

Technical Memo



To: Patrick Fahn, North Dakota Public Service Commission
From: Sara Simmers, Wenck Associates, Inc.
Date: September 5, 2017
Subject: PU-15-801 ONEOK 8-in Bakken Pipeline - Revegetation Inspection Report

**ONEOK Bakken Pipeline, LLC – 8-inch Natural Gas Liquids Pipeline
also known as the “Bear Creek Pipeline” – PSC Case No. PU-15-801 –
Revegetation Inspection Report**
Site Visit: August 17, 2017

In attendance:

- Norman Mueller, Construction Supervisor – ONEOK Partners
- Sara Simmers – Wenck Associates, Inc.

On behalf of the North Dakota Public Service Commission (NDPSC), Wenck Associates, Inc. (Wenck) conducted a revegetation inspection of the ONEOK 8-in Bakken Bear Creek NGL Pipeline Project (Project) in McKenzie County, North Dakota (ND), constructed by ONEOK Bakken Pipeline, LLC (ONEOK). The purpose of the inspection was to ensure the Project was constructed in compliance with the siting laws and rules and the applicable PSC Orders for the Project, which includes a requirement that all areas disturbed by construction be reclaimed and restored.

Construction was complete and the pipeline was placed in service August 2016. Reclamation and seeding activities began July 2016 and were completed November 2016. This report documents current conditions in the Project area after one full growing season.

Methods

Prior to field surveys, Wenck reviewed the Project Docket to determine NDPSC Orders regarding reclamation in the Project area. The docket review revealed several wetland/drainage crossings and grassland areas that would require reclamation following construction disturbance.

The Project area was inspected visually by driving to access points and walking within the Project right-of-way (ROW) at those points (**Figure 1**). Representative grassland and drainage areas were surveyed to determine species composition. Agricultural areas were observed from public roads and fencelines.

Results

As a whole, reclamation of the Project appears to be proceeding satisfactorily considering this is the first full growing season after seeding, with lower than normal precipitation and drought conditions.

Grasslands/Rangelands

Planted native grasses were growing throughout the reclamation area. In most of the areas of reclaimed grassland/rangeland, the seed that had been planted had germinated and had a cover between 50-75%. The seed mix was not available, but the species most commonly growing were western wheatgrass and slender wheatgrass (**Table 1**). Green needlegrass was also present in several areas but either was not planted in all areas or did not germinate in as many areas as the wheatgrasses. Several native forbs were also common and had presumably recolonized without seeding. Annual weeds had a cover up to 50% in areas, most commonly lambsquarters, Russian thistle, pepperweed, and tumble mustard (**Table 1**). Grazed pastures had less grass biomass, but the annual weeds were also grazed off or trampled and typically had lower cover between 5-25%, whereas in ungrazed areas the annual weeds made up 25-50% cover. After several more growing seasons the grasses should outcompete the annual weeds and dominate the reclaimed areas. Though bare ground is present, the dominance of planted grasses and other naturally colonized native forbs indicates that topsoil has been replaced and suitable plant growth material is present. Given time and moisture, native species will continue to establish and colonize throughout the area.

Table 1. Species Observed in Reclaimed Grassland/Rangeland

| Plant Type | Planted ¹ | | Naturally Colonized ¹ | |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Native | Introduced | Native | Introduced ² |
| Grasses | Western wheatgrass (<i>Pascopyrum smithii</i>); Slender wheatgrass (<i>Elymus trachycaulus</i>); Green needlegrass (<i>Nassella viridula</i>) | | | Smooth brome (<i>Bromus inermis</i>) |
| Forbs | | Yellow sweetclover (<i>Melilotus officinalis</i>) | White sagewort (<i>Artemisia ludoviciana</i>); Yellow coneflower (<i>Ratibida columnifera</i>); Daisy fleabane (<i>Erigeron strigosus</i>); Deer vetch (<i>Lotus purshianus</i>); Scarlet globemallow (<i>Sphaeralcea coccinea</i>); Fringed sagewort (<i>Artemisia frigida</i>) | Black bindweed (<i>Polygonum convolvulus</i>); Horseweed (<i>Conyza canadensis</i>); Pepperweed (<i>Lepidium densiflorum</i>); Lambsquarters/Goosefoot (<i>Chenopodium</i> sp.); Tall tumble mustard (<i>Sisymbrium altissimum</i>); Russian thistle (<i>Salsola</i> sp.); Absinthe wormwood (<i>Artemisia absinthium</i>) ; Black medick (<i>Medicago lupulina</i>) |

¹Seed mix tag not available so it is uncertain which species were planted or which had naturally colonized. Based on past knowledge of what is typically planted and if the plants appeared to be growing symmetrically in rows or not.

²Noxious weeds in bold.

There were a few problem areas, but because of the early stage of reclamation, it is unclear if intervention at this stage would be worthwhile. A horse pasture was dominated by annual weeds, had lower cover of planted grasses, and absinthe wormwood, a noxious weed, was present (**Photo 3**). In another long stretch of the ROW, where there had been no grazing,

the cover of annual weeds, particularly tumble mustard, and absinth wormwood was also very high (**Photo 6**). Management that may help increase the cover of the planted grasses includes mowing the annual weeds and spraying the wormwood. However, the reclamation has had only one full season of growth. Planted grasses may be able to increase in abundance in following years with better precipitation. Treating the wormwood may be ineffective unless the landowner also treats the patches in the adjacent grassland.



Photo 1. (Point 534). Facing: West. View of a reclaimed grassland area over rolling hills. The soil reclamation and recontouring over uneven terrain was done very well. Annual weed cover is most visible at about 25-50% cover; species noted include horseweed, lambsquarters, and Russian thistle. Several seedlings of the noxious weed absinth wormwood were present. Seeded grasses had germinated and were at about 50-75% cover, including western wheatgrass and slender wheatgrass. The native forbs yellow coneflower, white sagewort, and daisy fleabane had presumably recolonized the area from seed or vegetative parts remaining in the replaced topsoil. While bare ground and annual weeds were notable, the presence and cover of planted grasses indicates that given time and moisture grasses will continue to establish in this area.



Photo 2. (Point 535). Facing: Northwest. The foreground area is not part of the route. The ROW is visible going up the high hill/butte in the distance. Some larger areas of bare ground were noticeable on the top of the butte. These areas were not a major concern because that area is naturally low on topsoil; exposed subsoils and barren breaks were part of the natural landscape.



Photo 3. (Point 536). Facing: North. View of a reclaimed grassland area within a horse pasture. Cover of annual weeds was over 75% and included pepperweed, lambsquarters, and horseweed. The noxious weed absinth wormwood was present throughout the reclaimed area at less than 1% cover. Planted grasses were present throughout at about 5-10% cover. Several horses were actively grazing the area. The center of the photo is a low area where drainage runs which had been noted during the as-built inspection as having erosion forming. The erosion appeared to have been corrected and stopped; while there were water flow patterns visible in the soil, there was not any downcutting or channel formation.



Photo 4. (Point 537). Facing: Northwest. View of reclaimed grassland/rangeland over rolling hills. Recontouring and soil replacement appeared excellent. The area was being actively grazed, which appeared to reduce the cover of annual weeds to less than 10%. Planted grasses were evenly distributed with a cover between 50-75%. Staked erosion rolls were in place in the swale on the left of the photos. Other erosion and drainage controls were observed along the ROW (not shown in photo), including waterbars, vertical waterbars, and culverts.



Photo 5. (Point 538). Facing: Northeast. View of reclaimed grassland/rangeland along steep slope. Recontouring, soil replacement, and erosion controls were complete and in good condition. Active grazing in this area kept annual weed cover down, but it was also affecting the cover and establishment of planted grass cover, in combination with the dry conditions. The distribution of planted grasses varied somewhat in this area from between 25-75% cover. Bare ground was up to 50% in some areas. The introduced grass smooth brome was present, and green needlegrass had apparently been planted along with the typical western wheatgrass and slender wheatgrass.



Photo 6. (Point 540). Facing: South. View of ROW in a valley between two hills; to the south the route continues through the valley and over lower slopes of adjacent ridges. Along this area and continuing to the south, it appeared there was no active grazing. Cover of planted grasses was between 10-20% and bare ground was similar. Introduced weeds had a cover of about 50%, with mustard and black bindweed being common annuals and noxious absinthe wormwood seedlings being common as well. Wormwood was common in patches in surrounding grassland. ONEOK could attempt to chemically treat the wormwood in the ROW, but unless there was similar effort by the landowner in adjacent areas, the wormwood would likely continue to spread into the ROW.



Photo 7. (Point 545). Facing: Southeast. View of ROW across state-owned rangeland. The area had active grazing. Annual weed cover was less than 5% and no noxious weeds were noted. Cover of planted grasses was between 25-50% and there were areas of significant bare ground between plants. Dominant species were slender wheatgrass and western wheatgrass (planted); yellow sweetclover (possible planted or colonized); and the native forbs yellow coneflower, white sagewort, and fringed sagewort (colonized).

River Crossing and Drainages

The crossing of the Little Missouri River included a one mile bore under the river, with another one mile bore on the west side from the floodplain up to the top of the steep bluff on the west bank. The floodplain of the river was wooded on each side, and trees and shrubs had to be cut level to the ground surface over the permanent ROW. The workspaces for the bores were reclaimed with western wheatgrass, slender wheatgrass, and green needlegrass; their distribution was even but cover was fairly low from 10-25% (**Photos 8, 9**). Yellow sweetclover may have also been planted, or it was germinating from the topsoil seed bank. Bare ground was over 75% in the area. In the wooded area, native shrubs were growing back from cut stems and sedges and violets were recolonizing. The noxious weed Canada thistle (*Cirsium arvense*) was scattered in the wooded area; it was common in the adjacent woodland.



Photo 8. (Point 541) Facing: East. View across the cut of the ROW through the wooded floodplain toward the Little Missouri River (the route was bored but woody vegetation was cut to ground level within permanent ROW). The foreground shows the reclaimed workspace for the bores to the west and east from this point. The planted species were coming in across the area but cover was fairly low at 10-25%; species observed were western wheatgrass, slender wheatgrass, and green needlegrass. Yellow sweetclover and prostrate vervain (*Verbena bracteata*) were common. Bare ground was over 75%. In the cut area between woodland, native shrubs were growing back from cut stems and native woodland sedges (likely *Carex sprengei*) and wood violet were growing back. The noxious weed Canada thistle (*Cirsium arvense*) was scattered in this area; it was common in the adjacent woodland.



Photo 9. (Point 541) Facing: West. Opposite view from Photo 8 at the base of the steep and woody badlands bluff on the west bank of river floodplain. The area in the foreground is part of the reclaimed area of the workspace, as described above for Photo 8. Grasses are heavily grazed, but present, and annual weed cover is negligible.

Several upland drainages were crossed by the ROW (**Photos 2, 3, 10**). There were no areas observed during the inspection that had wetland vegetation. According to ONEOK, wetlands and stream crossings had been bored to avoid disturbance, which was corroborated by viewing the pipeline route on Google Earth. The upland drainages all appeared to have been recontoured to match the surrounding landscape. Vegetation growth was typical of surrounding reclaimed grassland with the presence and even distribution of planted grasses, but sometimes low cover as a result of grazing pressure and dry conditions.



Photo 10. (Point 545) Facing: Northwest. View of an upland drainage crossing. This particular drainage had several spots of bare ground, but overall the planted grasses were coming in, erosion control was in place, and drainage flows had been reestablished.

Cropland and Hayland

In agricultural areas (**Photos 11, 12, 13, 16**), crop growth was variable within the Project ROW. Growth of corn was typically consistent with the adjacent area, but in some fields wheat tended to have noticeably poorer growth. Poor growth would typically indicate issues with topsoil replacement, but with the drought conditions, the lack of moisture early in the season in combination with higher cover of annual weeds in the reclaimed area was likely the more significant factor for crop germination and growth. In some fields annual weed cover was over 50%, but this is not a major concern since it is the first year after reclamation. Annual weed populations are expected to decrease over time.

In hayland (**Photos 14, 15**), ONEOK indicated they were required to plant a grass seed mix first before planting alfalfa, based on recommendations from NDSU Extension. The planted grasses, along with alfalfa that was perhaps seeded or came up from the seed bank in the topsoil, ranged from 25-50% cover (**Table 2**). Annual weed cover was typically over 50%.

Table 2. Species Observed in Reclaimed Hayland

| Growth Form | Planted ¹ | | Naturally Colonized ¹ | |
|----------------------|-----------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Native | Introduced | Native | Introduced ² |
| Grasses | Western wheatgrass (<i>Pascopyrum smithii</i>); Slender wheatgrass (<i>Elymus trachycaulus</i>) | | | Smooth brome (<i>Bromus inermis</i>) |
| Forbs/ Shrubs | | Alfalfa (<i>Medicago sativa</i>) | White sagewort (<i>Artemisia ludoviciana</i>); Yellow coneflower (<i>Ratibida columnifera</i>); Daisy fleabane (<i>Erigeron strigosus</i>); Deer vetch (<i>Lotus purshianus</i>) | Lambsquarters/Goosefoot (<i>Chenopodium</i> sp.); Kochia (<i>Bassia scoparia</i>); Tall tumble mustard (<i>Sisymbrium altissimum</i>); Horseweed (<i>Conyza canadensis</i>); Pigeon grass (<i>Setaria</i> sp.); Field bindweed (<i>Convolvulus arvensis</i>) |

¹Seed mix tag not available so it is uncertain which species were planted or which had naturally colonized. Based on past knowledge of what is typically planted and if the plants appeared to be growing symmetrically in rows or not.

²Noxious weeds in bold.



Photo 11. (Point 532) Facing: South. Project ROW through a harvested wheat field, somewhat discernable by the scattered small patches of annual weeds. Pipeline markers were present at road crossing.



Photo 12. (Point 533). Facing: North. View of the Project ROW on the edge of a wheat field that had been baled for hay because of the drought conditions. Bales are visible on the left of the photo; the wheat had not been baled within the ROW, presumably because of the high annual weed cover.



Photo 13. (Point 542) Facing: South. View of the Project ROW through a corn field toward the southeast. No difference was observed between the Project ROW and other cropped areas. Pipeline markers were present (not shown).



Photo 14. (Point 543) Facing: East. View of the Project ROW through hayland. The dominant species were alfalfa, brome, slender wheatgrass, and the annual weeds lambsquarters, kochia, and field bindweed. Bare ground is present but the planted species should continue to establish.



Photo 15. (Point 543) Facing: Southwest. Project ROW through hayland, visible as a lighter-colored zigzag from the right of the photo, through the middle (south), then parallel to the scoria-surfaced road on the left of the photo. The ROW had planted species, as well as higher cover of annual weeds compared to the adjacent hayland, which was primarily alfalfa. Pipeline markers were present.



Photo 16. (Point 544) Facing: North. A field of some crop had been planted recently over the ROW; the seedlings were young, possibly winter wheat. Germination of the crop appeared to be consistent in and out of the ROW. Annual weeds were present in dense patches both in the ROW and the adjacent field. Pipeline markers were present.

Line Strike

On the east side of County Road 34, east of U.S. Highway 85, a line strike occurred in the northwest portion of the Bear Creek NGL Pipeline in early August 2017. A contractor installing a rural water polyline was attempting to bore underneath the NGL line, when they struck the line. A large area was tested and contaminated soils were removed from around the strike (**Photo 17**). The dirtwork contractor hired by rural water to remove soils and complete installation of the water line after the strike did not appropriately segregate surface scoria, topsoil, and subsoil (**Photos 18, 19**). ONEOK is in the process of getting the cleanup and repair completed. Reclamation of this area will likely be impaired due to the mixed soils.



Photo 17. (Point 546) Facing: North. The area excavated to repair the recent line strike and remove contaminated soils. The Bear Creek NGL Line is the gray-colored steel line; the strike repair is the reddish brown portion bounded by white bands. The rural water line is the black polyline below the NGL line and at an angle in the photo.



Photo 18. (Point 546) Facing: West. View of the equipment and spoil piles at the line strike site. The photo shows mixing of scoria piles with subsoils. This work was completed by a contractor for rural water, not ONEOK. No topsoil piles were visible in the area.



Photo 19. (Point 546) Facing: East. The area east of the line strike that had recent dirt work by the rural water contractor. The soil spread around appeared to be subsoil based on the color; scoria appeared to be mixed in. Repair and reclamation of the area was not complete at the time of the inspection, but the ability of vegetation to reestablish in the area will likely be hindered by how the soils were handled.

Conclusion

During the site visit, it was obvious drought conditions have affected reclamation results, along with the fact that the area has had only one full growing season to establish. There are some potential areas of grassland/rangeland that could be problematic in the future based on cover of annual weeds and presence of noxious weeds; however, it is unclear at this point if management interventions are necessary. Because the planted grasses were evenly present, even if currently at a low cover, they may be able to outcompete the weeds as they continue to establish and increase in cover. ONEOK planned to continue monitoring reclamation and was willing to take further steps to correct or assist reclamation efforts if deemed necessary. The PSC should determine the necessity of interventions by ONEOK and whether further inspections should be required.

The services performed by Wenck scientists for this Project have been conducted in a manner consistent with the degree of care and technical skill appropriately exercised by professionals currently practicing in this area under similar time and budget constraints.

Patrick Fahn
North Dakota Public Service Commission
September 5, 2017



Recommendations and findings contained in this report represent our professional judgment and are based upon available information and technically accepted practices at the present time and location. Other than this, no warranty is implied or expressed.

Sara Simmers, Natural Resources Scientist, prepared this report. Please direct questions to ssimmers@wenck.com or by phone to 701-751-6128.



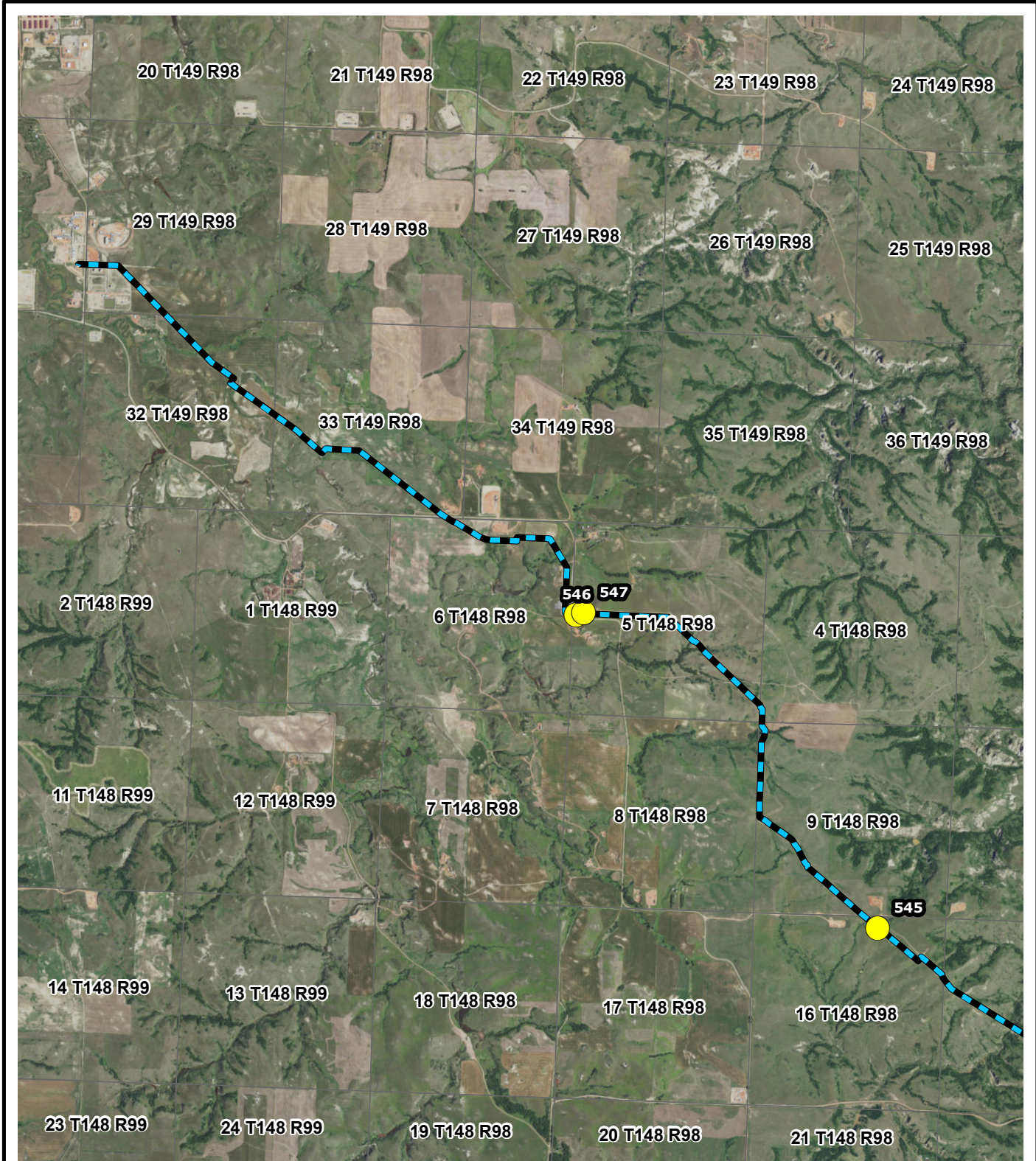
Sara Simmers, Natural Resources Scientist

September 5, 2017
Date



Justin Askim, Project Manager

September 5, 2017
Date

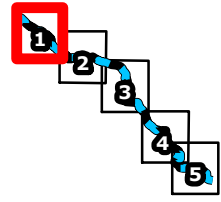


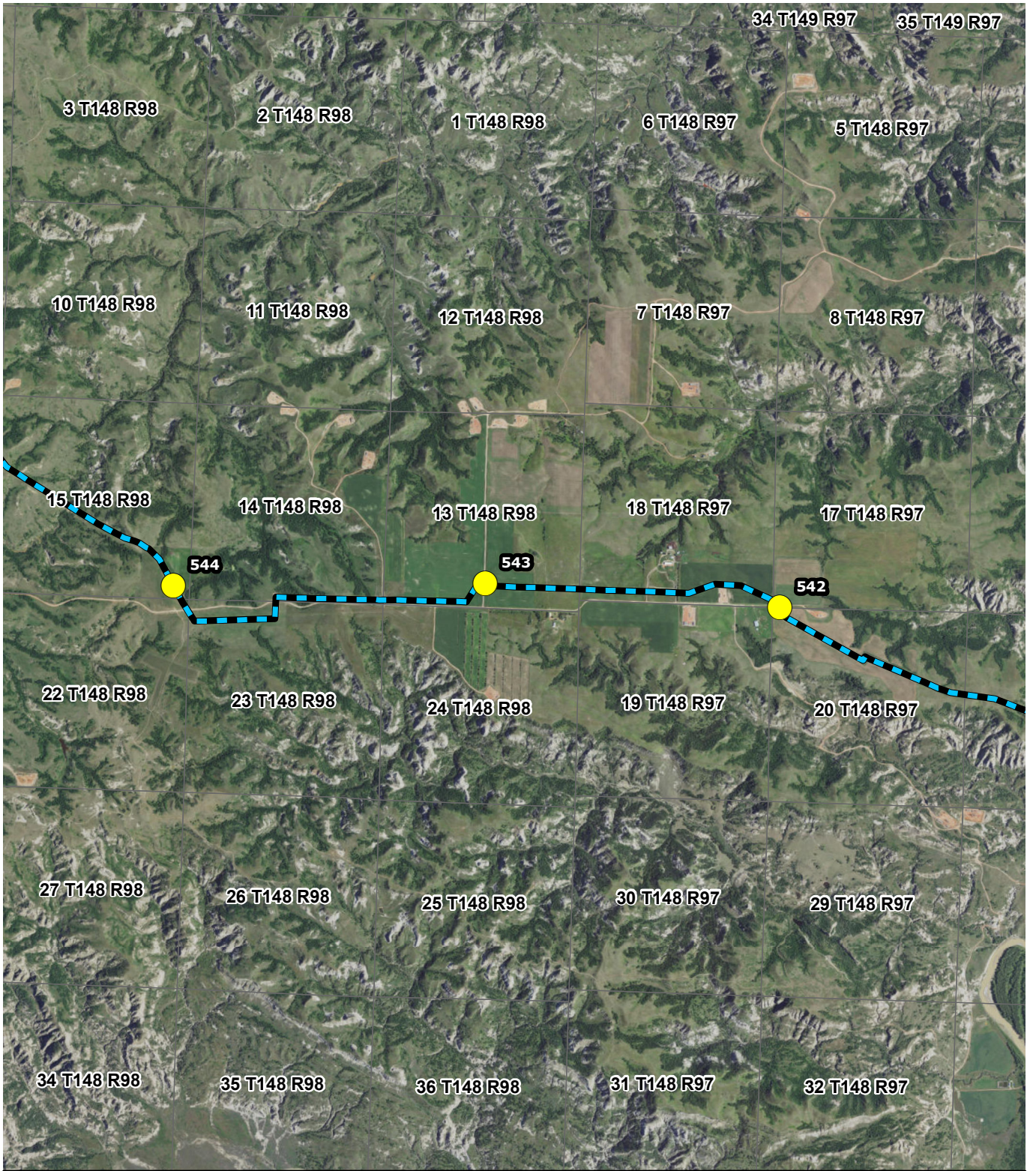
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- Observation Points
- Noxious Weeds Present
- Bear Creek Pipeline
- Section









2015 Aerial Photograph (Source: ND GIS Hub)

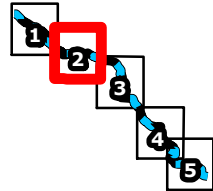
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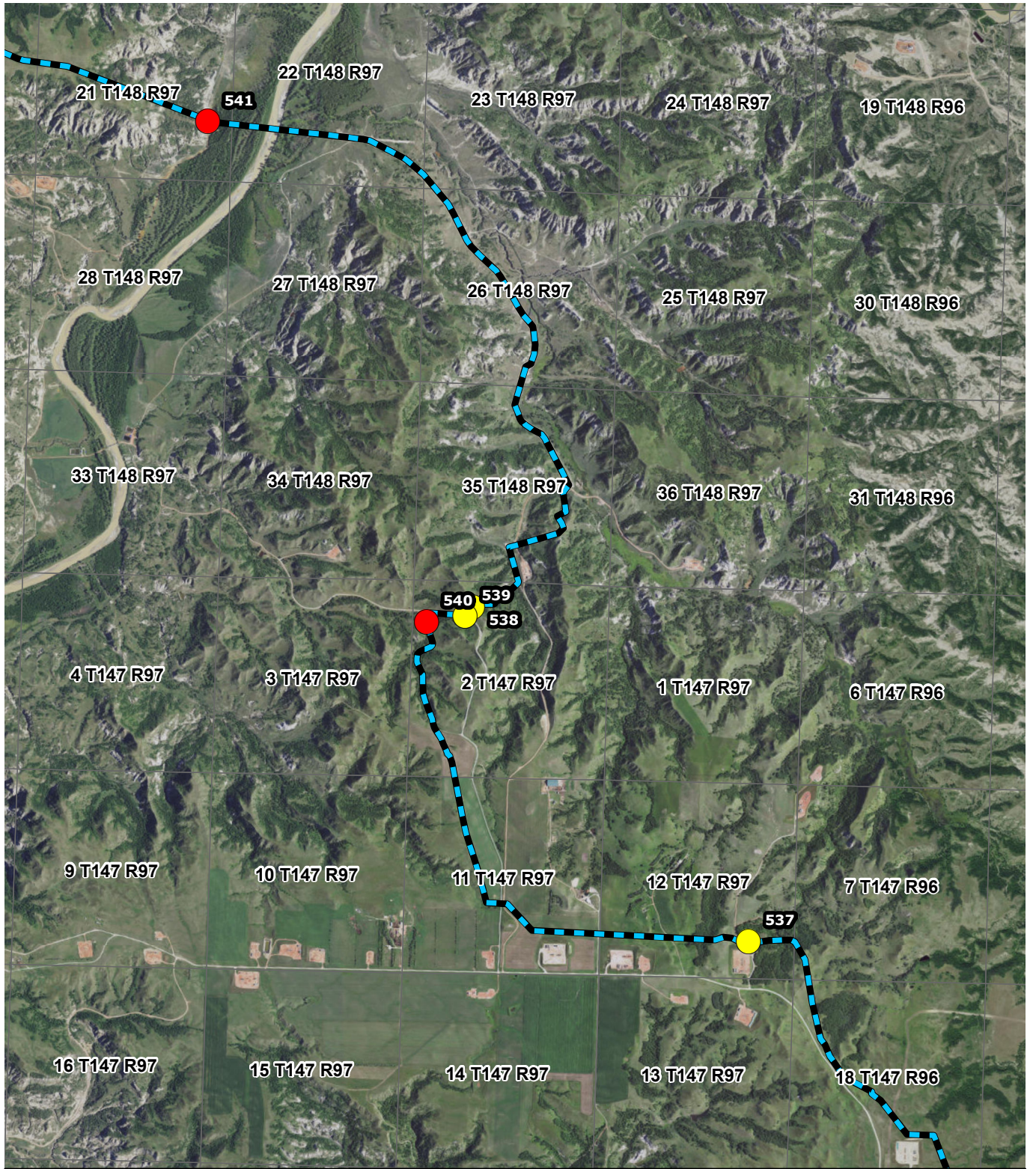
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-  Bear Creek Pipeline
-  Section



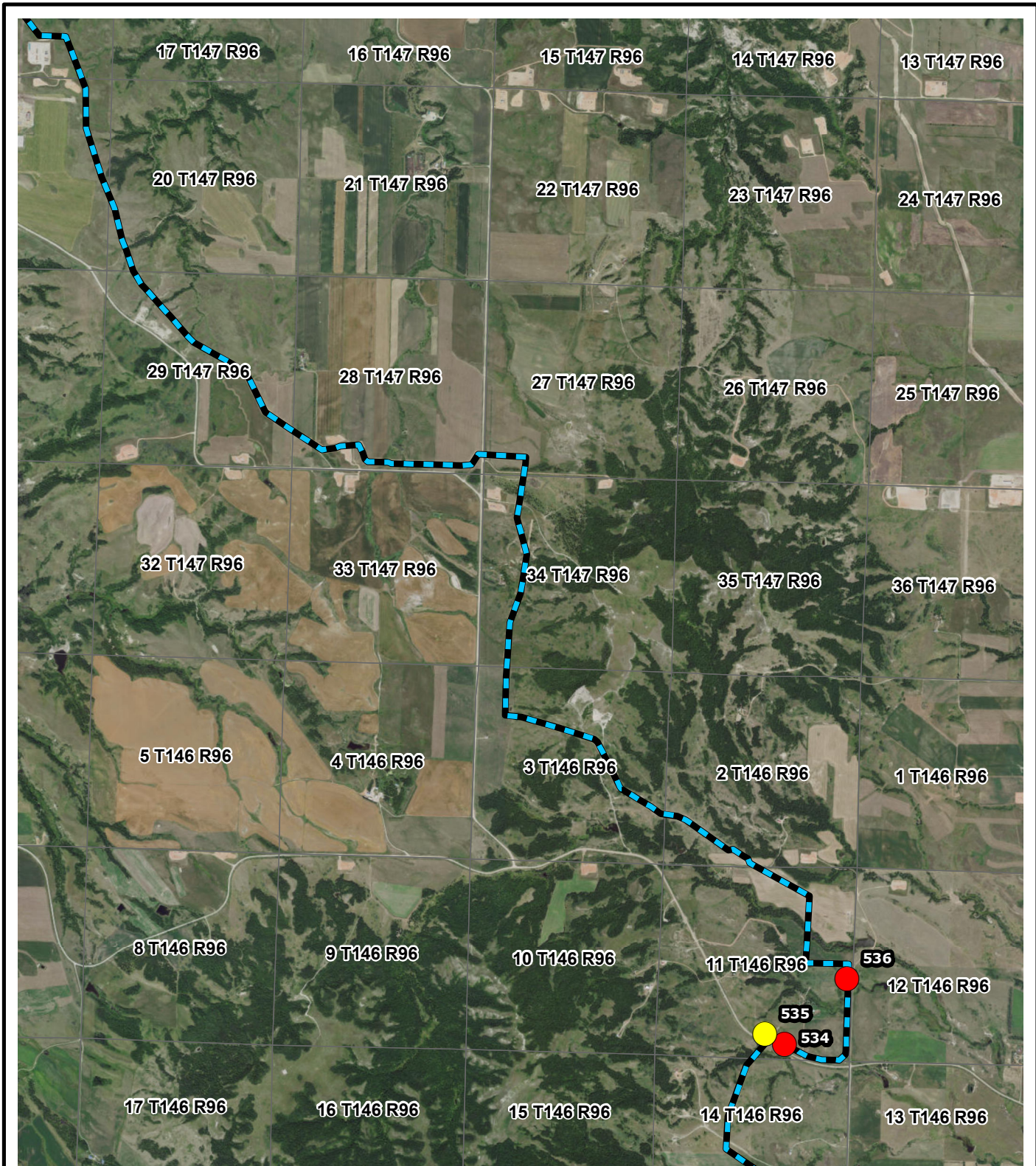


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- Observation Points
- Noxious Weeds Present
- Bear Creek Pipeline
- Section

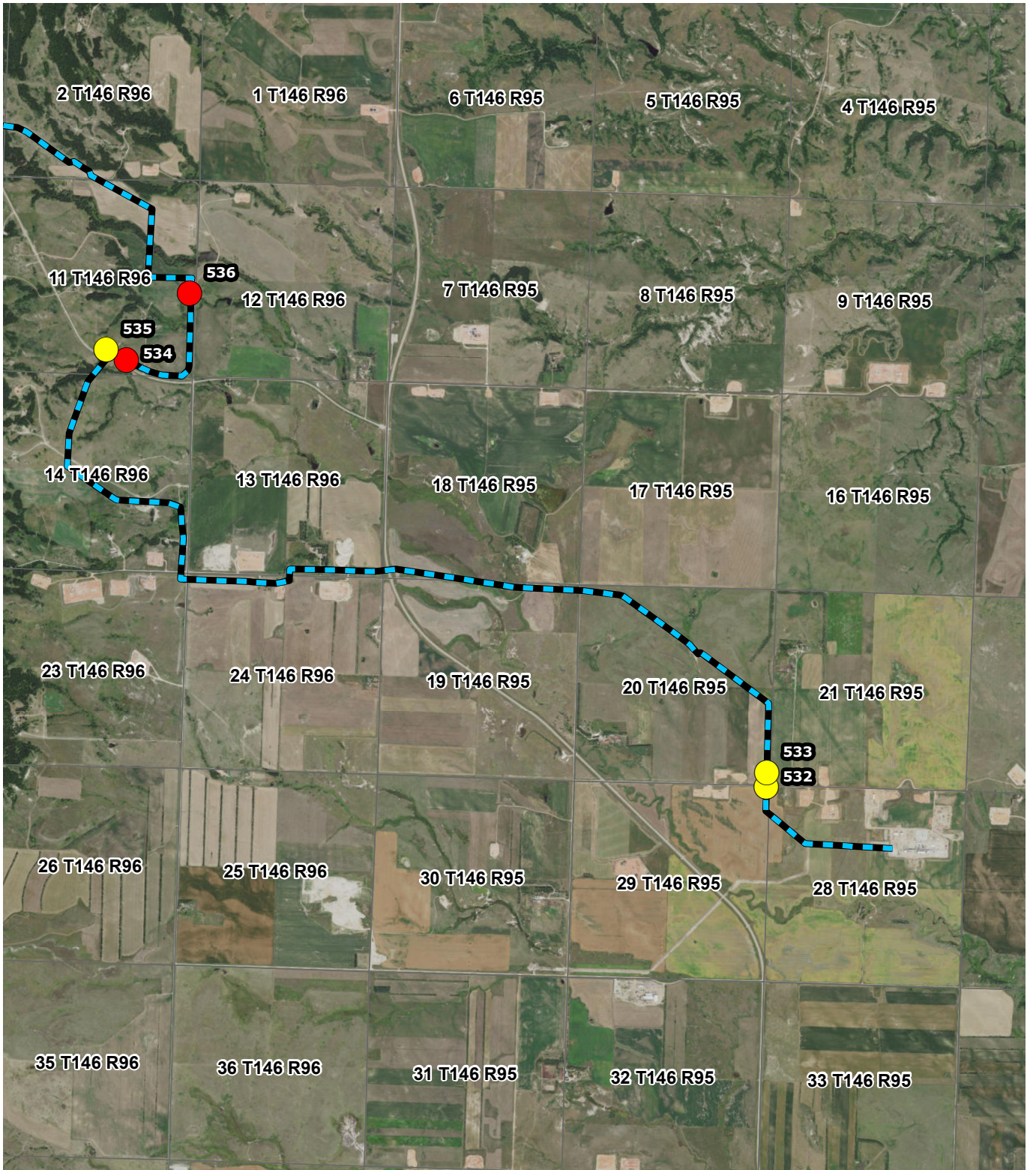


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- Observation Points
- Noxious Weeds Present
- Bear Creek Pipeline
- Section







2015 Aerial Photograph (Source: ND GIS Hub)

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-  Observation Points
-  Noxious Weeds Present
-  Bear Creek Pipeline
-  Section

