STATE OF IOWA
DEPARTMENT OF COMMERCE
BEFORE THE IOWA UTILITIES BOARD

IN RE: )
) Docket No. HLP-2014-0001
) DAKOTA ACCESS LLC )

DIRECT TESTIMONY OF

THOMAS FENTON

ON BEHALF OF

SIERRA CLUB IOWA CHAPTER

OCTOBER 12, 2015

EXHIBIT SIERRA CLUB–TF–1
Q. Please state your name.
A. My name is Thomas Fenton

Q. Please state your employment history.
A. I am an Emeritus Professor of Agronomy at Iowa State University. I have been teaching at Iowa State since 1961.

Q. Is your curriculum vitae attached as Exhibit Sierra Club-TF-2?
A. Yes.

Q. Please state your educational background.
A. I have a B.S. degree in Agriculture, M.S. degree (Agronomy) from the University of Illinois and a Ph.D. degree (Agronomy, Soil Science) from Iowa State University.

Q. Please describe what the subject of agronomy entails.
A. Agronomy is the science and technology of producing and using plants for food, fuel, fiber, and land reclamation. Agronomy encompasses work in the areas of plant genetics, plant physiology, meteorology, and soil science. Agronomy is the application of a combination of sciences like biology,
chemistry, economics, ecology, earth science, and genetics. Agronomists today are involved with many issues including producing food, creating healthier food, managing environmental impact of agriculture, and extracting energy from plants. Agronomists often specialize in areas such as crop rotation, irrigation and drainage, plant breeding, plant physiology, soil classification, soil fertility, weed control, and insect and pest control.

Q. Have you had experience in reviewing the impacts on soils and crops from the installation and operation of pipelines?

A. Yes. I have served as a consultant for land owners in several cases. The most recent was against Alliance Pipeline Company in 2000. Another was against Northern Natural Gas Company in 1980. I also reviewed a study entitled “Report on Pipeline Construction Effects on Corn Yields and Other Factors in 1980 in Clinton County Iowa” done by Dr. Dumenil, an Agronomy Department colleague. There were also other cases but I discarded some of the older reports since I retired.

Q. What impacts on soils and crops result from the construction of a pipeline?

A. During construction of a pipeline the soils in the construction right-of-way are compacted, soil horizons are separated, the pipe is a barrier that disrupts the natural
system of water movement, and surface and subsurface drainage are impacted.

Pipelines should not be installed when soils are moist or wet. Maximum compaction occurs when the soil moisture content is at or near field capacity. Field capacity is that moisture content when the potential for soil compaction is at its maximum. In my experience in the past pipeline companies install pipe when soil moisture is too high and compaction occurs.

Q. Describe the impacts from compaction of the soils.

A. Soil is a three-phase system composed of solids, liquids and gases. Under ideal conditions solids comprise 50% of the volume, the other 50% of the volume is pore space and 50% of the pore volume (25% of the total volume) is equally divided between pores that hold water and air, respectively. The Iowa soils developed under prairie vegetation will contain about 5% organic matter and 45% mineral particles in the solid phase. Bulk density is the soil parameter that is used to characterize this relationship. For medium-textured soils the bulk density for the conditions listed above would be 1.2 to 1.3 grams per cubic centimeter. The bulk density of soil horizons beneath the surface horizon for soils formed in uniform parent material and in their natural state would generally increase with increasing depth in the soil profile.
Soil compaction is the process that occurs when soil particles are pressed together reducing the pore space between them. Soils compact when a load applied to soils, such as wheel traffic, is greater than the strength of the soil. This increases the weight of solids per unit volume of soil and is characterized by the bulk density. Soil compaction occurs in response to pressure (weight per unit area) exerted by machinery or animals and results in increased bulk density. The major cause of soil compaction is wheel traffic and is directly related to the weight per unit area, soil texture, organic matter content, and the moisture content at the time a load is applied to the soil. Reports of compacted conditions extending to two or more feet are not uncommon. The negative effects of soil compaction are magnified when associated with other plant stress situations and therefore weather patterns are an important variable in how crops respond to compacted conditions. There is near universal agreement that compaction of soils results in damage to the soil and decreases yield for some period of time.

For construction purposes such as road building, it is desirable to compact the soil material to make a good road base. To obtain maximum compaction, construction engineers employ the concept of optimal moisture content, the moisture content corresponding to maximum density when using the same...
compaction force, generally between 20 and 30 percent moisture by weight, for medium textured materials. This would correspond to moisture content in the upper part of the soil after a significant rain and after the soil had been allowed to dry for approximately 24 hours without significant evaporation and/or respiration. Soil scientists refer to this soil moisture content as “field capacity.” Pipeline installation generally has a time schedule and so installation activities will continue regardless of weather conditions and without consideration of the moisture content of the soil.

Q. Describe the impacts for the soil horizons being separated.

A. During construction of a pipeline the topsoil (A horizon), subsoil (B horizon) and parent material (C horizon) should be stockpiled separately and replaced in the trench in the order they were before being removed. Even if the horizons are replaced in the correct order, there will still be contrasts in the contacts between materials that will affect water movement and root penetration. There should be no traffic over the stockpiled areas.

The A horizon contains the highest concentration of nutrients so it is important that it be replaced. However, the depth of rooting for corn and soybeans is 5 to 6 feet so
proper replacement of the subsoil and parent material is also important. In my experience it is very difficult with heavy equipment to properly replace the horizons in the proper depth and the proper order. It is also important to replace the soil layers when soil moisture content is low so there is less compaction.

Q. Describe the disruption of the natural system of water movement.

A. Soil forming factors have developed the drainage system over the past few thousand years. Pore size and continuity, macro and micro flora and fauna will have been disturbed. The oil pipeline itself is a barrier, like a dam, that disrupts the natural system of water movement.

When the pipe is installed, the surface elevation will generally be higher due to more material placed on top of the filled trench to allow for subsidence of the fill material. This can result in interruption in the path of surface water flow and develop wet spots as a result of the topographic change. Subsurface drainage systems can also be affected by breakage and disruption of the system.

Furthermore, if the oil in the pipe is hot enough, it would alter the freeze-thaw cycle in the soil. The freeze-
thaw cycle is important for creating soil structure and alleviating compaction.

Q. Describe impacts to the soil from the existence of the pipe after construction.

A. Soil temperature will be affected by the presence of the pipeline. Freezing and thawing cycles will probably be reduced which can affect correction of compaction and will also affect micro and macro fauna and flora. The latter could result in increased potential for crop diseases. The micro and macro fauna and flora are part of the organic material which create soil fertility. In addition, these organisms are temperature sensitive. The impact from oil pipeline temperature on the organisms is unknown, but likely would adversely impact soil fertility. If the soil above the pipeline does not freeze, this could cause disruption in some field activities or any other traffic across the field.

Q. If drainage tiles are broken during construction of the pipeline, how would that affect the growth of the crops?

A. A broken tile would affect the amount of water in the soil. The purpose of drainage tile is to remove excess water. If the tile is broken it does not serve that purpose. It may also be difficult to determine where the broken tile is located. The color of the tile would make it difficult to see the broken tile, if it is not made of orange tile. In
addition, the ponding of the excess water may not be where
the broken tile is located.

Q. Describe impacts to the soil from a leak or spill of oil
from the proposed pipeline.

A. The impacts would be significant. I recently read about
the 2013 oil leak in North Dakota. It covered 7.3 acres with
20,000 barrels of crude oil. They began work on the cleanup
in 2013 and estimate it will be late 2016 before it is
finished with a total cost of more than $20,000,000. One
comment I thought was appropriate was, “oil spills are always
bad news for the environment”.

Oil is composed of hydrogen and carbon. Carbon is the
energy source for microorganisms in the soil. If a large
amount of carbon is introduced into the soil it would
stimulate microbial growth in the soil. That would tie up the
nitrogen in the soil that would otherwise be used for the
crops.

But perhaps the most significant adverse effect from an
oil spill would be the oil coating the soil particles. That
would change the moisture dynamics in the soil. By that I
mean that the oil would prevent water from moving though the
soil naturally. In addition, the oil would coat plant roots
if the spill occurred during the growing season. If oil is
coating plant roots, the roots cannot absorb the nutrients and moisture needed to grow.

Wang et al. (2008) state that soils contaminated with petroleum are a serious hazard to human health, cause organic pollution of ground water which limits its use, causes economic loss, environmental problems, and decreases the agricultural productivity of the soil. The toxicity of these products to microorganisms, plants, animals and humans is well established.

Q. Have you reviewed Section 6.14 of Dakota Access’s Agricultural Mitigation Plan with respect to construction in wet conditions?

A. Section 6.14 of Dakota Access’s Agricultural Mitigation Plan states that:

...construction in wet soil conditions will not commence or continue at times when or locations where the passage of heavy construction equipment may cause rutting to the extent that the topsoil and subsoil are mixed, or underground drainage structures may be damaged.

This section fails to define a proper standard for when wet soil conditions cause a cessation of construction. The proper standard for cessation of construction is when field moisture conditions cause the land to not be suitable for normal farming activities. Essentially, if a farmer should not be driving his equipment on the field, then a construction
worker should not be driving his equipment on the field. The reason is due to soil compaction.

The second sentence of Section 6.14 states:
To facilitate construction in soft soils, DAPL may elect to remove and stockpile the topsoil from the traveled way...

This entire sentence should be stricken. “Soft soils” are not a defined term in soil science.

Q. Have you reviewed Section 6.8 of Dakota Access’s Agricultural Mitigation Plan with respect to restoration after soil compaction and rutting?

A. Section 6.8 states that tillage shall be performed under soil moisture conditions which permit “effective working of the soil.”

The term “effective working” should be changed to “effective tillage”. The language should be amended to require that tillage shall not occur except when field moisture conditions are suitable for normal farming activities.

Q. Have you reviewed Section 6.10 of Dakota Access’s Agricultural Mitigation Plan with respect to revegetation of untilled land?

A. Section 6.10 sets forth standards for revegetation of untilled land. Generally speaking, revegetation should not be limited to untilled land. This should be a requirement
upon the pipeline company for all land that is disturbed and tilled in order to minimize erosion.

With respect to Section 6.10, in the last sentence, it states that:

The landowner may request ground cover where the construction is completed too late in the year for a cover crop to become established to prevent soil erosion.

This is the improper standard. The landowner should not have to request ground cover. The default rule should be that ground cover is required, again due to the obvious risk of soil erosion. In the event that it is too late for a cover crop to be established, there should be an additional requirement that the pipeline company must implement erosion control measures as provided in section 6.3 and must also return to plant a cover crop.

Q. Have you reviewed Section 6.3 of Dakota Access’s Agricultural Mitigation Plan with respect to erosion?

A: Section 6.3 attempts to generally define erosion control measures, but this language is very minimal and needs additional safeguards for landowners.

At a minimum, Section 6.3 should additionally refer to all erosion control standards as defined within Section 9.4(5) of the IUB rules in the Iowa Administrative Code.

Section 6.3 has the following statement:
DAPL will develop a Storm Water Pollution Prevention Plan (SWPPP) that will detail the project specific stormwater and soil erosion prevention measures.

Landowners should expect more detail than this. A template should be developed which includes sufficient detail to specify the types of storm water pollution preventative measures.

Erosion is going to be a large concern due to the amount of soil that is removed and replaced. Erosion control measures such as temporary terraces and/or silt fences are critical.

One short term concern will be the water flow as a result of the crowned surface. Water will run up against the crown, then run alongside the crown where the soil is loose, causing more soil to erode. Erosion control measures must address this issue.

The Board should consider implementing a standard based upon tolerable soil loss limits (T values) for each soil unit. For example, a soil unit such as Clarion loam, 5 to 9% slope, moderately eroded has a tolerable soil loss limit of _5 tons per acre. There are standards already in place and these standards should be adopted as a part of Section 6.3.

Section 6.3 should also reference the necessity of establishing vegetation.
Finally, 6.3 should require the pipeline company to remove temporary erosion control measures, such as silt fences and temporary terraces when erosion is no longer a concern.

Q. Have you reviewed Section 6.6 of Dakota Access’s Agricultural Mitigation Plan with respect to depth of pipeline?

A. There is only one reference with respect to the location of the pipeline within the Agricultural Mitigation Plan. In Section 6.6(b) concerning tile it states that the pipeline shall be installed at least 24 inches from tile. I generally agree with this statement.

However, under normal conditions for farming practices, the pipeline should always be installed below all farm tile. I cannot conceive of any reason why a pipeline should be installed above farm tile. If there happens to be deep farm tile, consideration should be given to boring the pipeline underneath.

Furthermore, in addition to the 24 inch separation requirement, the standards should require the pipeline to be installed at least 4 feet below the surface.

There are various reasons for this. First, the standards already refer to a deep till of 18 inches. Normal farming practices do not warrant installing a tile any shallower than
40 inches. Second, erosion does occur, especially in property having slope.

It would be advisable that there be a standard or law which clearly states that farmers who conduct normal farming practices and operations shall NEVER be liable for damage to this oil pipeline. Perhaps this is something that can be addressed by the Board.

Even with the 4 feet minimum depth, there is a problem with future drainage within that watershed. It is not uncommon for an owner of an upland parcel to install tile which empties onto a parcel down slope, and many times the down slope parcel will continue that tile. Tile is typically installed at a depth of 40". However, if we have a down slope parcel which has a pipeline installed at a depth of 48", then a future tile project can only be installed at depth of 24" (which would be shallower at the top of the drain tile. This future tile project would not only affect the down slope parcel which has the pipeline, but also all upland parcels. Essentially, the pipeline is going to affect future potential tile drainage in the entire watershed.

Q. Have you reviewed Section 6.2 of Dakota Access’s Agricultural Mitigation Plan with respect to topsoil separation and replacement?
A. The Agricultural Mitigation Plan generally refers to “topsoil” and “subsoil”. “Topsoil” is the “A horizon” and subsoil is the “B horizon”. But the Plan fails to account for parent material, which is in the “C horizon”. “Parent Material” is usually defined as the material in which the topsoil and subsoil develop.

There should be three separate stockpiles when all three types of soil layers are encountered. All references to stockpiling should refer to potentially three different stockpiles of soil.

Furthermore, a liner, such as heavy plastic or such other material should be used to place the stockpiles. This will protect the ground surface where the stockpiled soils are placed.

Section 6.2 states as follows:

...The actual depth of the topsoil, not to exceed 36 inches, will first be stripped and stockpiled from the pipeline trench...

I disagree. Topsoil in some soils is often deeper than 36 inches. The words “not to exceed 36 inches” should be removed. All topsoil should be stockpiled separately.

Section 6.2 also states:

Topsoil will also be stripped from the adjacent subsoil storage areas to a maximum depth of 12 inches or the actual depth of topsoil if less than 12 inches or as agreed upon with the landowner.
Certainly, I would agree that landowner approval is necessary if topsoil is to be stripped from adjacent storage areas prior to stockpiling. However, if landowner input is not obtained, it would be my opinion that there be no stripping of that topsoil for either subsoil or parent material storage. In order to minimize soil compaction, no stockpiling should occur unless soil moisture conditions are appropriate. Finally, as noted above, the liner should be required as this will help minimize soil compaction.

Another portion of Section 6.2 states:

Upon request from the landowner DAPL will measure topsoil depth at selected locations before and after construction.

That should be absolutely required in all instances unless waived in writing by the landowner.

In the last paragraph of Section 6.2, it refers to tillage down to 12 inches to manipulate the soil such that the original contours and elevation are restored. I would require 18 inches, provided such tillage occurs in proper soil moisture conditions and also provided proper erosion control measures are put in place after such tillage, unless waived by the landowner.

Q. Does this conclude your prepared testimony?

A. It does.