate Policy Program
Michigan Environmental Justice Coalition
New York Lawyers for the Public Interest

Supporting Environmental Justice Organizations:
7 Directions of Service
Alliance for Affordable Energy
Asian Pacific Environmental Network (APEN)
Center for Coalfield Justice
Center for Community Action and Environmental Justice
Communities for a Better Environment
Central California Asthma Collaborative
Central Valley Air Quality Coalition (CVAQ)
Cheyenne River Grassroots Collective
Citizens for Clean Air and Water in Freeport Texas
Citizens for Coalfield Justice
Coalition Against Death Alley
Common Ground Rising
Communities for a Better Environment
Cooperation Jackson
Detroit Hamtramck Coalition for Advancing Healthy Environments
East Michigan Environmental Action Council
Friends For Environmental Justice
Giniw Collective
Greater New Orleans Housing Alliance
Greater New Orleans Interfaith Climate Coalition
Gulf Coast Center for Law & Policy
Harambee House, Inc. / Citizens for Environmental Justice
Healthy Gulf

Honor the Earth
Idle No More SF Bay
Inclusive Louisiana
Indigenous Lifeways
Ironbound Community Corporation
Just Transition Alliance
Kickapoo Peace Circle
Lakota People's Law Project
Little Manila Rising
Little Village Environmental Justice Organization
Micronesia Climate Change Alliance
Migiziwillfly
Mujeres Unidas y Activas
Multicultural Alliance for a Safe Environment
Native Movement
NC Climate Justice Collective
New York City Environmental Justice Alliance
Nicaragua Center for Community Action
North Dakota Native Vote
OPAL Environmental Justice Oregon
Parable of the Sower Cooperative
People Organizing to Demand Environmental and Economic Rights (PODER)
People's Action
Pueblo Action Alliance
SouthWest Organizing Project
Spirit of the Sun, Inc.
Texas Environmental Justice Advocacy Services (t.e.j.a.s.)
The People's Justice Council
Turtle Island Restoration Network
United Native Americans
UPROSE
UUFD Environmental Justice Team
Waterspirit
Women's Earth and Climate Action Network

Supporting Organization Sign On:
1000 Grandmothers for Future Generations
198 methods
350 Bay Area Action
350 Colorado
350 Conejo / San Fernando Valley
350 Mass
350 New Orleans
350 Seattle
350 Seattle
350 Triangle
350.org
350Hawaii

5 Gyres Institute
A Community Voice
Accelerate Neighborhood Climate Action
Activist San Diego
AFGE Local 704
Agricultural Justice Project
Animals Are Sentient Beings Inc
Association of Young Americans
Athens County's Future Action Network/ACFAN
Beyond Plastics
Biofuelwatch
Bold Alliance
Breathe Project
Buckeye Environmental Network
Businesses for a Livable Climate
Cabrini Care for Creation
California Communities Against Toxics
California Faculty Association
California Safe Schools
Call to Action Colorado
Capitol Heights Presbyterian
Care for Creation Team
CatholicNetwork US
Center for Biological Diversity
Center for Environmental Health
Center for International Environmental Law
Citizen Power, Inc.
Citizen's Alliance for a Sustainable Englewood
Citizens Resistance At Fermi Two (CRAFT)
Clean Air Council
Clean Energy Action
Climate Hawks Vote
CO Businesses for a Livable Climate
CO Dem. Party – Energy & Environmental Initiative
CO Small Business Alliance
Coalition to Protect New York
COCRN Colorado Community Rights Network
Colorado Western Slope Businesses for a Livable Climate
Community for Sustainable Energy
Concerned Citizens of St. John
Concerned Health Professionals of Pennsylvania
ConnectX Eco
Dakota Rural Action
DC Statehood Green Party
Divest Ed
Dogwood Alliance
Don't Waste Arizona
Earth Action, Inc.

Earth Care
Earth Guardians
ecoAmerica
EcoEquity
Ecology Center
Empower our Future
End Climate Silence
Extinction Rebellion San Francisco Bay Area
Food & Water Watch
Fox Valley Citizens for Peace & Justice
FracTracker Alliance
FreshWater Accountability Project
Friends of the Earth
GAIA
Grassroots International
Greater New Orleans Climate Reality Project
Greenpeace USA
Heartwood
I-70 Citizens Advisory Group
Indivisible Ambassadors
Indivisible Ventura
Indigenous Outreach at St.Frances Cabrini Church
Inland Ocean Coalition
Interfaith Council for Peace and Justice
John Muir Project
Long Beach Alliance for Clean Energy
Long Island Progressive Coalition
Loudoun Climate Project
Louisiana League of Conscious Voters
Louisville Metro Public Defender
Madhvi4EcoEthics
Mayfair Park Neighborhood Association Board
Mental Health & Inclusion Ministries
Mn350
Montbello Neighborhood Improvement Association
Mothers Out Front Colorado
MoveOn.org Hoboken
Nancy Negrette Brows, Hair & Lashes Studio
Natural Capitalism Solutions
NELA Climate Collective
Network for a Sustainable Tomorrow
New Energy Economy
New Mexico Environmental Law Center
North American Climate, Conservation and Environment(NACCE)
North Range Concerned Citizens
Northern Alaska Environmental Center
Nuclear Energy Information Service (NEIS)
Nuclear Information and Resource Service (“for a nuclear-free, carbon-free world”)

Ohio Poor People's Campaign
Oil Change International
Our Revolution
Peace Action WI
Peak Plastic Foundation
Physicians for Social Responsibility – Los Angeles
Physicians for Social Responsibility Pennsylvania
PIIC
Plastic Pollution Coalition
Plymouth Friends for Clean Water
Private Equity Stakeholder Project
Progressive Democrats of America
Property Rights and Pipeline Center
Protect Our Water Heritage Rights (POWHR)
Putnam Progressives
Rachel Carson Council
RapidShift Network
Resist the Pipeline
Revolving Door Project
Richmond Our Power Coalition
River Valley Organizing
Rogue Climate
San Antonio Bay Estuarine Waterkeeper
San Francisco Bay Physicians for Social Responsibility
San Luis Valley Ecosystem Council
Santa Cruz Climate Action Network
Saphron Initiative
Save EPA (former employees)
School Sisters of Notre Dame
Science and Environmental Health Network
Science for the People – Twin Cities
SEED of SW NM
Small Business Alliance
SoCal 350 Climate Action
Social Eco Education (SEE)
Solar Wind Works
SolidarityINFOService
Southwest Organization for Sustainability
St Frances Cabrini Catholic Community
St luke presbyterian
Sunnyside United Neighbors, inc (SUNI)
System Change Not Climate Change
Terra Advocati
Texas Campaign for the Environment
The Green House Connection Center
The Last Plastic Straw
The Romero Institute
The Shame Free Zone

Third Act Virginia
Tishman Environment & Design Center, The New School
Triple Justice Organization
UCAN
Unitarian Universalist Association
Unitarian Universalist Mass Action
Unite North Metro Denver
United Women in Faith
Valley Watch, Inc.
Vote Climate
Wall of Women
Waterway Advocates
Western Slope Businesses for a Livable Climate
WildEarth Guardians
Wilwerding Consulting
Women's Environment and Development Organization (WEDO)
Working for Racial Equity
Womxn from the Mountain
YUCCA (Youth United for Climate Crisis Action)
Zero Hour

Attachment No. 8

Every Dollar Spent on This Climate Technology Is a Waste

Credit... Josh Haner / The New York Times

By Charles Harvey and Kurt House *New York Times* Aug. 16, 2022
https://bit.ly/3Qw1xvU

[Dr. Harvey is a professor of environmental engineering at the Massachusetts Institute of Technology. Dr. House is the chief executive officer of KoBold Metals, a metals exploration company.]

The technology called carbon capture and storage is aptly named. It is supposed to capture carbon dioxide emissions from industrial sources and pump them deep underground. It was a big winner in the climate provisions of the Inflation Reduction Act passed by Congress last week and signed into law by President Biden on Tuesday.

What the technology, known as C.C.S., also does is allow for the continued production of oil and natural gas at a time when the world should be ending its dependence on fossil fuels.

The Inflation Reduction Act does more to cut fossil fuel use and fight climate change than any previous legislation by expanding renewable energy, electric cars, heat pumps and more. But the law also contains a counterproductive waste of money, backed by the fossil fuel industry, to subsidize C.C.S.

Fifteen years ago, before the cost of renewable energy plummeted, carbon capture seemed like a good idea. We should know: When we began a start-up 14 years ago — the first privately funded company to make use of C.C.S. in the United States — the idea was that the technology could compete as a way to produce carbon-free electricity by capturing the carbon dioxide emissions emitted from power plants and burying them. But now it's clear that we were wrong, and that every dollar invested in renewable energy — instead of C.C.S. power — will eliminate far more carbon emissions.

Even so, this technology has broad political support, including from Senator Joe Manchin of West Virginia, an ally of the coal industry, because it enables the continued extraction and burning of fossil fuels while also preventing the resulting carbon dioxide from entering the atmosphere. Industry campaigns such as "Clean Coal" have also promoted the technology as something that could ramp up quickly to bridge the gap to the deployment of large-scale renewable energy. But by promoting C.C.S., the fossil fuel industry is slowing the transition away from fossil fuels.

Under the Inflation Reduction Act, facilities using this technology will be eligible for generous tax credits provided they break ground by the end of 2032 — an extension of the current deadline of 2025. Those benefits come on top of $12 billion in government investments in C.C.S., as well as in technology that would pull carbon dioxide directly from the air, which were included in the infrastructure bill signed by President Biden last fall.

C.C.S. is seen as a solution to the emissions problem for a range of industries, from electricity generating plants powered by fossil fuel to industrial facilities that produce cement, steel, iron, chemicals and fertilizer.

Where C.C.S. has been most widely used in the United States and elsewhere, however, is in the production of oil and natural gas. Here's how: Natural gas processing facilities separate carbon dioxide from methane to purify the methane for sale. These facilities then sometimes pipe the "captured" carbon dioxide to what are known as enhanced oil recovery projects, where it is injected into oil fields to extract additional oil that would otherwise be trapped underground.

Of the 12 commercial C.C.S. projects in operation in 2021, more than 90 percent were engaged in enhanced oil recovery, using carbon dioxide emitted from natural gas processing facilities or from fertilizer, hydrogen or ethanol plants, according to an industry report. That is why we consider these ventures oil or natural gas projects, or both, masquerading as climate change solutions.

The projects are responsible for most of the carbon dioxide now sequestered underground in the United States. Four projects that do both enhanced oil recovery and natural gas processing account for two-thirds to three-quarters of all estimated carbon sequestered in the United States, with two plants storing the most. But the net effect is hardly climate friendly. This process produces more natural gas and oil, increases carbon dioxide emissions and transfers carbon dioxide that was naturally locked away underground in one place to another one elsewhere.

In an effort to capture and store carbon dioxide from fossil-fuel-burning power plants, the Department of Energy has allocated billions of dollars for failed C.C.S. demonstration projects. The bankruptcy of many of these hugely subsidized undertakings makes plain the failure of C.C.S. to reduce emissions economically.

The Kemper Power Project in Mississippi spent $7.5 billion on a coal C.C.S. plant before giving up on C.C.S. in 2017 and shifting to a gas-powered plant without C.C.S. The plant was partially demolished in October 2021, less than six weeks before President Biden signed the infrastructure bill with its billions of taxpayer money for C.C.S.: good money thrown after bad. The FutureGen project in Illinois started as a low-emission coal-fired power plant in 2003 with federal funds, but ultimately failed as a result of rising costs.

The Texas Clean Energy and Hydrogen Energy California C.C.S. projects were allocated over a half- billion dollars collectively, then dissolved. The list goes on, with at least 15 projects burning billions of dollars of public money without sequestering any meaningful amount of carbon dioxide. Petro Nova, apparently the only recent commercial-scale power project to inject carbon dioxide underground in the United States (for enhanced oil recovery), shut down in 2020 despite hundreds of millions of dollars in tax credits.

These projects failed because renewable electricity generation outcompetes C.C.S. Renewable power now is cheaper than coal-fired power without C.C.S. Add the cost of the energy required to couple C.C.S. with fossil fuel power and it becomes hopelessly uncompetitive. We can only guess how much more the full costs of

C.C.S. would exceed renewable power because, after decades of promotion and many billions of dollars spent, we still have next to no real-world data about the costs of running, maintaining and monitoring large C.C.S. projects.

These C.C.S. projects are subsidized by Section 45Q of the federal tax code, which now offers companies a tax credit for each metric ton of carbon dioxide injected into the ground. Those enhanced oil recovery subsidies would rise under the new law, to $60 per ton from $35. The legislation also significantly broadens the number of facilities eligible for tax credits. And they will be able to claim the tax credit through a tax refund. The 45Q program is nominally a program to fight climate change. But since nearly all carbon dioxide injections subsidized by 45Q are for enhanced oil recovery, the 45Q program is actually an oil production subsidy.

The Internal Revenue Service does not provide information about who gets the credits. But we do know that it issued more than $1 billion of these credits as of 2020.

These subsidies create a perverse incentive, because for companies to qualify for the subsidies, carbon dioxide must be produced, then captured and buried. This incentive handicaps technologies that reduce carbon dioxide production in the first place, tilting the playing field against promising innovations that avoid fossil fuels in the steel, fertilizer and cement industries while locking in long-term oil and gas use.

Industry campaigns for C.C.S. also have shifted their decades-long disinformation fight: Instead of spreading doubt about climate science, the industry now spreads false confidence about how we can continue to burn fossil fuels while efficiently cutting emissions. For example, Exxon Mobil advertises that it has “cumulatively captured more carbon dioxide than any other company — 120 million metric tons.”

What Exxon Mobil doesn’t say is that this carbon dioxide was already sequestered underground before it “captured” it while producing natural gas and then injected it back into the ground to produce more oil. These advertising campaigns lend support to government programs to directly subsidize C.C.S.

Solving climate change requires resources; misappropriating these resources makes solving the problem harder. We have no time to waste. We need to stop subsidizing oil extraction and carbon dioxide production in the name of fighting climate change and stop burning billions in taxpayer money on white elephant

projects. Clean power from carbon capture and sequestration died with the success of renewable energy; it’s time to bury this technology deep underground.

Charles Harvey is a professor of environmental engineering at the Massachusetts Institute of Technology. Kurt House is the chief executive officer of KoBold Metals, an exploration company seeking metals for batteries.

Attachment No. 9

IOWA STATE UNIVERSITY
College of Agriculture and Life Sciences

https://www.cals.iastate.edu/news/releases/pipeline-study-shows-soil-compaction-and-crop-yield-impacts-construction-right-way

Pipeline study shows soil compaction and crop yield impacts in construction right-of-way

Iowa State University College of Agriculture and Life Sciences
November 11th, 2021

AMES, Iowa — An Iowa State University study looking at the impacts of soil disturbance and early remediation practices from construction of the Dakota Access Pipeline finds significant soil compaction and gradual recovery of crop yield in the right-of-way over five years.

The research funded by Dakota Access Pipeline (DAPL) aimed to investigate construction influences of the underground pipeline on farmland. The pipeline transports crude oil over 1,172 miles from North Dakota to Patoka, Illinois, passing through South Dakota and about 347 miles in Iowa. The study's primary goal was to assess the extent of soil and cropping disturbances in the approximately 150-foot right-of-way caused by land clearing, topsoil removal and soil mixing, pipeline trenching and backfilling during the construction process.

Researchers also wanted to evaluate the effectiveness of state-mandated remediation requirements and a DAPL agricultural mitigation plan designed to minimize impacts to cropland. The Iowa Utility Code requires pipeline projects to remove topsoil and apply deep tillage to exposed subsoil before replacing the topsoil. The researchers are continuing to study the benefits of these practices, which can be costly.

Such field-based research quantifying soil properties and recovery in the years after a pipeline installation on farmlands is limited across the corn-soybean regions of the United States.

“Our findings show extensive soil disturbance from construction activities had adverse effects on soil physical properties, which come from mixing of topsoil and subsoil, as well as soil compaction from heavy machinery,” said Mehari Tekeste, assistant professor of agricultural and biosystems engineering, director of the Soil Machine Dynamics Laboratory at Iowa State, and leader of the project.

Tekeste worked with a team that included: Mark Hanna, retired Iowa State Extension agricultural engineer; Robert Horton, who holds the Charles F. Curtiss Distinguished Professorship in Agriculture and Life Sciences in agronomy; and Elnaz Ebrahimi, research scientist in agricultural and biosystems engineering.

After the local pipeline construction was completed in 2016, the researchers began studying the impacts of construction and reclamation on a short stretch where the pipeline crossed an Iowa State research farm near Ames, Iowa. They monitored soil characteristics like bulk density and chemical properties at different depths across three zones within the right-of-way and adjacent undisturbed crop fields. In 2017 and 2018, they analyzed yield data for corn and soybean plots planted on the reclaimed land in the pipeline right-of-way under two tillage systems (no-till and conventional tillage) and compared the yields to crops in the undisturbed fields with similar soils. A peer-reviewed article in the journal “Soil Use and Management” summarizes their early results.

“Overall, in the first two years, we found the construction caused severe subsoil compaction, impaired soil physical structure that can discourage root growth and reduce water infiltration in the right-of-way,” said Horton, the lead soil physicist on the project. They also found changes in available soil water and nutrients.

Though the heavy equipment-induced compaction was still evident two years after construction, a deep subsoil tillage treatment showed some benefit for alleviating the compaction.

The team found crop yields in the right-of-way were reduced by an average of 25% for soybeans and 15% for corn during the first and second crop seasons, compared to undisturbed fields.

“However, we have already started to see gradual recovery in yields from the soybean-corn rotation re-established in the right-of-way,” Ebrahimi said. “Also, results from our tillage comparisons suggest that use of no-till slightly improved corn production in the right-of-way zones, especially under the unfavorable weather conditions of 2020.”

The researchers are finalizing analyses from the subsequent years of the project. What they can say at this point is the compaction and yields are very slowly starting to recover. Ebrahimi has simulated the impacts of the soil compaction on crop yields over time using the Agricultural Production Systems sIMulator (APSIM). A publication on her results is in the process of review.

“We would like to continue this research -- and especially collect more years of data on corn – and use it to provide recommendations for best management practices that can more effectively mitigate the impacts of future pipeline installation on crop yields,” Tekeste said.

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RESEARCH PAPER

Soil Use and Management | WILEY

Effect of subsoil tillage during pipeline construction activities on near-term soil physical properties and crop yields in the right-of-way

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Abstract

Persistence of subsoil compaction in construction right-of-way (ROW) areas is a major cropland concern following installation of underground pipelines. Soil physical disturbance and remediation practices including removal of topsoil, subsoil tillage and replacement of topsoil were investigated in a soybean–corn rotation field, which was located within a pipeline ROW. The objectives of the study were to investigate the effectiveness of subsoil tillage (300 and 450 mm) applied shortly after the pipeline installation used to help restore soil physical properties and to recover crop yields. Soil bulk density, soil cone index and crop yields (soybean and corn) from three ROW trafficked zones (Z1, Z2 and Z3) and adjacent unaffected zones were compared at one year and two years after pipeline installation. Compared to 300 mm of subsoil tillage in the ROW zones, 450 mm of subsoil tillage did not significantly improve the soil bulk density and crop (soybean and corn) yields. Compared to 300 mm of subsoil tillage, 450 mm of subsoil tillage created significantly lower soil cone index values within the treated soil layer. Compared to yield data from the adjacent unaffected zones, the ROW zones (Z1, Z2 and Z3) had statistically significant ($p < .05$) crop yield declines of 25% in soybean (2017) and 15% in corn (2018). The near-term soil physical properties and crop yield have been improved from the subsoil tillage applied in the affected zones; however, their recovery to normal conditions as in the unaffected areas has not been achieved within the 2-year period.

KEYWORDS

corn, soil bulk density, soil cone penetration resistance, soybean, subsoil tillage, tillage systems

1 | INTRODUCTION

Natural gas and oil consumption are projected (U.S. Energy Information Administration, 2019) to increase globally and domestically through 2040. According to the report released by the Interstate Natural Gas Association of America (INGAA, 2015), extraction and transportation of natural resources will require establishment of thousands of kilometres of new pipeline infrastructures. As an inevitable consequence, installation of underground pipelines implicates extensive soil disturbance with adverse effects on soil physical properties through soil compaction and mixing of topsoil and subsoil because of construction right-of-way (ROW) activities (Naeth, McGill, & Bailey, 1987; Shi, Xiao, Wang, & Chen, 2014; Yu et al., 2010). Machinery-induced excessive soil compaction reduces crop yield (Bell, 2010; Lowery & Schuler, 1991;

Raper, Reaves, Shaw, van Santen, & Mask, 2005; Soon, Rice, Arshad, & Mills, 2000) through increases in soil bulk density and soil strength (Cambi et al., 2015; Kumar, Chen, Sadek, & Rahman, 2012; Lepilin, Laurén, Uusitalo, & Tuittila, 2019; Raper et al., 2005).

Restoration of soil productivity after disturbance depends on the severity of soil compaction, vulnerability of the loosened soil conditions to re-compaction, crop type and climate (Batey, 2015; Batey & McKenzie, 1999; Shi et al., 2014; Spoor, 2006). However, there are still knowledge gaps in understanding soil structural deterioration, effectiveness of tillage reclamation methods and revegetation strategies in disturbed ROW areas during the post-construction phase (Batey, 2015; Brown, 2012; Noble, 2006). Field-based research studies are rare that quantify soil compaction and recovery time in the subsequent years after installation of underground pipelines. Some studies have indicated the negative impacts of ROW construction activities on soil structure (Li, Deng, Cao, Lei, & Xia, 2013; Soon et al., 2000; Tekeste, Hanna, Neideigh, & Guillemette, 2019; Turney & Fthenakis, 2011) and crop yield in highly productive farmlands of the US-Midwest (Olson & Doherty, 2012). Soil structural recovery can be measured by spatial and temporal comparisons of soil characteristics, such as soil bulk density and cone penetration resistance in disturbed and non-disturbed areas.

Developing effective reclamation methods for disturbed croplands requires an accurate determination of the soil disturbance, the soil compaction and the restoration cycle of specific soil types after ROW activities. Different strategies such as application of subsoil tillage, alternative tillage systems and crop rotations can be applied during the post-construction phase. The decision on proper soil recovery management varies based on site-specific conditions, where the level of soil disturbance and environmental factors correlate with the intensity of site management necessary to promote soil restoration in cropland (Antille et al., 2016; Bolling & Walker, 2000; Li et al., 2013).

Determination of proper subsoil tillage depth, number of repeated tillage passes and traffic management to avoid unnecessary trafficking is important factors to consider in developing a best management strategy (Spoor, Tijink, & Weisskopf, 2003). The no-tillage (NT) system has been promoted to conserve soil, water and crop yields (Blanco-Canqui, Claassen, & Stone, 2010; Yadav, Lal, & Meena, 2019) and can potentially restore soil structure and productivity by increasing aggregate stability and soil organic matter (Kumar et al., 2012; Vepraskas, Busscher, & Edwards, 1995; Woodward, 1996).

Measurements made on an exposed subsoil after pipeline installation but prior to topsoil replacement at a pipeline site (Tekeste et al., 2019) indicated extremely high peak vertical soil stresses (up to 133 kPa) and bulk density (1.72 Mg m^{-3}) equal to the Proctor compaction test maximum bulk density value. Such extreme soil compaction created during the pipeline construction phase and at a depth below the conventional deep tillage practices raised the need to investigate post-construction soil recovery management practices. Our current study investigates the effects of subsoil tillage and surface tillage on soil compaction and crop yields in pipeline installation ROW zones of a field in the Midwest region of the U.S.A.

The specific objectives of this paper are to (a) investigate the near-term effects of subsoil tillage treatments and surface applied tillage systems on soil compaction (soil bulk density and soil cone index) within the ROW zones and (b) quantify soybean and corn yield variations related to soil disturbance intensity within ROW disturbed zones relative to the adjacent unaffected areas.

2 | MATERIALS AND METHODS

2.1 | Description of the field site

Field plots were established on a crop farm along the Dakota Access Pipeline (DAPL) ROW area, which was located on an Iowa State University (ISU) farm in Story County, Iowa. A soybean (*Glycine max*)—corn (*Zea mays* L.) rotation was established on a 2 ha area after subsoil tillage reclamation practices, and topsoil replacement was completed in the ROW. As explained in the DAPL agricultural mitigation plan, the main construction activities in the ROW included removing and stockpiling topsoil (approximately depth of 525 mm), trenching and burying the pipeline, performing subsoil tillage to loosen the compaction created from the heavy machine trafficking and finally replacing the topsoil. Clarion loam (fine-loamy, mixed, super-active, mesic Typic *Hapludolls*) and Canisteo clay loam (fine-loamy, mixed, super-active, calcareous mesic Typic *Endoqualls*) were the two dominant soil series at the site (Web Soil Survey, 2018). Tekeste et al. (2019) provided further details on the heavy machinery equipment deployed during the pipeline construction phase and tillage equipment used for the subsoil tillage applications. The current study focuses on near-term soil physical properties and crop yield after the topsoil restoration practices of the DAPL agricultural mitigation plan were completed.

The field site was classified into ROW trafficked (disturbed) zones and adjacent unaffected (non-disturbed) areas. The ROW traffic area was divided into three zones based on the intensity of vehicular trafficking during the pipeline construction phase. Zone 1 (trench, Z1) was an area where the pipeline was buried, Zone 2 (Z2) was categorized as a heavy traffic area, and Zone 3 (Z3) was the area that received a relatively light traffic intensity. Each of the zones in the ROW was considered as a measurement zone. Classifying the zones as measurement zones was essential because the variations in

traffic intensity among the zones were created according to the DAPL field operation protocol.

Prior to replacing the topsoil to the ROW area, subsoil tillage treatments including two levels (300 and 450 mm) were established using a Randomized Complete Block Design (RCBD). The subsoil tillage treatment levels of 300 and 450 mm were randomly assigned on the experimental units within each of the zones in four replications. The subsoil tillage was applied directly to the exposed subsoil shortly after completion of the ROW construction activities and before topsoil was replaced. Each subsoil tillage plot was 7.6 m wide by 18.0 m long. The field plot setup also included two undisturbed (unaffected) zones, named control-north (CN) and control-south (CS), which were located on the north and south sides of the pipeline.

As part of the DAPL mitigation plan, the topsoil was replaced to the ROW zones and levelled by a Caterpillar D7E bulldozer (fully loaded weight was 256 kN with a track that had a nominal track contact length of 3.02 m and a width of 0.76 m, Figure 1). Following the site-levelling, surface tillage was performed using a field cultivator with a tool depth of 100 mm.

Post-construction phase cropping system surface soil conventional tillage operations were applied perpendicular to the pipeline on the field plots. The conventional tillage refers to operation of fall disc ripping, which was applied after the corn cropping season. Spring seed-bed tillage was applied using a field cultivator prior to planting both during the corn and soybean cropping seasons. No-till planting plots designated as 'no-till' (NT) were added during the second crop season (2018) adjacent to the conventional tillage (CT) plots.

2.2 | Soil bulk density and soil cone index measurements

During the post-construction phase, soil bulk density (BD) and soil cone index (CI) were measured in fall 2017 and fall 2018. In 2017, because of the limited number of field working days, soil cone index measurements were taken from the relatively high traffic zones in the ROW zone (Z1 and Z2) and in one unaffected zone (CN). Both in 2017 and 2018, soil core samples for BD measurements were sampled from Z1, Z2, Z3 and the unaffected zones (CN and CS). A Giddings hydraulic-driven sampling probe (Giddings Machine Co.) was used to collect a 76 mm diameter and 1,200 mm long soil core at each sampling position. Twelve soil core sampling locations were taken along the centre of each zone within the ROW and in the unaffected crop field zones (CN and CS). Within each zone, three samples in two replicates were taken within each subsoiling depth treatment. Each tube sample was cut into 50 mm increments starting from the topsoil surface. The soil core samples were oven-dried at 105°C for 48 hr to determine dry soil bulk density and soil moisture content on a dry mass basis (%, d.b.).

A tractor-mounted three-probe cone penetrometer designed and built at ISU (Tekeste et al., 2019) was used to measure the soil cone index according to ASABE standards (ASAE Standards, 2004a and ASAE Standards, 2004b). Within each top surface tillage measurement zone (9 m × 7 m), the three-probe cone penetrometer was inserted at 30 mm s^{-1} (ASAE Standard, 2004b) on six sampling points. A total of 288 soil cone index measurements were taken within each zone. Cone penetration resistance force was measured using a Transducer Techniques model LPU-500 load cell transducer with 2224-N capacity (Transducer Techniques, LLC) and a Metromatics USB DEWE-43 DAQ System (Metromatics) acquiring data at 100Hz. Soil cone index (kPa) was calculated by dividing the cone penetration resistance force by the 285 mm^2 ASABE cone base area (ASAE Standard, 2004a).

2.3 | Crop planting and harvesting

Soybean (2017) and corn (2018) were planted on 760 mm row-spacing using an 8-row John Deere Max Emerge 5 Planter model pulled by a John Deere 6170R MFWD. Planting was performed parallel to the pipeline. Yield from the centre four rows of each plot, conventional and no-till sections, was combine harvested using the on-board Harvestmaster system

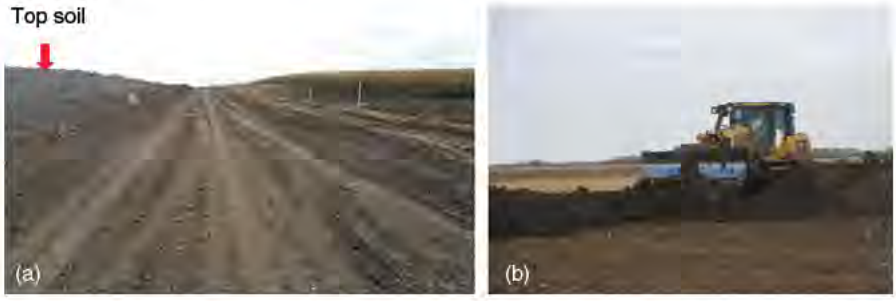

FIGURE 1 (a) Topsoil pile adjacent to the ROW zones. (b) The top soil was replaced by a Caterpillar D7E bulldozer after the exposed subsoil was tilled. The Caterpillar D7E fully loaded weight was 256 kN. Each track had a nominal track contact length of 3.02 m and a width of 0.76 m (Tekeste et al., 2019) [Colour figure can be viewed at wileyonlinelibrary.com]

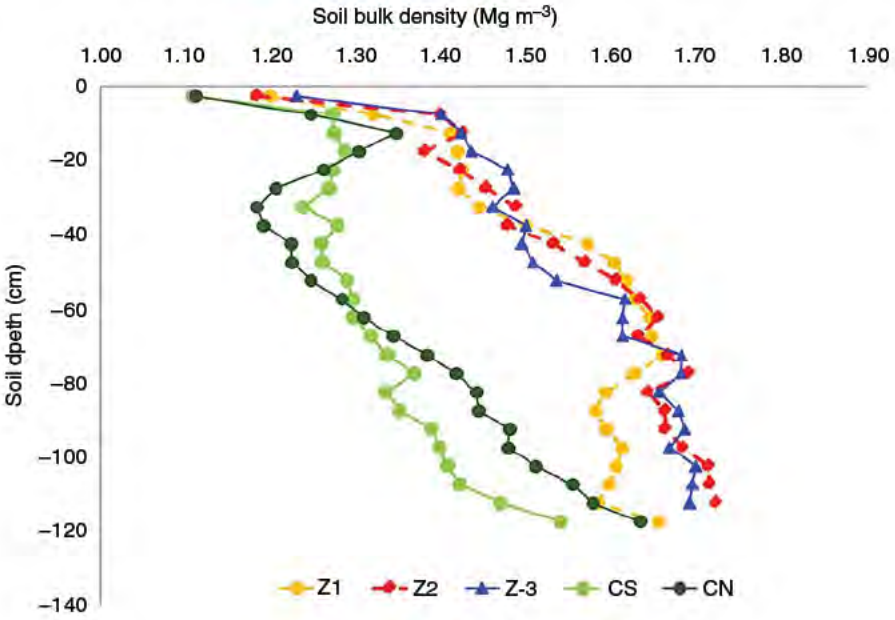

FIGURE 2 Soil bulk density profiles from fall 2017 within the ROW zones (Z1, Z2 and Z3) and the unaffected zones (CN and CS) [Colour figure can be viewed at wileyonlinelibrary.com]

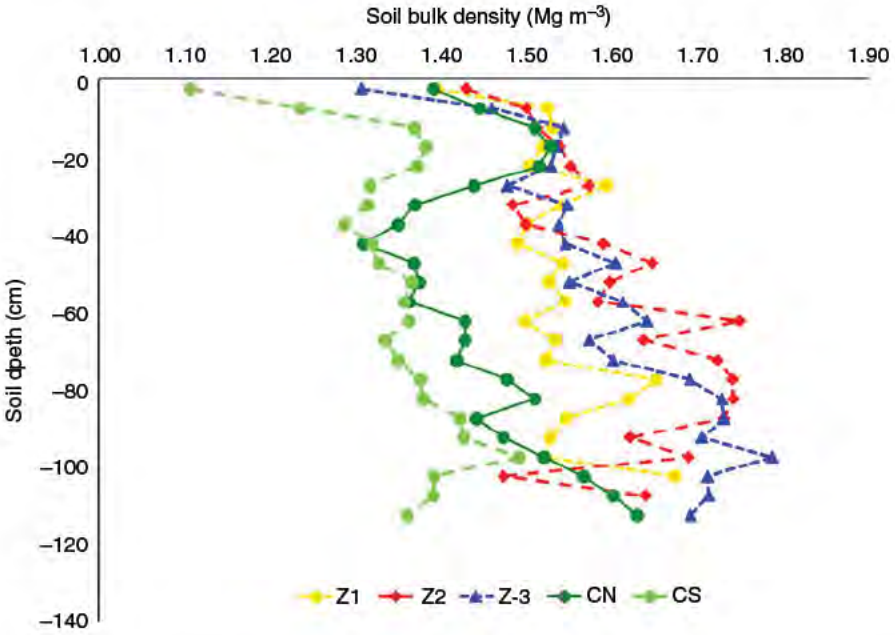

FIGURE 3 Soil bulk density profiles from fall 2018 within the ROW zones (Z1, Z2 and Z3) and the unaffected zones (CN and CS) [Colour figure can be viewed at wileyonlinelibrary.com]

HM800 grain gauge (Logan, UT) on a John Deere 9450 combine harvester. Within the smallest experiment unit (post-construction tillage system) of the ROW zones, there were a total of 16 samples of crop yield (two four centre crop rows for the two subsoil tillage treatments (300 and 450 mm) at four replicates). The harvesting pattern for the CN and CS zones was similar to the harvesting pattern within the ROW zones.

2.4 | Data analysis

All measured data for BD, CI and crop yield were subjected to analyses of variance using the GLM procedure (SAS JMP Ver. 14.JMP, 2013) and compared using Fisher's least significant difference (LSD) method with 95% confidence (p-value .05). Analyses of variance were also performed to compare the soil physical properties and crop yields from the individual zones within ROW zones and compared with the data from the adjacent unaffected zones (control). Improvement indices were calculated as relative changes in BD and CI from 2017 to 2018 for the top soil layer (top layer soil restoration, TSR) and the subsoil layer (subsoil layer soil restoration, SSR). The conventional tillage operations perpendicular to the pipeline precluded the ability to randomize conventional and no-till plots with respect to each other within the two levels of post-construction subsoiling (300 and 450 mm) that were previously established. Statistical comparison between the two post-construction tillage systems (NT and CT) from

the near-term study was not feasible because of the inability to randomly assign the no-till and the tilled plots within each of the ROW trafficked zones. In order to avoid experimental bias because of the placement of the no-till adjacent to the tilled plots, statistical comparisons of subsoil tillage impacts on the measured soil properties and crop yields were done within each of the tillage systems.

3 | RESULTS AND DISCUSSION

3.1 | Soil bulk density

Soil bulk density profiles from the ROW zones (Z1, Z2 and Z3) (Figure 2, fall 2017; and Figure 3, fall 2018) indicated that soil compaction still persisted two years after the heavy equipment traffic and subsoil tillage. Differences in BD between the ROW and the unaffected zones were obvious in the top (0–500 mm) and deep (500–1,200 mm) soil layers. A summary of BD for the top soil layer (0–500 mm) and the deep soil layer (500–1,200 mm) is provided in Table 1.

In fall 2018, Z2 had the lowest BD in the top soil layer (0–500 mm) within the ROW. The mean BD of the top layer (fall 2018) within the ROW was 1.52 Mg m^{-3}, which was significantly larger than the BD in the unaffected zones of CN (1.44 Mg m^{-3}) and CS (1.29 Mg m^{-3}). For the deep soil layer (below 500 mm deep) from the fall 2018, no statistical differences ($LSD_{0.05}$ = 0.045 Mg m^{-3}) of BD were found among the ROW zones (Z1, Z2 and Z3) with 300 and 450 mm subsoil tillage. Within the deep soil layer, the BD averaged over both years among the ROW zones and the two subsoil tillage treatments were 1.60 Mg m^{-3}, a value estimated to be at 93% of the maximum Proctor compaction test value (Tekeste et al., 2019). The BD in the deep layer (500–1,200 mm) within the ROW was statistically larger ($LSD_{0.05}$ = 0.0040 Mg m^{-3}) than the BD in the adjacent unaffected zones (CN = 1.48 Mg m^{-3} and CS = 1.39 Mg m^{-3}).

The BD restoration (improvement index) calculated as percentage changes of 2018 BD data relative to the 2017 BD data is shown in Table 1. The BD restoration for the 0 to 500 mm soil layer was not significant because of subsoil tillage applied on the ROW zones (p = .196) or because of interaction effects of the ROW zones and subsoil tillage (p = .11). In the subsoil layer (500 to 1,200 mm), the BD showed significant improvements on Z1 (SSR = 9.2) (p < .05), which was better than the improvements in Z2 (SSR = 1.25%) and in Z3 (SSR = −0.60%). Within the ROW zones, the BD in the subsoil layer decreased from 1.65 Mg m^{-3} (fall 2017) to 1.60 Mg m^{-3} (fall 2018). No statistical differences in BD recovery were observed in the subsoil tillage treatments within each ROW zone (p > .05).

3.2 | Soil cone index

Figure 4 illustrates soil cone index (CI) profiles in fall 2017 and fall 2018 in ROW zones that received 300 and 450 mm subsoil tillage (Figure 4a–d). The subsoil tillage treatments in Figure 4 refer to the subsoil tillage treatments applied on the exposed subsoil prior to the topsoil replacement in fall 2016 (Tekeste et al., 2019). Within the ROW zones (Z1 and Z2), two peak soil cone penetration values occurred. One peak was at an approximate depth of 100 mm with the mean maximum values averaged by ROW and subsoil tillage depth of 2.06 MPa in 2017 and 1.73 MPa in 2018 (Figure 4a–d). The second peak in the soil cone penetration values occurred in the heavy equipment trafficked subsoil layer (300–600 mm soil layer) with mean maximum values averaged by ROW of

TABLE 1 Soil bulk density measured in fall 2017 and fall 2018 in a surface soil layer (0–500 mm) and a subsoil layer (500–1,200 mm) in post-pipeline construction right-of-way (ROW) zones (Z1, Z2 and Z3) and in unaffected zones (CN and CS)

Zone	Soil depth class (mm)	Soil bulk density (Mg m^{-3})				Soil bulk density restoration[b] (%)
		Fall 2017		Fall 2018		
		Mean[a]	*SD*	Mean	*SD*	
Z-1	0–500	1.46 (C)	0.06	1.53 (B)	0.14	−4.6 (TSR)
Z-1	500–1,200	1.67 (A)	0.04	1.53 (B)	0.14	9.2 (SSR)
Z-2	0–500	1.42 (DC)	0.04	1.49 (C)	0.11	−4.7 (TSR)
Z-2	500–1,200	1.62 (AB)	0.08	1.60 (A)	0.11	1.3 (SSR)
Z-3	0–500	1.42 (C)	0.08	1.55 (B)	0.09	−8.4 (TSR)
Z-3	500–1,200	1.66 (A)	0.03	1.67 (A)	0.05	−0.6 (SSR)
CN	0–500	1.23 (E)	0.08	1.44 (D)	0.12	
CN	500–1,200	1.41 (D)	0.03	1.48 (C)	0.06	
CS	0–500	1.25 (E)	0.03	1.29 (E)	0.05	
CS	500–1,200	1.31 (E)	0.05	1.39 (D)	0.04	

[a]Mean soil bulk density values followed by the same letter are not significantly different at α = 0.05.

[b]TSR and SSR were calculated as relative changes in BD from 2017 to 2018.

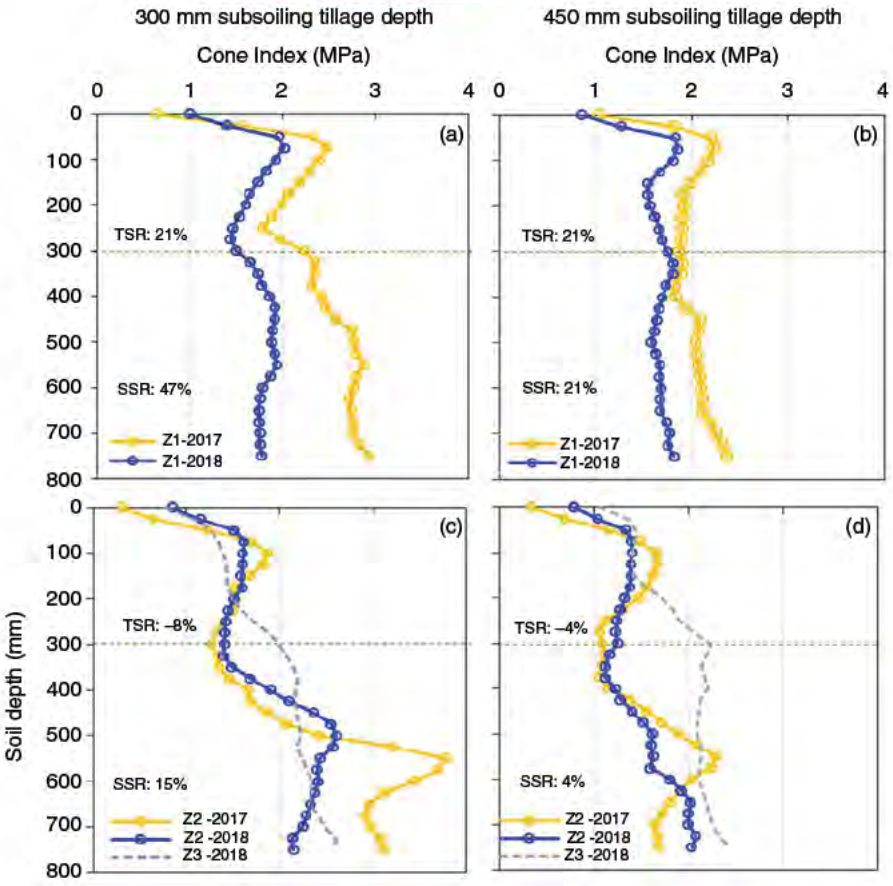

FIGURE 4 Soil cone penetration resistance profile for soils within trafficked ROW zones and unaffected zone from the fall 2017 and fall 2018 data. Within the ROW trafficked zones, subsoil tillage treatments of 300 mm (a, c) and 450 mm (b, d) were applied. Dashed lines (at 300 mm) separate the top soil layers from the subsoil layers. TSR and SSR (%) represent soil strength improvement within the affected zones (i.e. Z1, Z2) comparing data from fall 2017 and fall 2018. In Z3, TSR and SSR were not calculated because data were not collected in fall 2017 [Colour figure can be viewed at wileyonlinelibrary.com]

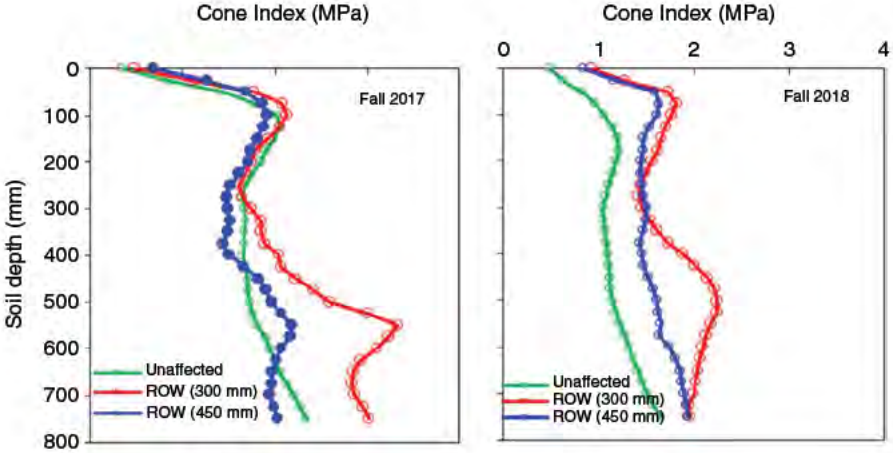

FIGURE 5 Mean soil cone penetration resistance profiles within ROW and unaffected zones from fall 2017 and fall 2018 data. Within the ROW trafficked zones, subsoil tillage treatments of 300 and 450 mm were applied [Colour figure can be viewed at wileyonlinelibrary.com]

2.76 MPa in 2017 and 1.99 MPa in 2018. Even though subsoil tillage was used, subsoil (below 300 mm) within Z1 and Z2 (Figure 4a–d) had significantly larger CI values ($p < .01$) compared to subsoil (below 300 mm) in the unaffected zones (Figure 5). The excessive soil compaction (CI greater than 2 MPa) in Z3 (fall 2018) occurred at a shallower depth than in Z1 and Z2. As part of the DAPL construction activities, the exposed subsoil surface in Z3 was at a higher elevation than the other ROW zones. Thus, the maximum CI occurred at a shallower depth in Z3 than in Z1 and Z2, because less topsoil was replaced on Z3 than on Z1 and Z2.

The TSR and SSR percent improvements from fall 2017 data (Figure 4) were found only in Z1 and Z2. The amount of soil strength improvement from 2017 to 2018 (Figure 4a–d; TSR vs. SSR) varied by zone and depth. Among both top- and subsoil layers, Z1 showed a higher recovery rate than Z2 (Figure 4). Within the ROW (affected), the mean CI profile values in fall 2018 were less than those in fall 2017, indicating a temporal reduction of soil strength (ROW mean TSR and SSR of 7.5% and 22%, respectively).

The heavy equipment-induced subsoil compaction was still evident for 2 years after subsoil tillage (300 mm or

450 mm) (Figure 5), because the ROW CI values were significantly larger ($p < .01$) than those in the unaffected zones. Significant impacts ($p < .01$) in reducing the mean CI were observed in the 300–600 mm soil layer of the subsoil tillage treatments. The 2017 and 2018 soil cone penetration measurements (Figure 5) indicated that the 450 mm subsoil tillage loosened the traffick-induced deep compaction better than the 300 mm subsoil tillage. Relative per cent changes in CI from the disturbed (ROW) zones and the unaffected (undisturbed) zones increased by 46.2% (CT) and 54.3% (NT) in the 300 mm, and by 31.5% (CT) and 48.3% (NT) in the 450 mm subsoil tilled fields, respectively (Table 2). Shi et al. (2014) found the values of soil properties (alkali hydrolyzable nitrogen (AN), available phosphorous (AP), total nitrogen (NT) and soil organic matter (SOM)) in the ROW areas (trench, piling and working areas, which are equivalent to Z1, Z2 and Z3) were lower compared to the values outside the working areas (20 and 50 m from the pipeline line). According to Håkansson (1994), subsoiling can only partially loosen compaction in deep subsoil layers, and in regions with high precipitation, it may not be practical. Lowery and Schuler (1991) reported that deep compaction was not removed completely by subsoil tillage even four years after heavy axle load traffic. The excessive subsoil compaction within the ROW in particular at the deeper soil layer (300–600 mm) could remain for many years (300–450 mm) (Raper et al., 2005). The presence of soil compaction in the topsoil layers two years after pipeline operations might be because of the heavy vehicle (Caterpillar D7E) used to bulldoze the stockpiled soil back to the ROW. The topsoil compaction was not entirely removed by the shallow tillage (100 mm field cultivation).

The per cent changes in CI between the ROW zones and the unaffected area by the subsoil tillage treatments are shown in Tables 2 and 3. No-till plots had higher CI than the CT plots by 4% within the ROW and 2% in the unaffected areas, possibly contributing to the lack of statistical significance. Other studies (Bueno, Amiama, Hernanz, & Pereira, 2006; Kumar et al., 2012; Roth, Mayer, Frede, & Derpsch, 1988) reported that changing a tillage system from conventional tillage (CT) to no-tillage (NT) could result in higher soil BD and CI values especially in topsoil. Lower CI values are associated with the tilled layer near the soil surface. Cavalaris and Gemtos (2002) reported a linear increase of CI in their 0–200 mm soil layer, where the increase was steeper in the no-tillage system compared to the conventionally tilled soils. Radford, Yule, McGarry, and Playford (2007) reported that positive impacts of no-tillage (NT) were because of improvements in soil structure and soil resilience capacity after a disturbance, because soil organic matter increased, especially in the surface layer.

3.3 | Crop yields

The ROW working zones (Z1, Z2 and Z3) had statistically significant ($p < .05$) crop yield declines of 25% in soybean (2017) and 15% in corn (2018) in contrast to the crop yields from the adjacent unaffected zones (Figure 6). Yield reduction within zones ($p < .01$) followed the damage from soil compaction as the highest soybean yield was measured in the unaffected zones (mean from CN and CS of 4.2 Mg ha^{-1}), which had less soil compacted zones, followed by Z1 (3.2 Mg ha^{-1}), Z3 (3.1 Mg ha^{-1}) and Z2 (2.9 Mg ha^{-1}). The highest mean corn yield in the CT tilled zone (fall 2018) was observed in the unaffected zones (14.4 Mg ha^{-1}) followed by the corn yield from Z1 (12.5 Mg ha^{-1}), Z3 (11.9 Mg ha^{-1})

TABLE 2 Mean soil cone index (MPa) values from each zone in the ROW as influenced by subsoil tillage (300 and 450 mm) in conventional tillage (CT) and compared with the mean soil cone index (MPa) values from the unaffected zones in fall 2018. *SD* represents averaged standard deviation of means ($n = 8$)

Zones	Subsoil tillage (mm)	Soil Cone index (Mpa)		Relative change[a] (%)
		Mean	*SD*	
Zone 1	300	1.73	0.52	33
Zone 1	450	1.63	0.26	25
Zone 2	300	1.89	0.56	45
Zone 2	450	1.47	0.42	13
Zone 3	300	2.08	0.75	60
Zone 3	450	2.03	0.63	56
Unaffected		1.3	0.4	

[a]Relative change (%) was calculated from differences of mean soil cone index in each zone and subsoil depth relative to the unaffected zone.

TABLE 3 Mean soil cone index (MPa) values from each zone in the ROW as influenced by subsoil tillage (300 and 450 mm) in no-tillage (NT) system and compared with the mean soil cone index (MPa) values from the unaffected zones in fall 2018. *SD* represents averaged standard deviation of means ($n = 8$)

Zones	Subsoil tillage (mm)	Soil Cone index (Mpa)		Relative change[a] (%)
		Mean	*SD*	
Zone 1	300	1.89	0.46	47
Zone 1	450	1.82	0.29	41
Zone 2	300	2.05	0.92	59
Zone 2	450	1.83	1.29	42
Zone 3	300	2.03	0.65	57
Zone 3	450	2.09	0.46	62
Unaffected		1.29	0.37	

[a]Relative change (%) was calculated from differences of mean soil cone index in each zone and subsoil depth relative to the unaffected zone.

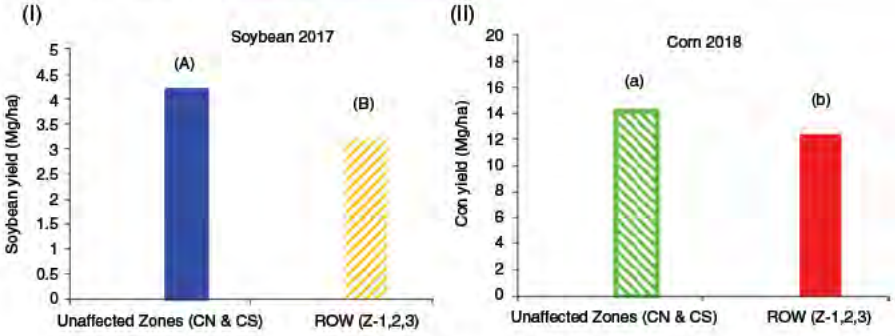

FIGURE 6 Soybean (I) and corn (II) crop yields (Mg ha^{-1}) from ROW affected (Z1, Z2 and Z3) and unaffected zones (CN and CS). Same letters assigned to the bars are not significantly different at the *p*-value of .05 [Colour figure can be viewed at wileyonlinelibrary.com]

and Z2 (11.5 Mg ha^{-1}). In the no-tilled (NT) zones (fall 2018), the highest mean corn yield was also observed in the unaffected zones (14.6 Mg ha^{-1}) followed by the corn yield from Z1 (13.3 Mg ha^{-1}), Z2 (12.6 Mg ha^{-1}) and Z3 (12.4 Mg ha^{-1}). Soybean and corn yields from the highest trafficked zone (Z2) were statistically lower compared to Z1 (Table 4). No statistical differences in crop yields were observed for the subsoil tillage treatments within each ROW zone ($p > .05$).

For corn from the ROW, the yield from the NT system in the ROW was 7% larger than that for the conventionally tilled soil. The difference in corn yield in the unaffected areas between the CT and NT system was minimum (−1%). As shown in previous studies (Gaultney, Krutz, Steinhardt, & Liljedahl, 1982; Lowery & Schuler, 1991; Raghavan, McKyes, Taylor, Richard, & Watson, 1979; Schjonning & Rasmussen, 1994), heavy axle load-induced soil compaction showed significant crop yield declines (9%–50%) compared to the control. Our study indicated that the yield depressions on soybean (fall 2017) and corn (fall 2018) could be attributed to heavy equipment traffic-induced increases in soil bulk density and soil cone penetration resistance, which caused mechanical impedance to root growth. Raper et al. (2005) reported negative impacts of soil compaction on crop yield occurred as soil cone index exceeded 2–2.5 MPa. Another potential reason for crop yield depressions in the ROW might be because of the mixing of top- and subsoil layers during construction activities and replacement of topsoil (data are not presented in this paper). Adjacent to the experiment site (approximately 1.6 km) along the pipeline, visual observations (Figure 7) were made in a soil trench cut perpendicular to the pipeline and across the ROW. The visual assessment showed that soil profiles in Z1 and Z2 had relatively poor soil structure and stubby (thicker) roots compared to the soil profile in the adjacent unaffected zone. Such a visual assessment could potentially be integrated into a post-construction feasibility assessment to minimize top- and subsoil mixing, especially during the topsoil replacement phase.

For short-term post-construction soil compaction management, application of subsoiling may be beneficial in the top- and subsoil layers to loosen the compacted layers that had soil cone index exceeding 2 MPa, a root limiting threshold value (Raper et al., 2005; Taylor & Gardner, 1963). The improved trend on crop yield in the short-term introduction of the NT system might be attributed to the benefits of reduced tillage practices (Sommer & Zach, 1992). Sommer and Zach (1992) reported the benefits of non-inverting soil loosening conservation tillage in reducing soil erosion, which implied that reduced tillage practices might have potential benefits as a long-term reclamation management strategy at pipeline construction sites.

TABLE 4 Soybean (fall 2017) and corn (fall 2018) yields (Mg ha^{-1}) from the ROW (Z1, Z2 and Z3) and the unaffected zones (average of CN and CS) in conventional tillage (CT) system, and no-tillage (NT) system (fall 2018). The no-till plots were added during the second crop season (2018)

	Crop Yield (Mg ha^{-1})					
	Soybean[a]		Corn[b]			
	CT		CT		NT	
Zone	Mean	*SD*	Mean	*SD*	Mean	*SD*
Z-1	3.2 (B)	0.57	12.5 (B)	1.50	13.3 (AB)	1.21
Z-2	2.9 (B)	0.43	11.5 (B)	2.01	12.6 (B)	1.49
Z-3	3.1 (BC)	0.32	11.9 (B)	1.57	12.4 (B)	1.88
Unaffected	4.2 (A)	0.59	14.4 (A)	1.12	14.6 (A)	0.81

[a]Soybean yield values followed by the same letter are not significantly different at $\alpha = .05$.

[b]Corn yield values followed by the same letter are not significantly different at $\alpha = .05$.

FIGURE 7 Visual observation of the soil structure from Zone 1, Zone 2 and the unaffected zone. A trench approximately 1 m wide by 2 m deep was excavated. Soil structure and root distribution were observed on the exposed trench face. The trench was on the DAPL pipeline, and it was located approximately 1.6 km east of the experimental plots [Colour figure can be viewed at wileyonlinelibrary.com]

4 | CONCLUSIONS

Pipeline construction activities and subsoil tillage remediation impacts on soil properties resulted in significantly ($p < .05$) larger CI and BD within the ROW zones compared to the adjacent unaffected zones. There were statistically significant ($p < .05$) crop yield declines of 25% in soybean (2017) and 15% in corn (2018) in the ROW zones relative to the crop yields in the adjacent unaffected zones. Subsoil tillage of 450 mm created statistically smaller soil cone index values in the 300–600 mm soil layer in the ROW, compared to the subsoil tillage of 300 mm ($p < .05$). BD and crop yield (soybean and corn), however, did not statistically differ for subsoil of 300 mm and 450 mm ($p > .05$). Within the near-term period, introducing no-till resulted 7% increase in corn yield (2018).

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RESEARCH PAPER

WILEY Soil Use and Management

Pipeline right-of-way construction activities impact on deep soil compaction

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Abstract

A 762-mm-diameter pipe 1,886 km long was installed to transfer crude oil in the USA from North Dakota to Illinois. To investigate the impact of construction and restoration practices on long-term soil productivity and crop yield, vertical soil stresses induced by a Caterpillar (CAT) pipe liner PL 87 (475 kN vehicle load) and semi-trailer truck (8.9 kN axle load) were studied in a farm field. Soil properties (bulk density and cone penetration resistance) were measured on field zones within the right-of-way (ROW) classified according to construction machine trafficking and subsoil tillage (300-mm-depth tillage and 450-mm-depth tillage in two repeated passes) treatments. At 200 mm depth from the subsoiled surface, the magnitude of peak vertical soil stress from trafficking by the semi-truck trailer and CAT pipe liner PL 87 was 133 kPa. The peak vertical soil stress at 400 mm soil depth appeared to be influenced by vehicle weight, where the Caterpillar pipe liner PL 87 created soil compaction a magnitude of 1.5 greater than from the semi-trailer truck. Results from the soil bulk density and soil cone penetration resistance measurements also showed the ROW zones had significantly higher soil compaction than adjacent unaffected corn planted fields. Tillage to 450 mm depth alleviated the deep soil compaction better than the 300-mm-depth tillage as measured by soil cone penetration resistance within the ROW zones and the unaffected zone. These results could be incorporated into agricultural mitigation plans in ROW construction utilities to minimize soil and crop damage.

KEYWORDS

deep tillage, soil bulk density, soil compaction, soil cone penetration resistance, vertical soil stress

1 | INTRODUCTION

Soil compaction is a process of soil particle rearrangement that reduces the air-filled fraction of soil pores and has been recognized as a major problem associated with crop production (Hamza & Anderson, 2005; Soane & Van Ouwerkerk, 1994). Compaction of soils often results in decreased soil aeration and hydraulic conductivity and increased soil bulk density and soil strength (Al-Adawi & Reeder, 1994; Hillel, 1998). Excessive soil compaction negatively affects crop yield and accelerates soil erosion (Al-Adawi & Reeder, 1994; Hillel, 1998; Soane & Van Ouwerkerk, 1994). Reviews on how soil compaction is created and management practices to minimize its negative effects on crop yield and the environment have been published by Hamza and Anderson (2005), Raper and Kirby (2006), and Batey (2009).

Numerous studies conducted in Europe and North America during the 1980s have shown that heavy vehicles with an axle load of 10 t or higher can create subsoil compaction to a depth of 500 to 600 mm (Etana &

Hakansson, 1994; Hakansson & Reeder, 1994; Lowery & Schuler, 1991; Schjonning & Rasmussen, 1994). Schjonning and Rasmussen (1994) measured soil physical properties (i.e., bulk density and penetration resistance) and small grain yields after field traffic by a heavy vehicle (Volvo BM 860 Dump Truck). The vehicle with two front tyres of 18.0R25 XRA*TL and four rear tyres of 20.5R 25XA*TL were loaded to 10 t per front axle and 22 t per rear tandem axle. Four wheel passes by the truck on the exposed plough bottom (200 mm from the soil surface) created severe subsoil compaction (soil cone penetration resistance of 4.2 MPa) which was nearly a fourfold magnitude greater than the soil cone penetration resistance measured on the control treatment (no compaction). Hakansson and Reeder (1994) suggested limiting vehicle load to 10 t per axle in order to reduce the incidence of subsoil compaction and minimize long-term negative impacts on crop yields.

Soil compaction also occurs in cropland during utility construction activities within right-of-way (ROW) areas from heavy equipment traffic, trenching and backfilling, having adverse potential impacts on crop yields and soil quality. Batey (2015) reported bulk densities of 1.7 t m^{-3} (undisturbed) and 1.9 t m^{-3} (running track) at a depth of 350 mm, and restricted crop root growth 15 years after a pipeline was installed in the 1970s in Murthly, Perthshire, UK. On excessively deep compacted soils (bulk density values of 1.9 to 2.0 t m^{-3}) such as in pipeline sites, Spoor (2006) recommended 5 to 6 repeated passes of tillage (up to 750 mm depth) to loosen the soils. The restoration of soil productivity and crop yield post construction depends on the vulnerability of the loosened soil conditions to re-compaction, crop type, climate and proper drainage (Batey, 2015; Spoor, 2006). Limited information was available on measurement of soil compaction and crop yield in the subsequent years after the pipeline installations (Batey, 2015).

Dakota Access, LLC (DAPL) (2016) installed a 762-mm-diameter pipe over 1,886 km to transfer crude oil in the USA from North Dakota to Illinois. The Iowa pipeline section was buried at a minimum depth of 1.2 m in all agricultural lands. DAPL developed an agricultural mitigation plan that implemented measures for minimizing impacts to cropland during the pipeline construction (e.g., land clearing, separation of top soil, pipeline trenching and backfilling of the subsoil materials) and restoration phases after compaction by heavy construction equipment on all impacted agricultural cropland (Dakota Access, LLC (DAPL) 2016). The DAPL mitigation plan includes three repeated passes of deep tillage to a depth of 450 mm on exposed subsoil, restoring the topsoil condition, and soil levelling to its preconstruction conditions in compliance with Chapter 9 "Restoration of Agricultural Lands During and After Pipeline Construction" of the State of Iowa Administration Code, Section 199: Utilities Division.

Limited field-based research studies are available to support the development of the agricultural farm and crop damage compensation plan from utility construction activities on croplands. Studies evaluating the impacts of heavy construction vehicles and restoration activities on subsoil compaction and long-term crop yields may benefit industry, researchers, extension and government institutions in developing data-driven decision support and restoration of agricultural soil and crop productivity to preconstruction conditions. The overall goal of this research was to quantify the impacts of utility construction equipment, heavy vehicle traffic management, and deep tillage on soil compaction and long-term crop yields. The objectives of this study were to (a) investigate the effects of construction equipment trafficking and deep tillage within the ROW on deep soil (subsoil) compaction, and (b) investigate the effects of deep tillage treatments on soil compaction.

2 | MATERIALS AND METHODS

2.1 | Experiment description

The experimental test was established along the pipeline ROW at the Iowa State University (ISU) farm in Washington Township of Story County, Iowa. A five year long-term corn–soybean (*Zea mays L. - Glycine max*) crop rotation study was established on an experimental plot of a 2 ha area consisting of a ROW section (46 m wide and 244 m long) and adjacent unaffected crop fields (39 m wide and 244 m long). The study began in fall 2016, and corn was planted in spring 2017. Clarion loam (*fine-loamy, mixed, superactive, mesic Typic Hapludolls*) and Canisteo clay loam (*fine-loamy, mixed, superactive, calcareous mesic Typic Endoqualls*) are the dominant soil series at the site according to the USDA soil survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx). The ROW was set at a bearing of 123° to accommodate the pipeline direction and was approximately 46 m wide. According to the DAPL agricultural mitigation plan, topsoil with an approximate depth of 525 mm below the original cropland topsoil surface was scraped from the ROW construction zone and stockpiled. Subsoil excavated from the pipeline trench was also stockpiled separately from the topsoil and returned to the excavated trench. Preceding the replacement of topsoil, the subsoil within the ROW which had been trafficked by heavy construction equipment was tilled to a depth of 450 mm from the top surface of the exposed subsoil using a subsoiler implement with 7-shanks at 760 mm spacing. The 450-mm-depth tillage was done in three repeated passes. After the topsoil was replaced, the land was levelled and tilled using a field cultivator at a tool depth of 100 mm.

Figure 1 shows the heavy vehicles frequently used for soil separation and pipeline installation. The ground contact

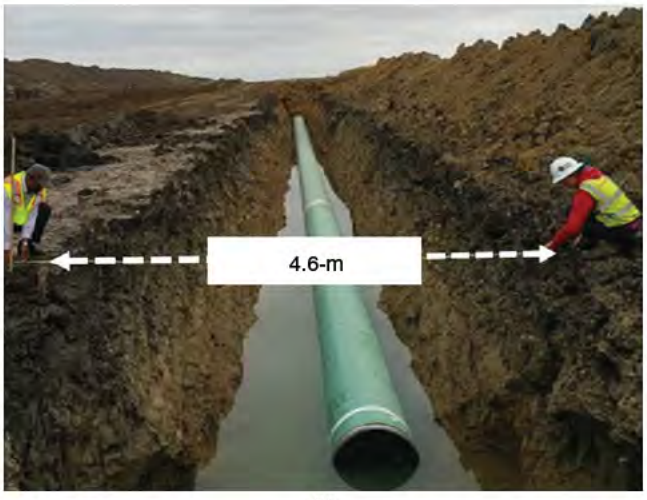
Caterpillar pipe liner PL 87. Fully loaded weight = 475 kN. Each track dimension had a nominal track contact length, which is the length of track in contact with a flat, unyielding surface (ISTVS, 1977), of 3.71 m and a width of 0.76 m.

Caterpillar 349F hydraulic excavator. Fully loaded weight = 522 kN. Each track had a nominal track contact length of 5.36 m long and a width of a 0.76 m.

Caterpillar D7E bulldozer. Fully loaded weight = 256 kN. Each track had a nominal track contact length of 3.02 m and a width of 0.76 m.

Semi-trailer truck with three pipes (each pipe was 24.4 m long, 0.76 m outer diameter, and 9.5 mm wall thickness).

(a)



(b)

FIGURE 1 Right-of-way pipeline construction heavy equipment—Caterpillar pipe liner PL 87, Caterpillar 349F hydraulic excavator, Caterpillar D7E bulldozer and semi-trailer truck with three pipes (a). The excavated trench for the pipe and the stockpiled subsoil adjacent to the pipe (b). At the experimental site, the pipe trench width was approximately 4.6 m [Colour figure can be viewed at wileyonlinelibrary.com]

pressure estimated from the vehicle weight and track contact area for the Caterpillar pipe liner PL 87, Caterpillar D7E bulldozer and Caterpillar 349F hydraulic excavator were 168, 111 and 128 kPa, respectively. The semi-trailer truck had single tyres on the front axle, dual tyres on each of two rear axles of the road tractor and dual tyres on each

of two rear axles of the trailer. The tyre size was 275/80R-24.5 (Michelin). According to the U.S. Department of Transportation (DOT), the front axle load of the semi-trailer truck carrying a full load should not exceed 8.9 kN on highway roads.

After observing the field operations and vehicle traffic management within the ROW, four zones were delineated depending on traffic intensity during land clearing, topsoil separation and pipe trenching and stockpiling subsoil materials. A 7.6 m wide zone with the pipe at centreline (CL) was classified as Zone-1 (Z-1). Zone-2 (Z-2) was classified as a zone adjacent to Z-1 and opposite to the stockpiled subsoil. Relative to all the zones within the ROW, Z-2 received the highest traffic intensity. Zone-3 (Z-3) received heavy equipment traffic less frequently and was located between Z-2 and the stockpiled topsoil. Between one of the unaffected crop field zones (located at the southern side of the pipe) and the stockpiled subsoil, a separate zone was classified as Zone-x (Z-x). Relative to Z-1, Z-2 and Z-3, Z-x was observed to receive the lowest traffic intensity. The four zones (Z-1, Z-2, Z-3 and Z-x) within the ROW and the two unaffected crop field zones (Control-N and Control-S) to the northern and southern side of the pipe were defined as experimental blocks in our experimental design (Figure 2). The unaffected crop zones were outside the ROW area and parallel to the pipeline.

2.2 | Peak vertical soil stress measurement

Soil stresses were measured prior to the topsoil replacement to quantify the impact of loading from the high axle vehicle trafficking on deep induced soil stresses. Within Z-x, vehicle induced peak vertical soil stresses were measured at three soil depths using a GEOKON model 3500, 1 MPa capacity, piezoelectric earth pressure sensor (GEOKON [Lebanon, NH, USA]) as a vehicle passed over the sensors. The Caterpillar pipe liner PL 87 (with bender) and semi-trailer truck (with three pipes) were tested passing over the buried sensors. The pressure sensor was 100 mm in diameter and 10 mm in thickness. Each pressure sensor was installed at one of three soil depths (200 mm, 400 mm and 600 mm) from the top surface of the exposed subsoil. The centre-to-centre distance between the adjacent sensors along the vehicle travel direction was 300 mm. A trench with a width approximately three times the diameter of the pressure sensor was excavated. Before the trench was covered with the spoil material, an approximate 50-mm-thick layer of clean Ottawa #10 sand was placed above and below the sensor, according to the pressure sensor calibration procedure explained in White, Vennapusa, and Gieselman (2009) for studies on roller compactor-induced soil stress measurement. The vertical soil stress data were acquired using a USB-1408FS data acquisition (DAQ) device (Measurement Computing Corp., Norton, MA, USA) and sampled at 100 Hz. The soil during the soil stress measurement was moist and its consistency was close to the lower plastic limit. During the one-week heavy vehicle trafficking, mean precipitation measured at the nearest weather station in Boone, Iowa was 8.5 mm.

FIGURE 2 Map of experimental research plot showing the designated construction zones (Zone-1, Zone-2, Zone-3 and Zone-x) and unaffected crop field zones (Control-S and Control-N) aligned in reference to the pipeline. Zone-P refers to where the topsoil was piled Colour figure can be viewed at wileyonlinelibrary.com]

2.3 | Soil sampling for bulk density measurement

After the pipe was installed and prior to topsoil placement, soil core samples were taken for dry soil bulk density and soil moisture content measurement within Z-1, Z-2, Z-3 and Z-x starting from the top surface of the exposed subsoil. A Gidding hydraulic driven sampling probe (Giddings Machine Co., Windsor, CO) was used to collect 76-mm-diameter and 916-mm-long soil cores at each sampling position. Nine soil core sampling locations were selected along the centre of each zone within the ROW. Similarly, nine soil core tube samples were taken from the unaffected crop field zone (Control-S). Each tube sample was cut into 50 mm increments. The soil core samples were oven-dried at 105°C for 48-hr to determine dry soil bulk density and dry basis soil moisture content.

2.4 | Deep tillage experimental design

A Randomized Complete Block Design (RCBD) subsoiling tillage experiment was established with two subsoil tillage depths (300 mm and 450 mm from the top surface of the exposed soil) within the zones (Z-1, Z-2 and Z-3; Figure 3). Each zone was considered as an experimental block, where the tillage treatments were applied in four replicates. Two repeated subsoil tillage passes were applied in parallel to the pipeline. A John Deere 8320R MFWD tractor (196 kW [263 hp] PTO power) tractor pulling a John Deere V-Ripper (5-shanks at

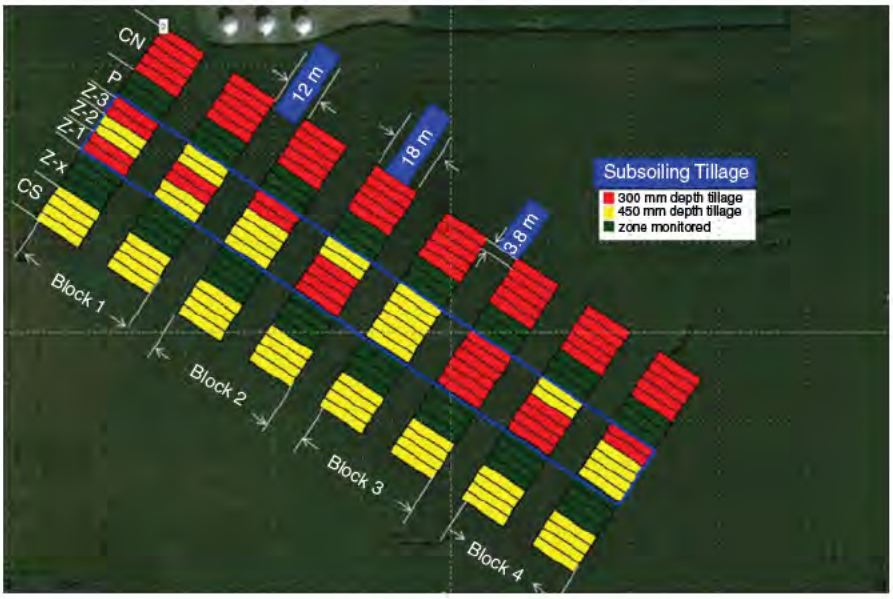


FIGURE 3 Based on the randomized complete block design (RCBD), the 300-mm- and 450-mm-deep tillage treatments were applied within Zone-1, Zone-2 and Zone-3 prior to topsoil replacement ("blue" rectangle). Each subsoil tillage plot size was 7.6 m width by 18 m long. Within the right-of-way (ROW), Zone-x and Zone-P (topsoil pile zone) were not part of the RCBD tillage experiment design. Crop field zones (Control-N, CN (north) and Control-S, CS (south)) were outside the ROW and unaffected by the pipeline construction [Colour figure can be viewed at wileyonlinelibrary.com]

760 mm spacing with DMI ripper points, 63.5-mm-wing width) was used to apply the subsoil tillage operation.

After the topsoil was replaced, the two unaffected zones designated as Control-N and Control-S (Figure 2) were added to the long-term (5-years) experimental plots to represent the soil and crop conditions outside the ROW that receive normal farm cultivation practices. Note that Control-N and Control-S had corn planted in the field adjacent to the ROW. At the unaffected zones, after the fall 2016 corn harvest and the pipeline construction were completed, including replacing the topsoil, Control-N received 300-mm-depth tillage using a Case 690 disk ripper pulled by a John Deere 8260R WFWD tractor (161 kW [216 hp] PTO power) which was followed by a second pass of 300-mm-depth tillage using the aforementioned John Deere 8320R MFWD tractor and the John Deere V-Ripper. In the Control-S zone, first pass tillage was completed at 300 mm depth using the Case 690 disk ripper pulled by the John Deere 8260R MFWD tractor and followed by a second pass of 450-mm-depth tillage using the John Deere V-Ripper pulled by the John Deere 8320R MFWD tractor. The disk ripper implement was the preferred tool to manage corn residue before applying the tillage using the V-Ripper without disc.

2.5 | Soil cone penetration resistance measurement

After the first year crop harvest in fall 2017, soil cone penetration resistance was measured according to the ASABE standards (ASAE Standards, 2004a,b). A tractor-mounted three-probe cone penetrometer designed and built at ISU (Figure 4) was used to measure the soil cone penetration resistance. Cone penetration resistance force was measured using a Transducer Techniques model LPU-500 load cell transducer with 2224-N capacity (Transducer Techniques,

FIGURE 4 Three-probe cone penetrometer mounted on the three-point hitch of a tractor. The lateral spacing between the penetrometer probes was 150 mm during field measurements. An ASABE 30-degree conical tip with 285 mm^2 cone base area was attached to each of the probes. The probe insertion rate was 30 $mm\ s^{-1}$ [Colour figure can be viewed at wileyonlinelibrary.com]

LLC (Temecula, CA)) and a Metromatics USB DEWE-43 DAQ System (Metromatics (North Lakes, Brisbane, QLD, Australia)) acquiring data at 100 Hz. Soil cone penetration resistance (kPa) was calculated by dividing the cone penetration resistance force by 285 mm^2 ASABE cone base area (ASAE Standards, 2004a).

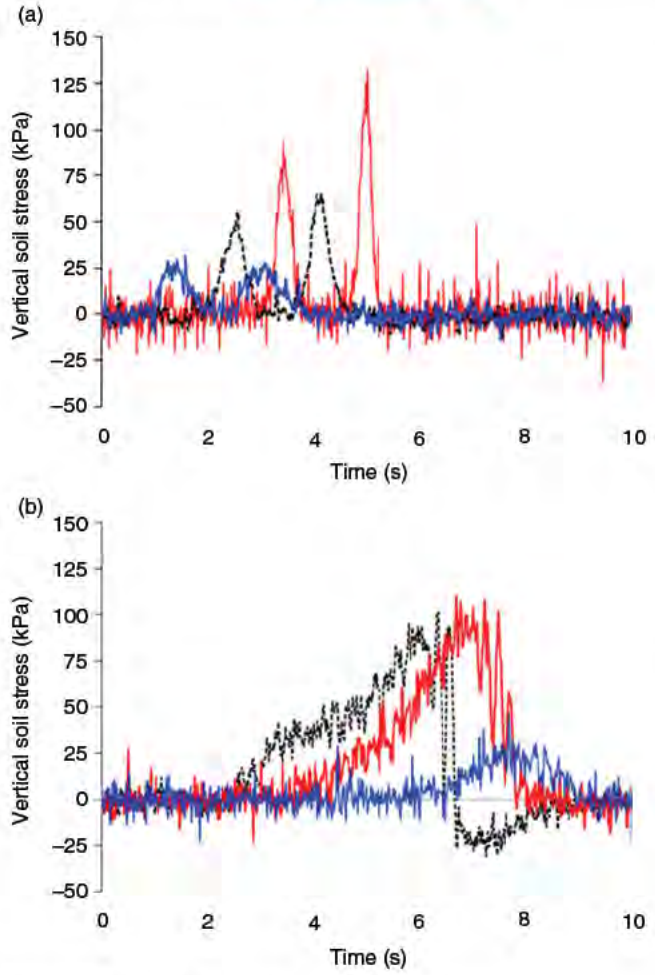


FIGURE 5 Soil vertical stress measured using the buried piezoelectric earth pressure cell at three depths ("red"—soil depth of 200-mm; "black"—soil depth of 400 mm; and "blue"—soil depth of 600 mm) as the semi-truck trailer hauling three pipes (24.4 m long, 0.76 m outer diameter, and 9.5 mm wall thickness); (a) and the Caterpillar Pipe Liner PL 87 (with bender) passes (b). Note that the comparison was made on the peak induced vertical soil stress (maximum soil vertical stress) from the front axle pass of the semi truck trailer and track pass of the Caterpillar Pipe Liner PL 87 [Colour figure can be viewed at wileyonlinelibrary.com]

2.6 | Data analysis

Data analysis to compare the vertical soil stresses from the vehicles was performed on the first pass peak vertical soil stress. In order to not hinder pipeline construction field operations, the construction equipment for loading the pressure sensors was available for only one week. Thus, the measurement with the pressure sensor buried at the three depths was limited to one replicate. The field machine productivity was approximately 0.2 km h^{-1} (personal communication with field superintendent).

Data from soil bulk density and soil cone penetration resistance were analysed using the GLM procedure in SAS JMP Ver. 14. (JMP, 2013). Means were compared using a *p*-value of 0.05 as a significance level. From the unaffected zone, the soil cores sampled from the top surface of the exposed subsoil to the end core length of the Gidding cylinder were used to compare with the soil bulk density at the corresponding soil depth from the ROW zones.

TABLE 1 Peak vertical soil stress induced from first pass of the heavy vehicle Caterpillar pipe liner PL 87 (with bender) and semi-truck trailer (with three pipes) on soil within the ROW

	Peak vertical soil stress (kPa)	
Soil depth (mm)[a]	Vehicle-A[b]	Vehicle-B[c]
200	133	133
400	115	78
600	63	49

[a]Soil depth was measured from the top surface of the exposed subsoiled soil to the top surface of the sensor. [b]Vehicle-A: Caterpillar pipe liner PL 87 (with bender). [c]Vehicle-B: Semi-truck trailer (three pipes).

3 | RESULTS AND DISCUSSION

3.1 | Peak vertical soil stress

Multiple peak values of vertical soil stresses were observed as the tyres of the semi-trailer truck passed over the buried pressure sensors (Figure 5). From a single pass of the Caterpillar Pipe Liner PL 87 (with bender) travelling at 0.45 m sec^{-1}, the peak vertical soil stress occurred towards the end of the track contact length. Table 1 shows the peak vertical soil stress measured from the first pass of the two heavy vehicles. At the shallow depth (200 mm), there was small difference in the peak vertical soil stress between the front axle (DOT highway limit of 8.9 kN) pass of the semi-trailer truck (275/80R-24.5 tyre) and the single pass of the Caterpillar pipe liner PL 87 (contact area of each track 2.82 m^2). At the depth of 400 mm, the peak vertical soil stress appeared to be influenced more by the vehicle weight, whereby the peak vertical soil stress from the Caterpillar liner PL87 was 1.5 times higher than from the semi-trailer truck. At 600 mm depth, the magnitude of peak vertical soil stress from the Caterpillar pipe liner PL 87 was 1.3 times the stress induced by the semi-trailer truck. Having one replicate measurement statistically limited the comparison of impacts from heavy vehicles of the semi-trailer truck versus the Caterpillar pipe liner PL87. The narrow contact ground area and tyre inflation pressure from the semi-trailer truck had a strong effect on shallow vertical soil stress, while the deep (400 mm and 600 mm) vertical soil stresses was affected more by the magnitude of vehicle load. The effect of vehicle type with high tyre inflation pressure and axle load on shallow and deep soil compaction was similar to previous studies (Bailey, Raper, Way, Burt, & Johnson, 1996; Hakansson & Reeder, 1994). Measurement of soil stress from the other heavy vehicle (Caterpillar 349F and Caterpillar D7E) passes showed similar trends as the effects from the Caterpillar pipe liner PL 87. The soil pressure measurements from the Caterpillar 349F and Caterpillar D7E passes had

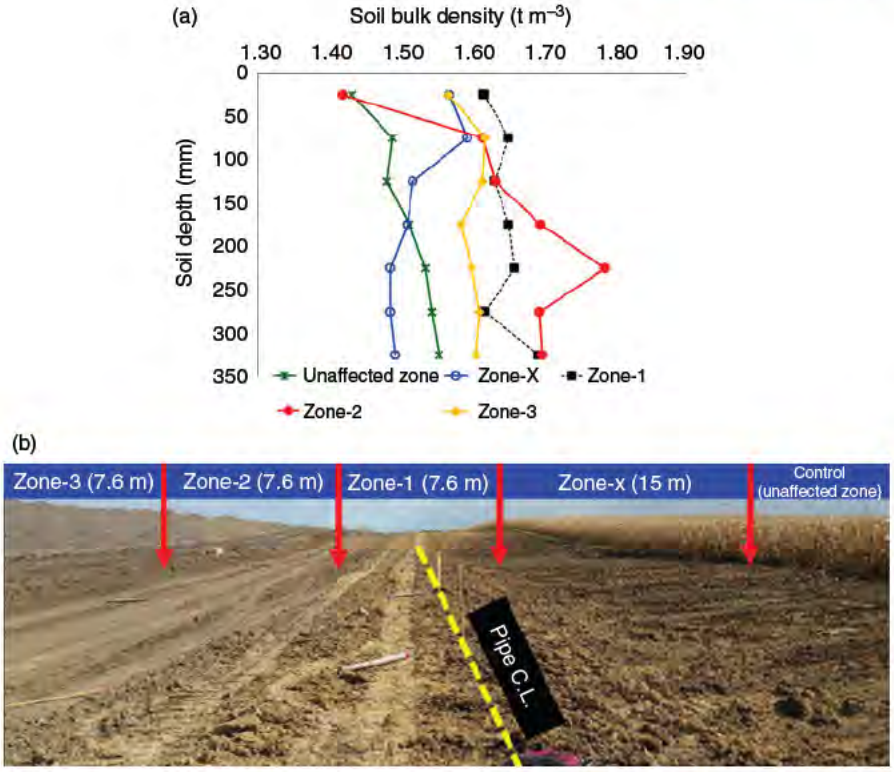


FIGURE 6 Soil bulk density with depth from the construction ROW zones (Zone-1, Zone-2, Zone-3 and Zone-x) and the unaffected zone (Control-S). The reported soil depth refers to the top surface of the exposed subsoil (b) within the ROW. "C.L." is the pipe centreline. Each data point is a mean of nine replicates [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 2 Mean soil bulk density ($t\ m^{-3}$) by soil depth class

Soil bulk density ($t\ m^{-3}$)					
Soil depth class[b] (mm)	Zone-1	Zone-2	Zone-3	Unaffected zone	Zone-x
0–50	1.62 (A)[a]	1.42 (B)	1.57 (A B)	1.46 (B C)	1.57(B)
50–100	1.65 (A)	1.62 (A)	1.62 (A)	1.52 (B)	1.59 (A B)
100–150	1.63 (A)	1.63 (A)	1.62 (A)	1.51 (B)	1.52 (B)
150–200	1.65 (A)	1.70 (A)	1.58 (A B)	1.54 (B)	1.51 (B)
200–250	1.66 (A)	1.79 (A)	1.60 (B)	1.55 (B)	1.49 (B)
250–300	1.62 (A)	1.70 (A)	1.61 (A)	1.59 (A B)	1.49 (B)
300–350	1.69 (A)	1.70 (A)	1.61 (A B)	1.57 (B)	1.49 (B C)

[a]The same letter within each depth indicates there is no significant difference at $p \leq 0.05$. [b]The zero soil depth is in reference to the top surface of the exposed subsoil. The difference between soil depth (mm) relative to undisturbed topsoil surface on the unaffected zone "Control-S" outside of the ROW and soil depth (mm) relative to the top surface of exposed subsoil was the topsoil removed from the ROW.

relatively high data variability, partly because there was substantial precipitation prior to data collection.

3.2 | Soil bulk density

The soil bulk density trend at different soil depth (Figure 6) shows the higher magnitude of soil compaction from the soil disturbance and vehicle trafficking in the construction ROW zones compared to the unaffected zone. The soil bulk density values in Figure 6 were all relative to the top surface of the exposed subsoil.

Comparing the soil bulk density values among zones (Z-1, Z-2 and Z-3) within the ROW and the unaffected area (Table 2), the soil compaction effect from the construction activity was statistically significant ($p < 0.05$) to a depth of 300 mm below the top surface of the exposed subsoil. The differences in soil bulk density between the unaffected zone and Z-x that received relatively light traffic were minimum,

except in the top 50 mm. The deep compaction in Z-1 and Z-2 had soil bulk density close to a Proctor compaction test (ASTM D698) of maximum bulk density (1.72 t m^{-3}) at an optimal soil moisture content (21.5%, d.b.) of a loam soil (33.29% sand; 45.21% silt; 21.5% clay). The Proctor compaction test was conducted on loam soil (Clarion loam series) sampled at a nearby ISU farm location. The control (unaffected) area and the least trafficked zone in the ROW (Z-x) had wetter soil conditions (Figure 7), indicating that the compaction from the construction activities, especially on Z-2 and Z-3, seemed to restrict water infiltration prior to the bulk density measurement. The backfilled subsoil to the pipe trench in Z-1 was compacted by DAPL to reduce soil settlement.

Within the ROW (below 300 mm from the top surface of the exposed subsoil), soil compaction was found with higher bulk density in Z-1 (1.67 t m^{-3}), Z-2 (1.70 t m^{-3}) Z-3 (1.58 t m^{-3}) than the less trafficked zone (Z-x) (1.52 t m^{-3}). Soil core samples from the unaffected zone below 300 mm from the top surface of the exposed subsoil were not available due to the limit of the maximum Giddings cylinder stroke length.

3.3 | Deep tillage effect on soil cone index

Table 3 shows means and standard deviations of soil cone penetration resistance values within Z-1, Z-2 and an unaffected area (Control-N) for two soil depth layers of 0 to 300 mm and 300 to 750 mm. Taking cone penetration readings on all zones within the ROW (Z-1, Z-2, and Z-3) and adjacent zones (Control-N and Control-S) was not practically feasible without introducing wide soil moisture variations during the sampling period. To minimize undesired soil moisture effects on cone penetration resistance, we focused on Z-1, Z-2 and Control-N for comparison of the tillage remediation effects within the ROW and the adjacent unaffected area. The soil moisture contents during the cone penetration reading from the topsoil (0–150 mm) within Z-1, Z-2 and Control-N were 16.28% d.b. (SD = 1.72%), 15.98% d.b. (SD = 1.11%), and 17.78% d.b. (SD = 1.72%), respectively. The soil moisture content was not significantly different across the various sampling zones (p = 0.09).

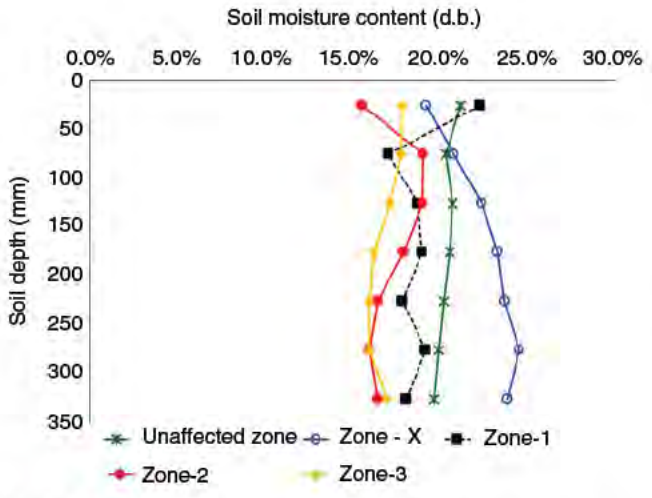


FIGURE 7 Soil moisture content of soil depth from four construction zones Zone-1, Zone-2, Zone-3, Zone-x and an unaffected zone (Control-S). The reported soil depth refers to the top surface of the exposed subsoil within the ROW. Each data point is a mean of nine replicates [Colour figure can be viewed at wileyonlinelibrary.com]

Within Z-1 and Z-2, the 300-mm-depth tillage and 450-mm-depth tillage applied prior to topsoil replacement did not have a significant effect on the soil cone penetration resistance within the 0 to 300 mm soil depth ($p > 0.05$). Comparing the zones within ROW (Z-1 and Z-2) to the unaffected area, Z-1 had statistically the highest soil cone penetration resistance ($p < 0.01$) in the topsoil profile (0–300 mm).

Deeper than 300 mm soil depth, the effect of the utility construction equipment on deep soil compaction was noticeable, even though the ROW zones received subsoiling from the tillage treatments (300-mm-depth tillage and 450-mm-depth tillage; Figure 8). Similar to the soil bulk density, deep soil compaction in Z-2 was higher than in Z-1 and in the adjacent unaffected crop field. Overall, the 450-mm-depth tillage alleviated the deep soil compaction created by the pipeline construction equipment better than the shallow tillage (300-mm-depth tillage). No significant differences ($p > 0.05$) in the mean soil cone penetration resistance (300 to 750 mm) were observed comparing the compaction from each of the ROW zones (Z-1 and Z-2) to the unaffected zone after Z-1 and Z-2 received the 450-mm-depth tillage. In the deeper soil profile (below 600 mm; Figure 8), Z-1 and Z-2 which received the 450-mm-depth tillage had soil cone penetration resistance values close to those of the unaffected area.

After subsoiling at the 300-mm-depth tillage in Z-1 and Z-2, the deep soil compaction (300 mm to 750 mm) was not fully removed (Figure 8) and soil compaction was significantly ($p < 0.05$) higher than in the unaffected area.

The pipeline construction equipment trafficking created deep soil compaction (a hardpan) as shown by an abrupt increase in soil cone penetration resistance as the cone penetrometer was inserted into the subsoiled layer (Figure 8). Tekeste, Raper, Schwab, and Seymour (2008) and Raper, Reaves, Shaw, van Santen, and Mask (2005) detected crop-limiting soil hardpan layers on Coastal Plains soils in the southeastern United States by analysing the soil cone penetration resistance profile for a soil depth range. Raper et al. (2005) applied site-specific tillage at a depth that had a maximum soil cone index approximating the depth of soil hardpan and reported soil compaction alleviation. Schjonning and Rasmussen (1994) also reported deep soil compaction on loam soils that persisted even after 5 years traffic with four passes of a vehicle with high axle load (32t) on the bottom of a 200 mm exposed soil layer.

The deep soil compaction created on the Clarion loam and Canisteo clay loam from the pipeline construction will require depth-specific subsoiling management in the future

TABLE 3 Mean soil cone index (MPa) for 0 to 300-mm and 300 to 750-mm soil depth range for the Zone-1, Zone-2 and the unaffected zone

Zone	Tillage remediation	Depth range (mm)[b]	Replicate	Soil cone index (MPa)	
				Mean	*SD*
Unaffected zone	Control-N[a]	0–300	4	1.7	0.19
		300–750	4	1.9	0.17
Z-1	300 mm depth tillage	0–300	4	2.1	0.3
		300–750	4	2.6	0.5
	450 mm depth tillage	0–300	4	2.0	0.2
		300–750	4	2.0	0.4
Z-2	300 mm depth tillage	0–300	4	1.4	0.4
		300–750	4	2.6	1.0
	450 mm depth tillage	0–300	4	1.3	0.1
		300–750	4	1.7	0.6

[a]The tillage practice in the unaffected area was similar to the tillage in control-N. [b]The top depth for the soil cone index reporting refers to the top surface of the unaffected zone.

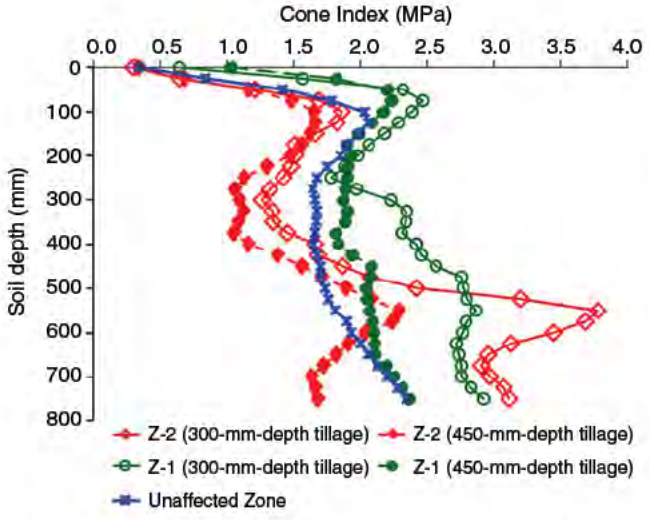


FIGURE 8 Soil cone index profile measured from the right-of-way (ROW) zones (Zone-1 and Zone-2) subsoiled at 300-mm- and 450-mm-depth tillage treatments prior to the topsoil replacement and the unaffected zone outside the ROW. The topsoil depth refers to the topsoil surface from the unaffected zone. Each data point is a mean of four replicates of the three-point cone penetrometer readings [Colour figure can be viewed at wileyonlinelibrary.com]

to remove the root-limiting hardpan layers and prevent the persistent problem of deep compaction. Excessive compaction deeper than 500 mm soil depth is relatively deeper than typical fall tillage practices (200-mm-depth tillage) in the area (Karlen, Kovar, Cambardella, & Colvin, 2013).

4 | CONCLUSIONS

A five-year long-term corn–soybean field experiment was established to assess impacts of utility construction activities and deep tillage remediation treatments (300-mm-depth tillage and 450-mm-depth tillage applied at the exposed subsoil) within the ROW.

Using a pressure sensor, the peak vertical soil stresses measured at three soil depths (200, 400, and 600 mm) successfully identified the machine configuration (size and tractive element) that created excessive soil compaction below the exposed subsoil.

The impact on soil compaction from pipeline installation on exposed subsoil was also evaluated comparing soil bulk density within ROW and adjacent unaffected crop field area. First-year soil responses to deep tillage were also investigated using cone penetration resistance measurement. Heavy vehicle and high traffic intensity within the ROW created deep soil compaction with significantly higher soil bulk density in the pipeline zone (Z-1) and adjacent heavily trafficked zone (Z-2) to a depth of 300 mm. Comparing the soil cone penetration profile from the ROW deep tilled zones and the unaffected zone, deep tillage applied using a 450 mm depth alleviated the deep compaction created during the pipeline construction. Subsoiling using 300-mm-depth tillage, however, did not significantly reduce the deep soil compaction.

Delineating the pipeline construction zones on the basis of vehicle trafficking, the techniques to quantify machine induced peak vertical soil stress and subsoil tillage management may be used to develop soil compaction management plans for pipeline construction activities in cropland.

Future studies will include deep tillage management effects on soil compaction (bulk density and cone penetration resistance) and corn–soybean crop yields.

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Attachment No. 11

February 28, 2022

Iowa Chapter
Physicians for Social
Responsibility

Sign in Colorado. ---------- *Source: Jeffre Beall*

Carbon Capture and Public Health

*By **Sheri Deal-Tyne**, Health & Energy Policy Researcher, PSR Iowa, 2/28/22.*

This series began with **Carbon Capture Basics**, a basic overview of the process of Carbon Capture and Sequestration (CCS) and a brief synopsis of the current debate concerning its promotion. In this second report, we dive deeper into a frequently overlooked issue: the public health implications of CCS. *Read the first report **here**.*

Anthropogenic, or human-made, CO2 has been a focus of concern for scientists and environmentalists for decades. CO2 makes up about **80%** of total greenhouse gas emissions (methane is next at 10%). The burning of fossil fuels (coal, natural gas, and oil) is the largest source of CO_2 emissions.

The UN Intergovernmental Panel on Climate Change (IPCC) released a report in 2018 announcing that CO_2 emissions would need to decline 45% from 2010 levels by 2030 and reach "net-zero" by 2050 to avoid a global temperature rise **beyond 1.5°C**. Many in the business and academic communities promote CCS and Carbon Capture and Utilization Sequestration (CCUS) as vital to reaching "net-zero" for the IPCC goal. PSR Iowa feels it is essential to recognize the significant public health risks associated with CCS. This report discusses the hazards accompanying each stage of the CCS process.

In the first stage, the CO2 is captured and separated from other gases, using expensive technology requiring an additional energy source. Capture is proposed at various sites, including coal- and gas-fired power plants and ethanol production facilities. In the second stage, the CO2 is compressed into liquid form, again requiring energy, and then pumped into and transported via pipelines. In the third and final stage, the liquid CO2 is injected into the earth at the sequestration site.

Lethality of CO2

CO2 is the colorless and odorless gas humans exhale during respiration, contributing to the perception that CO2 is harmless. Concentrated CO2 is an asphyxiant and a recognized **toxicant** cited by OSHA, ACGIH, DOT, and NIOSH. Gaseous CO2 is 1.5 times heavier than air. Liquid CO2 is 10% heavier than water. When released in large

quantities as gas or liquid, CO_2 settles on the ground, flows downhill, and displaces ambient air.

Ambient air is the air we all breathe. The concentration of CO_2 in ambient air is around 400 parts per million (ppm) or 04% but can be elevated in areas with high vehicle traffic or industrial activity. *Atmospheric CO_2* is the measurement of CO_2 in the earth's atmosphere. Atmospheric CO_2 **levels** are tracked by the National Oceanic and Atmospheric Administration (NOAA) and the Scripps Institution of Oceanography.

Table. Health Effects of Exposure to Elevated CO_2 Levels
— *Information courtesy of Ted Schettler, MD, MPH*

CO_2 concentration	Health Effect	Exposure Time
0.04% (Ambient Air)	No Health Effect	Lifetime
2% (20,000 ppm)	Respiratory center stimulated causing increases in breathing (tidal) volume	Rapid
4% (40,000 ppm)	Increases in breathing rate becomes distressing;	Immediately dangerous to life or health (IDLH) [NIOSH]
7-10%	Dimmed sight, sweating, tremor, unconsciousness	After only a few minutes
Over 10%	Convulsions, coma, death	Less than a minute
Over 20%	Emergency, Loss of consciousness, rapid death	Seconds

The physiological response to and seriousness of CO_2 inhalation varies depending on the concentration of CO_2 and the length of exposure time. Conditions from low to moderate exposures are generally reversible when a person is removed from the high CO_2 environment.

CO_2 Capture Sites

As the debate about CCS gains momentum, that familiar idiom "can't see the forest for the trees" springs to mind. Proponents of CCS focus on the potential value of removing CO_2 from industrial sites while quietly ignoring associated hazards. Combustion of fossil fuels and ethanol production release many pollutants along with CO_2. These co-pollutants are associated with a wide range of public health dangers.

Extensive **research** has demonstrated the health hazards of coal-generated electricity. NOx, SO_2, mercury, and $PM_{2.5}$ are emitted from coal plants along with CO_2. NOx causes

airway inflammation, decreased lung function, asthma exacerbation, increased response to allergens, and contributes to particulate matter and ground-level ozone. SO2 causes wheezing, shortness of breath, chest tightness and exacerbates asthma. Continued exposure reduces the ability of the lungs to function. SO2 reacts with water to become acid rain. Mercury is a potent neurotoxin, especially for developing fetuses and young children. $PM_{2.5}$ contributes to premature mortality, increased hospitalizations, cardiovascular disease, bronchitis, cognitive decline, dementia, preterm birth, low birth weight, and congenital disabilities.

Pollutants from natural gas-generated electricity include less NOx and fewer particulates, do not include mercury, but do include significant methane leakage. In addition to being a precursor to ground-level ozone formation, and as a greenhouse gas, methane is **much more potent** than CO2.

Note that each stage of CSS technology requires its own energy sources, which generate additional emissions. CO2 capture systems at power-generation plants and ethanol production facilities **also require copious amounts of water** for cooling and other purposes leading to extensive water consumption and increased water pollution, often in areas already facing water scarcity.

CO2 Transport

Large-scale development of CCS across the US will require the construction of thousands of miles of new pipeline infrastructure impacting ecosystems along their routes. Liquid CO2 is transported in a **highly pressurized state**—higher than natural gas. Additionally, liquid CO2 is corrosive when in contact with water, increasing the risk of leaks, fractures, and ruptures. Rupture of a highly pressurized liquid CO2 pipeline results in an explosive release of an extremely cold (less than -70° C) flood of liquid CO2 that forms ground-hugging clouds of gas and small particles that continue to spread until supply is turned off. Because CO2 displaces oxygen, internal combustion engines would be rendered inoperable near a leak or rupture, interfering with emergency responders. Potential mass casualties would overwhelm rural emergency health systems.

Watch **this video** to see what a CO2 pipeline rupture looks like.

CO2 Injection Sites

The rollout of CCS projects at the scale required to slow climate change effectively would require establishing CO2 sequestration sites throughout the US. **Estimates** (see pp 18-19) of the storage potential and feasibility are theoretical and vary widely.

The risks of CO2 sequestration **include** leakage of CO2 and increased occurrence of earthquakes like that experienced with high-pressure water injection at fracking sites. CO2 leaks at the surface could damage surface ecosystems or structures, threaten people and animals from high concentrations of CO2, and contribute to greenhouse gas accumulations, all undermining the theoretical value of CCS. Leaks that occur sub-surface could affect drinking water aquifers. Conceivably, using geologic formations as storage for carbon dioxide could compromise deep not-currently-used aquifers on which future generations may depend for drinking water.

Frontline Communities

Dr. J.M. Bacon, Professor of Environmental Sociology at Grinnell College, cautions us to be skeptical of "purely technological fixes when it comes to complex eco-social problems. From an Environmental Justice perspective, the first question is: how have communities been involved at the planning and decision-making stage?"

As has been widely documented, fossil fuel extraction and industrial processes have a legacy of disproportionately impacting Black, Brown, and Indigenous communities. Adding carbon capture to an existing fossil fuel or industrial site functions to extend the lifespan of that facility. Many of the communities already adversely impacted by these facilities would be further harmed by the increased emissions and water pollution associated with carbon capture units.

For example, an industrial corridor that stretches between New Orleans and Baton Rouge, Louisiana is being targeted as a **hub for carbon capture**. This corridor is home to more than 200 oil and gas refineries, petrochemical plants, and other industrial chemical facilities. The area is known as "*Cancer Alley*" because decades of poor air and water quality from industrial pollution have increased cancer rates and other health problems. The **communities** most affected are predominantly Black.

The White House Environmental Justice Advisory Council (WHEJAC) Final Recommendations on climate and environmental justice include a list of "EXAMPLES OF THE TYPES OF PROJECTS THAT WILL NOT BENEFIT A COMMUNITY" (**see page 59**). Number 2 on the list is CCS or CCUS. It is also essential to note that number 1 on the list is "Fossil fuel procurement, development, and infrastructure repair that would in any way extend lifespan or production capacity, transmission system investments to facilitate fossil-fired generation or any related subsidy."

History lessons: Satartia

In 2020, a CO_2 pipeline in Satartia, MS ruptured, sending 49 people to the hospital and leaving many with long-term health impacts. More than 250 people required evacuation. First responders needed self-contained breathing apparatuses to conduct their rescues. Residents' cars ceased to run, and victims were found dazed or even unconscious. See the full story **here**.

The Satartia pipeline rupture. Source: [Yazoo County Emergency Management Agency]

Conclusion

Superficially, the potential CO_2 reduction associated with CCS projects seems desirable. However, CCS technology and associated pipeline infrastructure are economically costly and come with a significant set of public health hazards. We can achieve *more* CO_2 reduction *and* eliminate pollution and mining and pipeline infrastructure by utilizing existing and accessible renewable energy like wind, solar, efficiency, and other readily scalable and available strategies. It is reckless to spend money on unproven technologies that contribute negligible benefit or, worse, disproportionately impact already disenfranchised communities. If we instead focus funding on renewable energy projects and infrastructure, we avoid the myriad health risks associated with CCS altogether.

Dear Reader

Stay tuned for our next installment where we take a much closer look at issues surrounding three proposed CCS projects in Iowa.

GLOSSARY

ACGIH: American Conference of Governmental Industrial Hygienists

CCS: Carbon capture and storage/sequestration—The process of capturing human-made CO_2 at its source and storing it to prevent its release into the atmosphere.

CCUS: Carbon capture, utilization, and storage/sequestration—captured CO2 is utilized in some way, typically for enhanced oil recovery.

Co-pollutant: Other types of pollutants that are generated during the burning of fossil fuels, along with CO2

DOT: Department of Transportation

Net-zero: A nebulous term promoted by some meaning an overall balance between emissions produced and emissions taken out of the atmosphere. Net-zero often replaces the term *carbon neutral*. To save our climate and health, we need to go beyond net-zero to zero production of carbon emissions.

NIOSH: National Institute of Occupational Safety and Health

NOx: Nitrogen oxide, a co-pollutant of fossil fuel combustion and potent greenhouse gas.

OSHA: Occupational Safety and Health Administration

Ozone: A co-pollutant of fossil fuel combustion, also known as "smog." Ozone attacks lung tissue by reacting chemically with it.

$PM_{2.5}$: Particulate matter, fine particles of toxic pollutants 2.5 microns or smaller in size. Such small particulates are dangerous because they can get into the lungs' alveoli, cross into the bloodstream, and lodge in internal organs.

Respiratory acidosis: A condition that occurs when there is an accumulation of CO2 in body fluids that causes acidic conditions that can lead to death.

Sequestration: In context to CCS, sequestration is the storing of CO2 in underground geologic formations.

SO2: Sulphur dioxide, a highly toxic co-pollutant resulting from fossil fuel combustion.

WHEJAC: White House Environmental Justice Advisory Council

FURTHER READING

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Zegart, Dan. 2021. "The Gassing of Satartia." *HuffPost.* **https://www.huffpost.com/entry/gassing-satartia-mississippi-co2-pipeline_n_60ddea9fe4b0ddef8b0ddc8f**

Attachment No. 12

LAND RECLAMATION
of the
Bison Pipeline

TRANSCANADA'S BISON PIPELINE in Montana 04/12/2011

Pictures: Bob Zellar – Billing Gazette

Lincoln Star Journal

A cattleguard damaged during installation of the Bison high pressure gas pipeline in southeast Montana 04/12/2011

Blowing and blown soil on Robert Rusley's property on the Bison high pressure gas pipeline right of way in southeast Montana. 10/27/2010

A pipeline sign lies fallen in a trench left after the soil over the Bison pipeline sunk in spring on Robert Rusley's property in southeast Montana 04/12/2011

One sign has fallen while another leans in the soft soil on the Bison high pressure gas pipeline right of way in southeast Montana 04/12/2011

Janelle Reiger walks on a concrete creek crossing damaged during installation of the Bison high pressure gas pipeline in southeast Montana 04/12/2011

Janelle Reiger stand in a trench left after the soil over the Bison pipeline sunk this spring on Wade Klauzer's property in southeast Montana 04/12/2011

Wade Kllauzer stands by a trench left after the soil over the Bison pipeline sunk this spring on his property in southeast Montana 04/12/2011

A pipeline sign lies fallen in a trench left after the soil over the Bison pipeline sunk this spring on Robert Rusley's property in southeast Montana
04/12/2011

Water erosion on Wade Klauzer's property on the Bison high pressure gas pipeline right of way in southeast Montana 04/12/2011

Janelle Reiger walks by a trench left after the soil over the Bison pipeline sunk this spring in southeast Montana 04/12/2011