CarbonSAFE Illinois Macon County
Subtask 10.3 – Development of a Regional Roadmap for Source Network and Storage Deployment – Technical Report

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Abstract

Research documented in this report includes (1) resource estimates for the Lower Mt. Simon Sandstone in the Illinois Basin, including storage and cost estimates, and (2) regional roadmaps for carbon capture and storage (CCS) deployment using five capture facilities throughout the Illinois Basin: Archer Daniels Midland Decatur (ADM Decatur), Abbott Power Plant, City Water, Light, and Power (CWLP), One Earth Energy, and Prairie State Energy Campus (PSEC). Resource estimates were developed using the Sequestration of CO_2 Tool (*SCO₂T*) and data provided by the Illinois State Geological Survey (ISGS), and regional roadmaps for CCS deployment were developed in *SimCCS Gateway*, a decision-support tool for designing CCS infrastructure.

Results from *SCO₂T* show considerable CO_2 storage potential within the Lower Mt. Simon Sandstone, totaling 52.1 $GtCO_2$, at an average total unit cost of \$23.45 per tCO_2, and a minimum and maximum total unit cost of \$2.53 per tCO_2 and \$189.60 per tCO_2, respectively. A subset of these results was then used to develop the storage facility inputs for *SimCCS Gateway.*

Four scenarios were used to develop regional roadmaps for CCS deployment, with storage facility locations as the primary variable between each scenario. Total annual capture amounts and associated costs for five capture facilities were provided by the ISGS, which were then used with the storage facility locations to develop candidate pipeline networks for transporting CO_2 between capture and storage facilities.

The results from *SimCCS Gateway* indicate a total unit cost between \$21.04 per tCO_2 and \$35.59 per tCO_2 for annual capture targets between 0.5 $MtCO_2$ to 9.167 $MtCO_2$, the total available capture amount from the five sources in this study. Additionally, the results indicate low-cost capture facilities are preferable to capture facilities with higher cost in almost all circumstances, including when the low-cost capture facilities are nearly 100 miles from the potential storage facility.

Finally, the inclusion of a high storage resource, low-cost storage facility that is accessible to multiple capture facilities may be more beneficial than storing all captured CO_2 at each site individually, and further research should focus on evaluating optimal reservoirs throughout the Illinois Basin.

Part 1: Characterization and Storage Estimates of the Lower Mount Simon Sandstone

Methods

Detailed reservoir characterization was conducted by the Illinois State Geological Survey (ISGS), which provided the input parameters for creating storage estimates and associated costs of the Lower Mt. Simon Sandstone. The method used in this study for creating these estimates is the Sequestration of CO_2 Tool (*SCO_2T*). *SCO_2T* was developed through reduced-order models (ROMs) of dynamic simulations of CO_2 injection in clastic reservoirs (Middleton 2020; Middleton, Chen et al. 2020; Middleton, Ogland-Hand et al. 2020).

The use of ROMs substantially decreases the time required for developing storage estimates compared to dynamic simulations, while still capturing elements of the dynamic modeling process. This method is ideal for large-scale feasibility studies, where detailed reservoir characterization at the local scale is unknown and more generalized reservoir parameters is acceptable.

SCO_2T requires five geologic parameters to develop storage and cost estimates: depth, net thickness, porosity, permeability, and geothermal gradient. A detailed analysis of the first four was done by the ISGS using well logs in Petrel (Figures 1 and 2). For use in *SCO_2T*, the four parameters provided by the ISGS were discretized on a 10-kilometer by 10-kilometer grid pattern (10K), shown in (Figures 3-6). Additionally, geothermal gradients were calculated for each grid cell using national temperature datasets (Blackwell, Richards et al. 2011; Gass 1982).

Since *SCO_2T* is developed through ROMs of dynamic simulations, it is only considered reliable within the tested parameter range (Table 1). When an input parameter for a grid cell was outside the accepted parameter range, it was increased or decreased to the minimum or maximum value, respectively. In addition to the geologic parameters, several economic and well engineering parameters are also required for *SCO_2T*. These parameters were held constant for all grid cells.

SCO_2T does not incorporate all associated costs with CO_2 storage, and many costs are site-specific and would need to be subsequently addressed (e.g., wastewater treatment). For this reason, the costs provided by *SCO_2T* may be considered on the lower end of accepted storage costs.

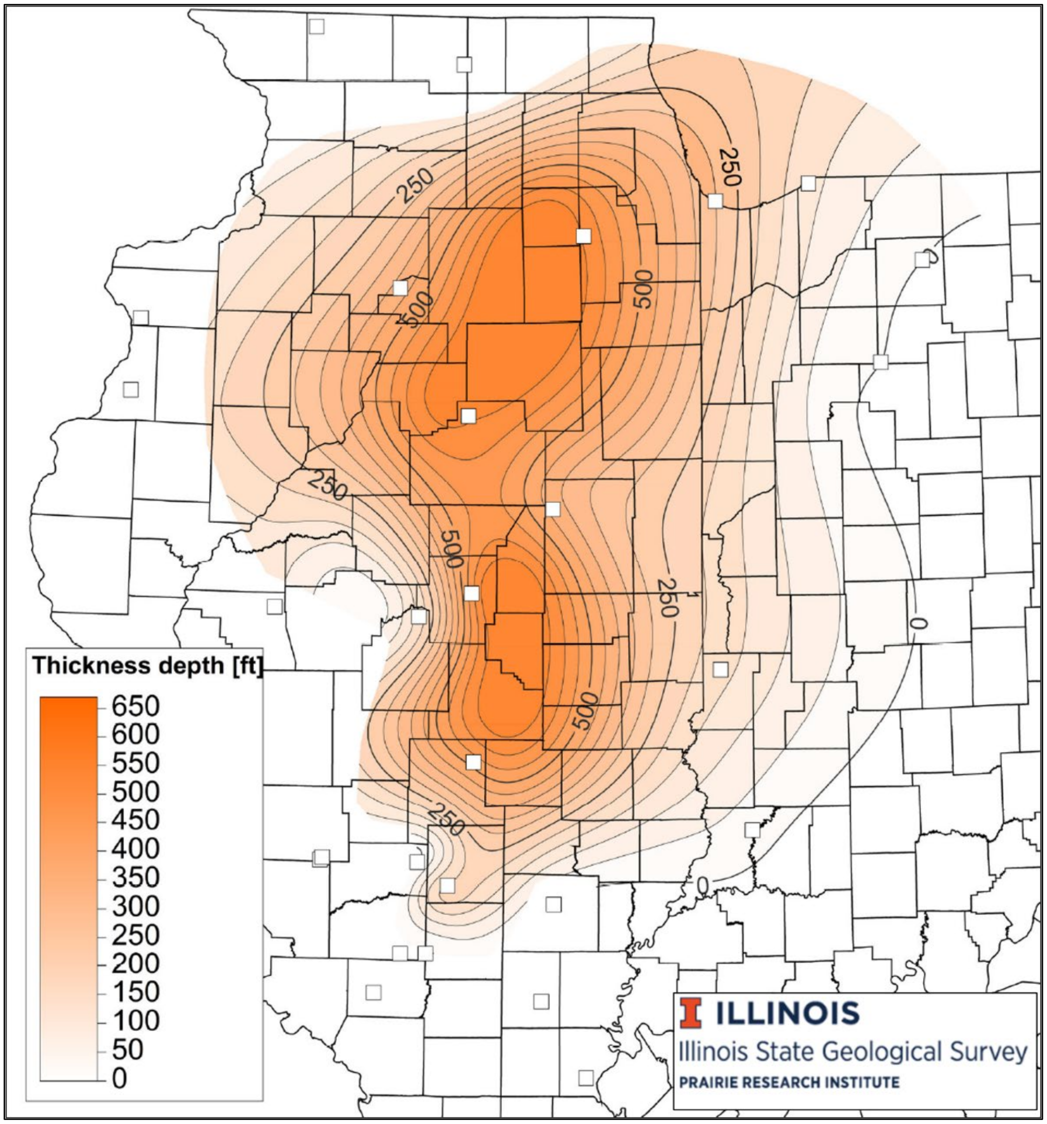


Figure 1. Net thickness of the Lower Mt. Simon Sandstone provided by the Illinois State Geological Survey. A porosity of 10% was used as the cutoff value for developing net thickness from gross thickness.

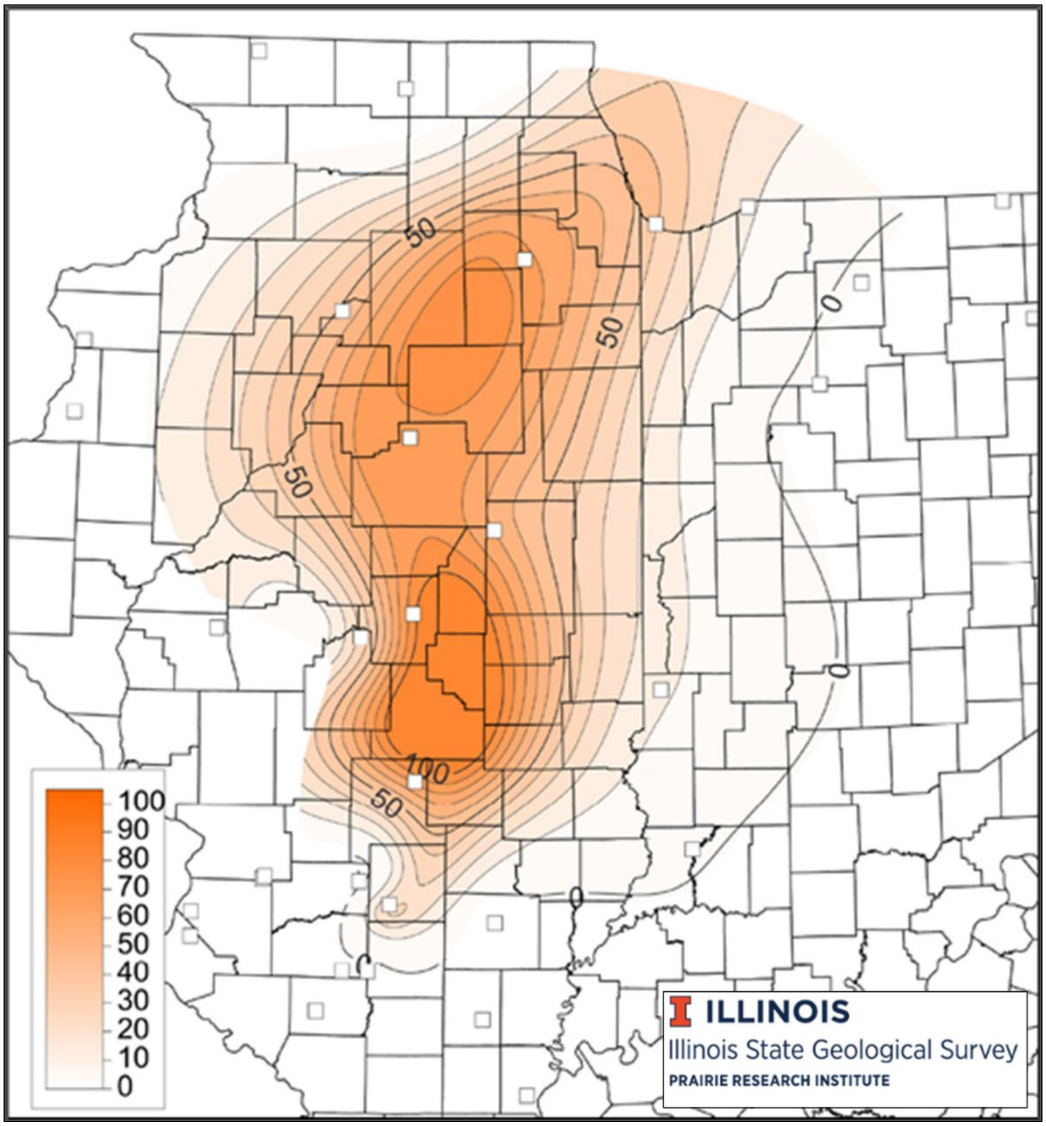


Figure 2. Phi-h in feet (porosity multiplied by thickness) map of the Lower Mt. Simon Sandstone provided by the Illinois State Geological Survey.

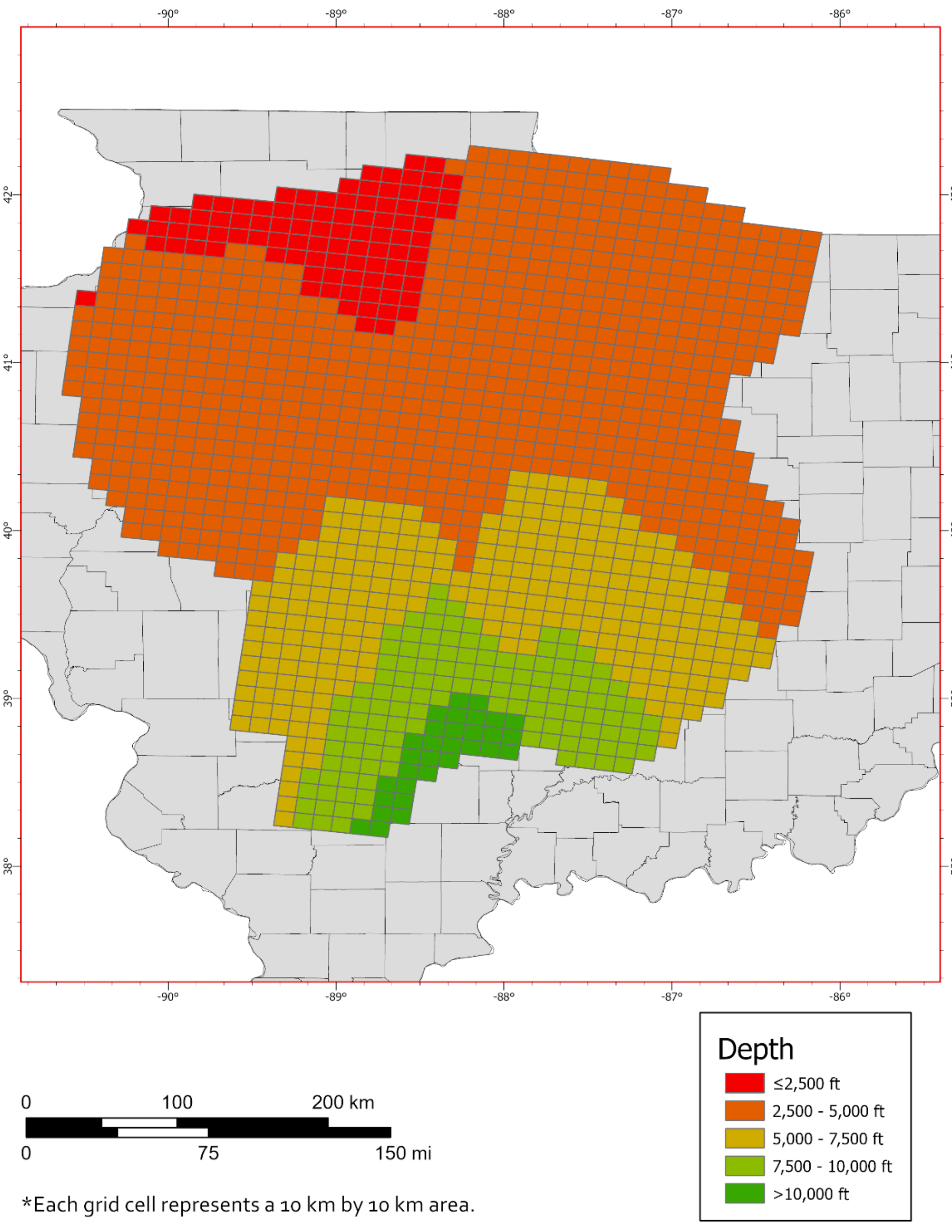


Figure 3. Average depth to the top of the Lower Mt. Simon Sandstone discretized on a 10 km by 10 km grid for SCO_2T.

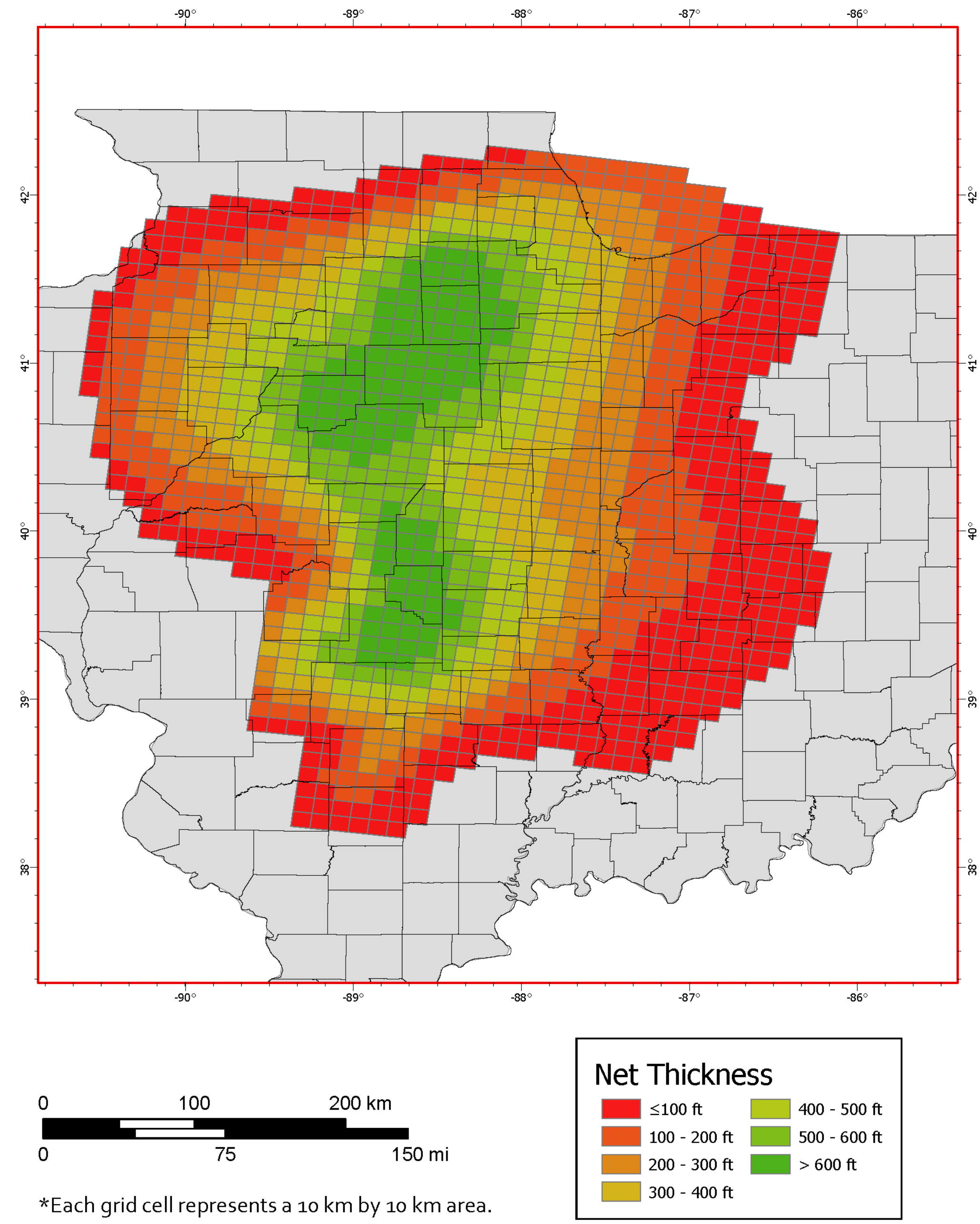


Figure 4. Average net thickness of the Lower Mt. Simon Sandstone discretized on a 10 km by 10 km grid for SCO_2T.

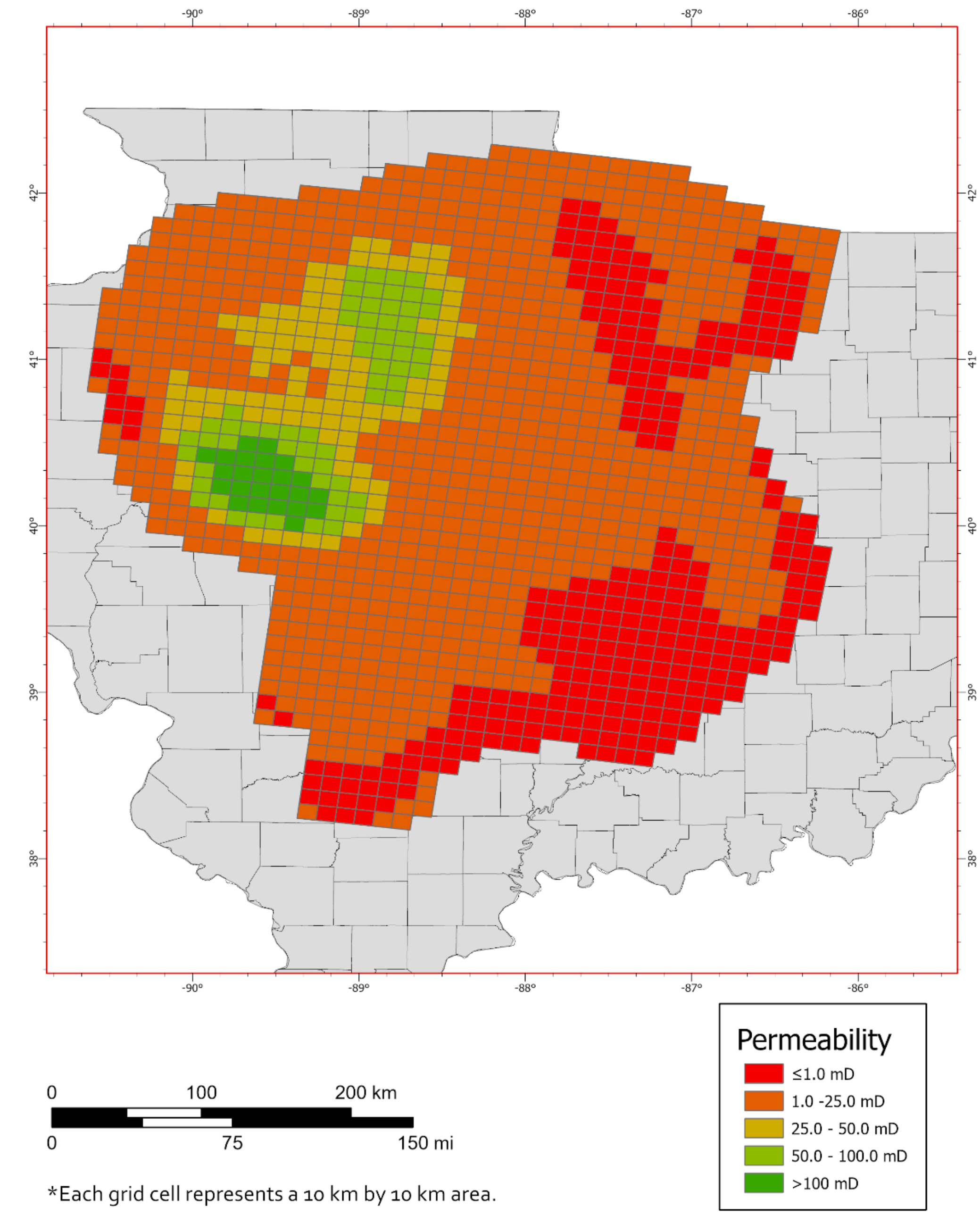


Figure 5, Average permeability of the Lower Mt. Simon Sandstone discretized on a 10 km by 10 km grid for SCO_2T.

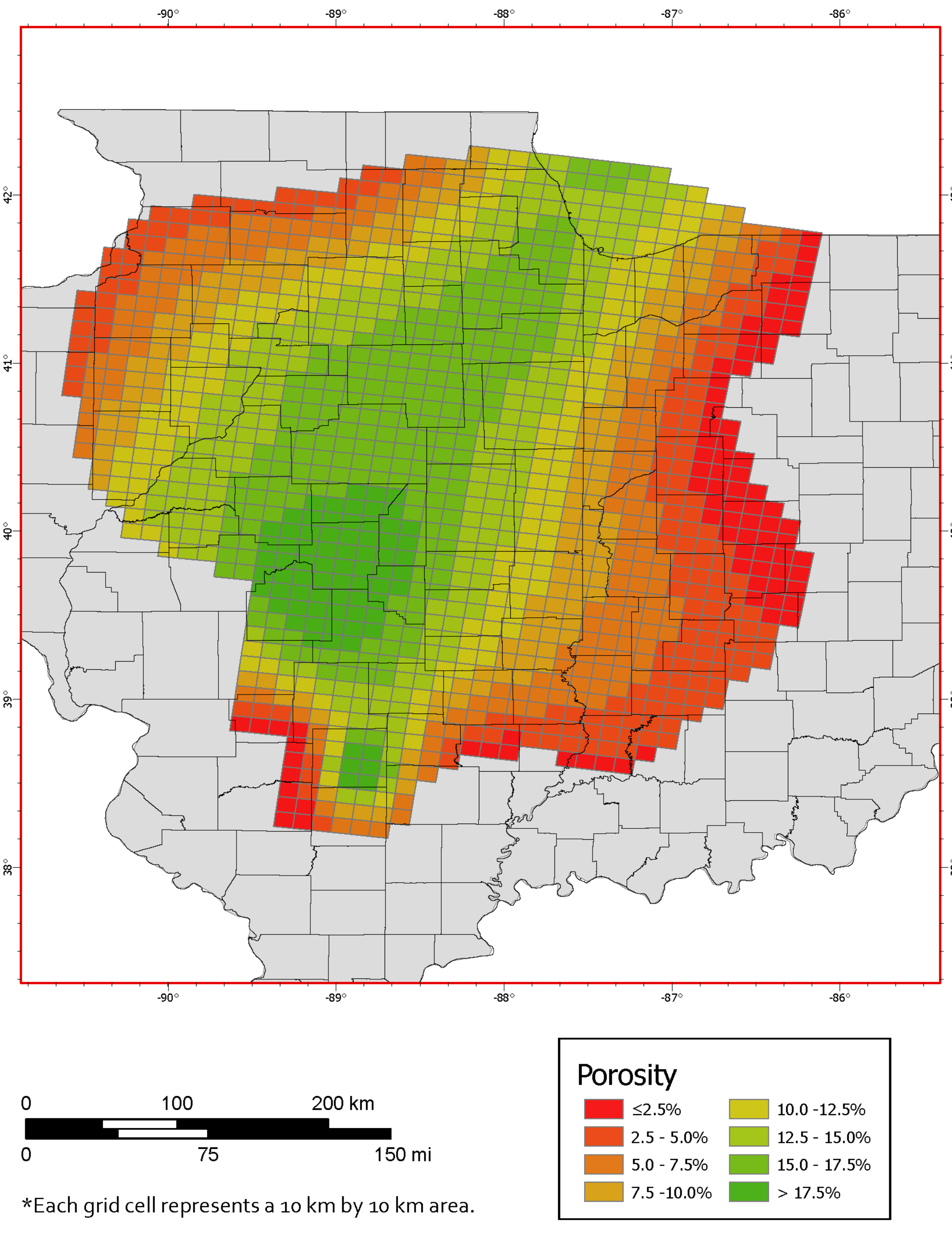


Figure 6. Average porosity of the Lower Mt. Simon Sandstone discretized on a 10 km by 10 km grid for SCO₂T.

Table 1 Accepted parameter range for SCO_2T.

Input Parameter	Minimum Value	Maximum Value	Units
Depth	1000	5000	m
Net Thickness	5	100	m
Porosity	5	40	percent
Permeability	1	1000	mD
Geothermal Gradient	15	45	°C/km

Results

Figure 7 shows the total storage estimate for each 10K grid cell throughout the study region. Storage resource estimates range from 1.6 $MtCO_2$/100 km^2 to 131.9 $MtCO_2$/100 km^2, with a mean of 42.2 $MtCO_2$/100 km^2. *SimCCS Gateway*, the program used in this study to provide optimal source-sink matching and pipeline infrastructure design, uses an "all-in-one" cost to store CO_2 in a specific cell, which will be referred to as a total unit cost (Figure 8). The total unit cost for individual 10K grid cells of the Lower Mt. Simon Sandstone range from \$2.53 per tCO_2 to \$189.60 per tCO_2, with a mean of \$23.45 per tCO_2. Subsets of the results from *SCO_2T* are used as inputs for *SimCCS Gateway* and will be described in the following section.

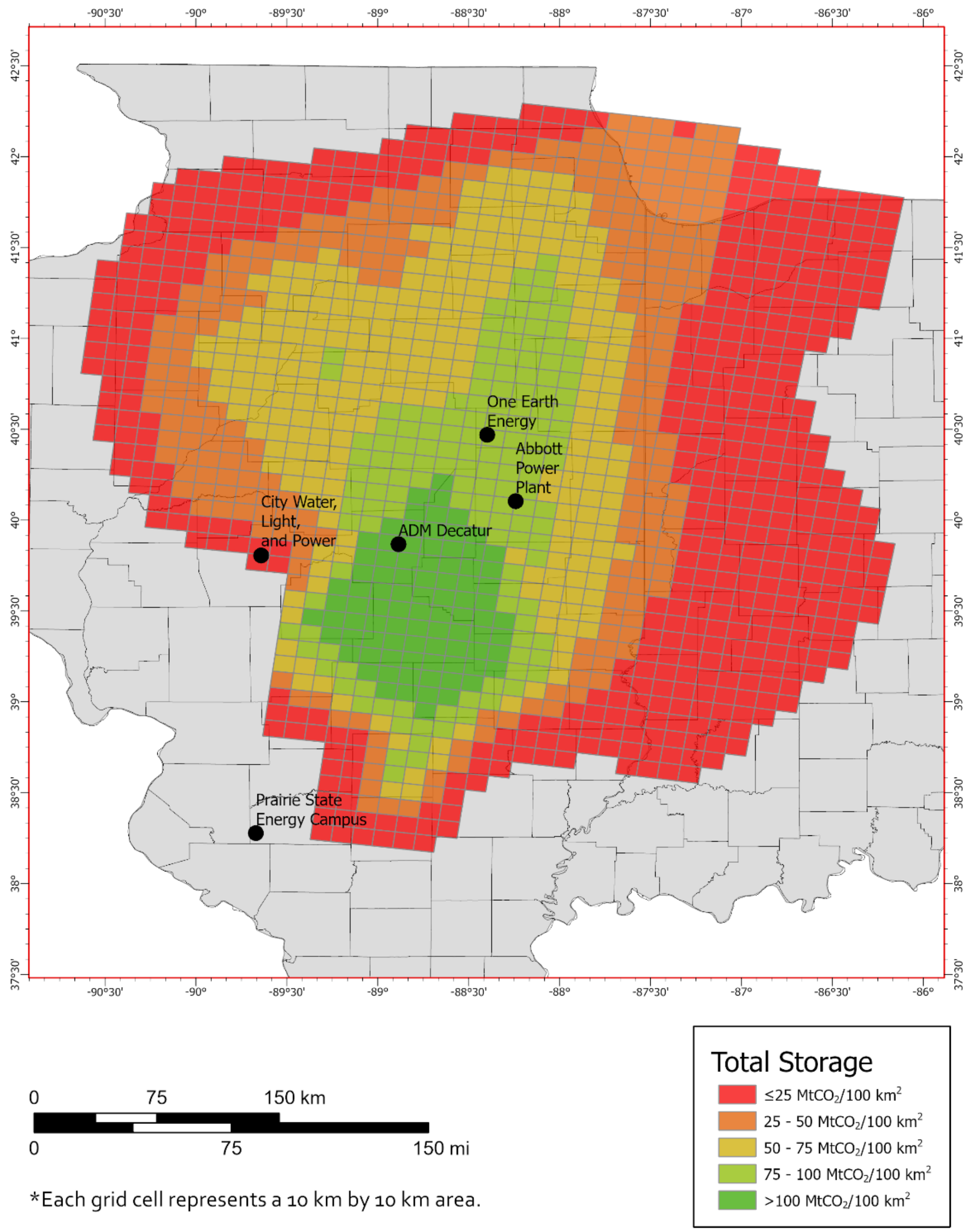


Figure 7. Total storage estimates from SCO2T for the Lower Mt. Simon Sandstone.

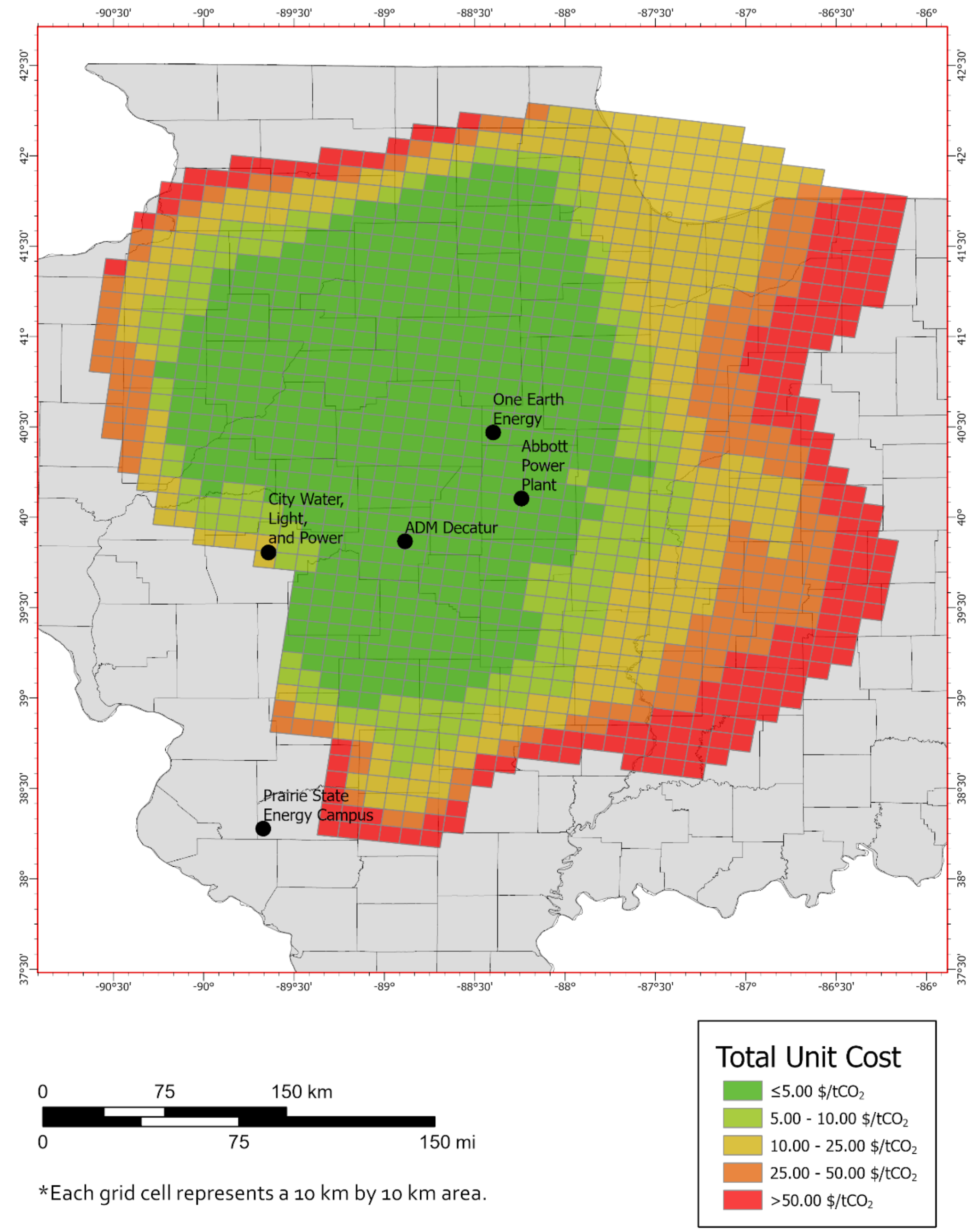


Figure 8. Total unit cost estimates from SCO_2T for the Lower Mt. Simon Sandstone.

Part 2: Development of a Regional Roadmap for Source Network and Storage Deployment

Methods

In addition to a suitable reservoir for CCS, a regional roadmap for CCS requires identifying capture targets and creating an optimal pipeline network to connect all sources and sinks. The ISGS provided data for the five sources to be used in this study: Archer Daniels Midland Decatur (ADM Decatur), Abbott Power Plant, City Water, Light, and Power (CWLP), One Earth Energy, and Prairie State Energy Campus (PSEC) (Figure 9; Table 2). As with the storage sites, the sources used in *SimCCS Gateway* require a total unit cost ($/t$CO_2$), and an annual capturable CO_2 amount (MtCO_2/yr).

To avoid convergence or computational time-related issues, a subset of the sinks described in Part 1 was selected for a given simulation in *SimCCS Gateway*. These selections were separated into four scenarios, which will be described below. For all scenarios, the source data remained the same as described above. Annual capture targets ranged from 0.5 MtCO_2/yr to 9.0 MtCO_2/yr in increments of 0.5 MtCO_2/yr, and a final simulation capturing the aggregated 9.167 MtCO_2/yr available from the five sources. The project length was set to 30 years for all simulations, corresponding to the 30-year injection period used to calculate the storage estimates and costs for the sinks using *SCO_2T*. The capital recovery factor remained constant at 0.10. The variability in sink choices for the four scenarios in this study are described below.

In Scenario 1, the four grid cells nearest to each capture facility were used for storage sites, providing a total of 20 potential storage sites (Figure 10). The total storage estimated for these 20 sinks is 1,227 MtCO_2, with a mean total storage of 61.3 MtCO_2/100 km^2, and minimum and maximum total storage of 2.45 MtCO_2 and 120.5 MtCO_2, respectively. The mean cost of storage was $28.61 per t$CO_2$ and ranged from $2.64 per t$CO_2$ to $133.65 per t$CO_2$. Note that the nearest sinks for PSEC are roughly 30 km from the source, due to the absence of the Lower Mt. Simon Sandstone closer to PSEC, which is the only storage reservoir considered in this report.

In Scenario 2, only the nearest sink grid cell is available for each source, providing a total of 5 potential storage sites (Figure 11). Allowing only one sink per source lowered the total storage from 1,227 MtCO_2 to 309 MtCO_2 and reduced the total number of pipeline segments from 111 to 32. However, comparison of the two pipeline candidate networks shows that most of the removed pipeline segments were short connections between sinks at a given source location, though a few of the long routes are removed as well. The mean storage cost rose slightly to $28.69 per t$CO_2$, while the minimum total unit cost remained $2.64 per t$CO_2$.

Since the storage grid cells have been discretized on a 10K grid format, the centroids for each grid cell were used for the coordinates of the sinks in *SimCCS* Gateway. The capture facility coordinates are based on their real location, so they do not align with the coordinates of the 10K grid cells, creating short CO_2 pipeline routes between the sources and nearest sinks. Given the primary location considered for storage in most CCS projects is on-site, Scenario 3 used the same total storage and cost values as Scenario 2 for all sinks, but changed their coordinates to be identical to the nearest capture facility, essentially creating “on-site” storage estimates and costs for each facility (Figure 12). The only source where this had a major impact is at PSEC, but in all four scenarios, the low storage and cost estimates from the nearest grid cell containing the Lower Mt. Simon Sandstone along the southern boundary of the study area caused all CO_2 captured at PSEC to be transported to storage complexes closer to the other sources. The Scenario 3 storage location selection method decreased the number of potential pipeline routes to twelve.

In Scenario 4, the same sinks were used as in Scenario 3, and a sixth grid cell, defined as a potential storage hub, was added within an area of interest provided by the ISGS (Figure 13). The location of this grid cell was chosen as the best 10K grid cell that, (1) intersected the area of interest, (2) had the lowest cost, and (3) had the largest storage capacity. This scenario was created to see if the presence of an optimal storage facility would impact the routing of CO_2,

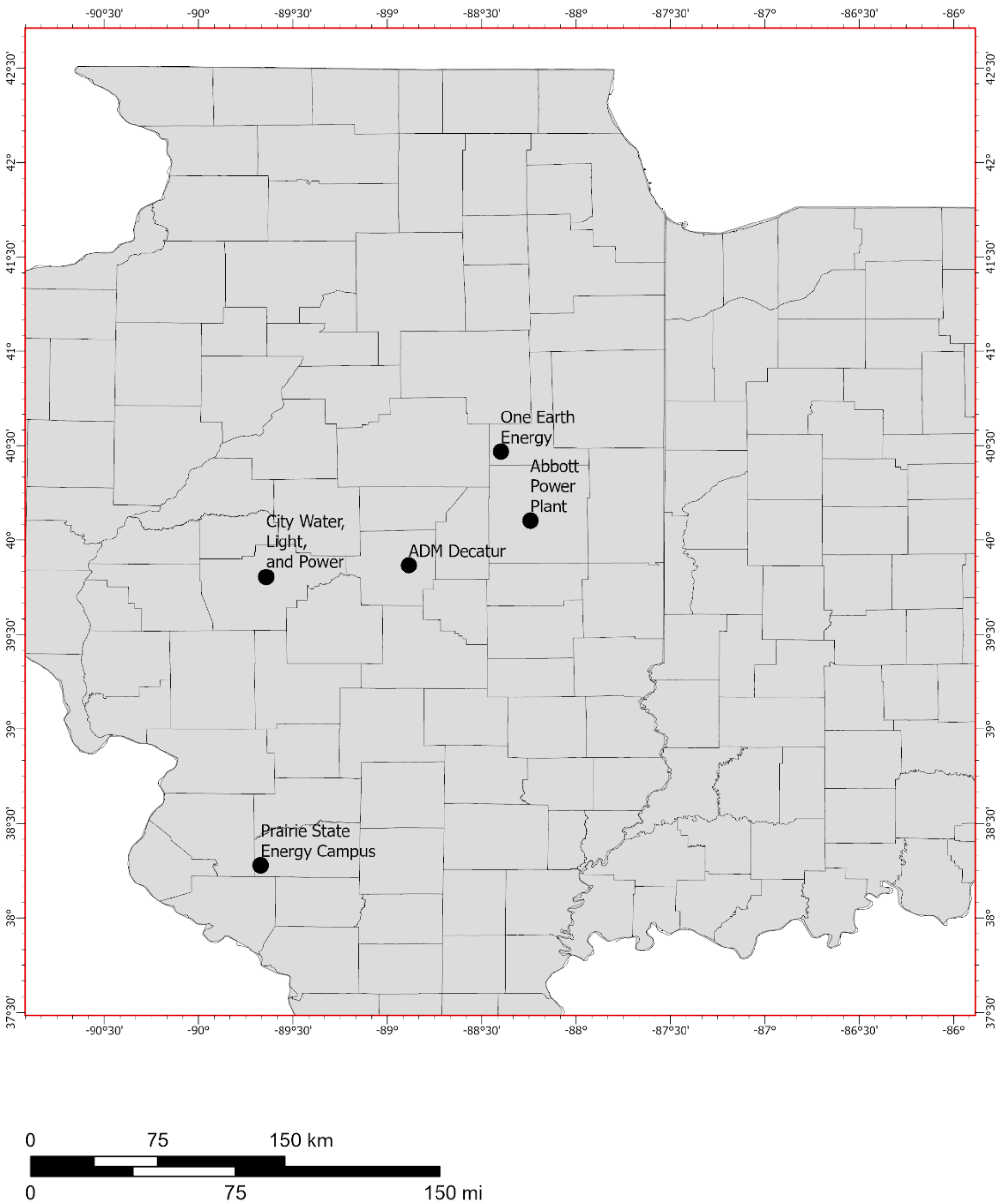
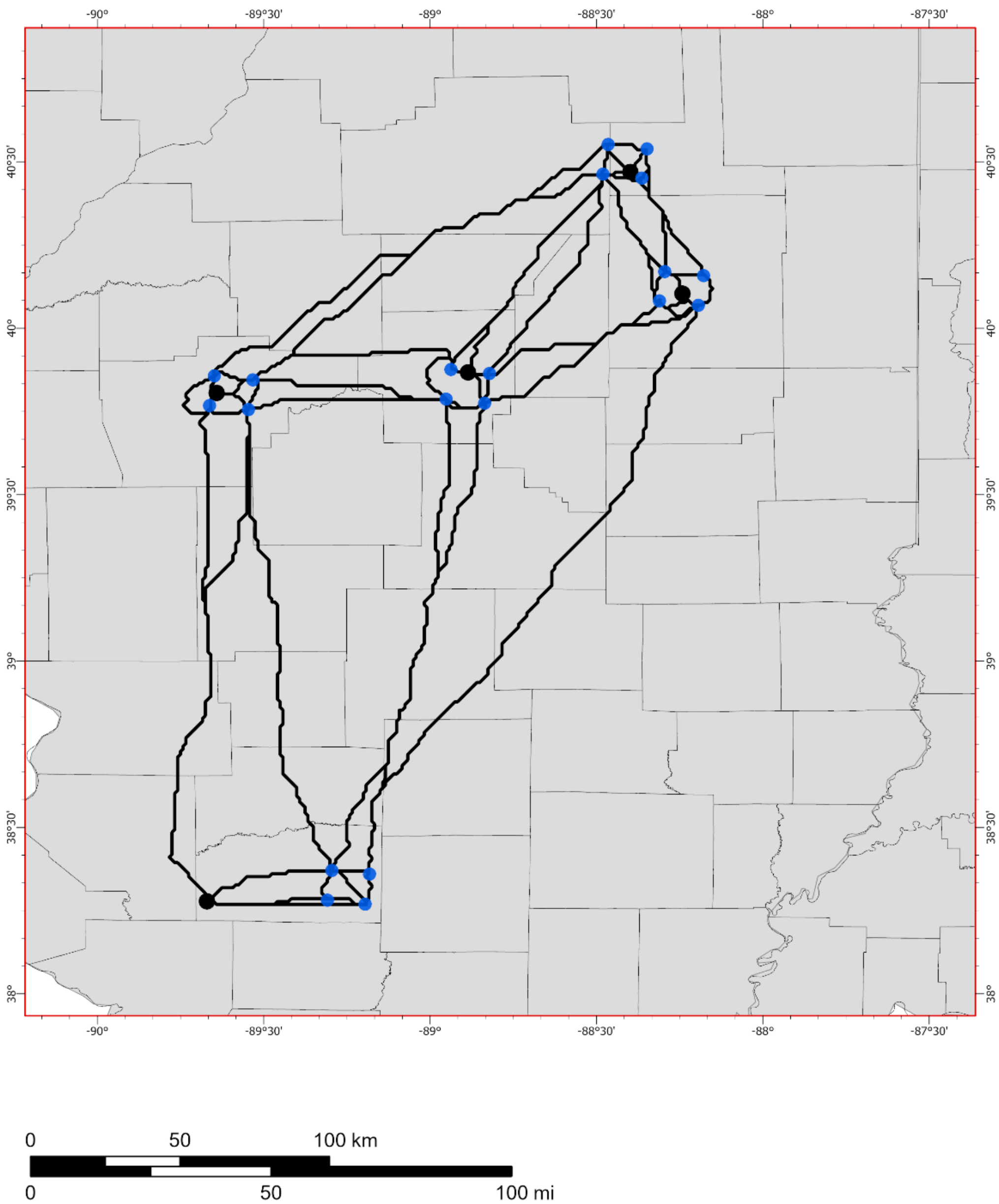


Figure 9. Overview of the locations of the capture facilities used in this study.

primarily as it pertains to PSEC and CWLP, which do not have reservoir-quality storage conditions nearby within the Lower Mt. Simon Sandstone. The addition of the sixth storage location increased the potential pipeline routes to 18 and added 131.9 $MtCO_2$ at a cost of \$2.53 per tCO_2.

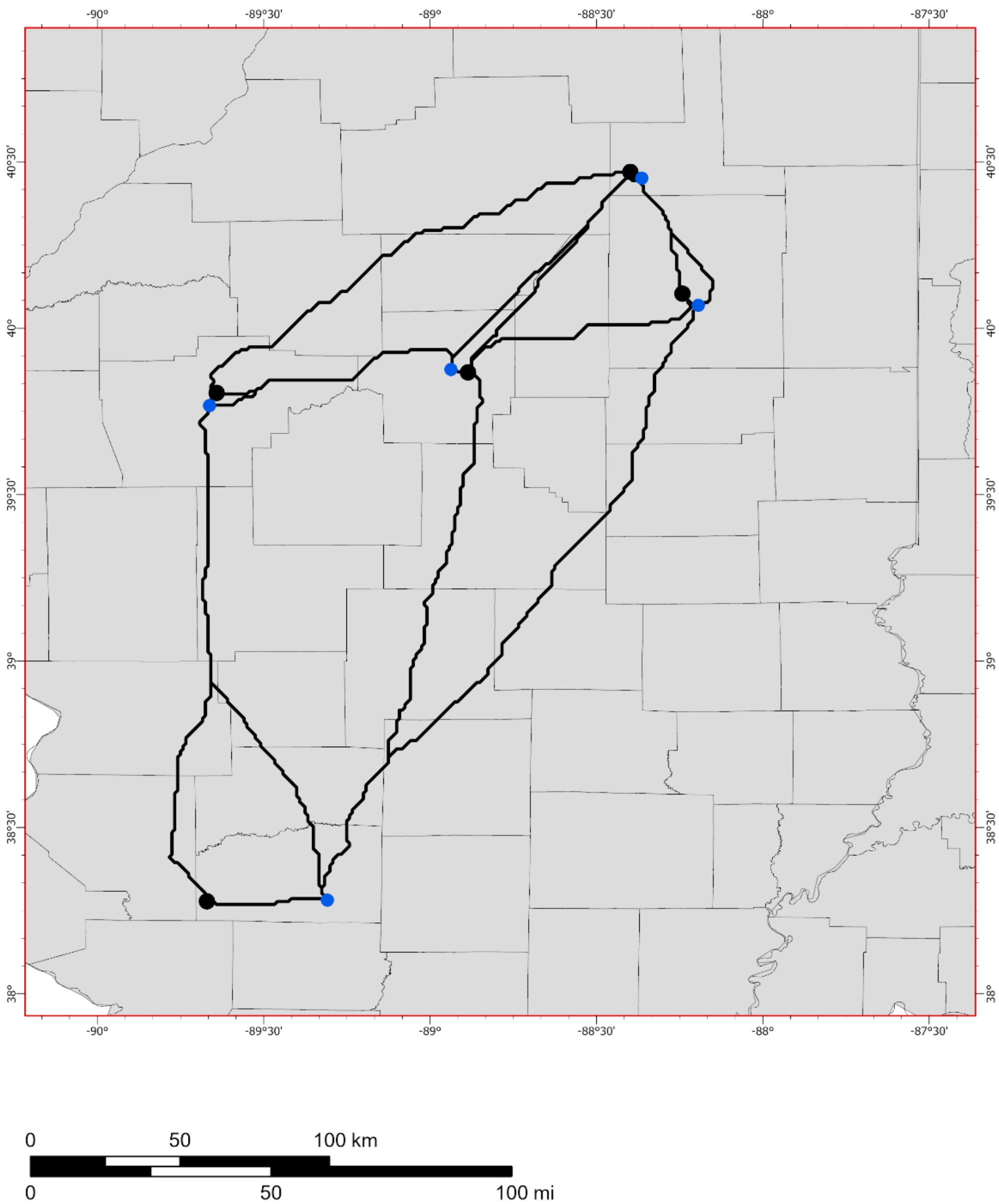
Table 2. Overview of capture facility input data used for SimCCS Gateway simulations.

Facility	**Annual Capturable CO_2 ($MtCO_2$/yr)**	**Total Unit Cost (\$/tCO_2)**
ADM Decatur	1.000	18.4
Abbott Power Plant	0.292	81.21
City Water, Light, and Power	1.434	48.72
One Earth Energy	0.450	26.07
Prairie State Energy Campus	6.000	26.45



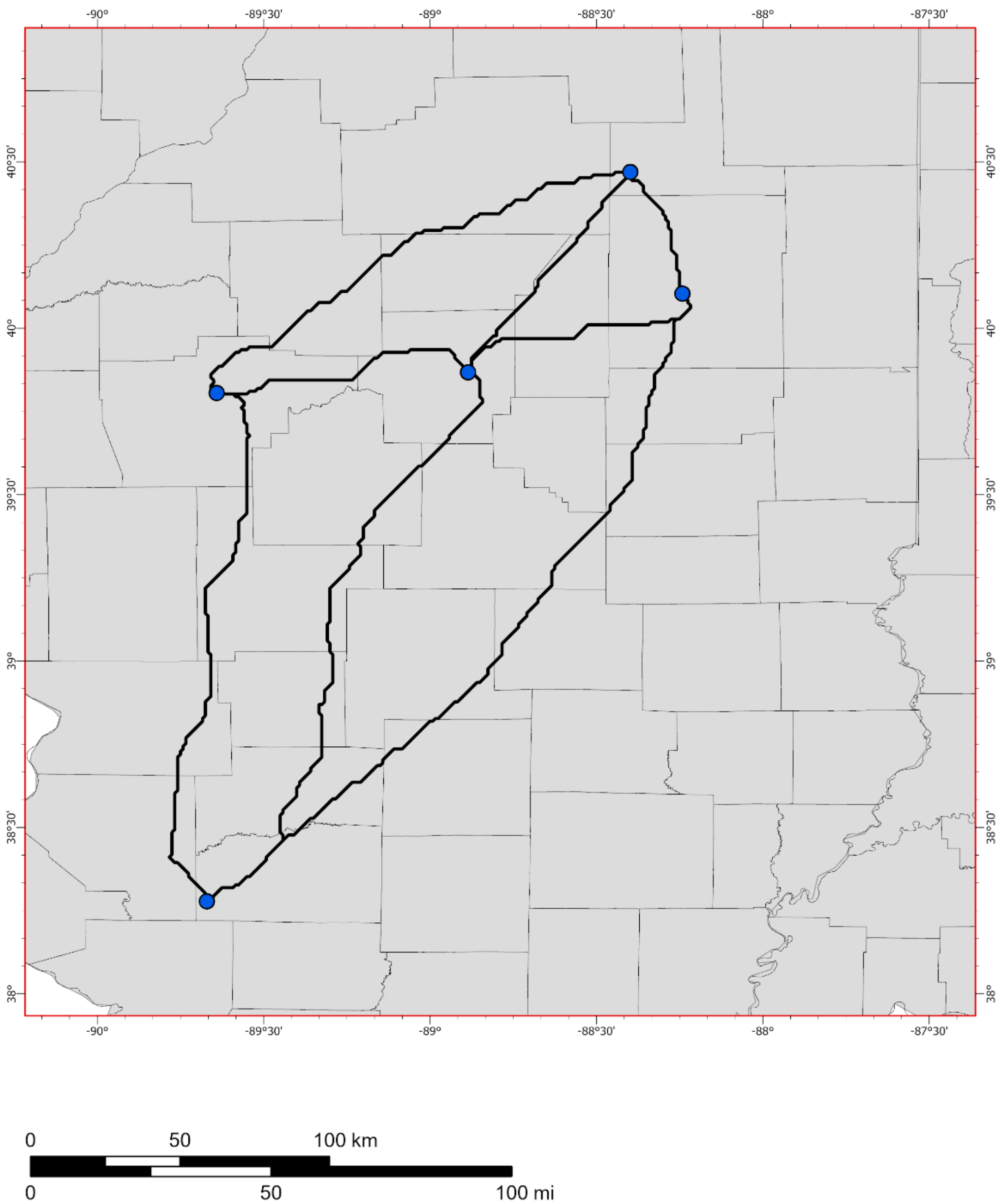
*Each grid cell represents a 10 km by 10 km area.

Figure 10. Available sources (black dots), sinks (blue dots), and candidate pipeline network (black lines) for Scenario 1 for use in SimCCS Gateway.



*Each grid cell represents a 10 km by 10 km area.

Figure 11. Available sources (blue dots), sinks (black dots), and candidate pipeline network (black lines) for Scenario 2 for use in SimCCS Gateway.



*Each grid cell represents a 10 km by 10 km area.

Figure 12. Available sources (blue dots), sinks (black dots), and candidate pipeline network (black lines) for Scenario 3 for use in SimCCS Gateway.

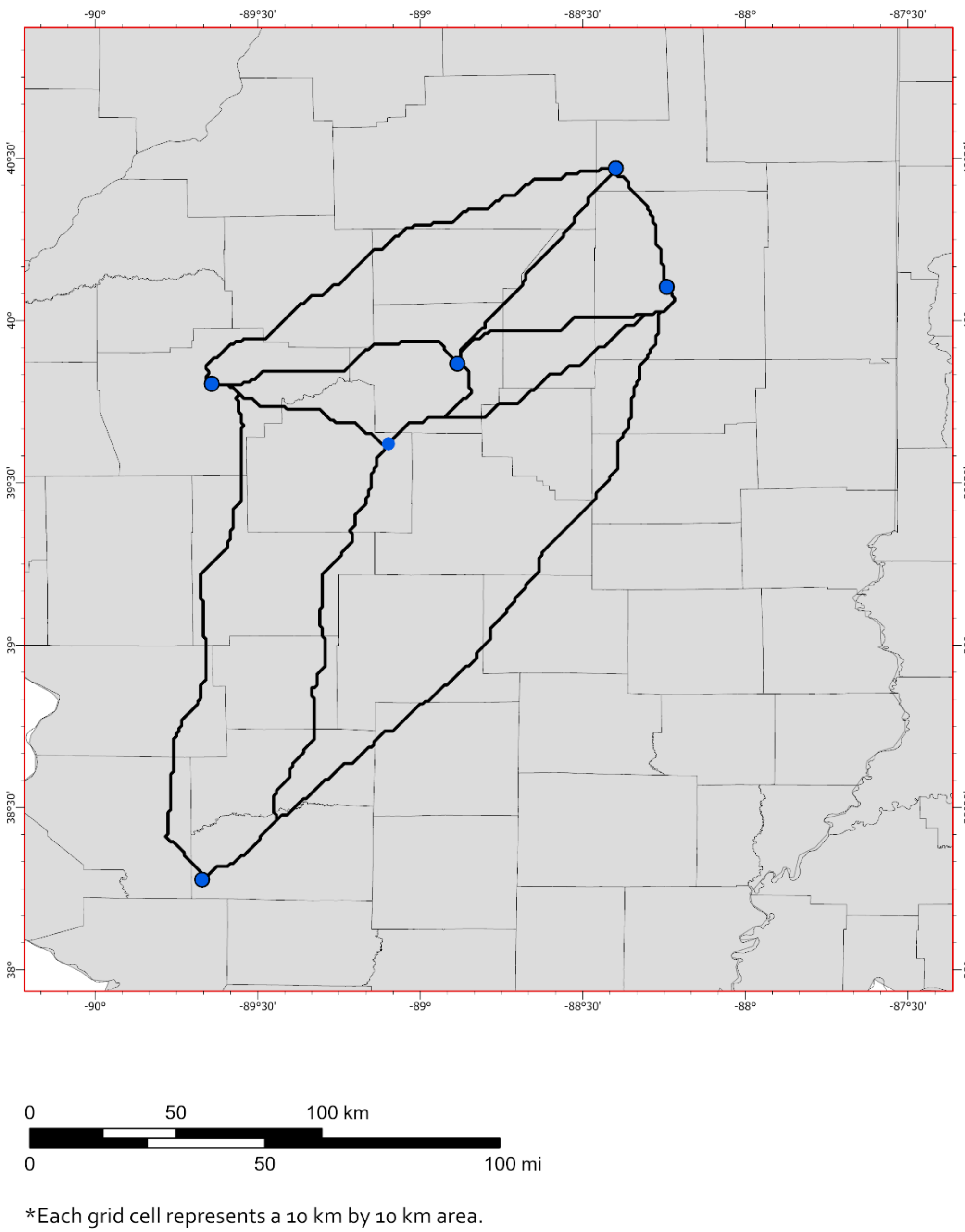


Figure 13. Available sources (blue dots), sinks (black dots), and candidate pipeline network (black lines) for Scenario 4 for use in SimCCS Gateway.

Results

A total of 76 simulations were conducted within *SimCCS Gateway*, 19 for each of the four scenarios. The pattern of deployment of the five sources is nearly identical in all four scenarios (Figure 14). The five sources are typically deployed based on the total capture cost of each source, with the lowest cost capture facilities deployed first. Interestingly, the pattern is broken in all four scenarios when the annual project capture target is 1.5 $MtCO_2$/yr, before returning to the pattern of capturing from the lowest cost sources available at 2.0 $MtCO_2$/yr and continuing for the remainder of the annual capture target amounts. This is likely due to the limited reservoir-quality Lower Mt. Simon Sandstone near the PSEC, which requires routing CO_2 to higher quality reservoirs closer to the other sources to be cost competitive. At 1.5 $MtCO_2$/yr, the savings in capture cost from PSEC over CWLP are outweighed by the cost of pipeline routing, but this is reversed beginning at 2 $MtCO_2$/yr.

Project Total Unit Cost

The project total unit cost ranges from \$21.04 per tCO_2 to \$35.59 per tCO_2 (Figure 15). The project total unit cost increases as the annual project capture target increases since higher cost capture and storage facilities are not utilized until they are required. The difference in total unit cost between the four scenarios ranges from \$0.25 per tCO_2 to \$1.04 per tCO_2. Figure 16 separates the project total unit cost into the costs associated with capture, storage, and transport.

Capture Unit Cost

The project capture unit cost ranges from \$18.40 to \$30.73 per tCO_2. Though capture facilities provide the majority of the total unit cost for a CCS project, the cost difference between scenarios attributed to cost of capture is zero in all scenarios and annual capture targets, with the exception of an annual capture target of 4.5 $MtCO_2$/yr. At the 4.5 $MtCO_2$/yr capture target, Scenario 3 has a total unit cost for capture \$0.16 greater than the other three scenarios because it has a fourth capture facility in use while the other three scenarios only have three.

Storage Unit Cost

The project storage unit cost ranges from \$2.57 to \$3.02. The difference in total unit cost for storage ranges from \$0.00 per tCO_2 to \$0.28 per tCO_2, the difference increasing as the annual project capture target increases.

Transport Unit Cost

The project transport unit cost ranges from \$0 to \$2.23 per tCO_2. The difference in total unit cost for transport between scenarios is nearly zero at capture targets up to 1.5 $MtCO_2$/yr, but significant at capture targets greater than 1.5 $MtCO_2$/yr, which is largely attributed to the lack of any pipeline needed at low capture amounts for Scenarios 3 and 4. The difference in total unit cost ranges from \$0.25 per tCO_2 to \$0.86 per tCO_2.

An analysis of the repeated occurrence of specific sources, sinks, or pipeline networks across various scenarios can probabilistically inform the decision-making process to deploy large-scale CCS project. Figure 14 shows that using the lowest-cost capture options, even when they are not near a suitable storage complex, often results in the lowest total project unit cost for a given annual capture target. This is shown with PSEC being used before CWLP and Abbott Power Plant in almost all project capture amounts, even though the captured CO_2 is transported hundreds of kilometers.

Results by Scenario

The results of each scenario will be described below, with an overview of all scenarios presented in Table 3. Figure 17 shows an aggregate of all annual capture target amounts for Scenario 1, weighting sources, sinks, and pipeline routes by how often they were used in the various simulations. As indicated in Figure 14, PSEC was used in most of the annual capture targets for Scenario 1, but in all cases the captured CO_2 was transported to one of the storage facilities surrounding ADM Decatur. Both Abbott Power Plant and One Earth Energy stored all captured CO_2 in nearby sites and did not connect to the remaining capture facilities. City Water, Light, and Power, used a nearby storage facility at lower annual project capture targets, but connected to the storage system surrounding ADM Decatur at higher annual project capture targets (see Appendix for individual scenarios).

In Scenario 2, where the storage facilities were limited to the nearest grid cell to each source, all five capture facilities become connected, with PSEC transporting all captured CO_2 to ADM Decatur (Figure 18). At higher annual project capture targets, additional CO_2 is also transported to the storage facilities surrounding Abbott Power Plant and One Earth Energy. This difference between Scenario 1 and Scenario 2 indicates that a storage hub may be a suitable option, but the storage complex must be sufficiently large, in this case larger than one grid cell, to accommodate multiple capture facilities.

Scenario 3 develops a nearly parallel aggregated result as Scenario 2 (Figure 19). The only major difference between the two scenarios is the pipeline route used from PSEC to ADM Decatur, as there is limited CO_2 storage east of PSEC, which created cost savings (Figure 16).

Scenario 4 incorporates a storage facility, defined by the ISGS, between three of the facilities in this study (Figure 20). Results indicate high potential for a storage hub in this location, as it was used in 16 of the 19 annual project capture targets. If PSEC is considered a viable capture facility, and it was in all scenarios after an annual project capture target of 1.5 $MtCO_2$/yr, the addition of a storage hub presents a more economically viable option than transporting CO_2 from PSEC to ADM Decatur. This is further supported by Scenario 4 results showing the lowest total unit cost among all four scenarios at annual project capture targets larger than 1.5 $MtCO_2$/yr.

Table 3. Overview of input and output variables of all scenarios. *Parentheses indicate mean value.*

Scenario Parameters	Scenario 1*	Scenario 2	Scenario 3	Scenario 4
Input Sources	5	5	5	5
Input Sinks	20	5	5	6
Candidate Pipeline Routes	21.29 – 35.02 (28.50)	21.29 – 35.59 (29.12)	21.04 – 35.44 (28.86)	21.04 – 34.58 (28.32)
Capture Total Unit Cost ($/t$CO_2$)	18.40 – 30.73 (24.28)	18.40 – 30.73 (24.60)	18.40 – 30.73 (24.61)	18.40 – 30.73 (24.60)
Transport Total Unit Cost ($/t$CO_2$)	0.25 – 2.06 (1.46)	0.25 – 2.23 (1.78)	0.00 – 1.93 (1.51)	0.00 – 1.50 (1.10)
Storage Total Unit Cost ($/t$CO_2$)	2.64 – 2.96 (2.72)	2.64 – 3.02 (2.74)	2.64 – 3.02 (2.74)	2.57 – 3.02 (2.62)

* *Annual capture targets of 6.0, 7.5, and 8.5 MtCO_2/yr resulted in errors in SimCCS Gateway.*

Discussion

As shown by the variability in pipeline candidate networks and sinks used by each scenario, the optimal deployment of CCS provided by *SimCCS Gateway* is dependent on the provided input data. Though *SimCCS Gateway* is a powerful tool, it is not currently capable of developing all potential network designs for every combination of storage facilities available (i.e. all combinations of 10K grid cells from Figure 8). While the development of the four scenarios described in this study were systematic in approach and attempted to remove qualitative biases, they were not an exhaustive list of CCS deployment scenarios in the study area. The results of Scenario 4, where the lowest cost storage site is chosen even though it includes additional transport costs, indicates that further research should focus on increasing our understanding of the subsurface throughout the Illinois Basin, as an optimal storage hub could provide a cost-effective opportunity for capture facilities with higher costs.

Results from *SimCCS Gateway* could also be improved by using dynamic reservoir modeling results coupled with detailed economic assessments. The Sequestration of CO_2 Tool is designed for site screening, so further simulations in *SimCCS Gateway* should be considered once more detailed reservoir characterizations are available.

Scenario 1

Scenario 2

Scenario 3

Scenario 4

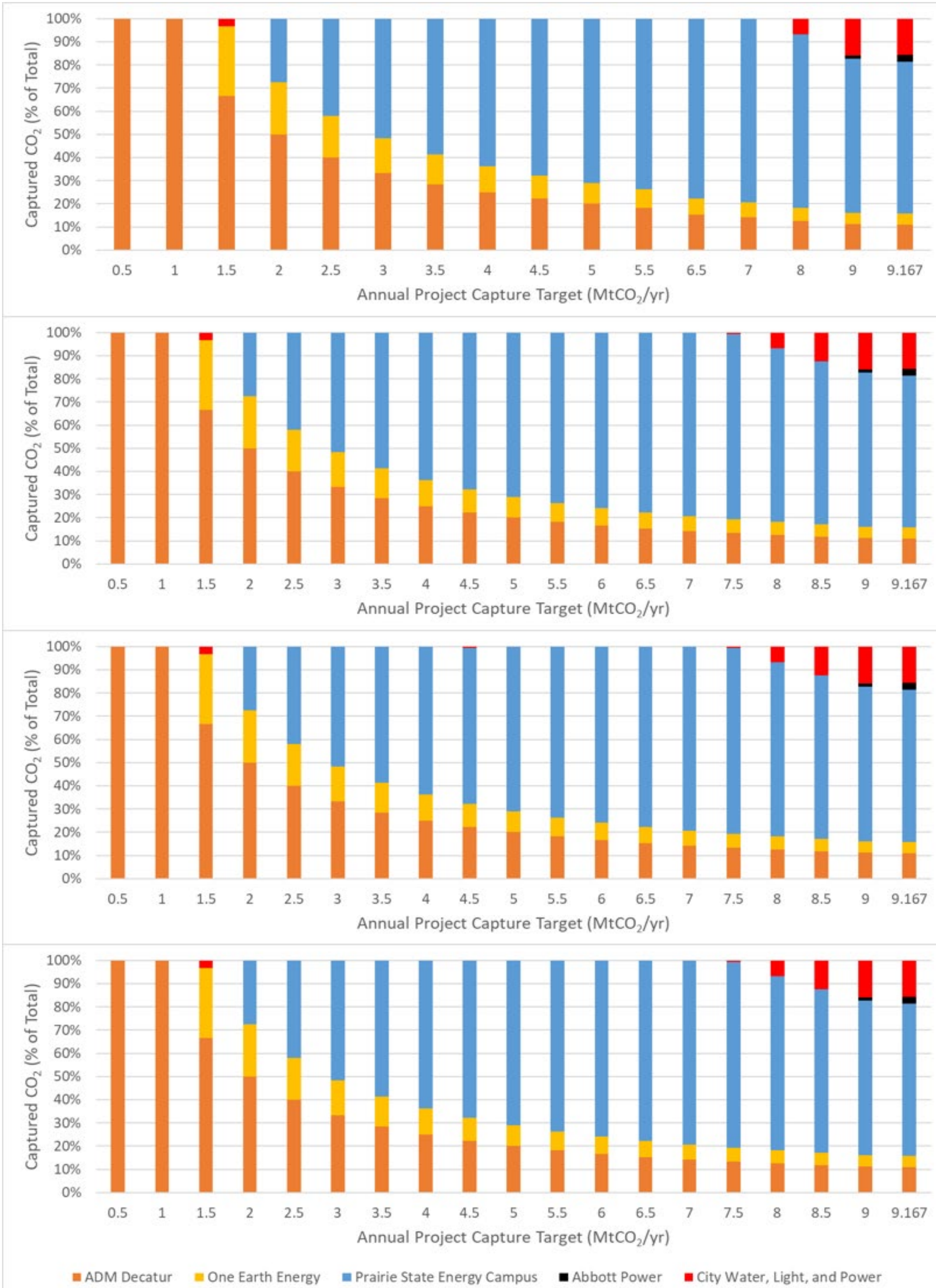


Figure 14. For all four scenarios: captured CO_2 by capture facility as a percent of total captured CO_2 for a given annual project capture target.

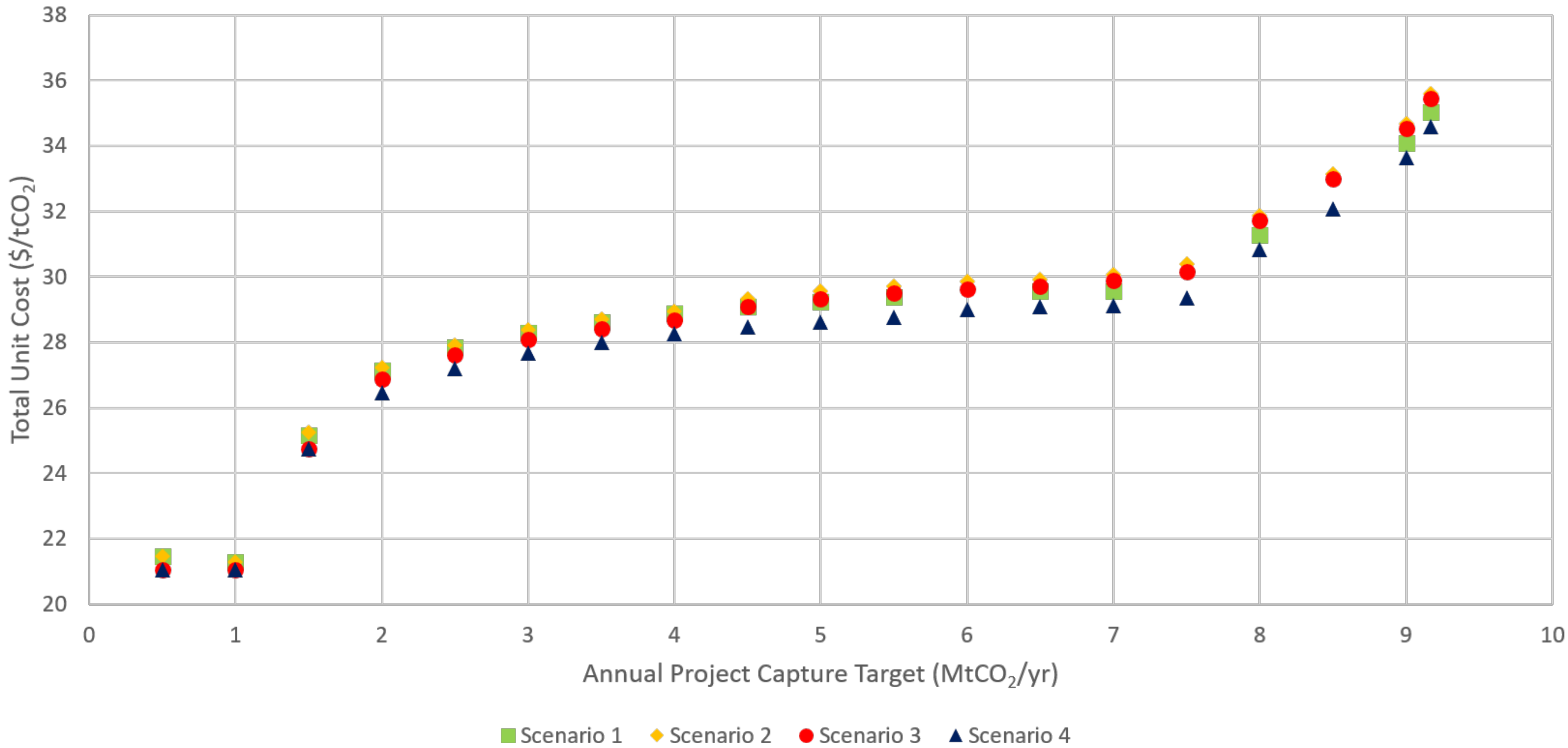


Figure 15. Total unit cost for each annual project capture target simulation, separated by scenario.

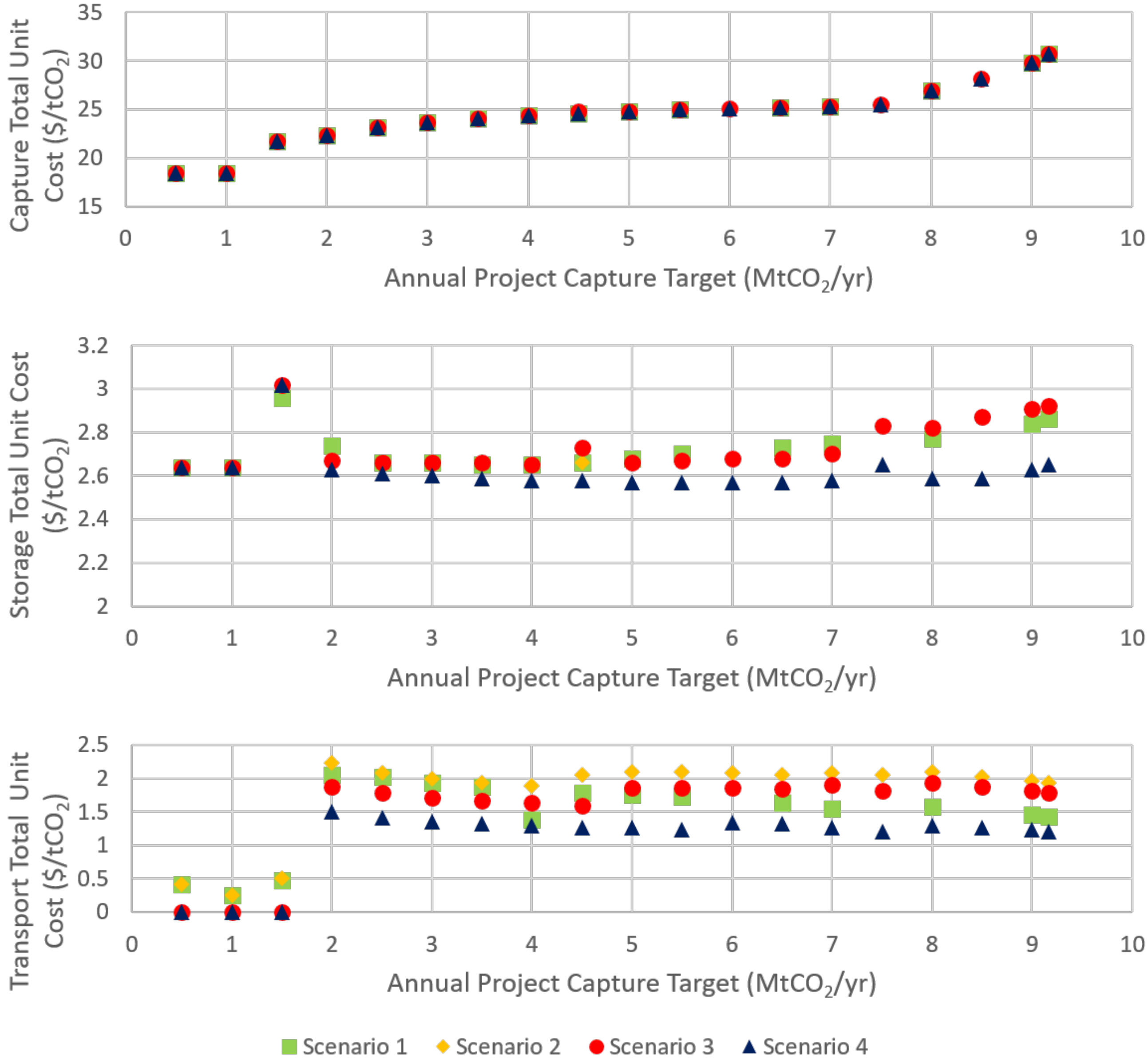


Figure 16. Total unit cost for capture, storage, and transport for each annual project capture target simulation, separated by scenario.

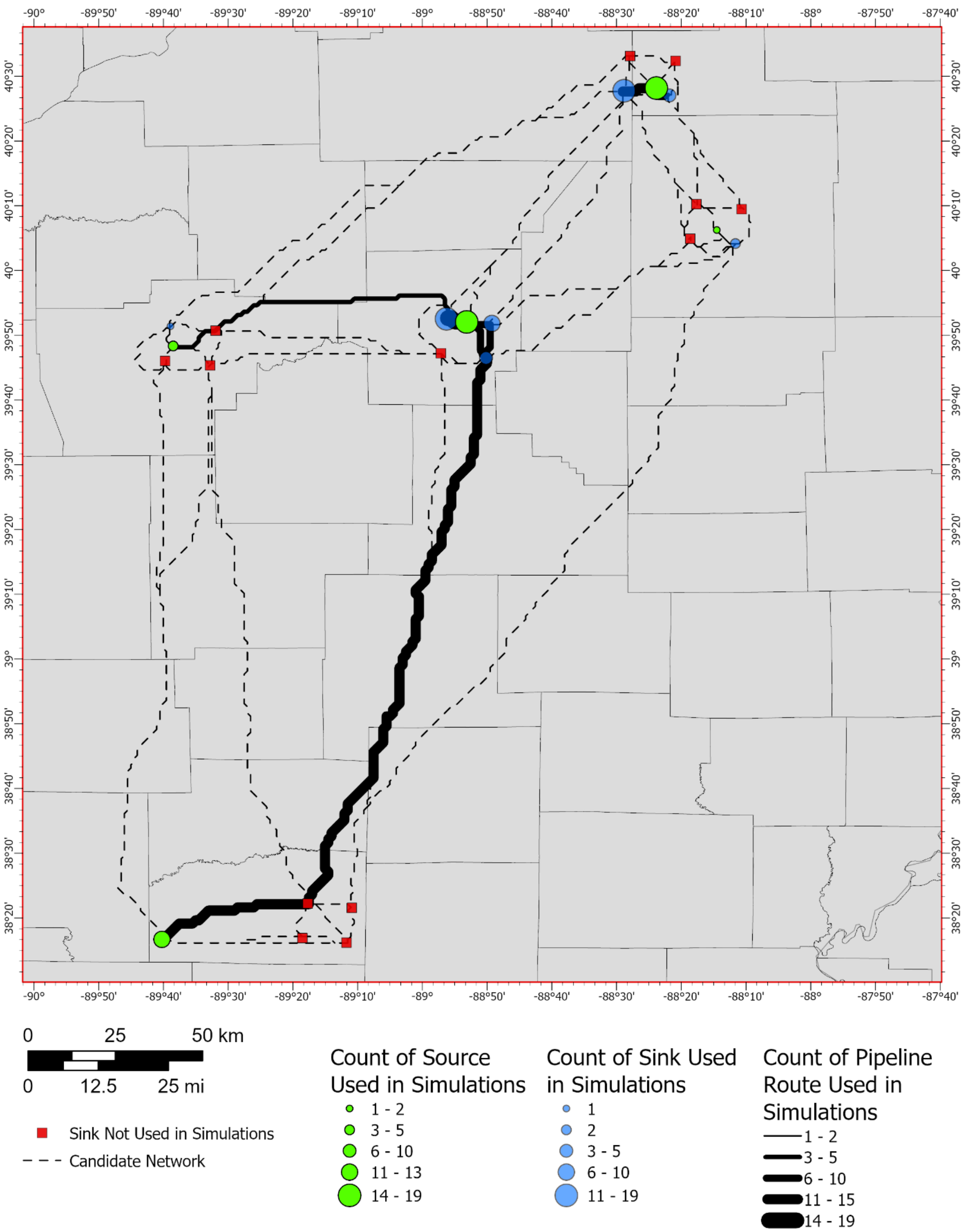


Figure 17. Aggregate of all SimCCS Gateway simulations for Scenario 1. Heavier lines indicate a pipeline route was used in a larger number of simulations. Larger green and blue circles indicate a greater number of simulations used a source or sink, respectively.

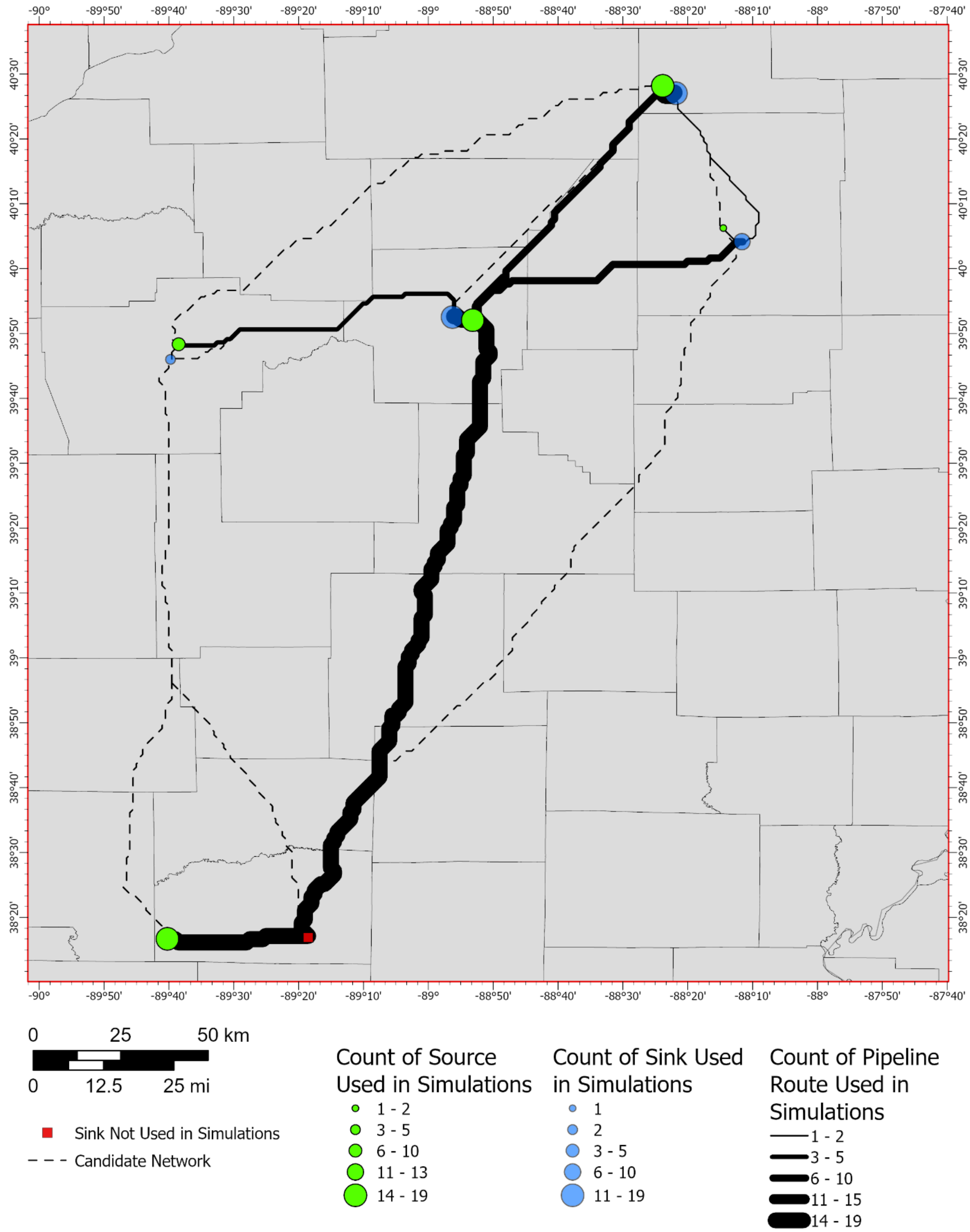


Figure 18. Aggregate of all SimCCS Gateway simulations for Scenario 2. Heavier lines indicate a pipeline route was used in a larger number of simulations. Larger green and blue circles indicate a greater number of simulations used a source or sink, respectively.

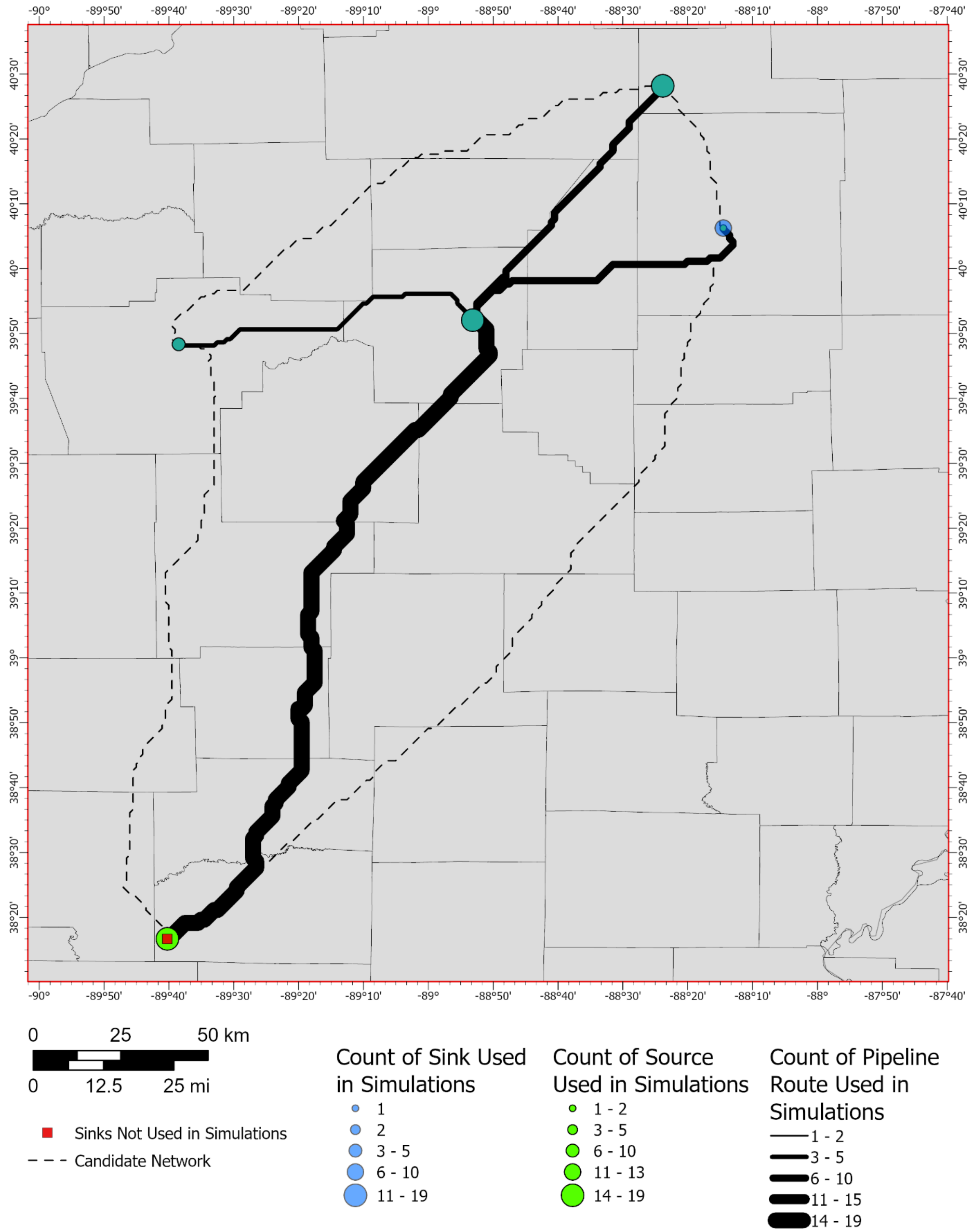


Figure 19. Aggregate of all SimCCS Gateway simulations for Scenario 3. Heavier lines indicate a pipeline route was used in a larger number of simulations. Larger green and blue circles indicate a greater number of simulations used a source or sink, respectively. Circles that appear blue-green include both capture and storage facilities.

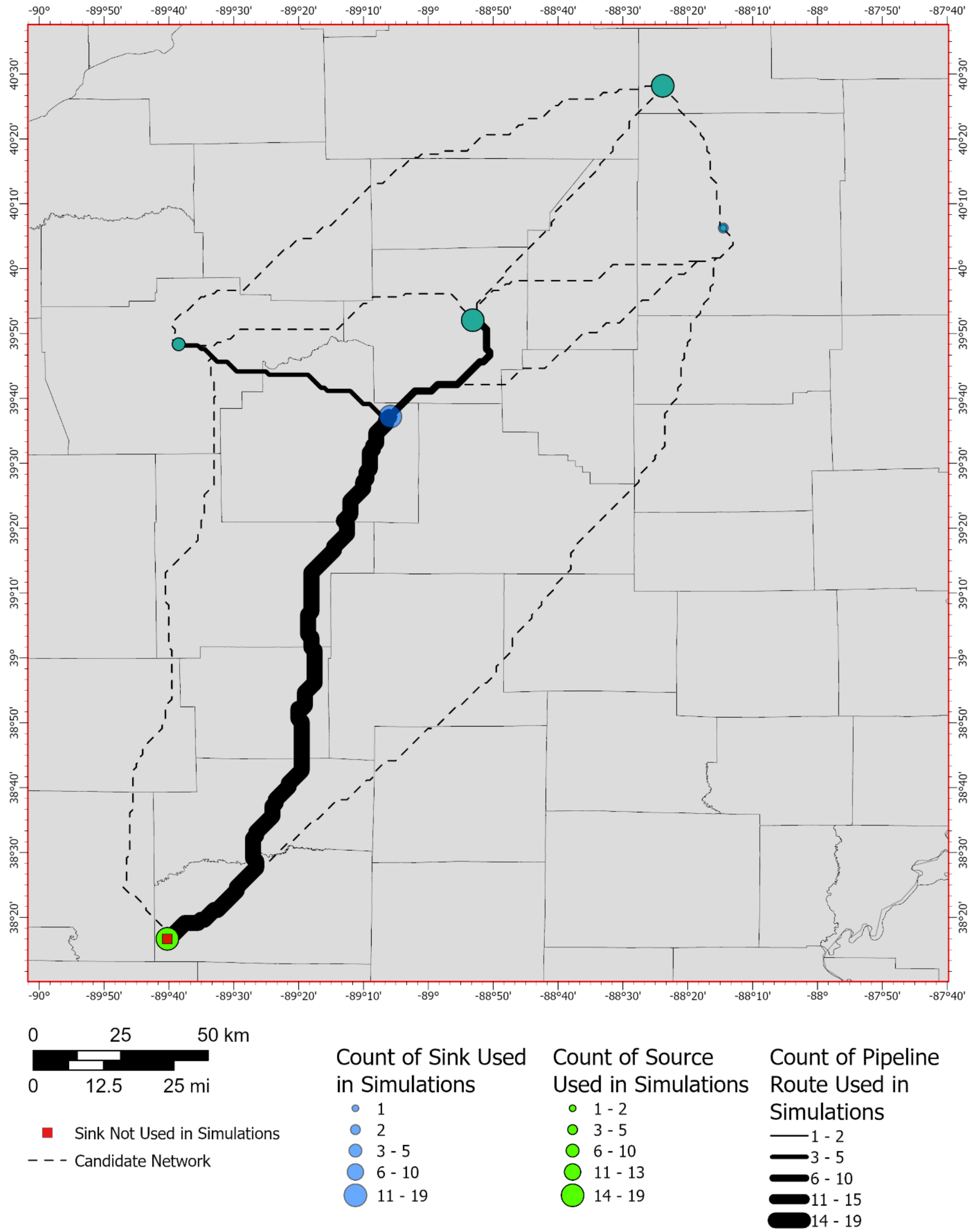


Figure 20. Aggregate of all SimCCS Gateway simulations for Scenario 1. Heavier lines indicate a pipeline route was used in a larger number of simulations. Larger green and blue circles indicate a greater number of simulations used a source or sink, respectively. Circles that appear blue-green include both capture and storage facilities.

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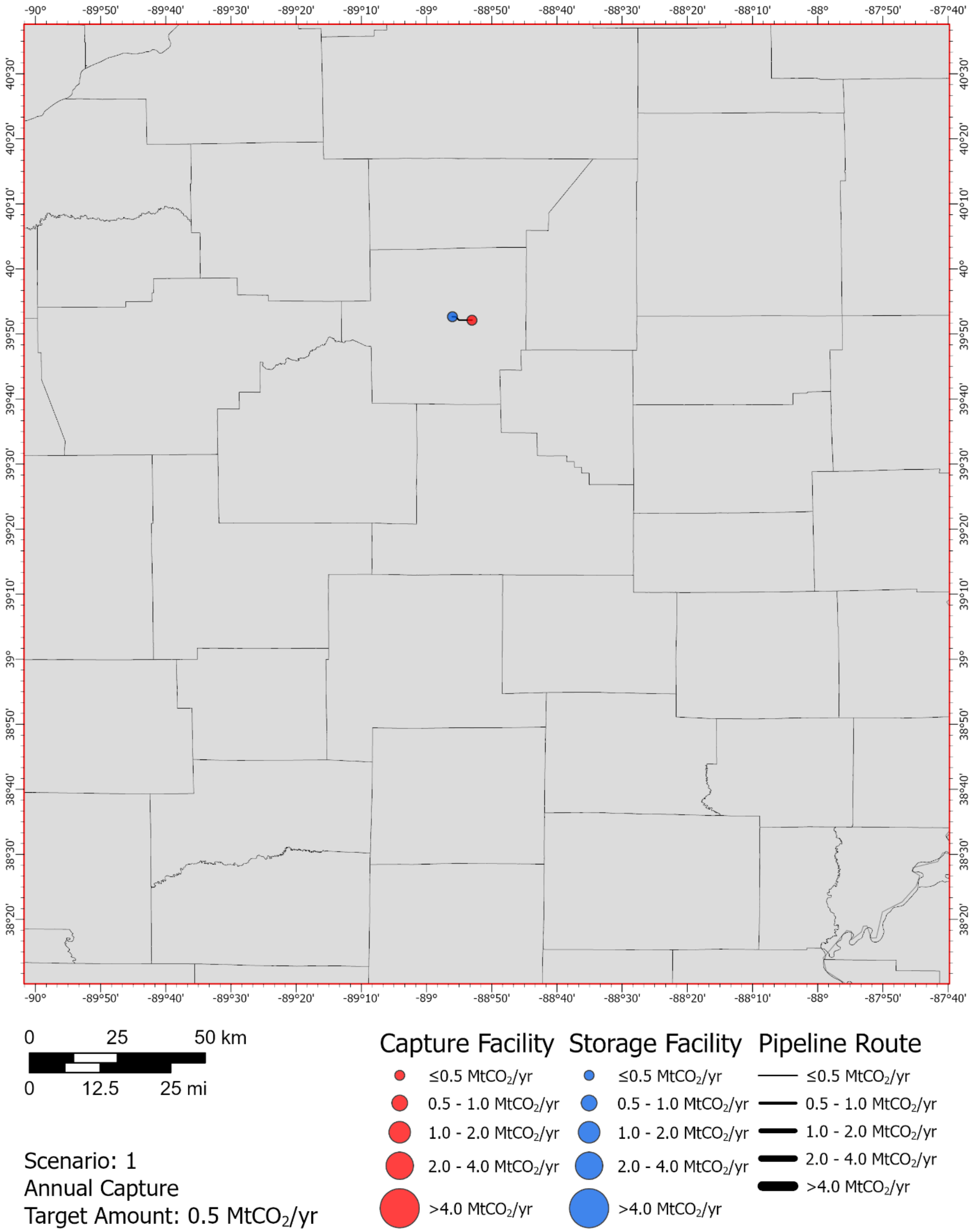
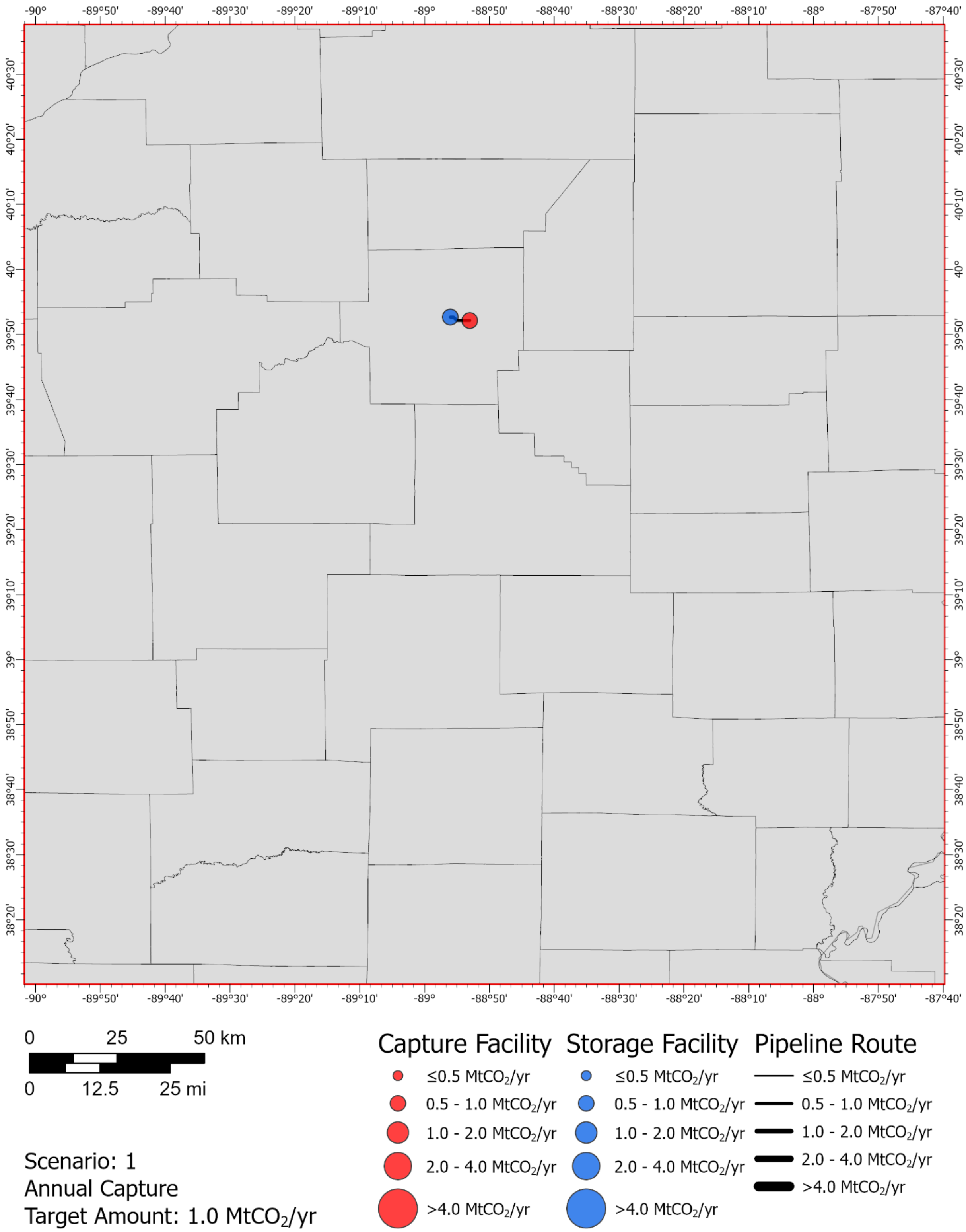
Appendix – Results of Individual SimCCS Simulations





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39°30'
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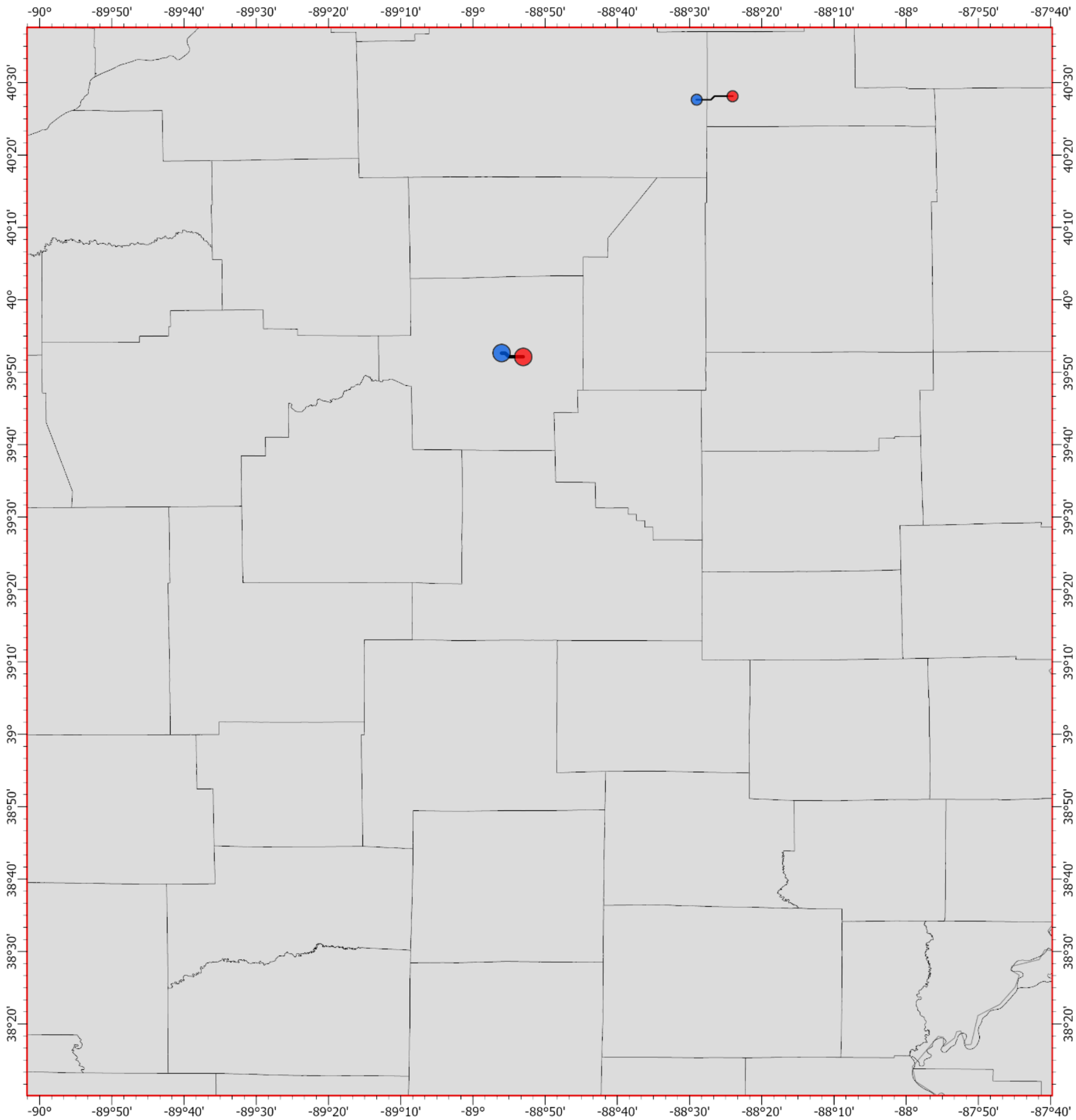
39°10'
39°
38°50'
38°40'
38°30'
38°20'
0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Storage Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Pipeline Route
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Scenario: 1
Annual Capture
Target Amount: 1.0 $MtCO_2$/yr

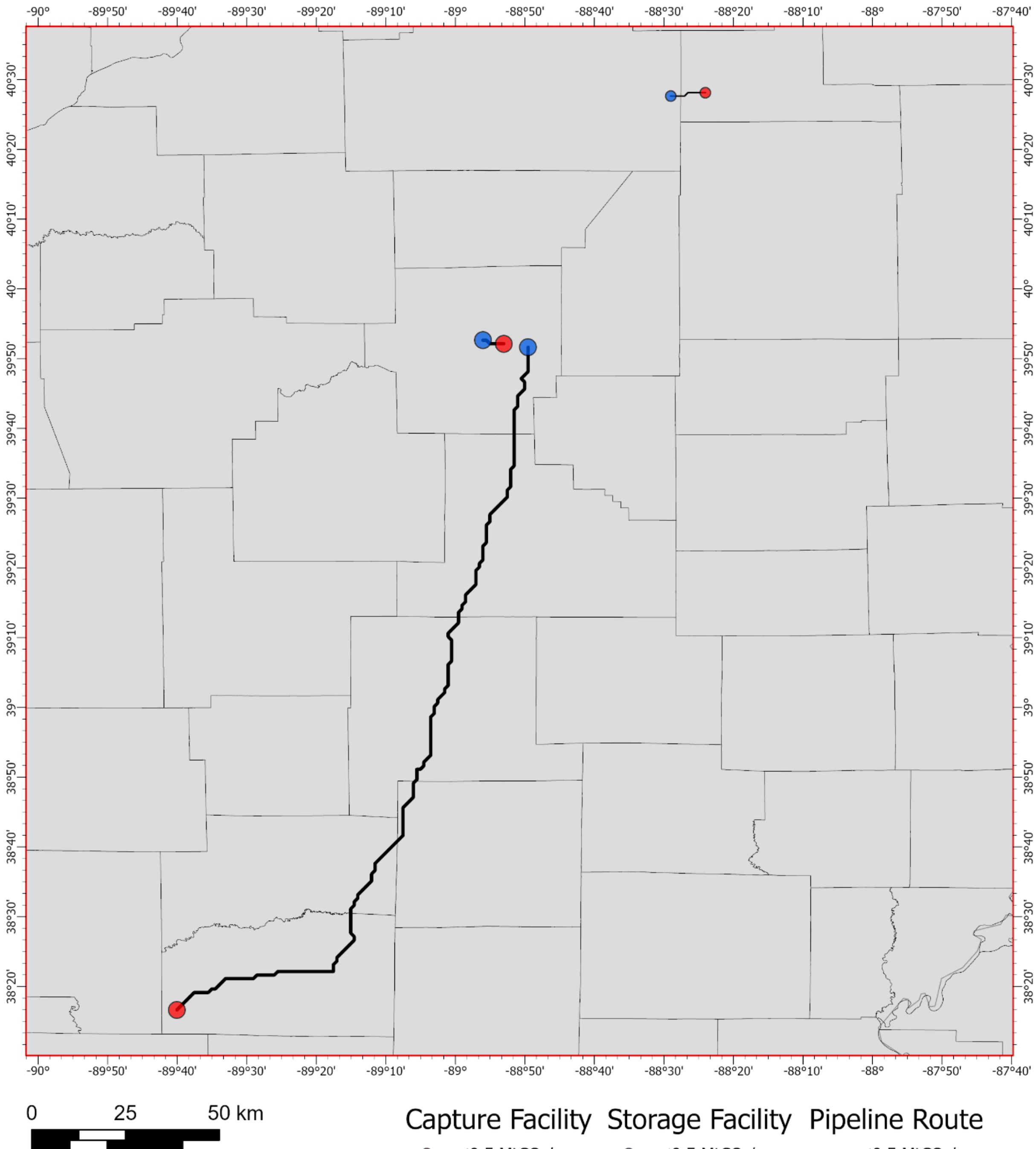


0 25 50 km

0 12.5 25 mi

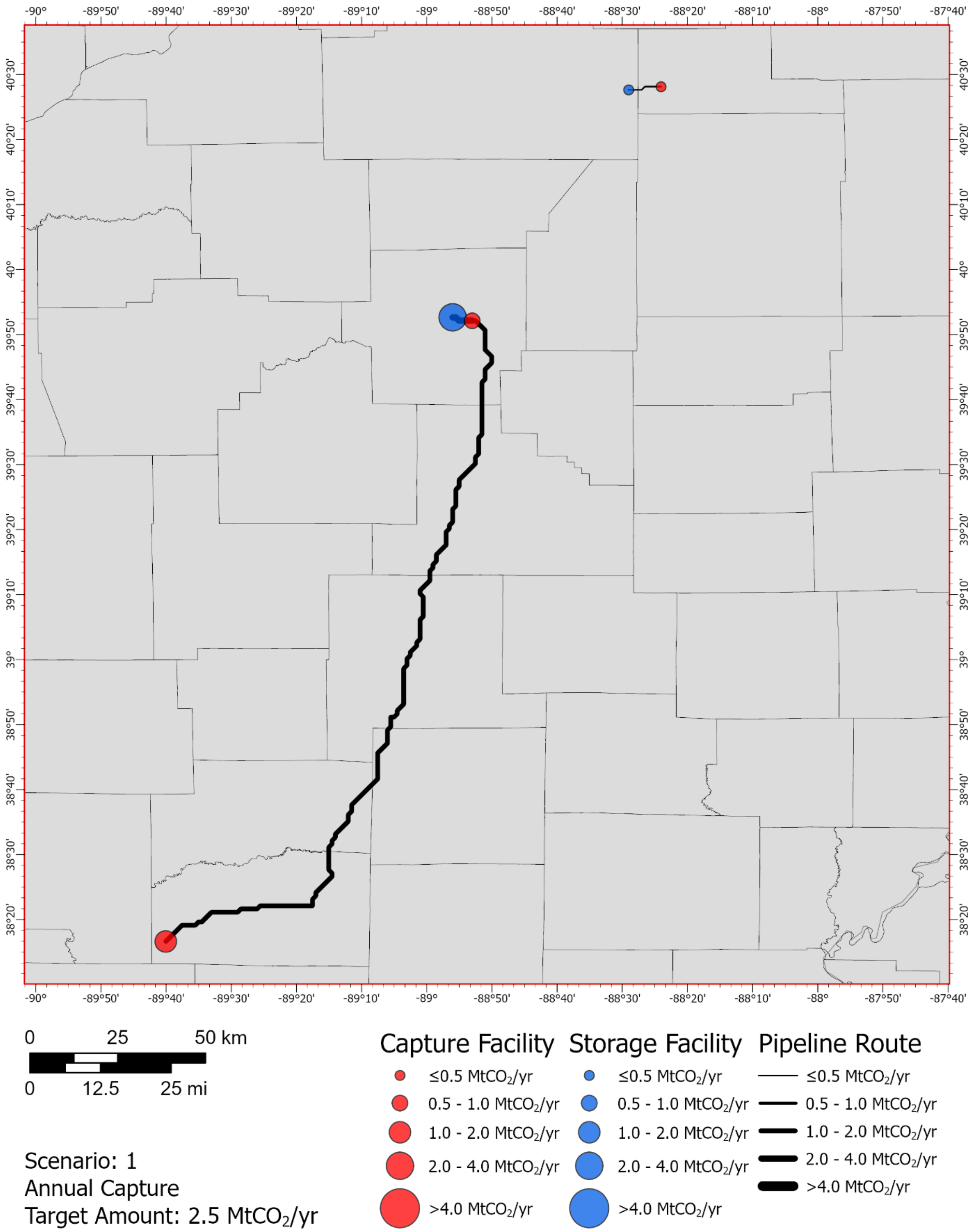
Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

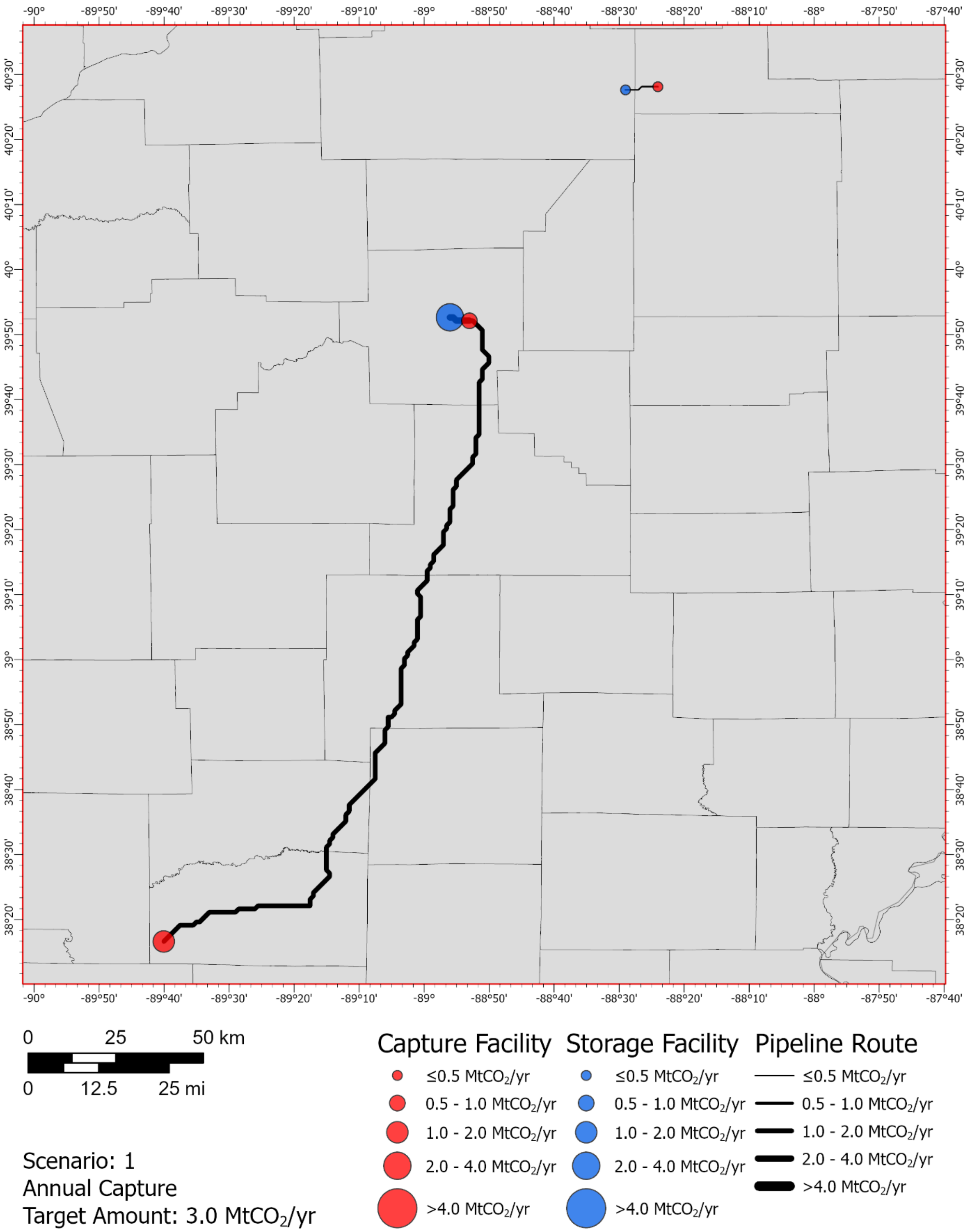
Scenario: 1
Annual Capture
Target Amount: 1.5 $MtCO_2/yr$



Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

Scenario: 1
Annual Capture
Target Amount: 2.0 $MtCO_2/yr$


-90° -89°50' -89°40' -89°30' -89°20' -89°10' -89° -88°50' -88°40' -88°30' -88°20' -88°10' -88° -87°50' -87°40'
40°30' 40°20' 40°10' 40° 39°50' 39°40' 39°30' 39°20' 39°10' 39° 38°50' 38°40' 38°30' 38°20'
0 25 50 km
0 12.5 25 mi
Scenario: 1
Annual Capture
Target Amount: 2.5 MtCO2/yr
Capture Facility
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Storage Facility
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Pipeline Route
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr



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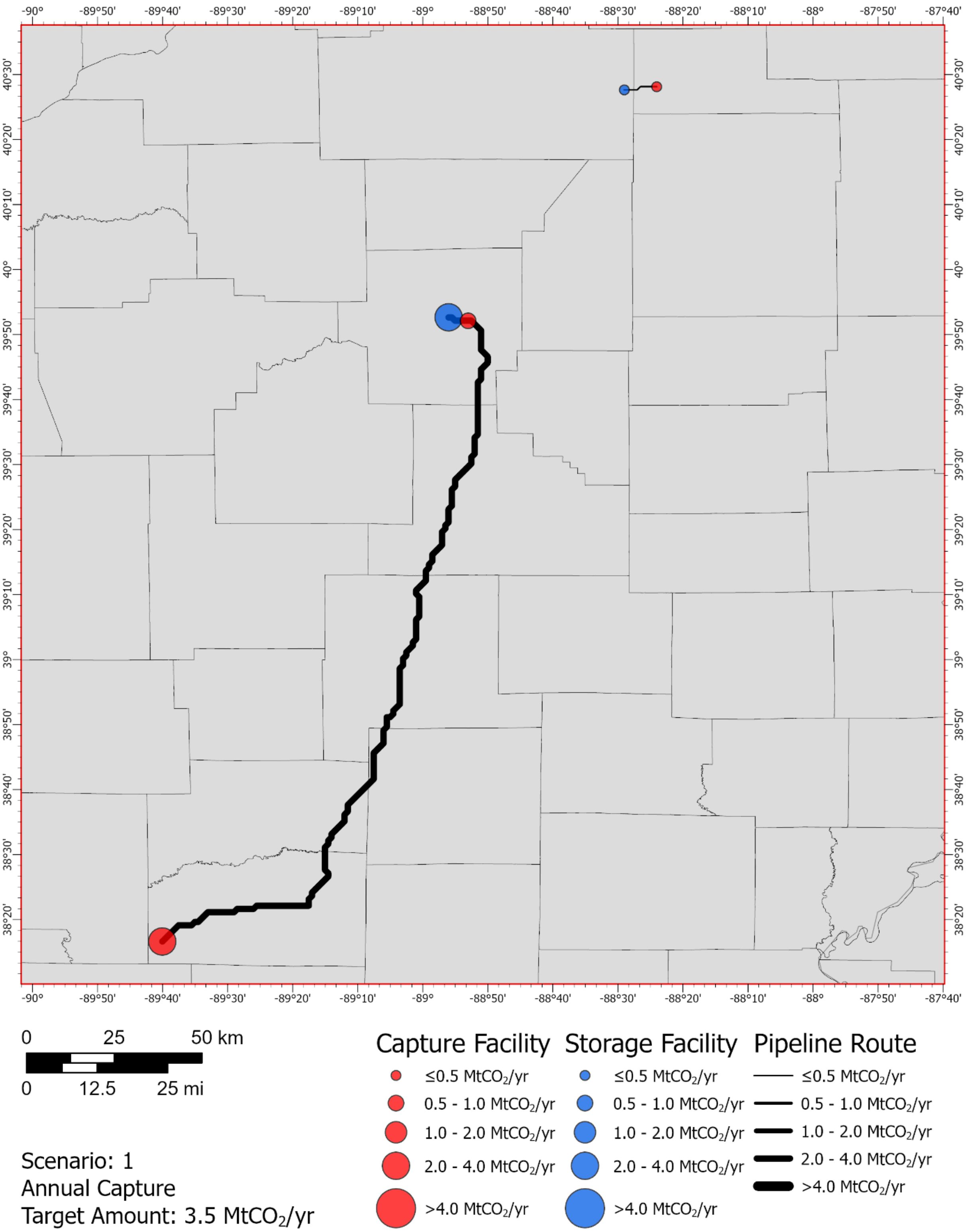
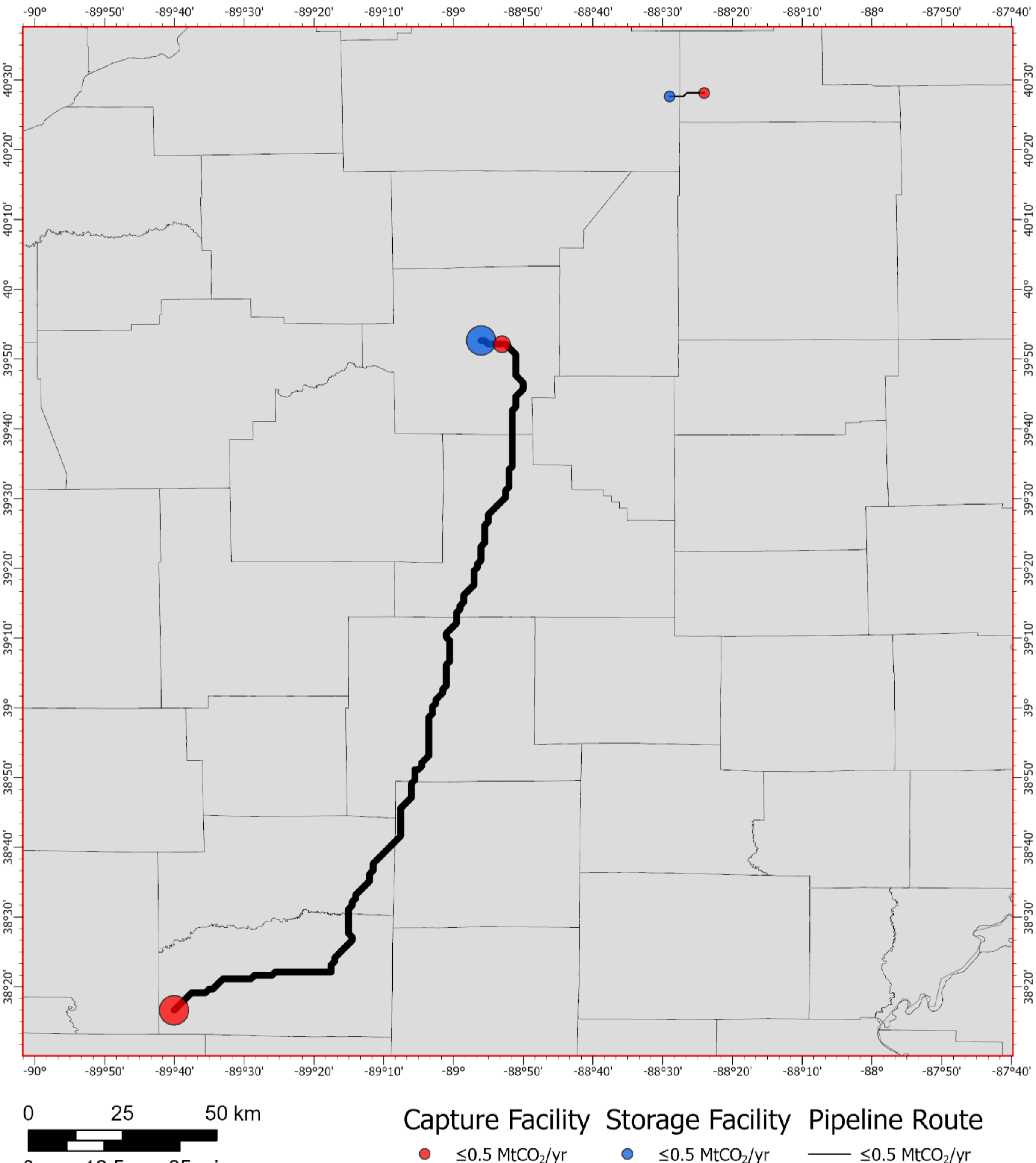
39°50'
39°40'
39°30'
39°20'
39°10'
39°
38°50'
38°40'
38°30'
38°20'
0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Storage Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Pipeline Route
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Scenario: 1
Annual Capture
Target Amount: 3.0 $MtCO_2/yr$

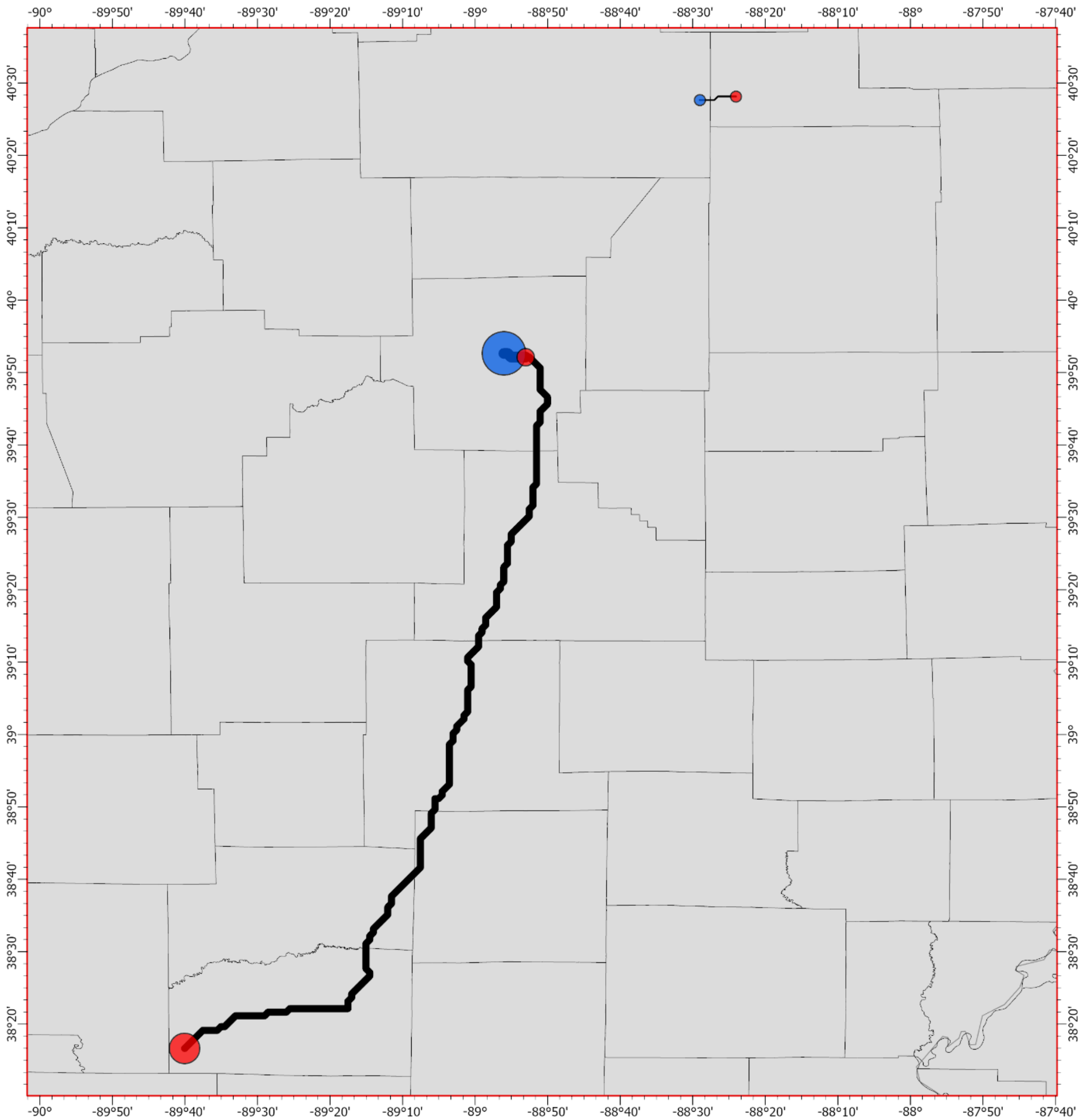


Scenario: 1
Annual Capture
Target Amount: 3.5 $MtCO_2$/yr



Scenario: 1
Annual Capture
Target Amount: 4.0 $MtCO_2/yr$

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

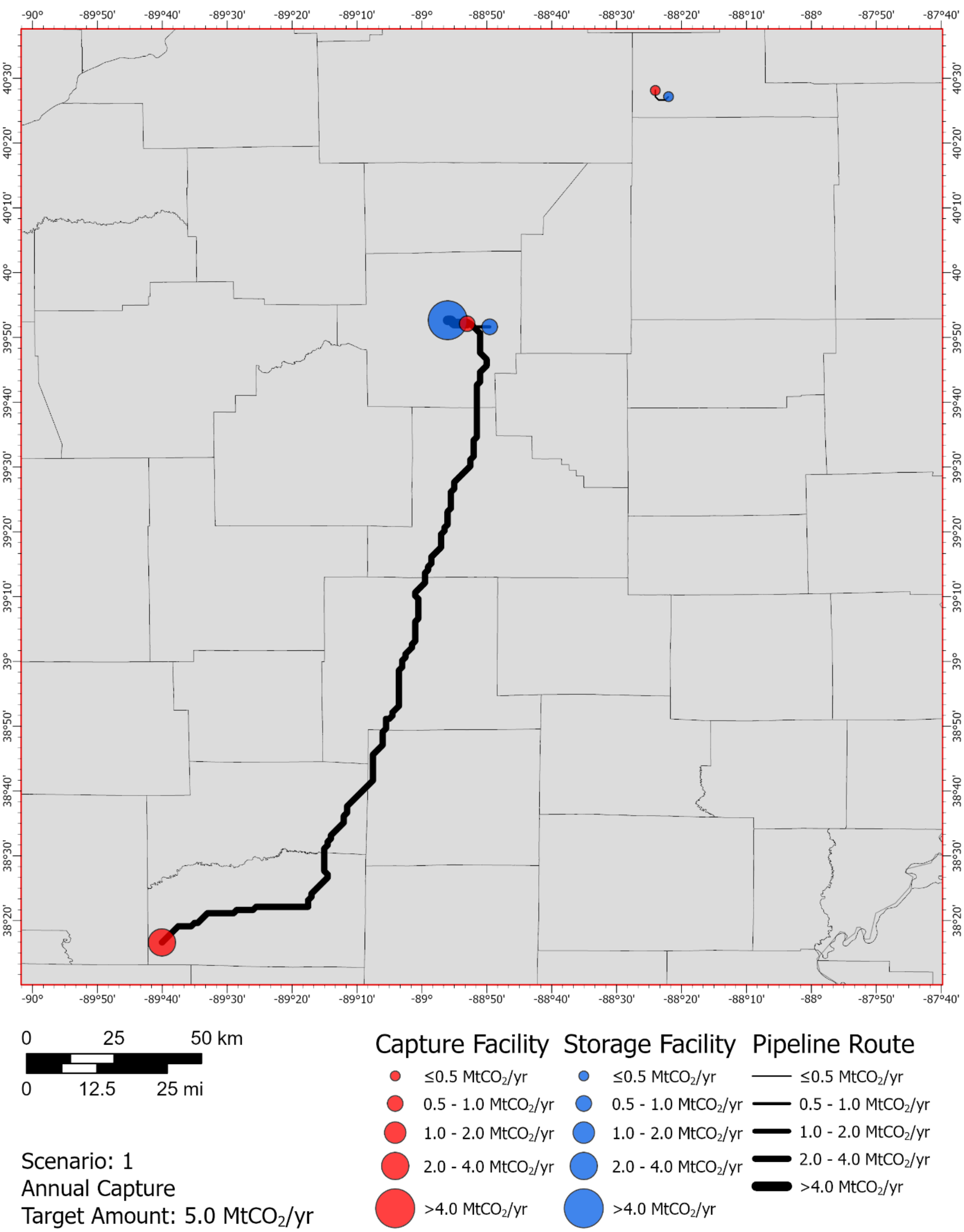


0 25 50 km

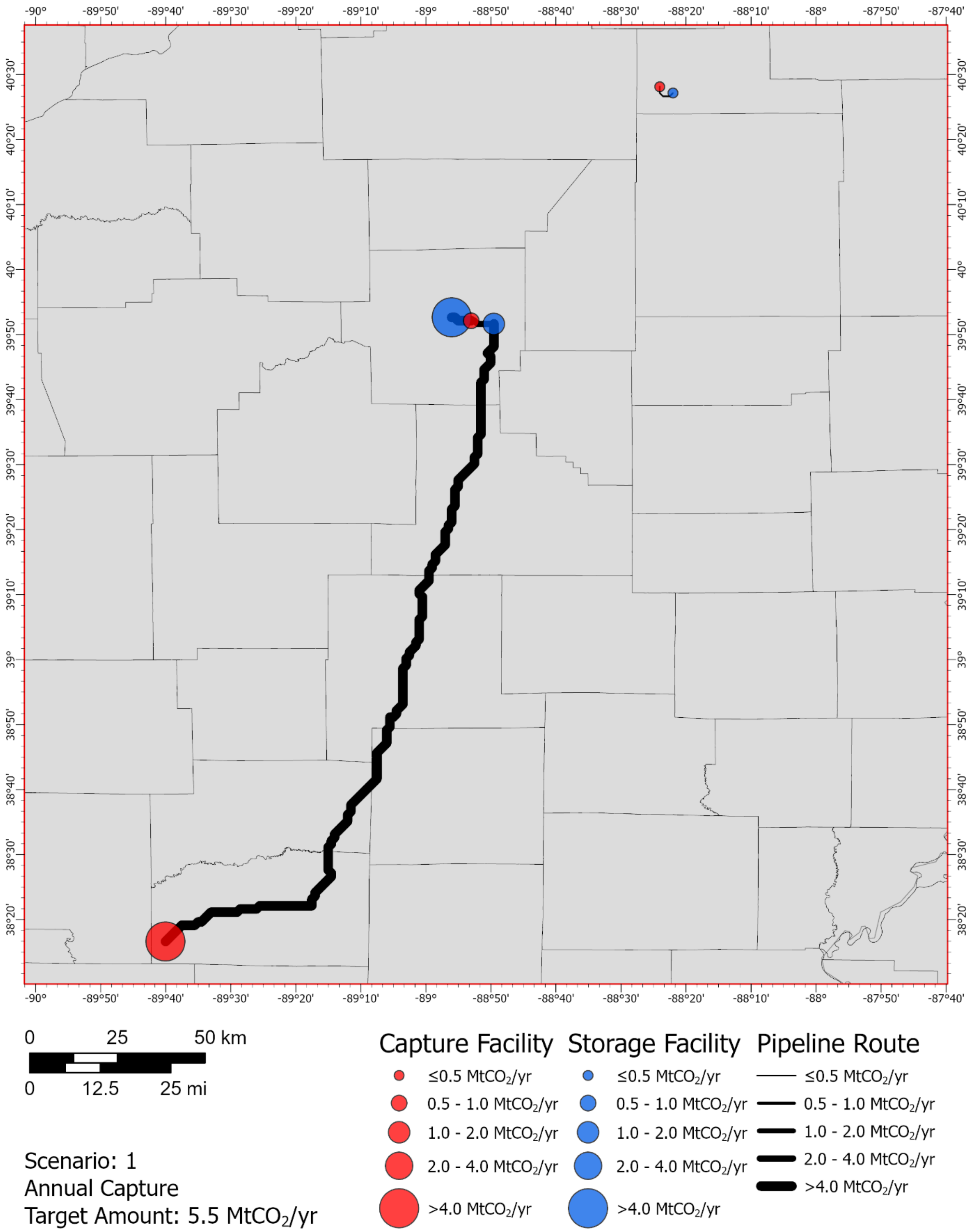
0 12.5 25 mi

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

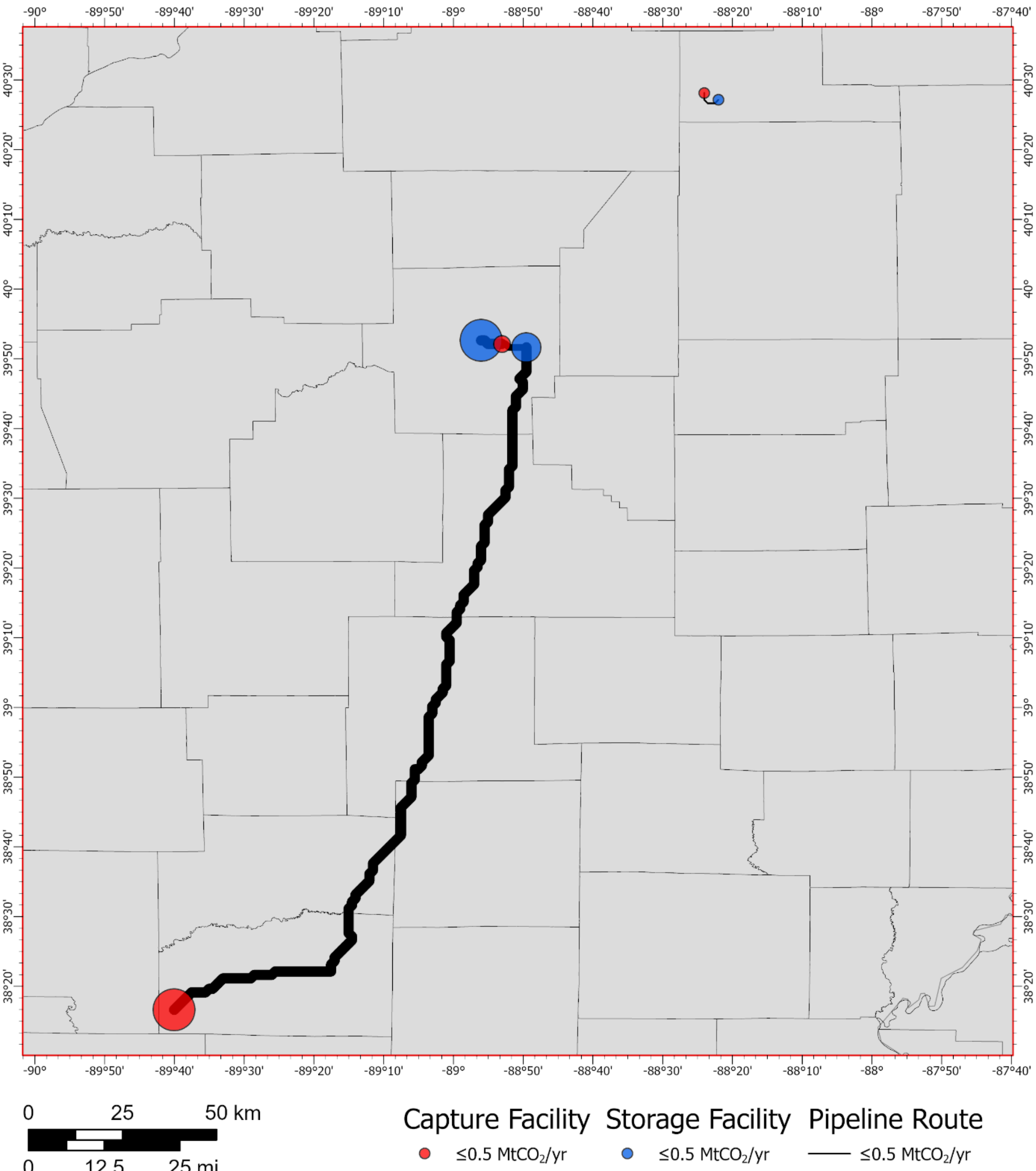
Scenario: 1
Annual Capture
Target Amount: 4.5 $MtCO_2/yr$



0 25 50 km
0 12.5 25 mi
Scenario: 1
Annual Capture
Target Amount: 5.0 MtCO2/yr
Capture Facility
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Storage Facility
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Pipeline Route
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr



Scenario: 1
Annual Capture
Target Amount: 5.5 $MtCO_2$/yr

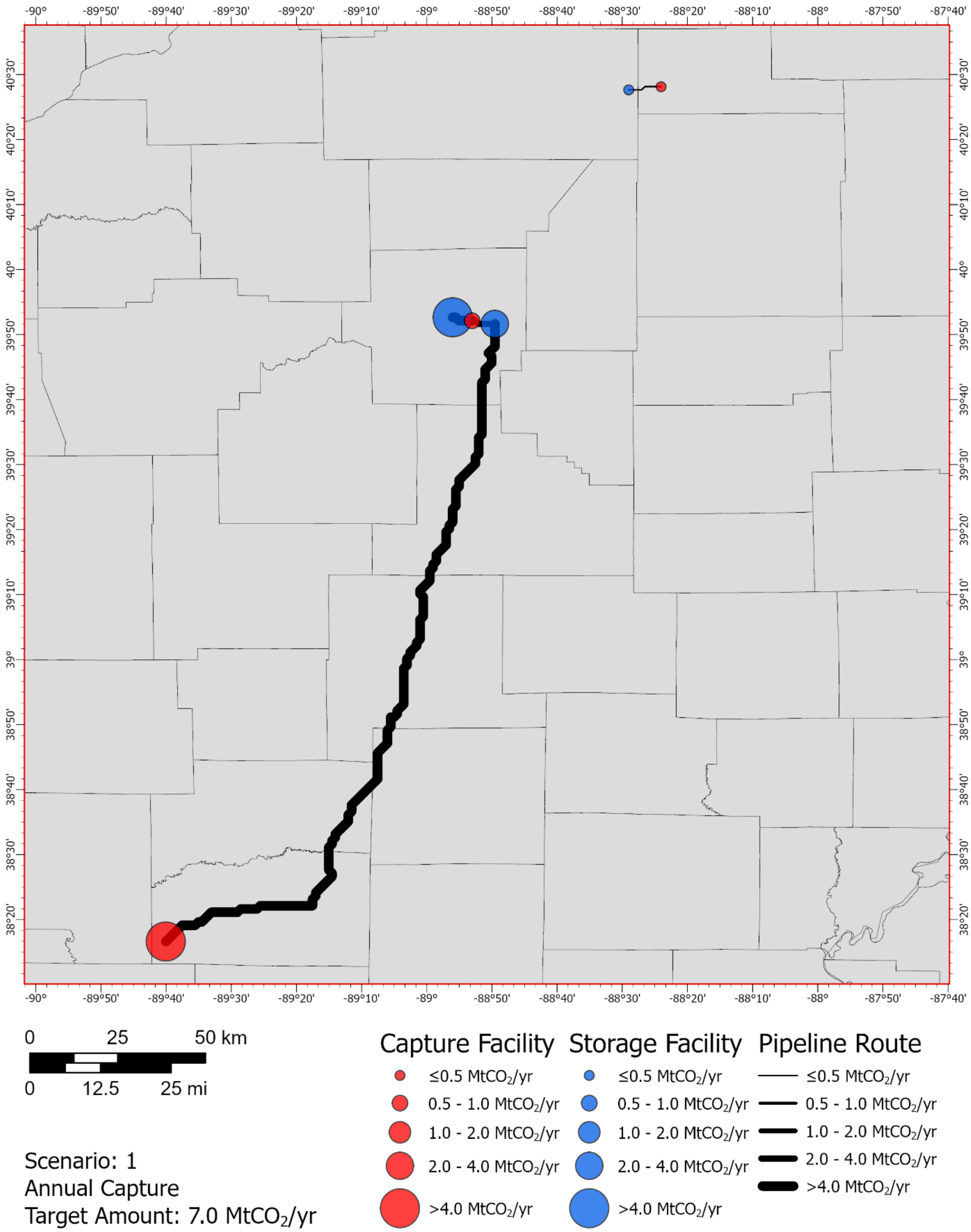


Capture Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$

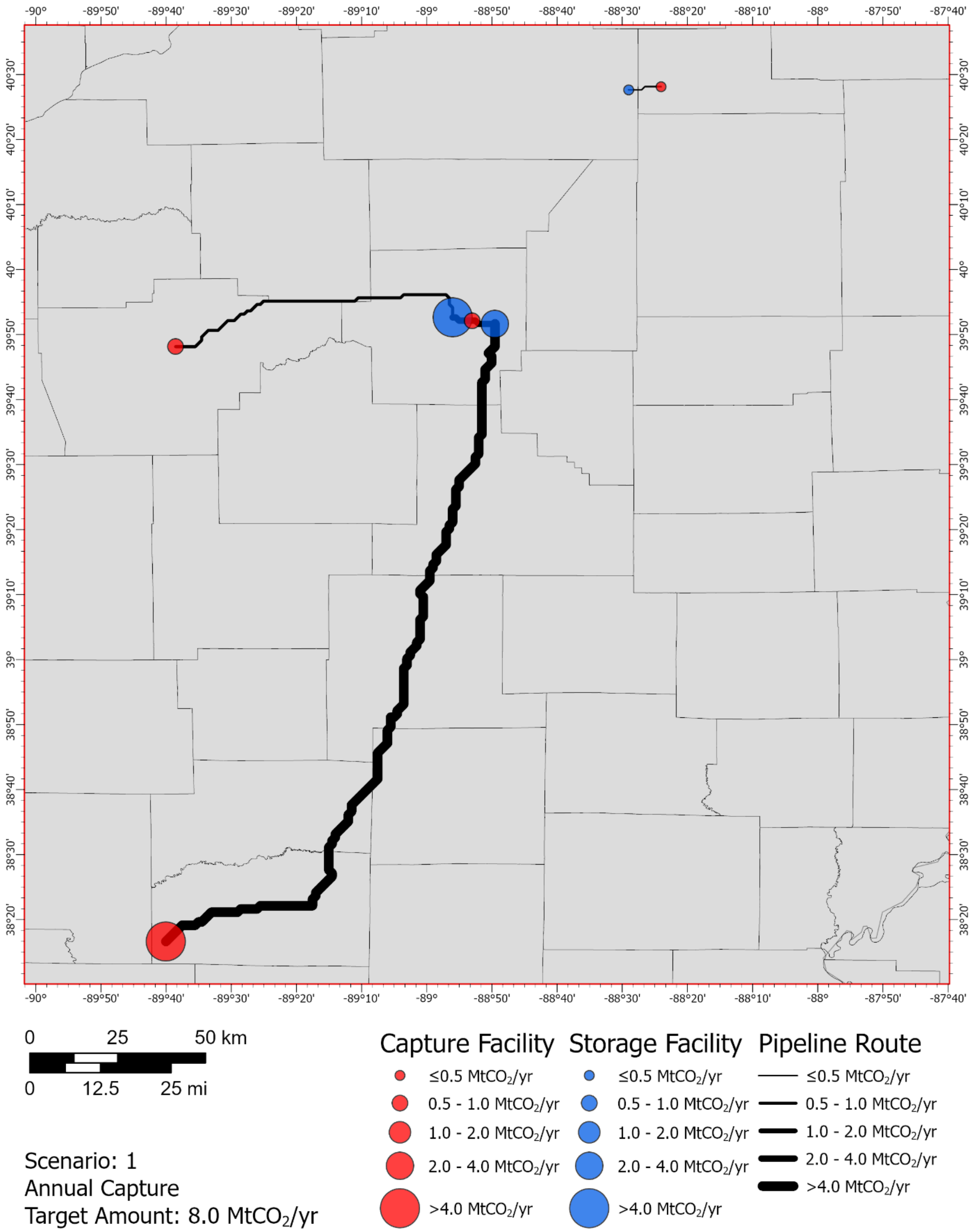
Storage Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$

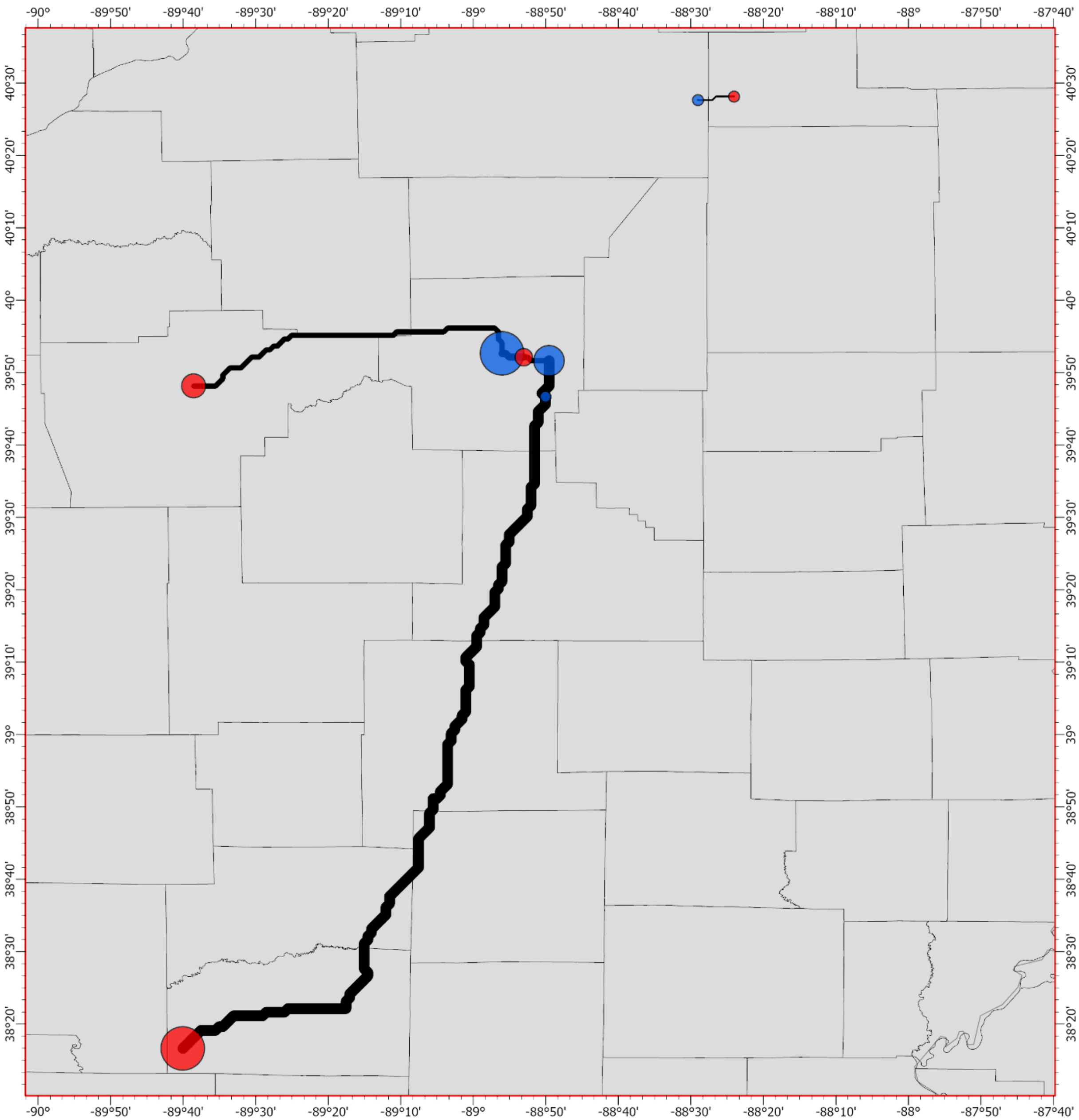
Pipeline Route
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$

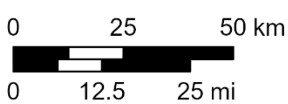
Scenario: 1
Annual Capture
Target Amount: 6.5 $MtCO_2/yr$



Scenario: 1
Annual Capture
Target Amount: 7.0 $MtCO_2/yr$

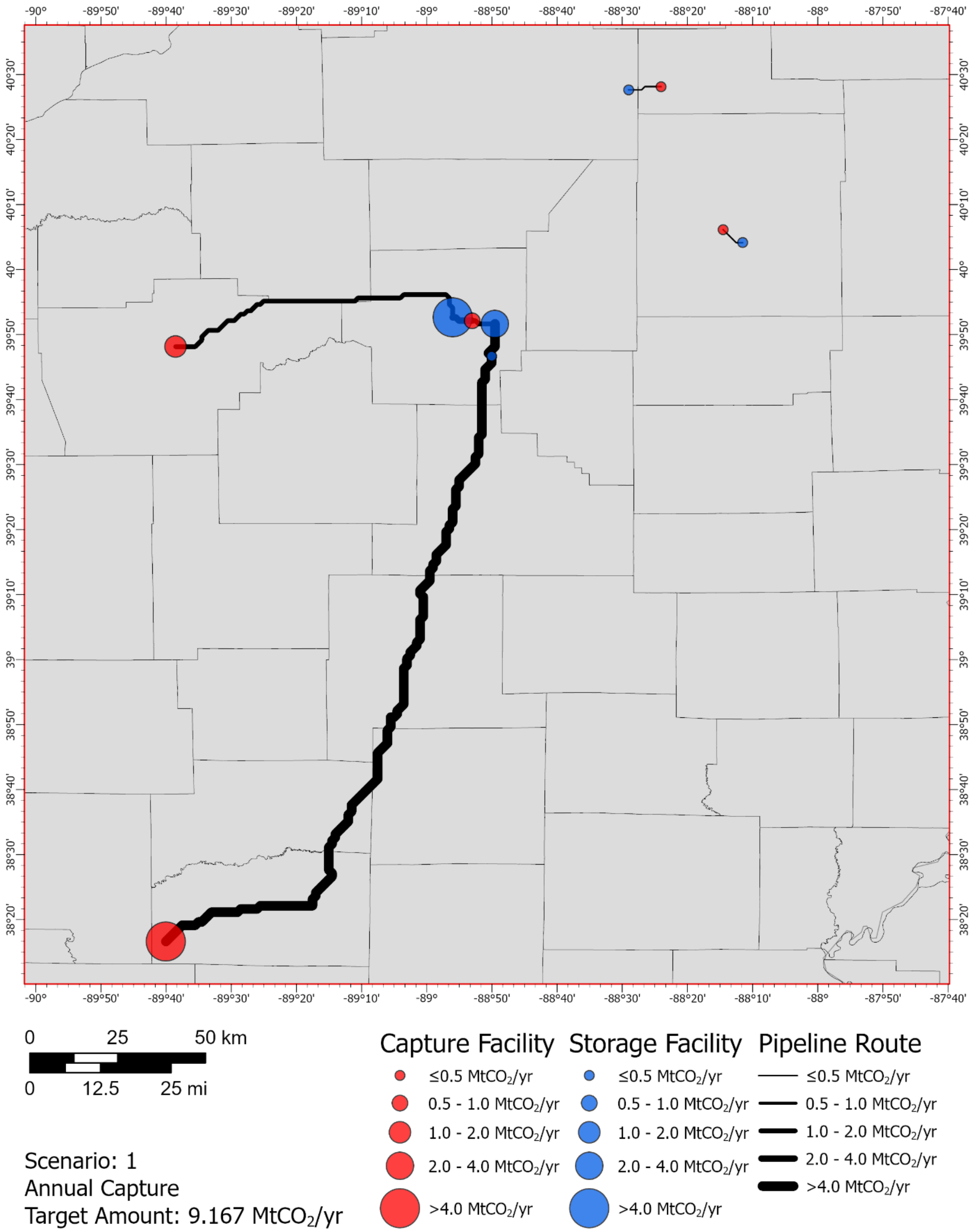

0 25 50 km
0 12.5 25 mi
Capture Facility
Storage Facility
Pipeline Route
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Scenario: 1
Annual Capture
Target Amount: 8.0 MtCO2/yr





Scenario: 1
Annual Capture
Target Amount: 9.0 $MtCO_2/yr$

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$



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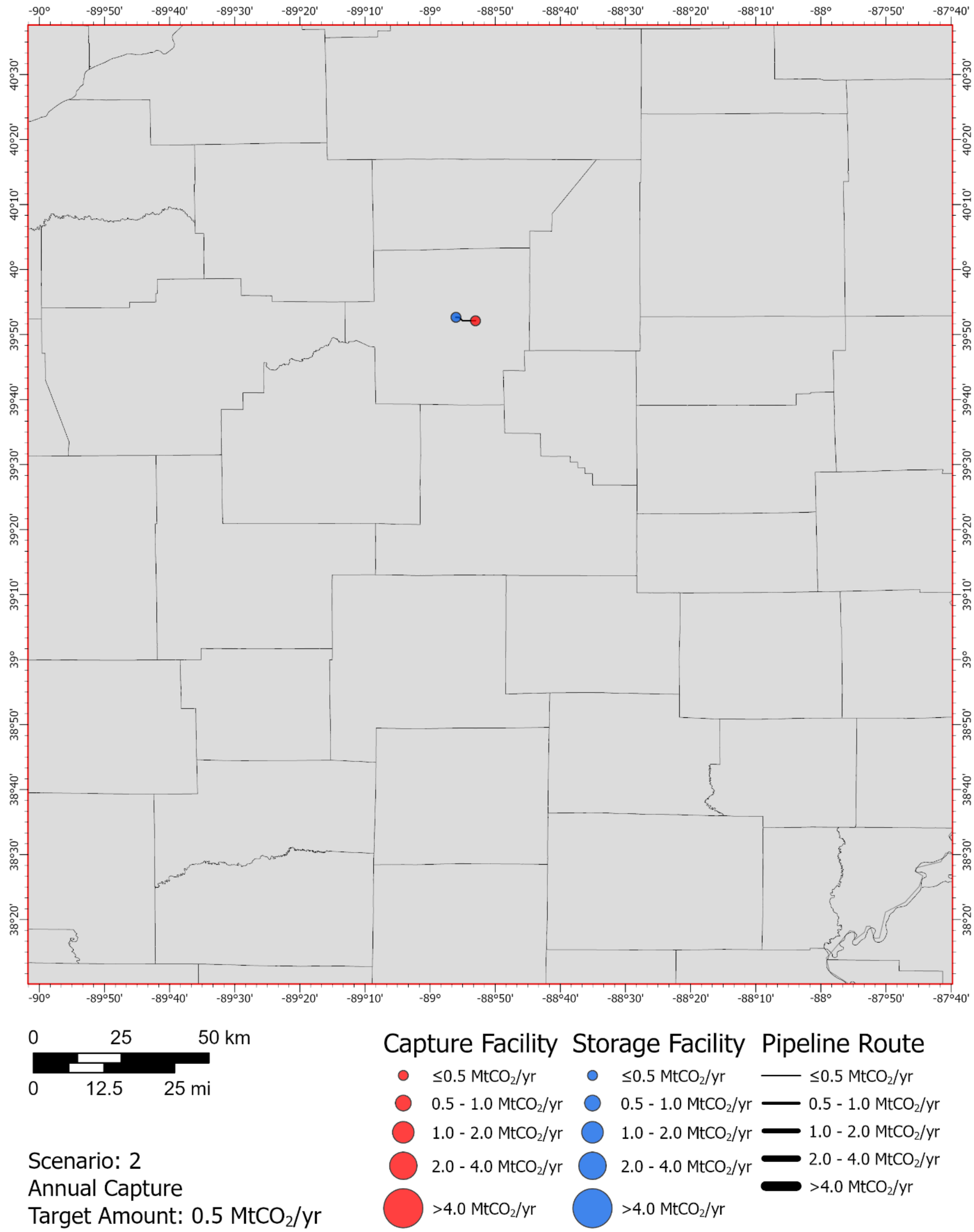
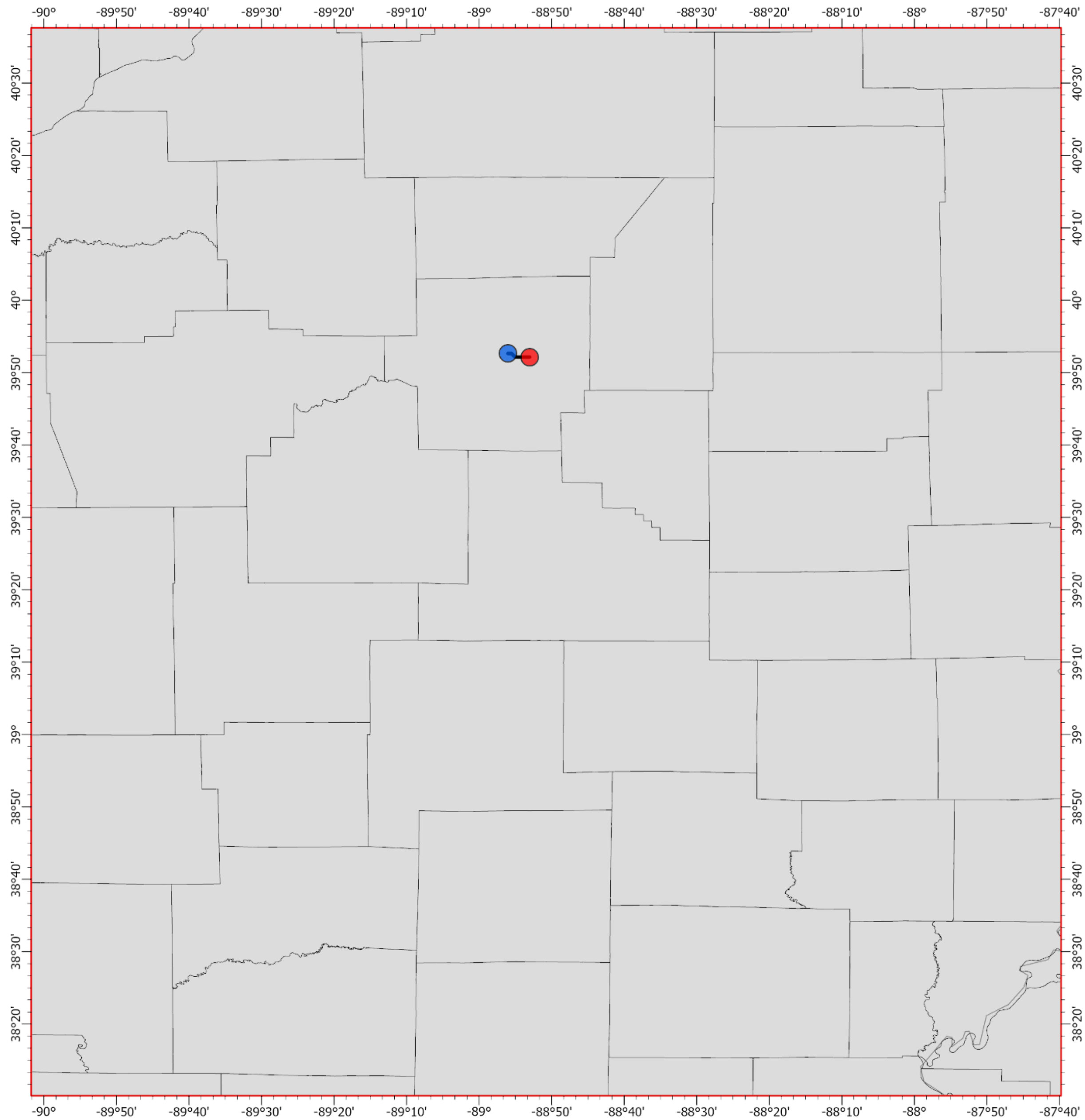
39°10'
39°
38°50'
38°40'
38°30'
38°20'
0
25
50 km
0
12.5
25 mi
Scenario: 1
Annual Capture
Target Amount: 9.167 $MtCO_2/yr$
Capture Facility
Storage Facility
Pipeline Route
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$



Scenario: 2
Annual Capture
Target Amount: 0.5 $MtCO_2$/yr

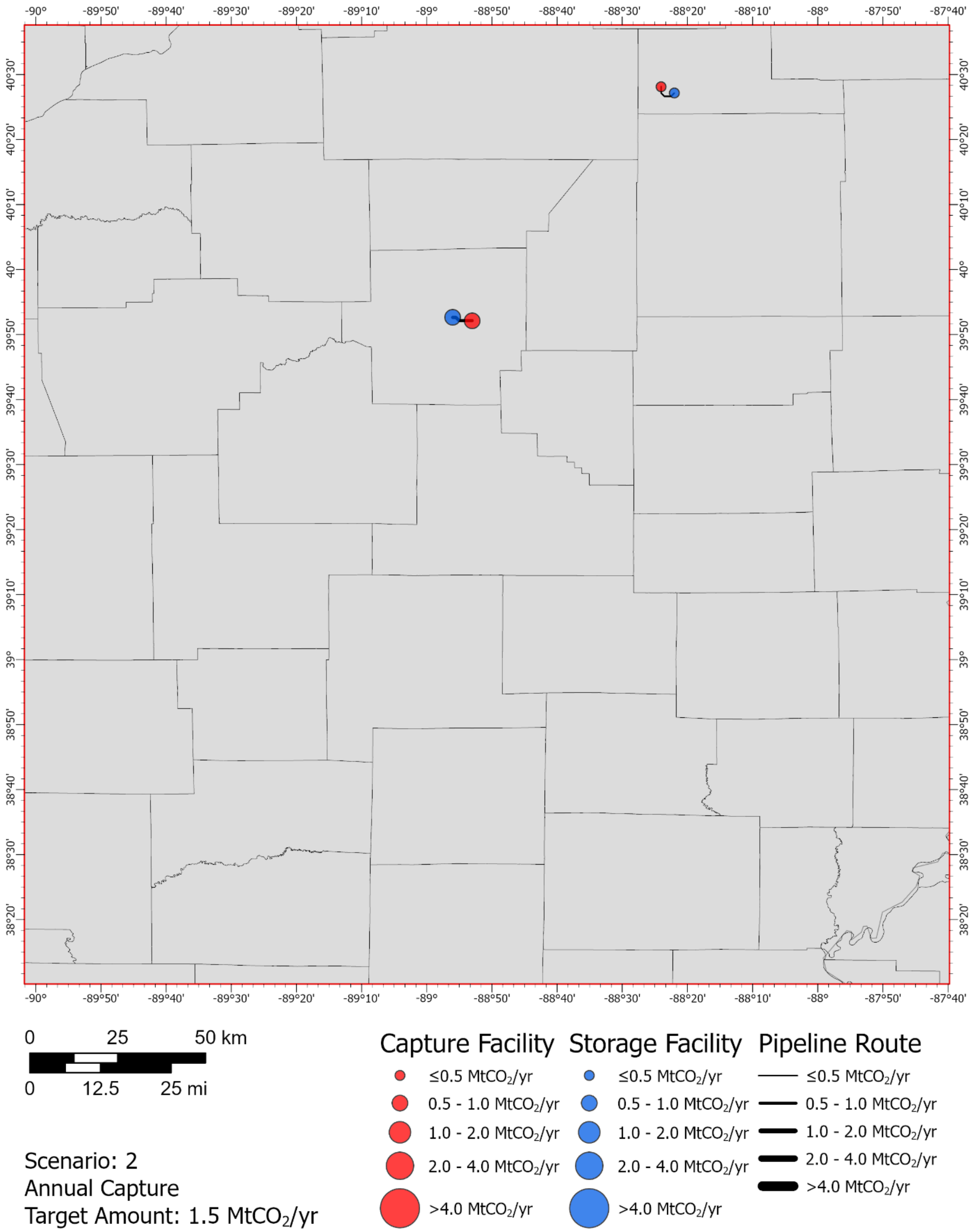


0 25 50 km

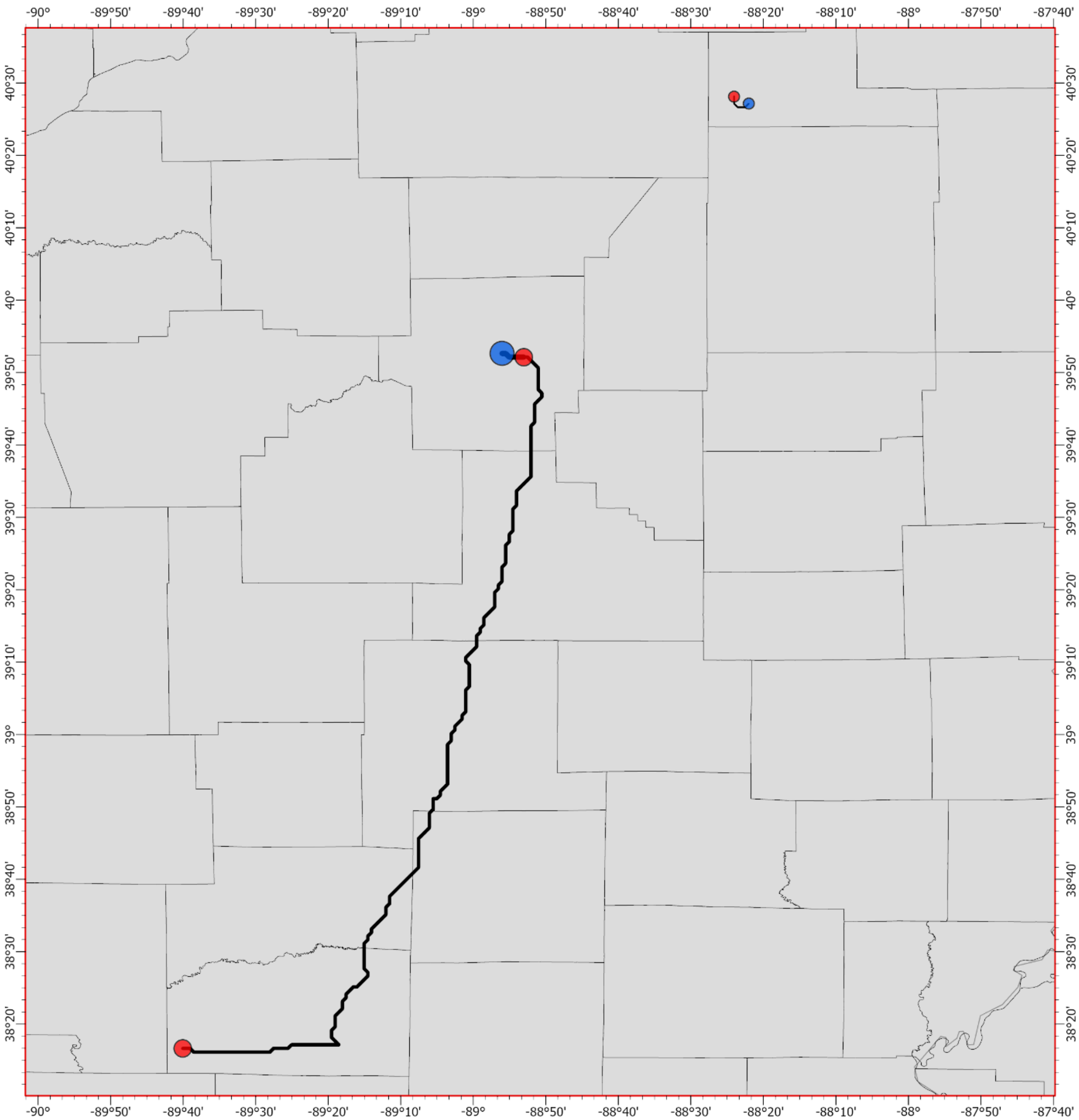
0 12.5 25 mi

Scenario: 2
Annual Capture
Target Amount: 1.0 $MtCO_2/yr$

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$



Scenario: 2
Annual Capture
Target Amount: 1.5 $MtCO_2/yr$

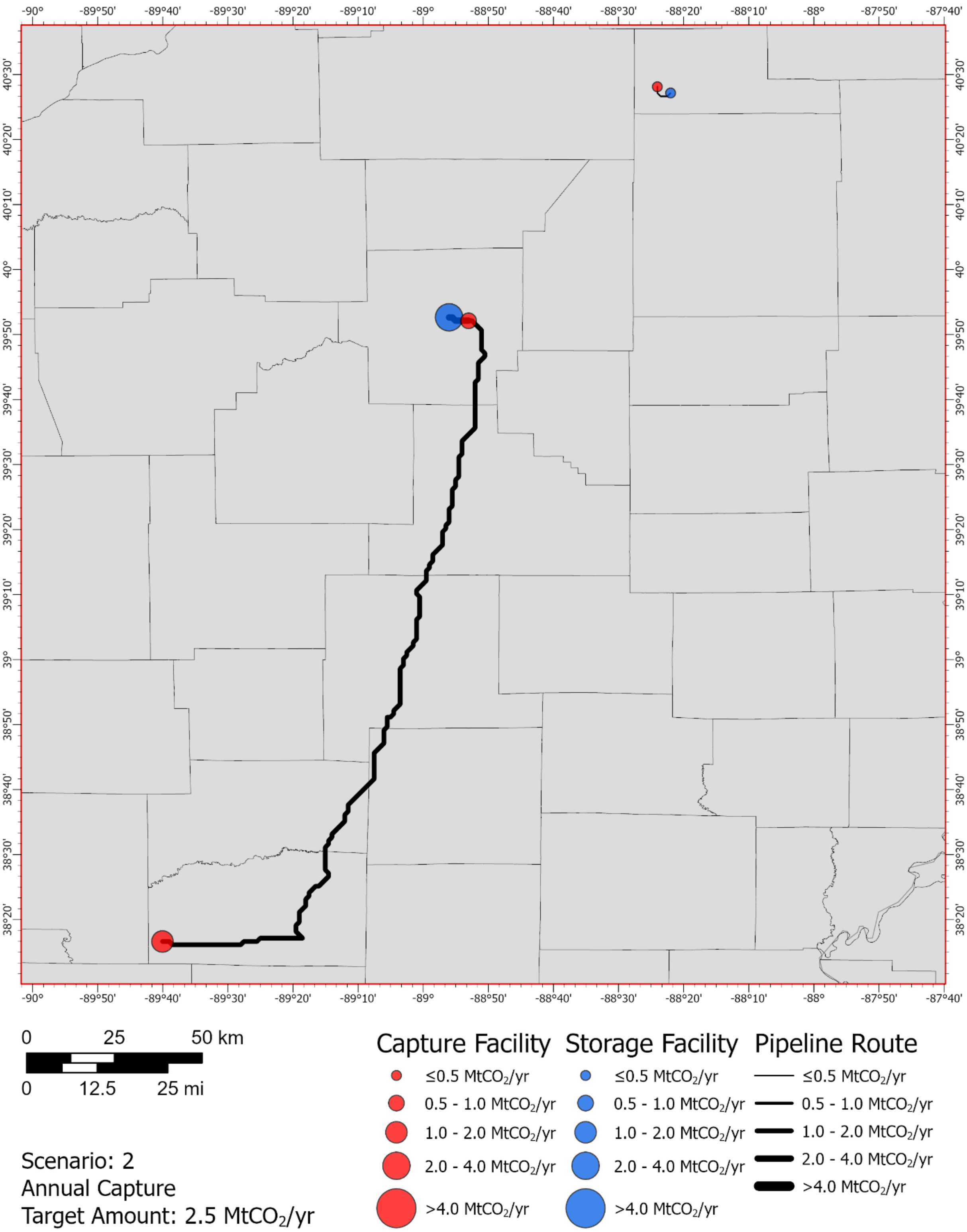


0 25 50 km

0 12.5 25 mi

Scenario: 2
Annual Capture
Target Amount: 2.0 $MtCO_2$/yr

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr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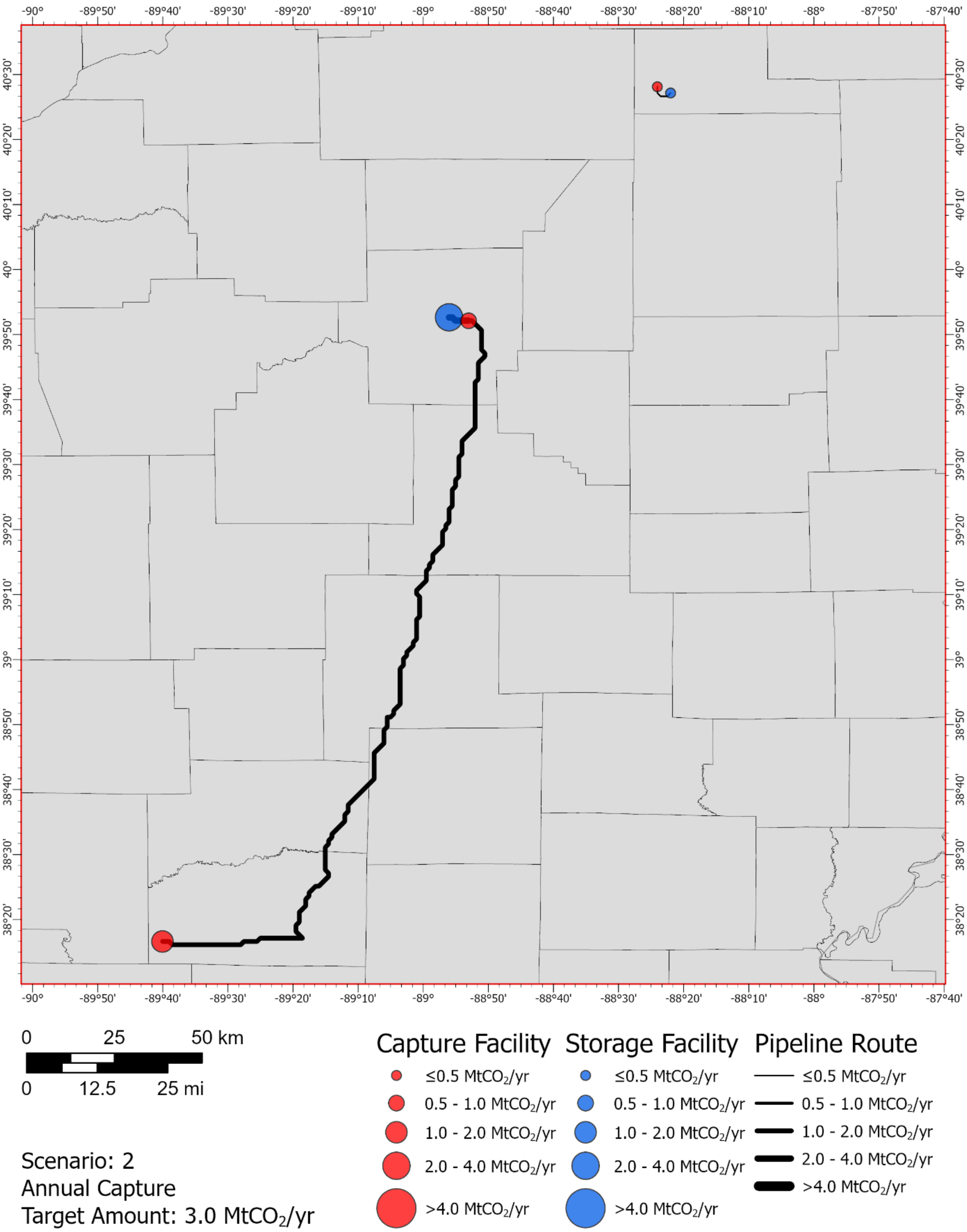
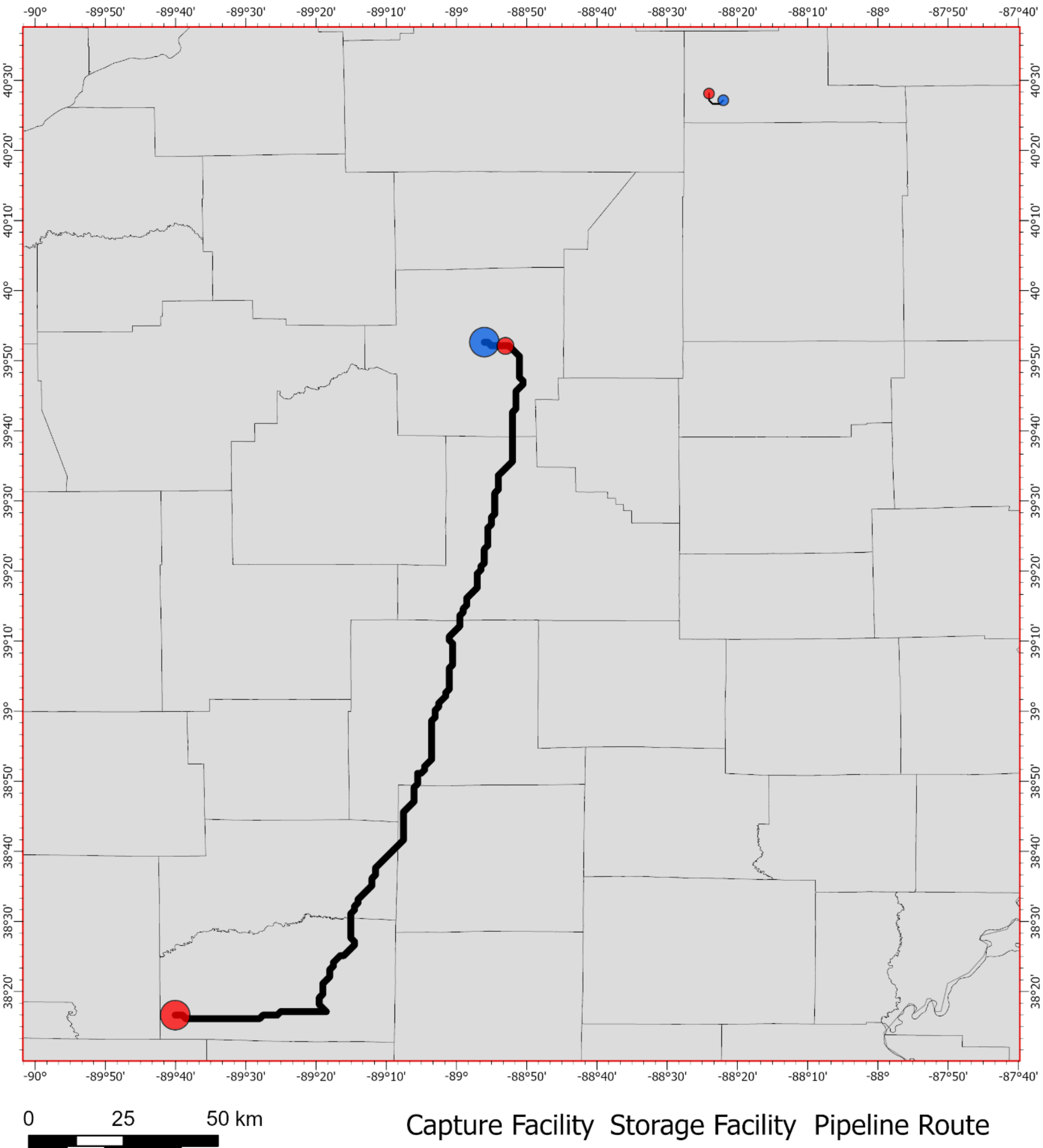
39°
38°50'
38°40'
38°30'
38°20'
0
25
50 km
0
12.5
25 mi
Capture Facility
Storage Facility
Pipeline Route
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Scenario: 2
Annual Capture
Target Amount: 2.5 $MtCO_2$/yr

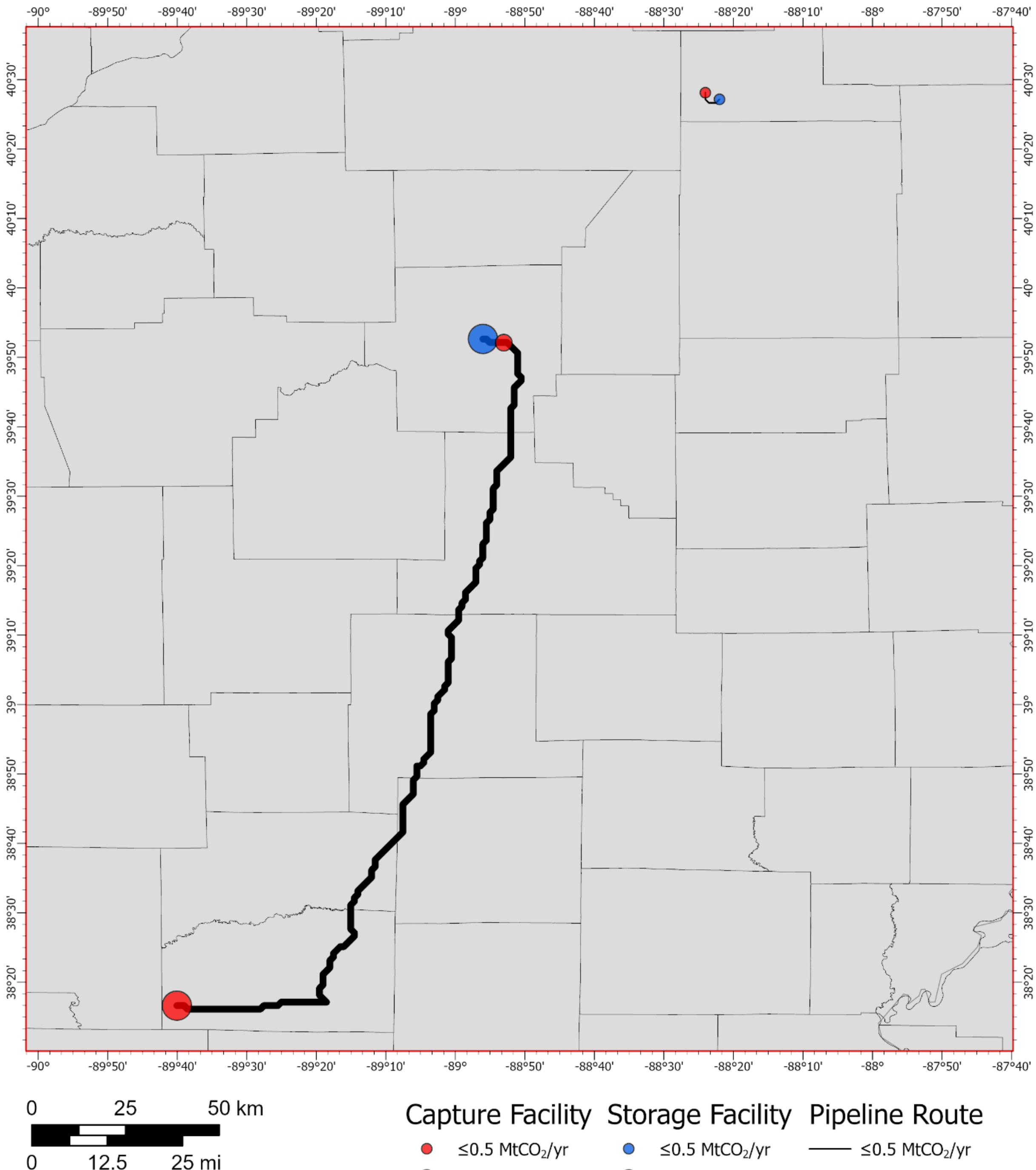


Scenario: 2
Annual Capture
Target Amount: 3.0 $MtCO_2$/yr



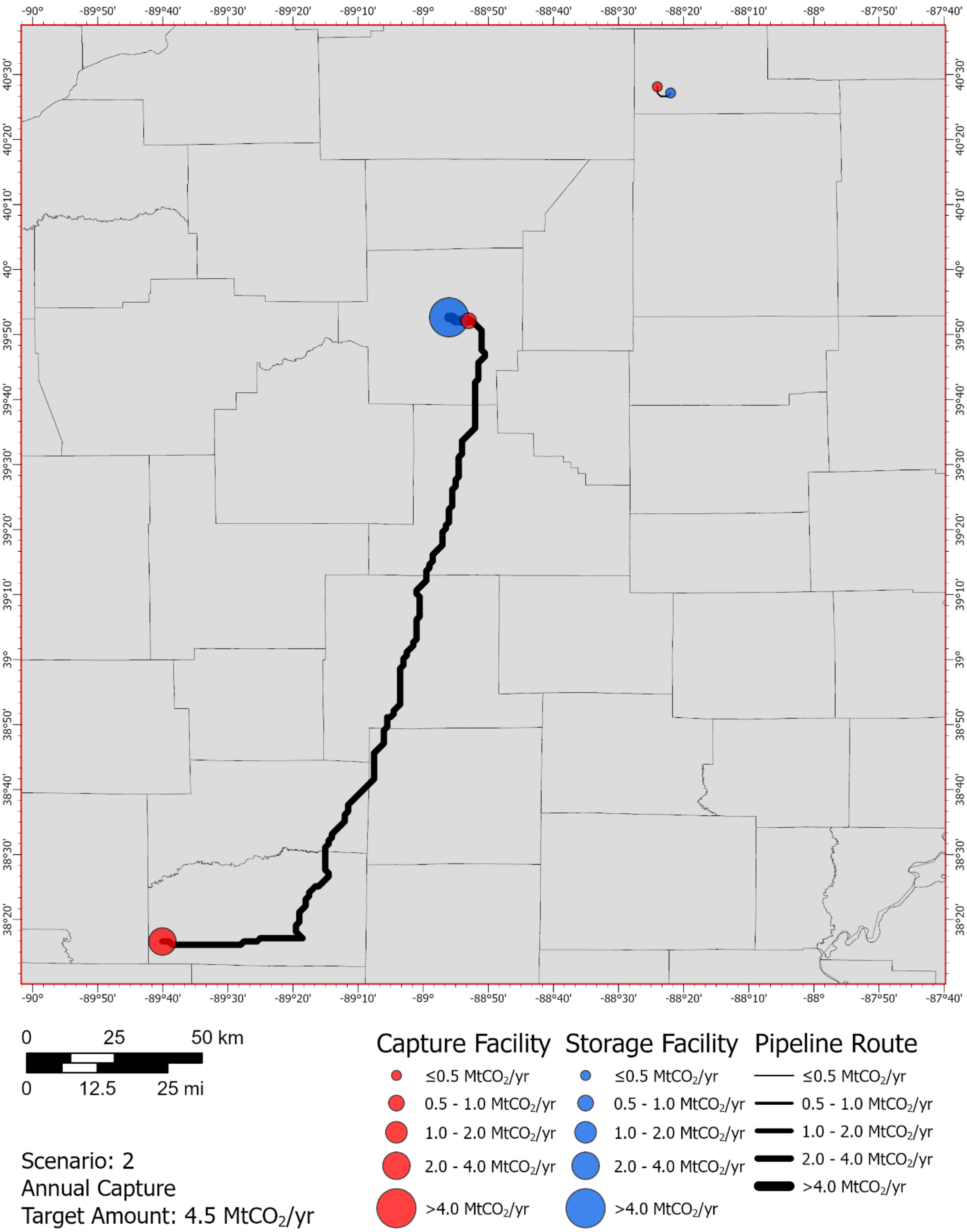
Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

Scenario: 2
Annual Capture
Target Amount: 3.5 $MtCO_2/yr$

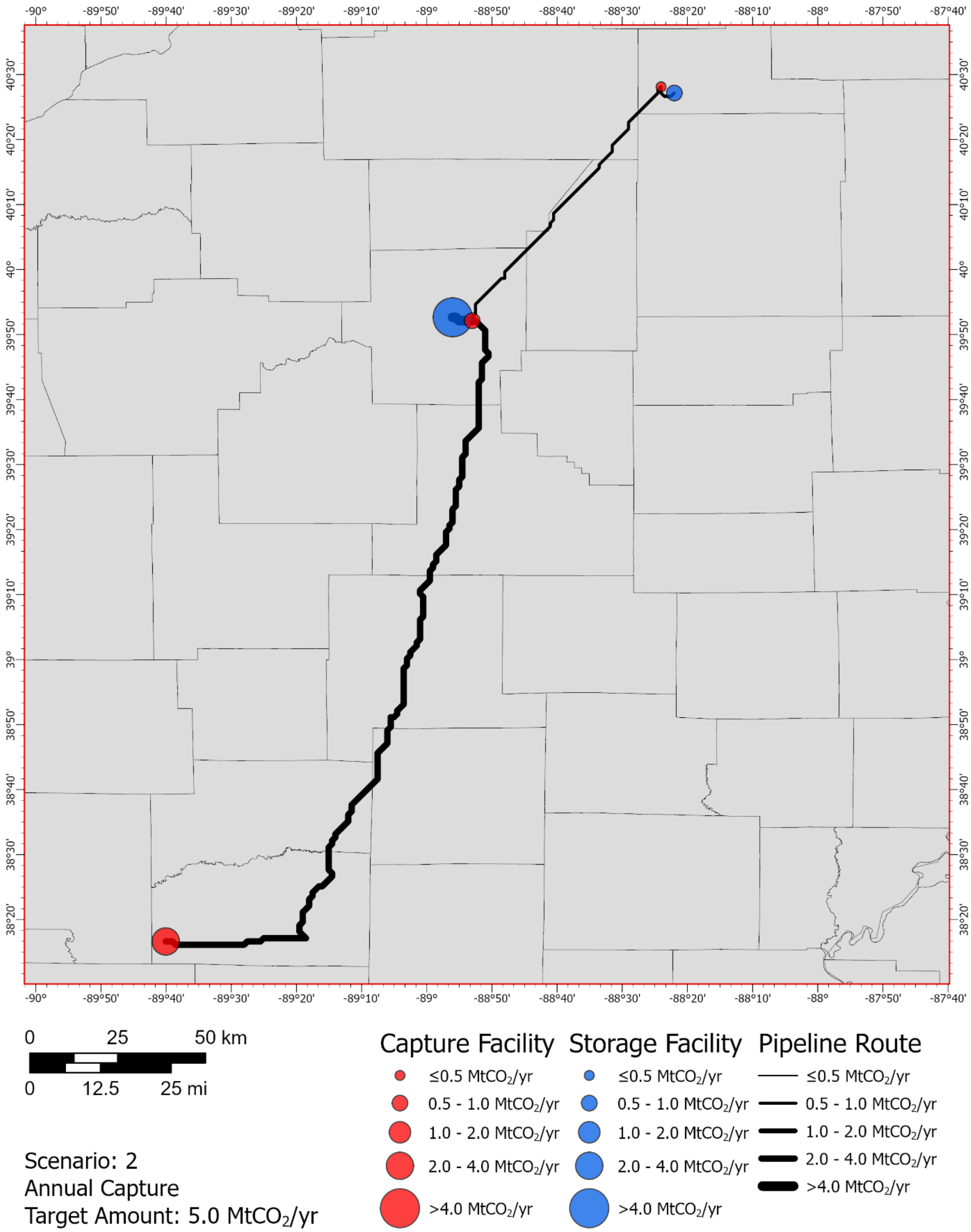


Scenario: 2
Annual Capture
Target Amount: 4.0 $MtCO_2/yr$

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$



Scenario: 2
Annual Capture
Target Amount: 4.5 $MtCO_2$/yr



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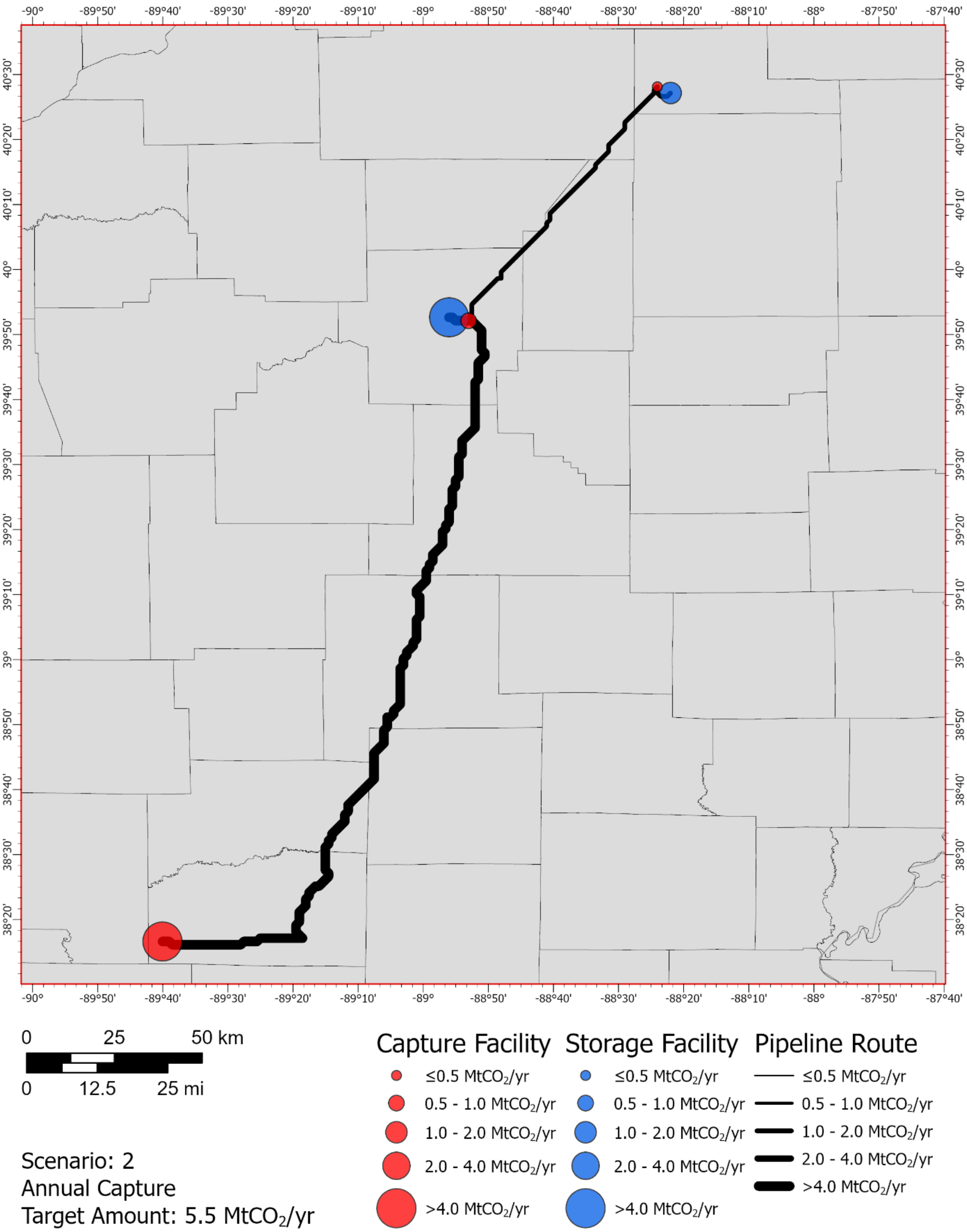
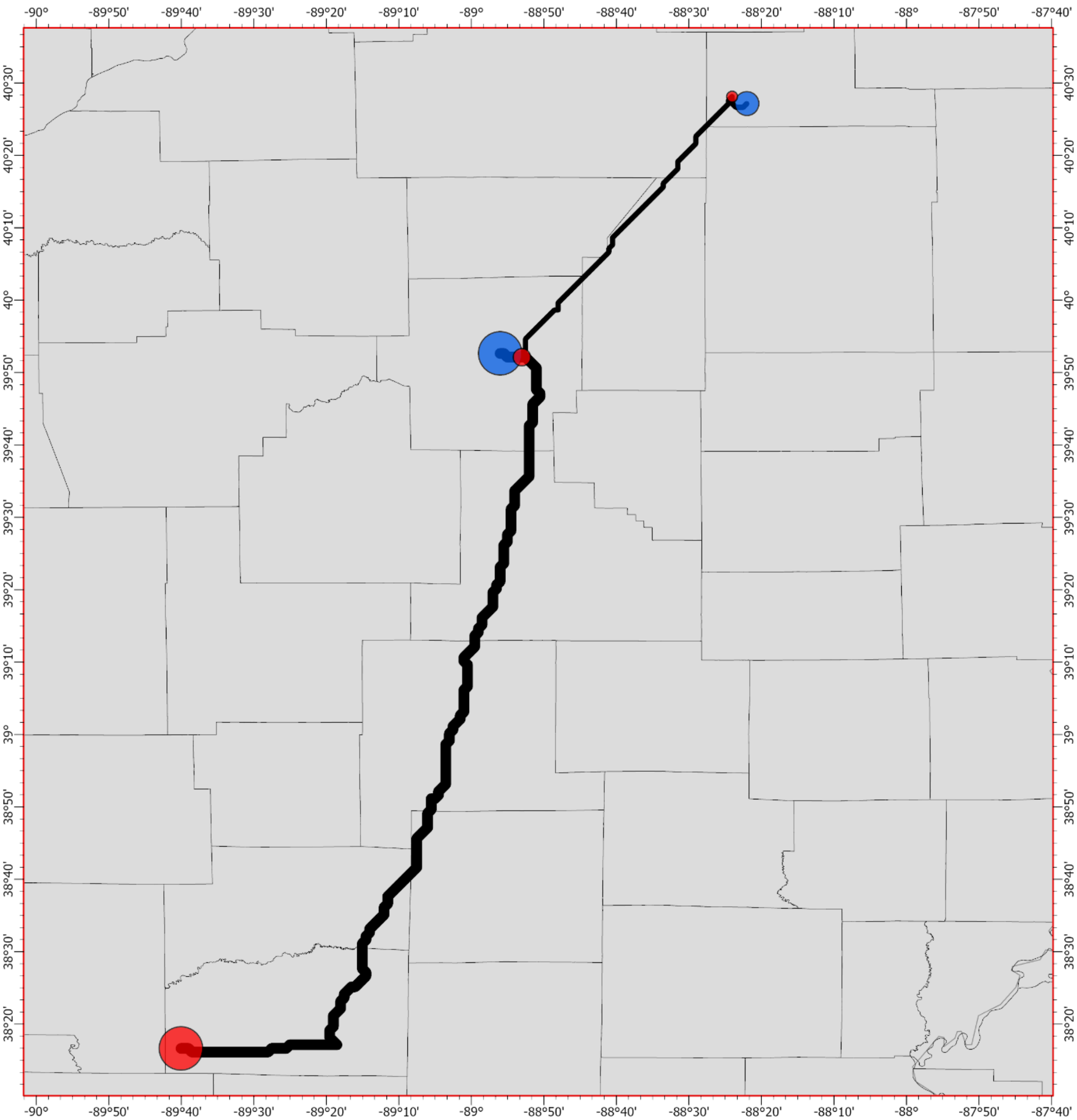
39°
38°50'
38°40'
38°30'
38°20'
0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Storage Facility
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Pipeline Route
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Scenario: 2
Annual Capture
Target Amount: 5.0 MtCO2/yr



Scenario: 2
Annual Capture
Target Amount: 5.5 $MtCO_2/yr$

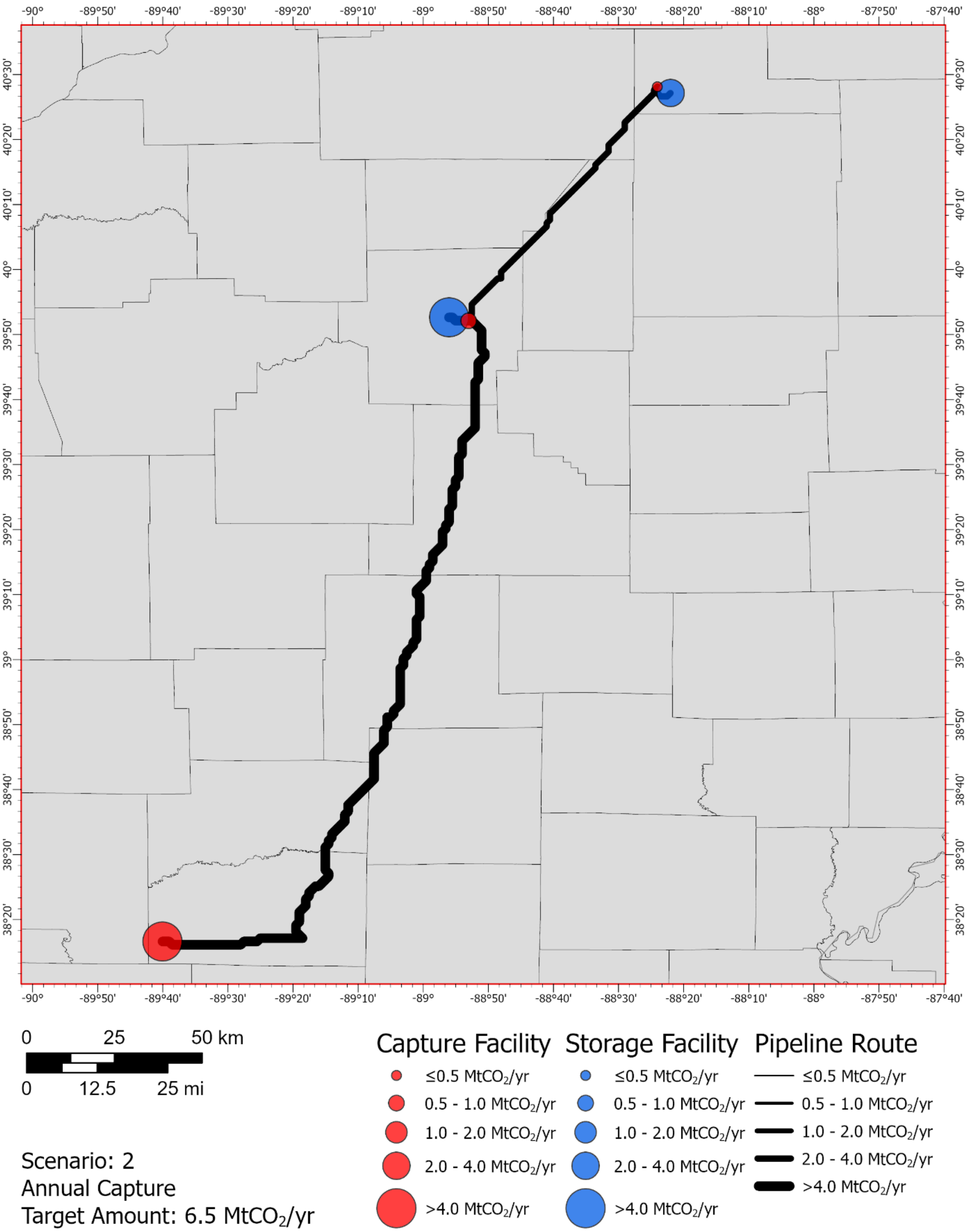


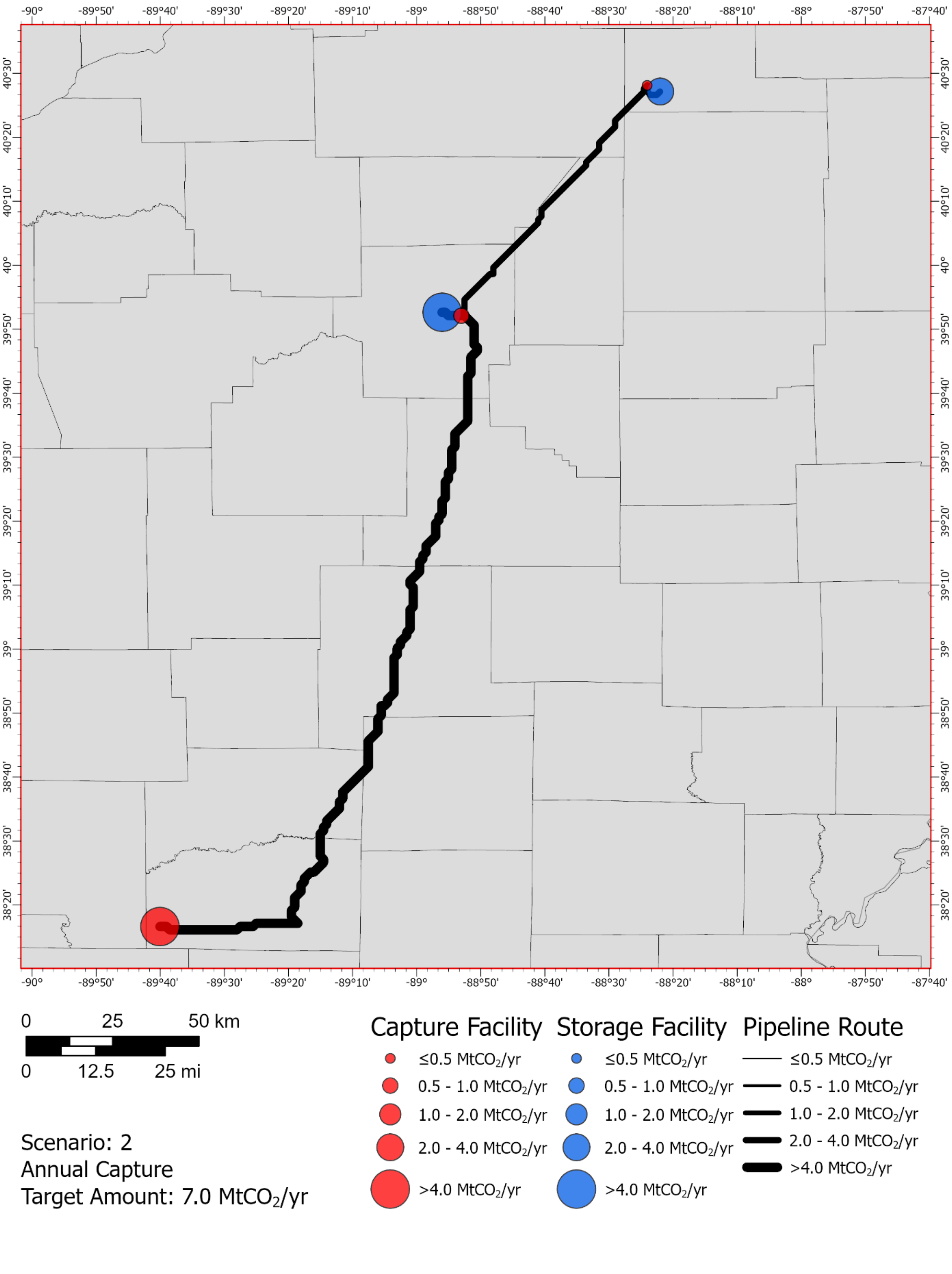
0 25 50 km

0 12.5 25 mi

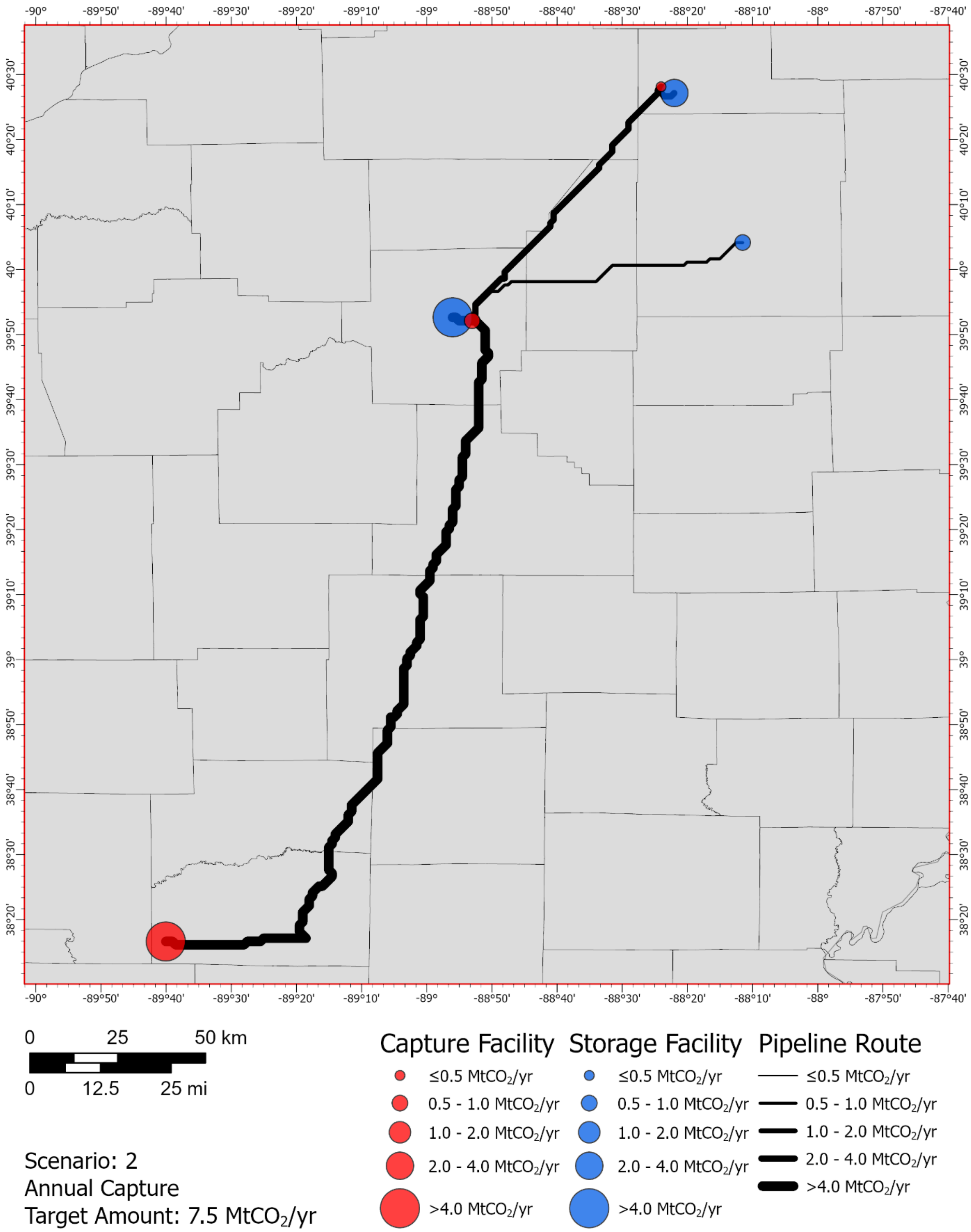
Scenario: 2
Annual Capture
Target Amount: 6.0 $MtCO_2/yr$

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$


0 25 50 km
0 12.5 25 mi
Capture Facility
Storage Facility
Pipeline Route
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Scenario: 2
Annual Capture
Target Amount: 6.5 MtCO2/yr



Scenario: 2
Annual Capture
Target Amount: 7.0 $MtCO_2$/yr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39°10'
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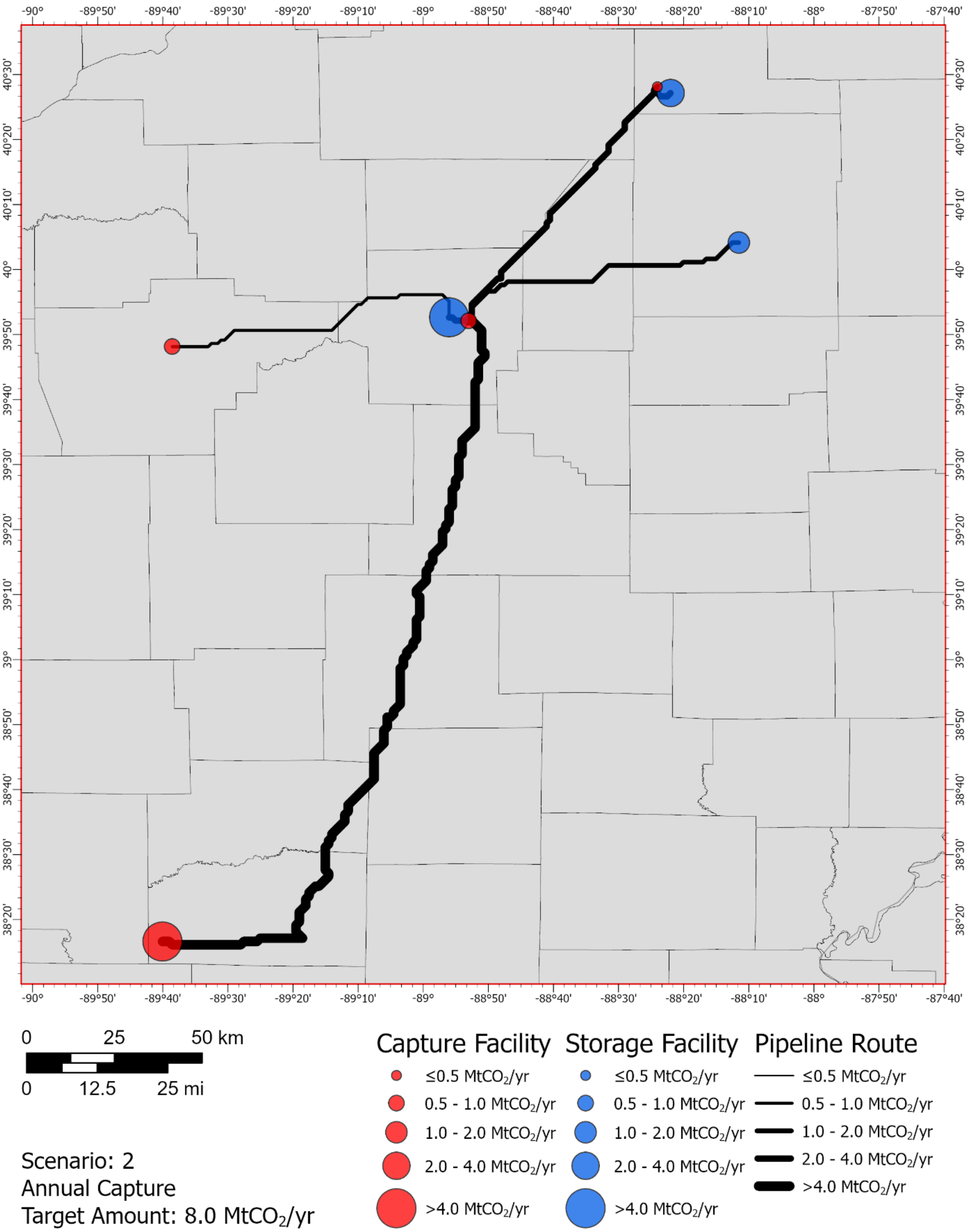
38°50'
38°40'
38°30'
38°20'
0 25 50 km
0 12.5 25 mi
Scenario: 2
Annual Capture
Target Amount: 7.5 $MtCO_2/yr$
Capture Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Storage Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Pipeline Route
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$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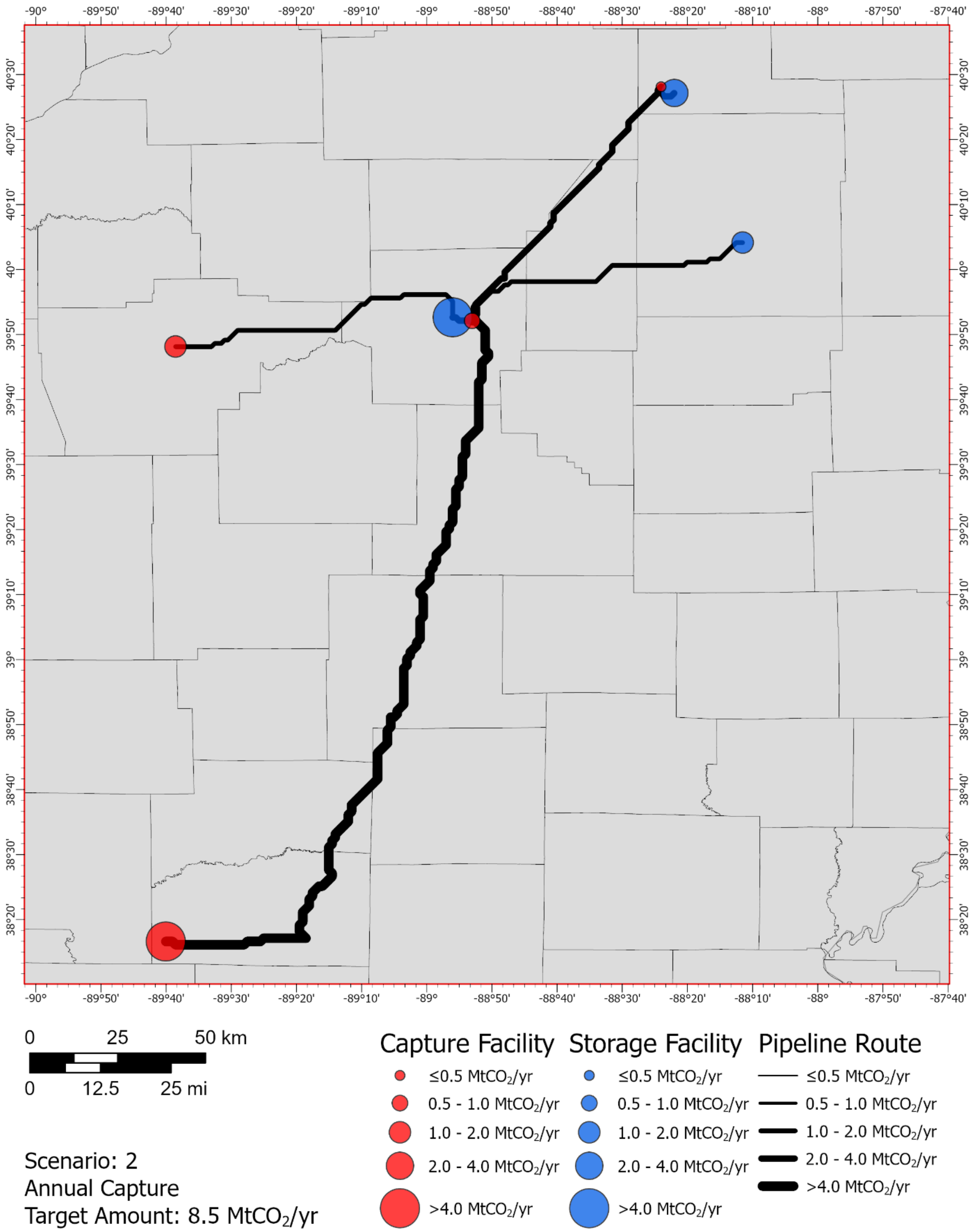
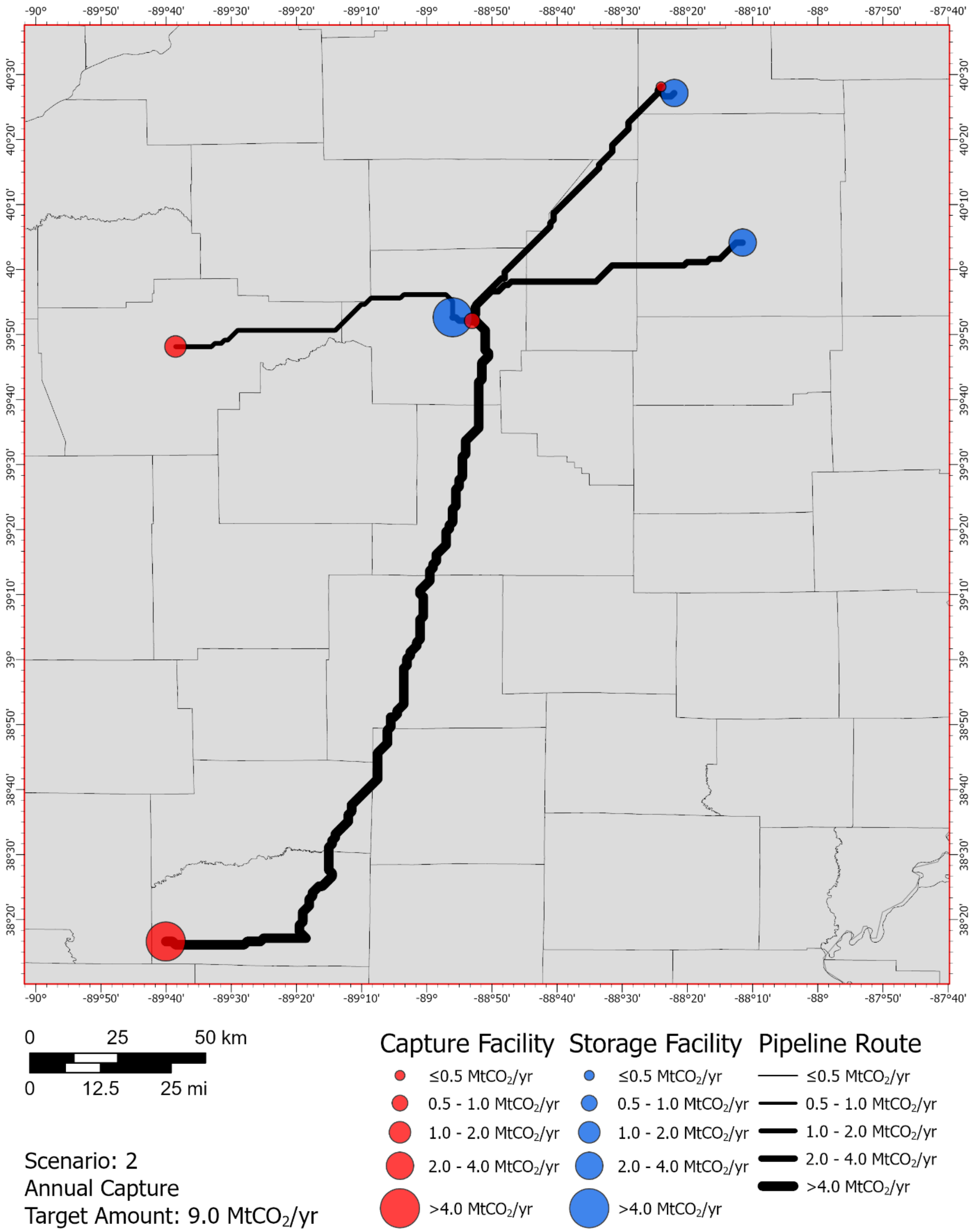
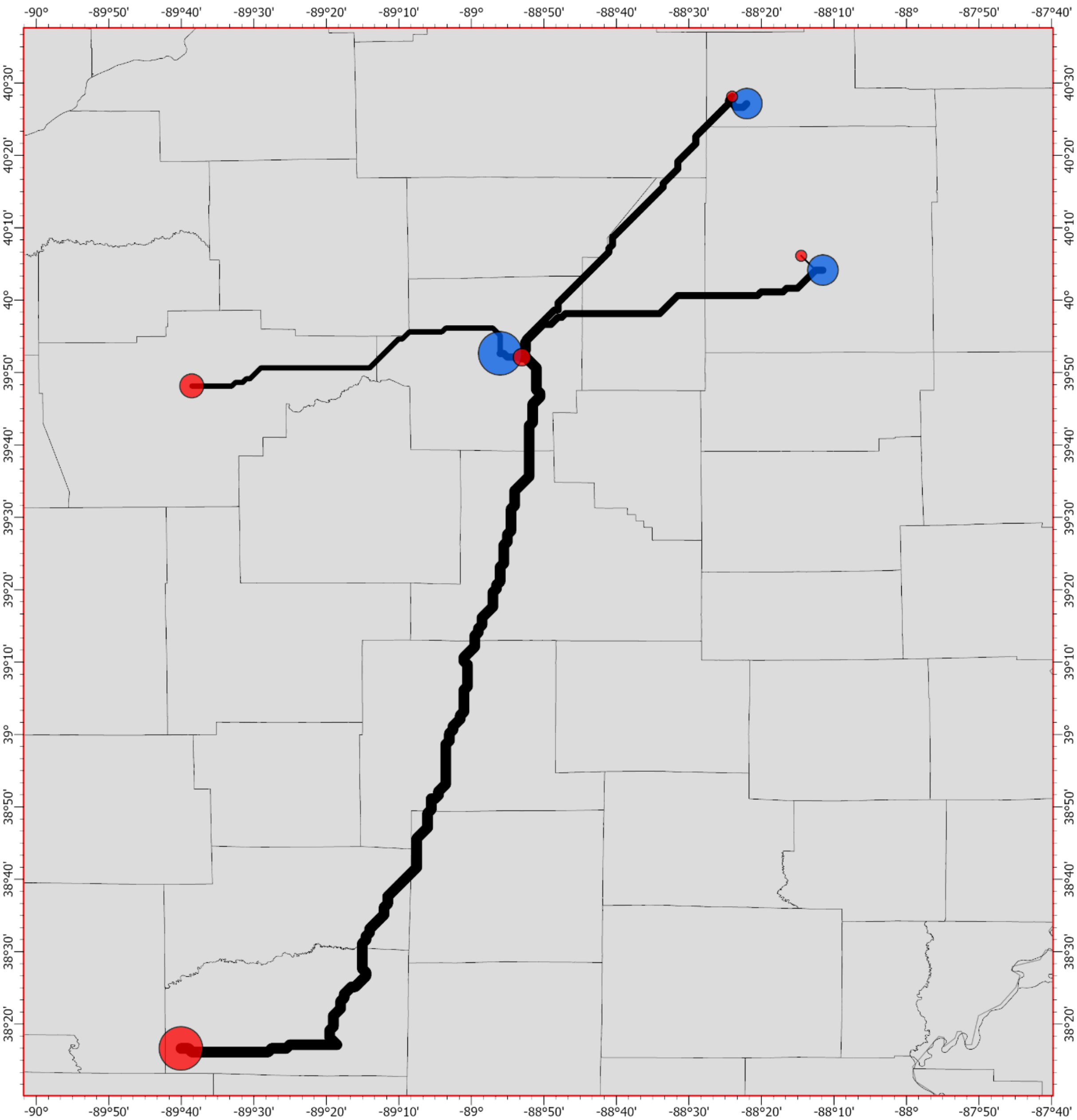
39°30'
39°20'
39°10'
39°
38°50'
38°40'
38°30'
38°20'
0
25
50 km
0
12.5
25 mi
Capture Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Storage Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Pipeline Route
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Scenario: 2
Annual Capture
Target Amount: 8.0 $MtCO_2/yr$



-90° -89°50' -89°40' -89°30' -89°20' -89°10' -89° -88°50' -88°40' -88°30' -88°20' -88°10' -88° -87°50' -87°40'
40°30' 40°20' 40°10' 40° 39°50' 39°40' 39°30' 39°20' 39°10' 39° 38°50' 38°40' 38°30' 38°20'
0 25 50 km
0 12.5 25 mi
Capture Facility
Storage Facility
Pipeline Route
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Scenario: 2
Annual Capture
Target Amount: 8.5 $MtCO_2$/yr



Scenario: 2
Annual Capture
Target Amount: 9.0 $MtCO_2$/yr

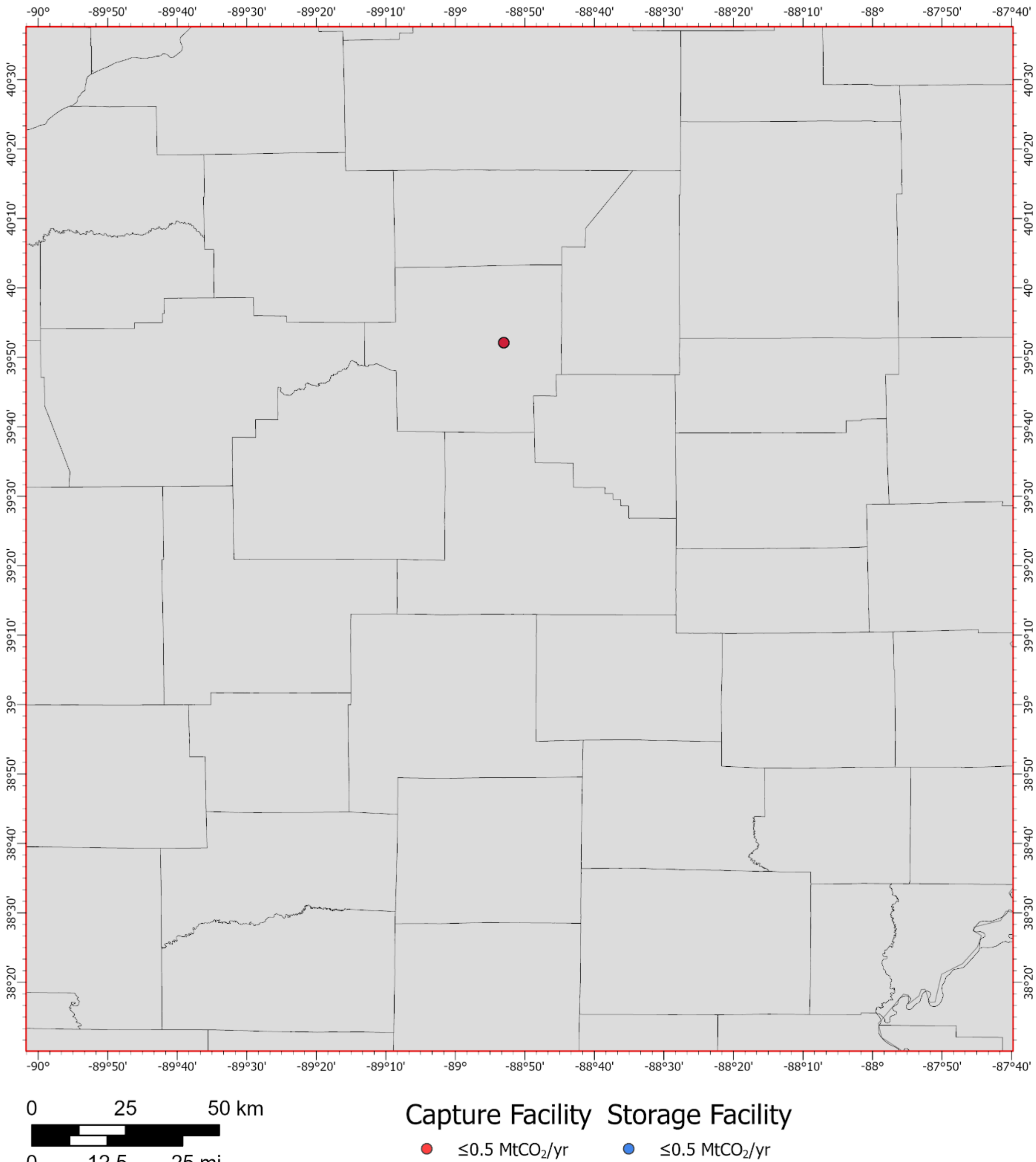


0 25 50 km

0 12.5 25 mi

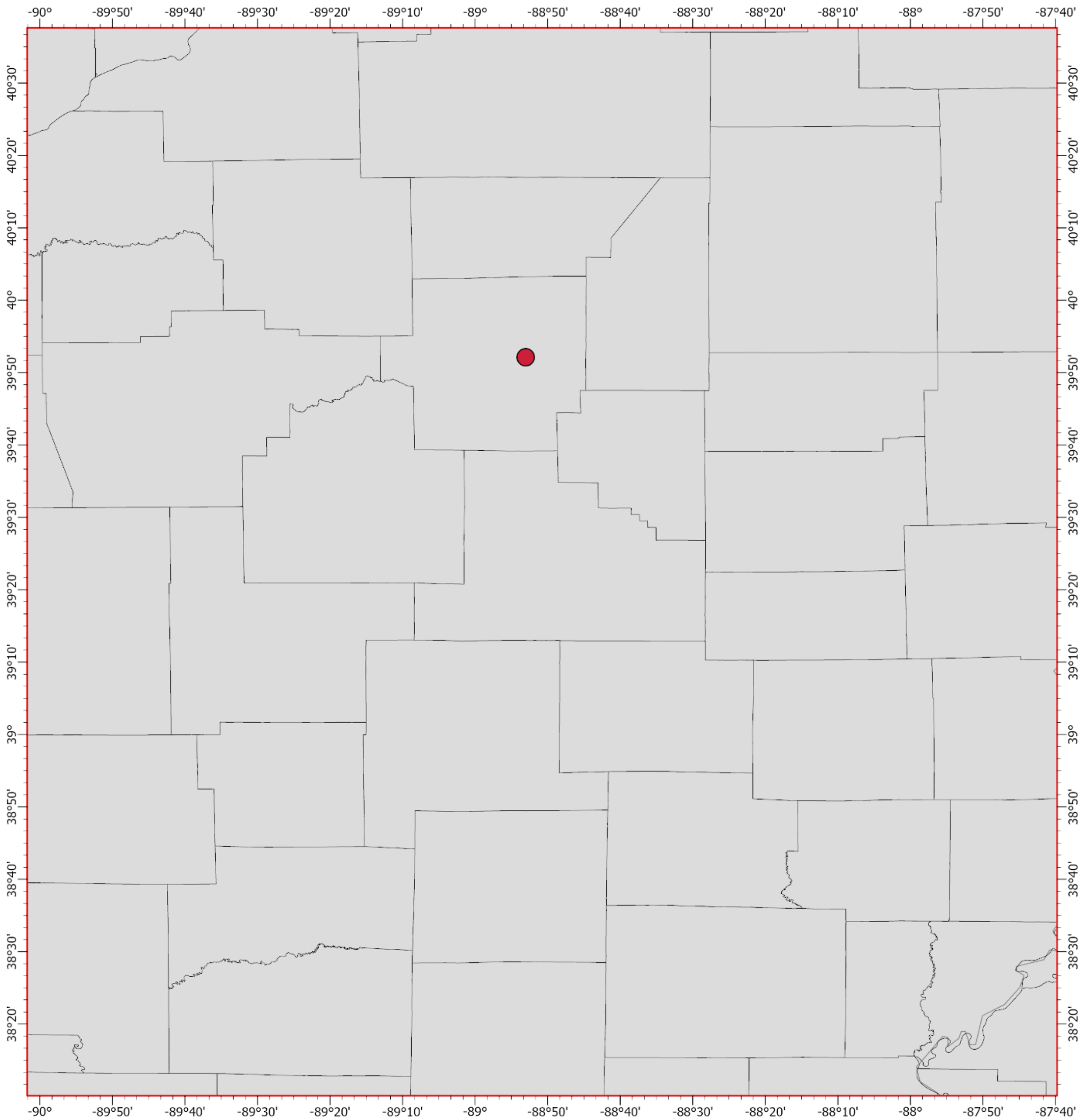
Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

Scenario: 2
Annual Capture
Target Amount: 9.167 $MtCO_2/yr$



Scenario: 3
Annual Capture
Target Amount: 0.5 $MtCO_2/yr$

Capture Facility	Storage Facility
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

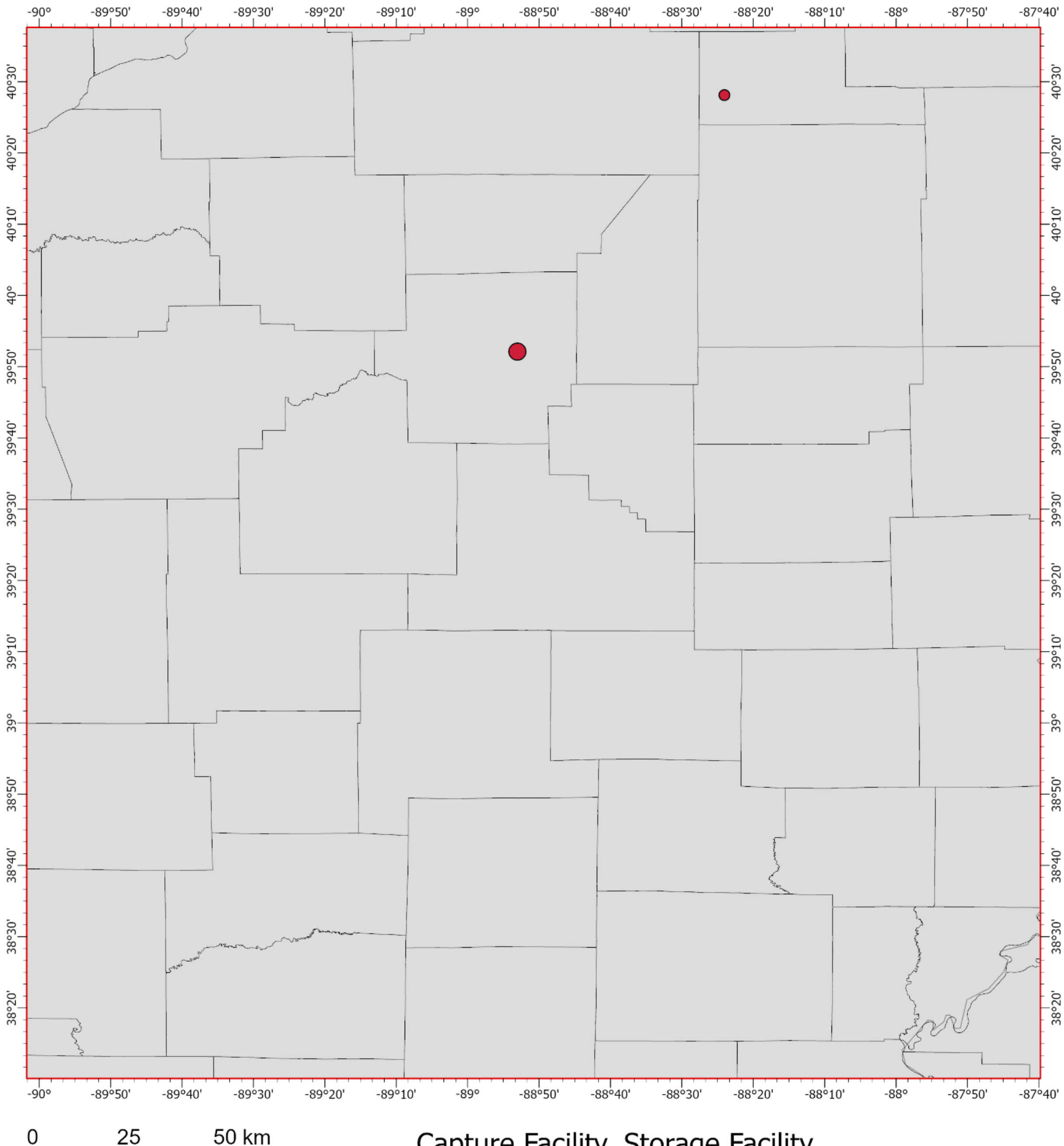


0 25 50 km

0 12.5 25 mi

Scenario: 3
Annual Capture
Target Amount: 1.0 $MtCO_2/yr$

Capture Facility	Storage Facility
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$



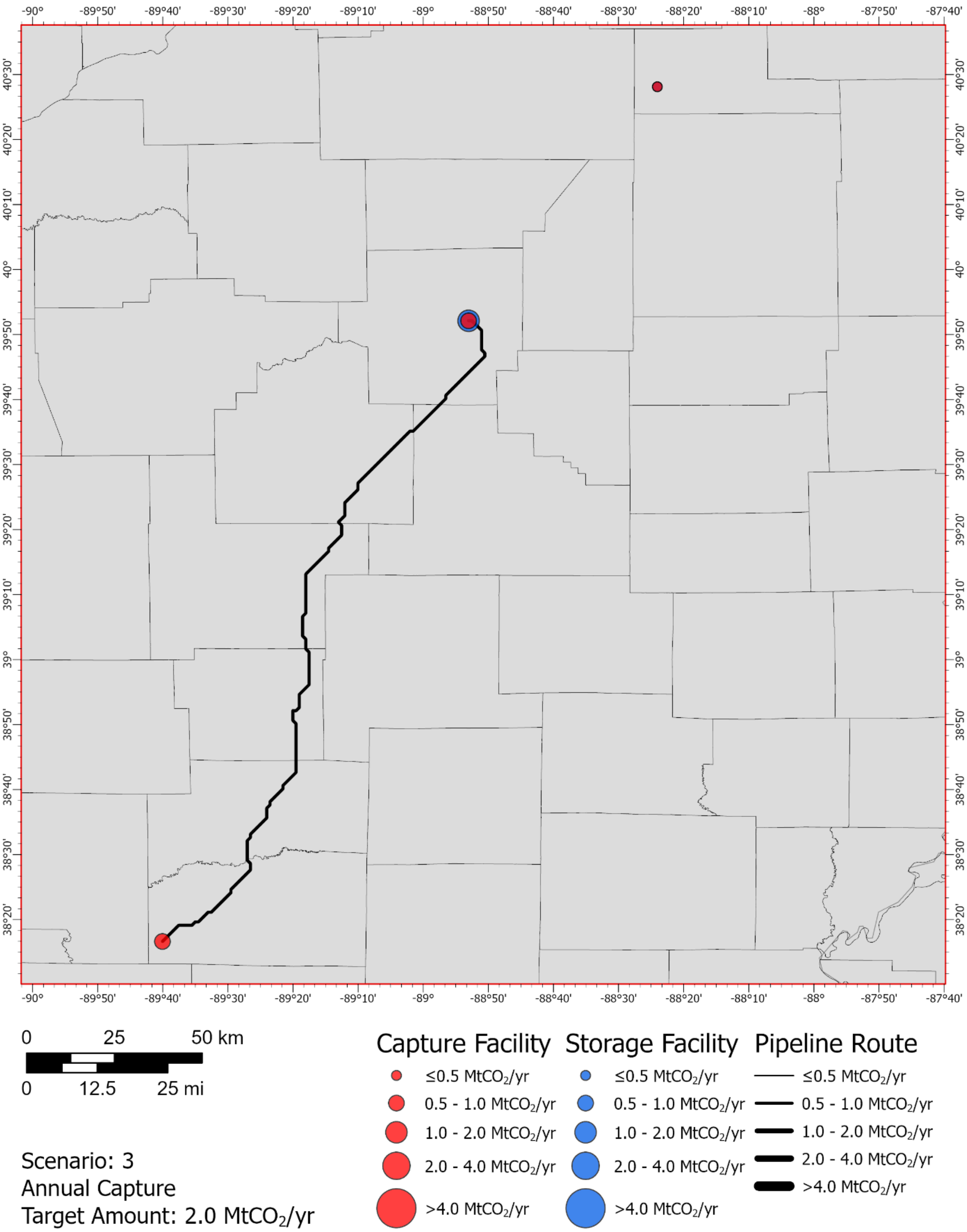
Capture Facility

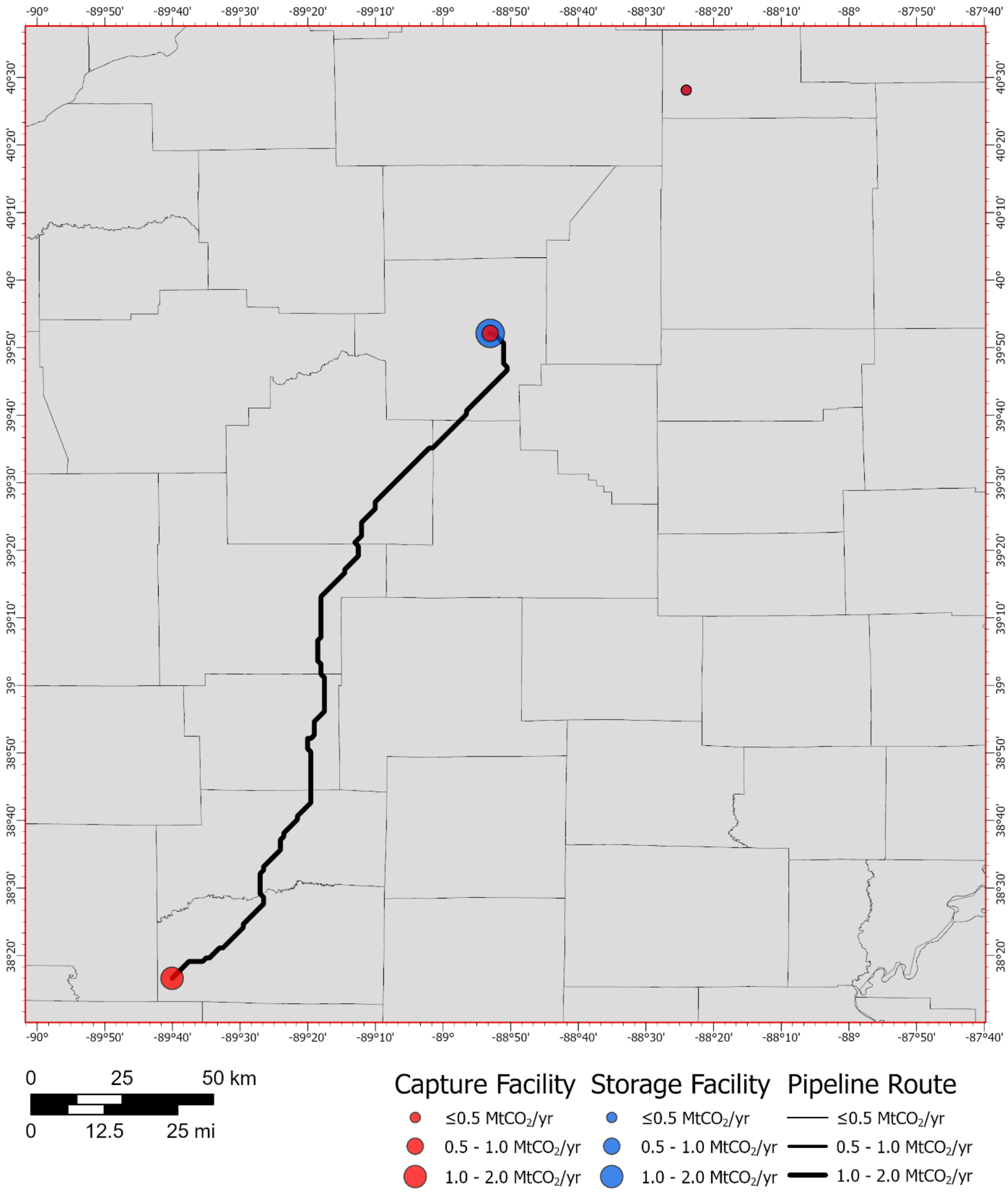
- ≤0.5 $MtCO_2/yr$
- 0.5 - 1.0 $MtCO_2/yr$
- 1.0 - 2.0 $MtCO_2/yr$
- 2.0 - 4.0 $MtCO_2/yr$
- >4.0 $MtCO_2/yr$

Storage Facility

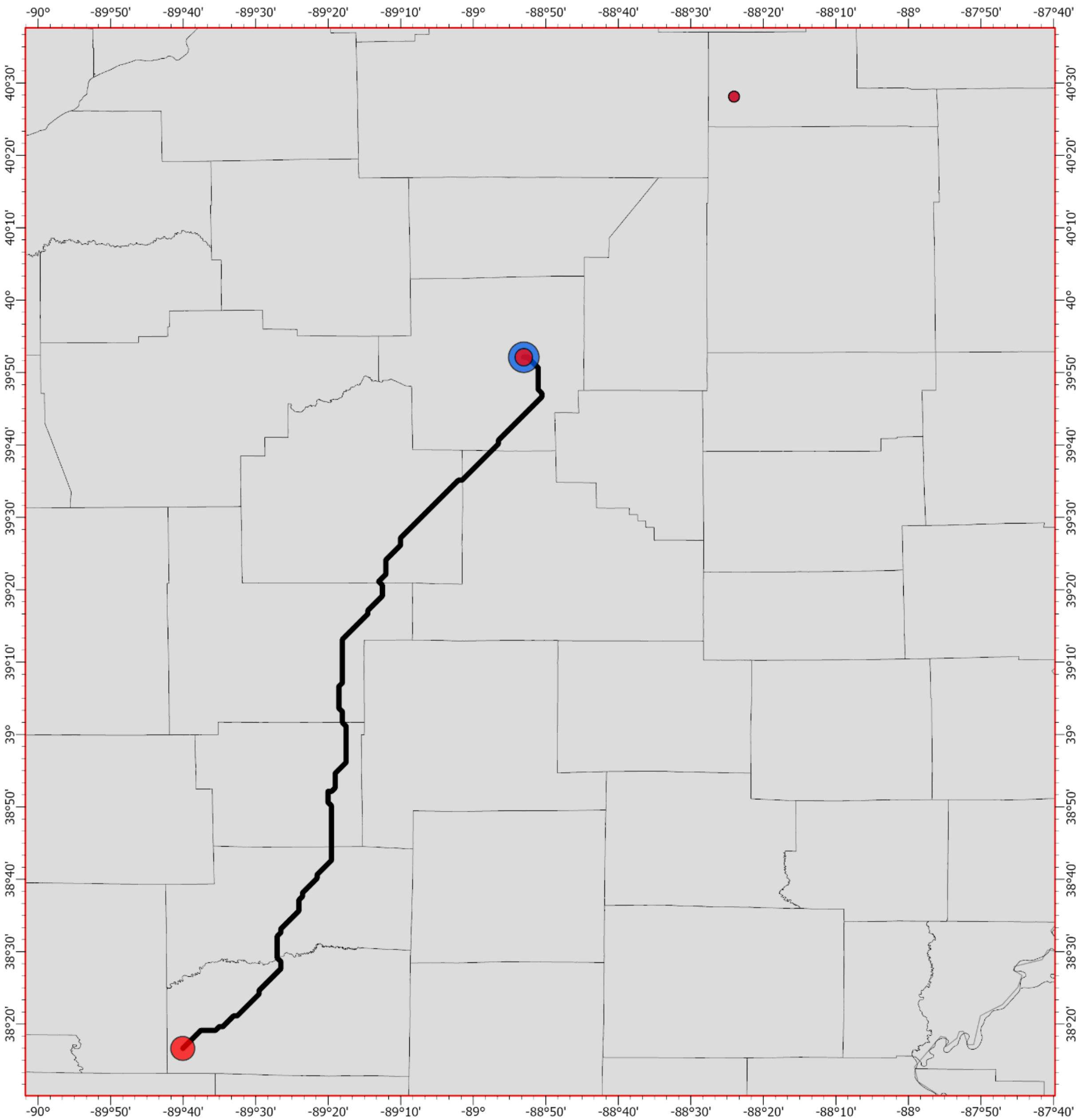
- ≤0.5 $MtCO_2/yr$
- 0.5 - 1.0 $MtCO_2/yr$
- 1.0 - 2.0 $MtCO_2/yr$
- 2.0 - 4.0 $MtCO_2/yr$
- >4.0 $MtCO_2/yr$

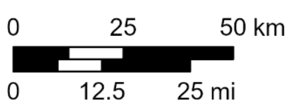
Scenario: 3
Annual Capture
Target Amount: 1.5 $MtCO_2/yr$


0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Storage Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Pipeline Route
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Scenario: 3
Annual Capture
Target Amount: 2.0 $MtCO_2$/yr



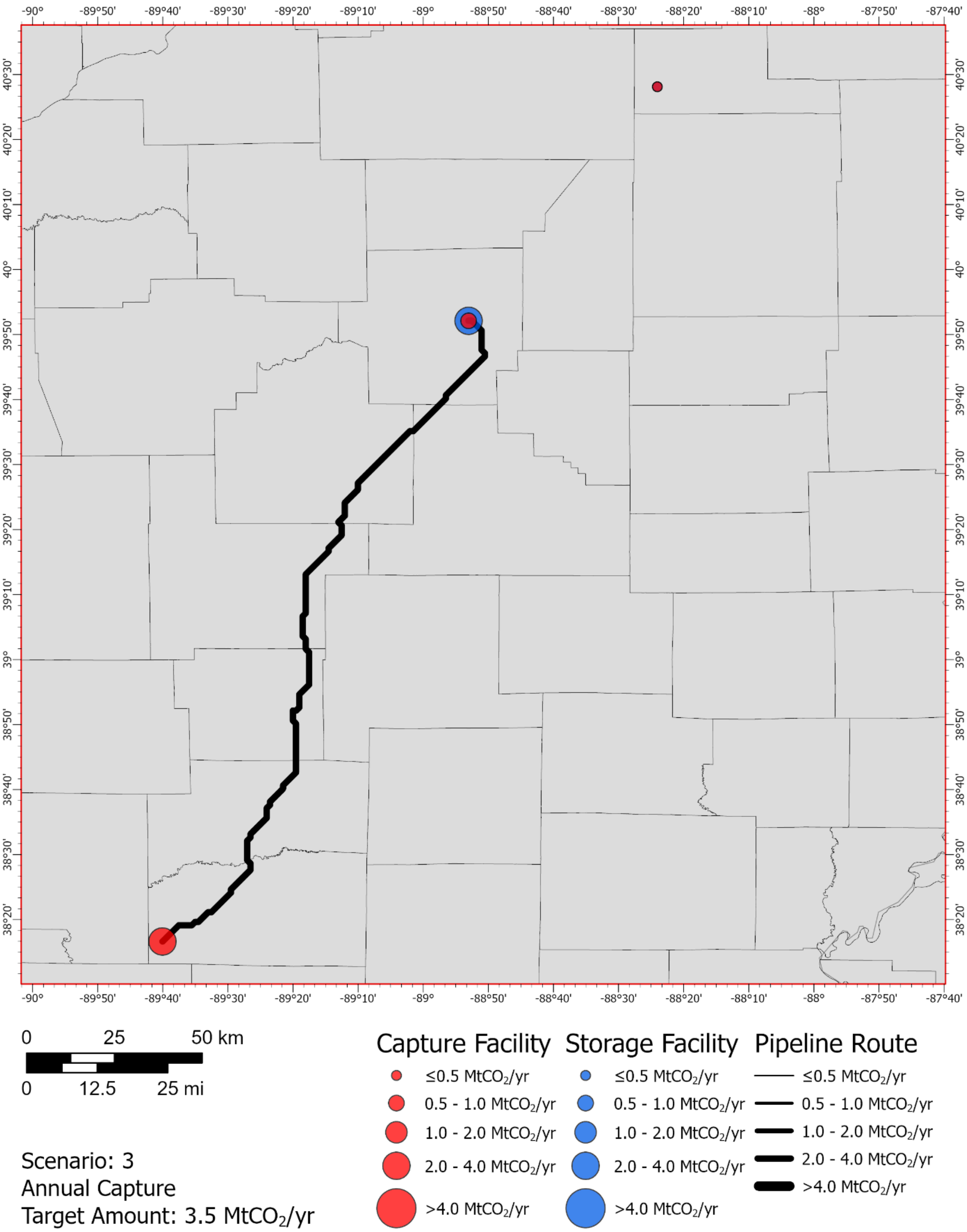
Scenario: 3
Annual Capture
Target Amount: 2.5 $MtCO_2$/yr



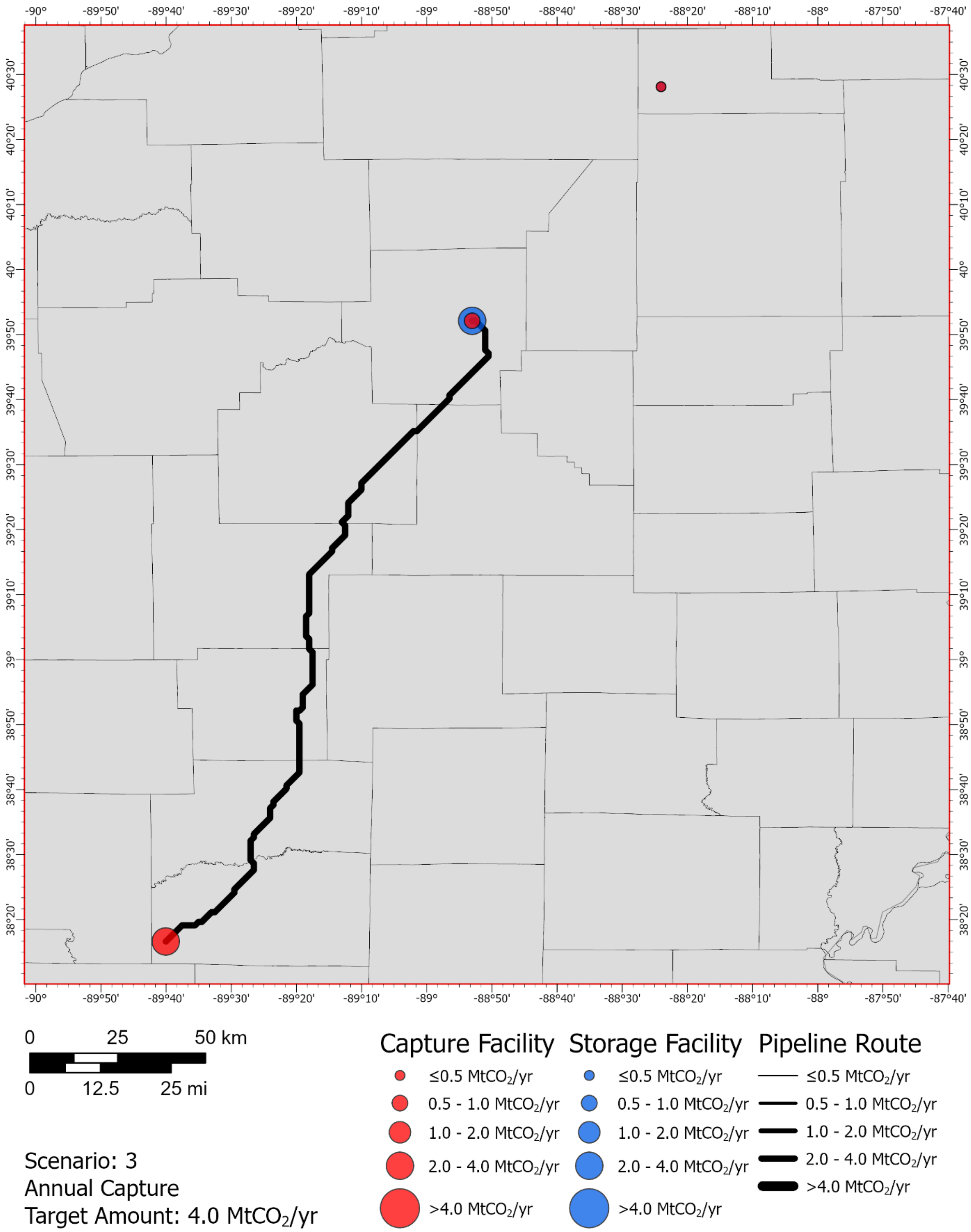


Scenario: 3
Annual Capture
Target Amount: 3.0 $MtCO_2/yr$

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$



Scenario: 3
Annual Capture
Target Amount: 3.5 $MtCO_2$/yr



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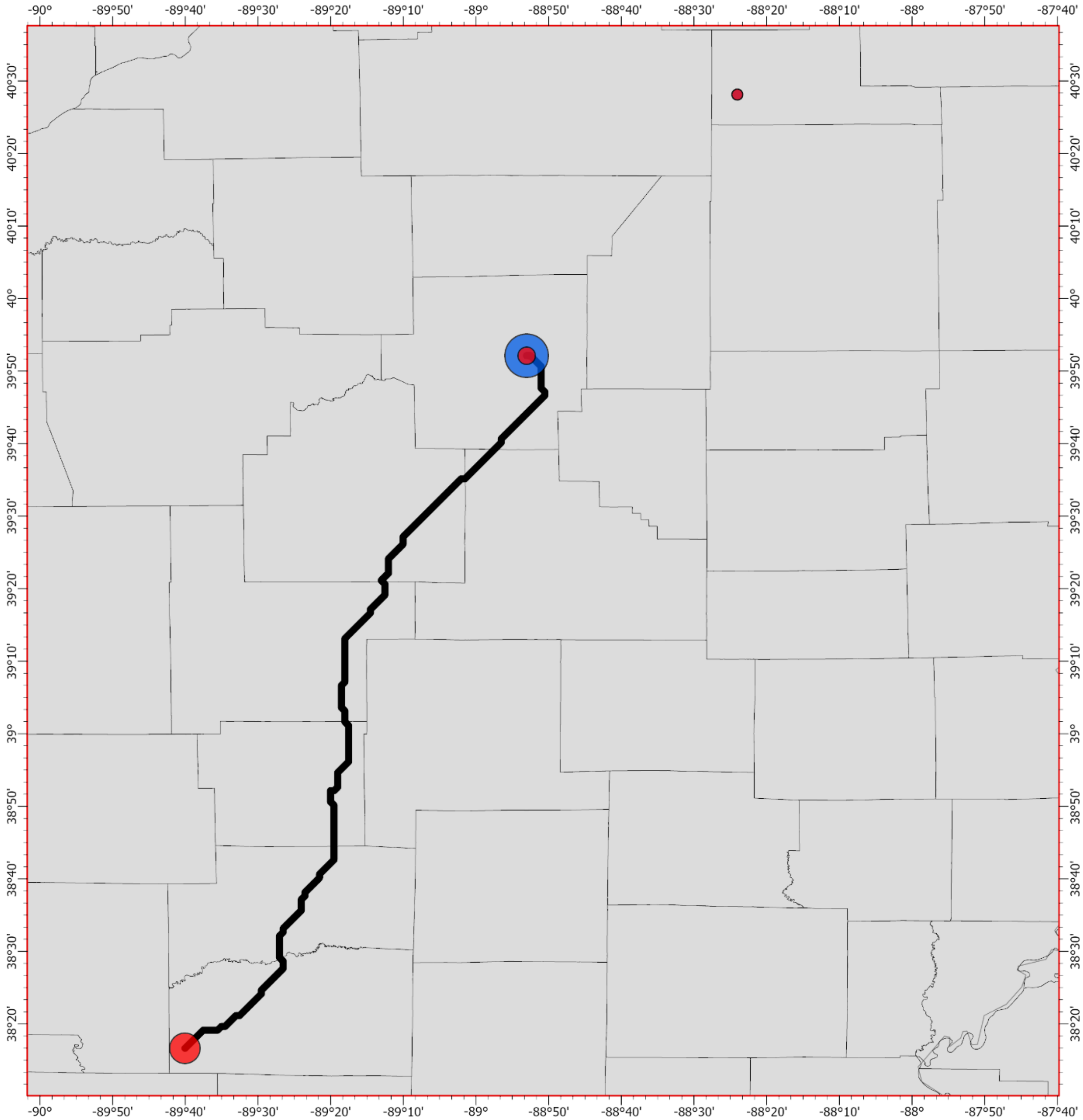
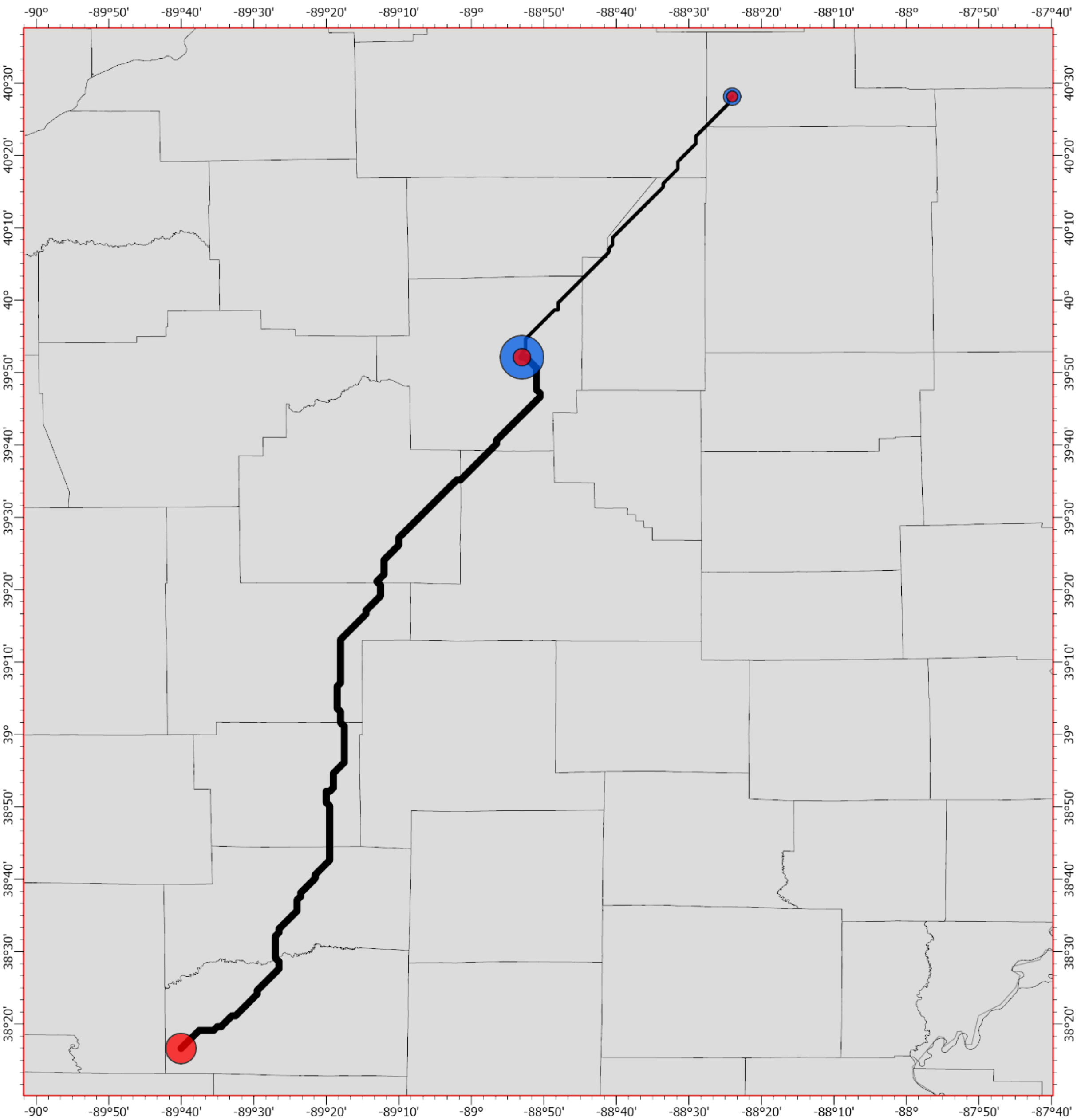
39°40'
39°30'
39°20'
39°10'
39°
38°50'
38°40'
38°30'
38°20'
0 25 50 km
0 12.5 25 mi
Capture Facility
Storage Facility
Pipeline Route
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Scenario: 3
Annual Capture
Target Amount: 4.0 MtCO2/yr



0 25 50 km
0 12.5 25 mi

Scenario: 3
Annual Capture
Target Amount: 4.5 $MtCO_2$/yr

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr

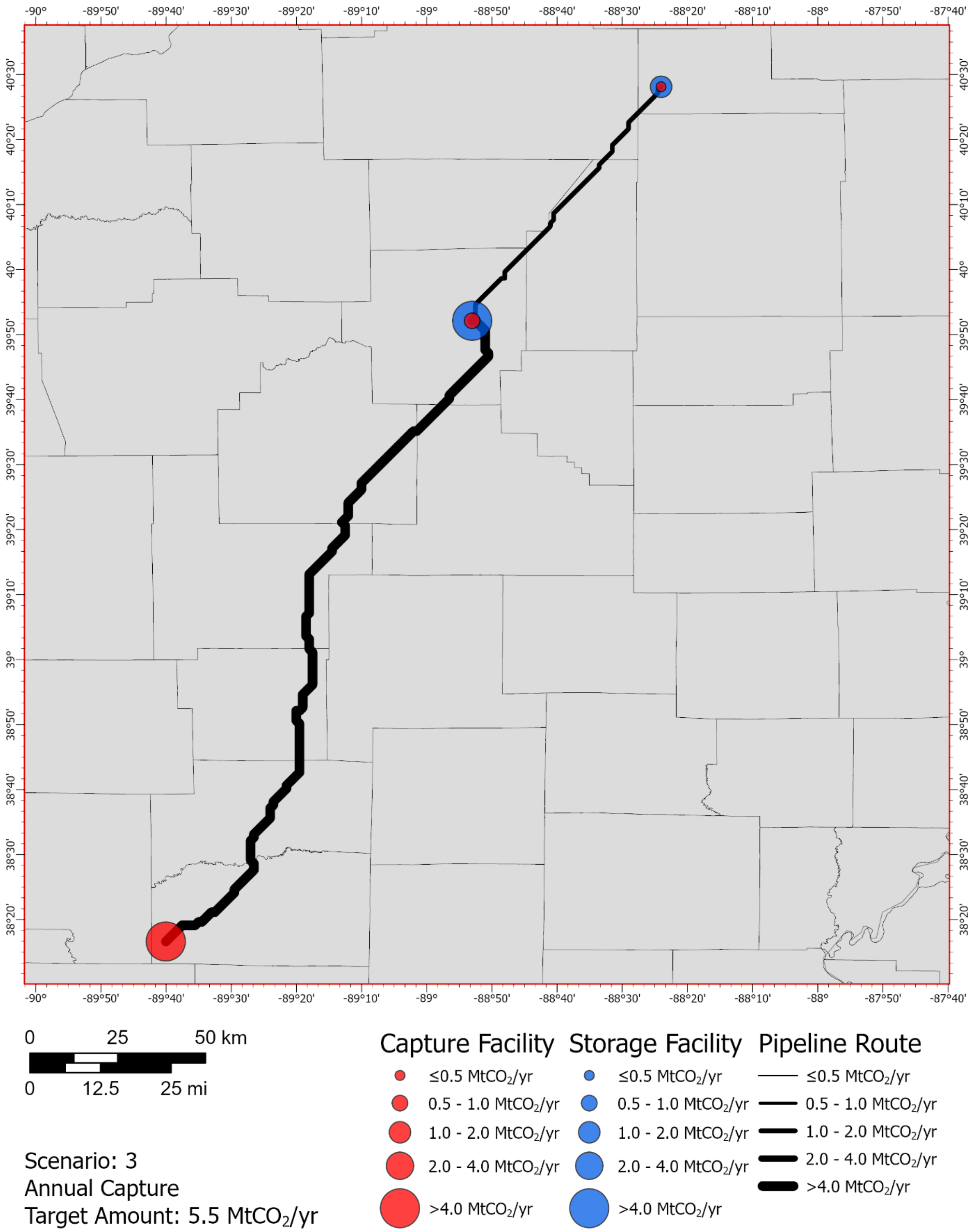


0 25 50 km

0 12.5 25 mi

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr

Scenario: 3
Annual Capture
Target Amount: 5.0 $MtCO_2$/yr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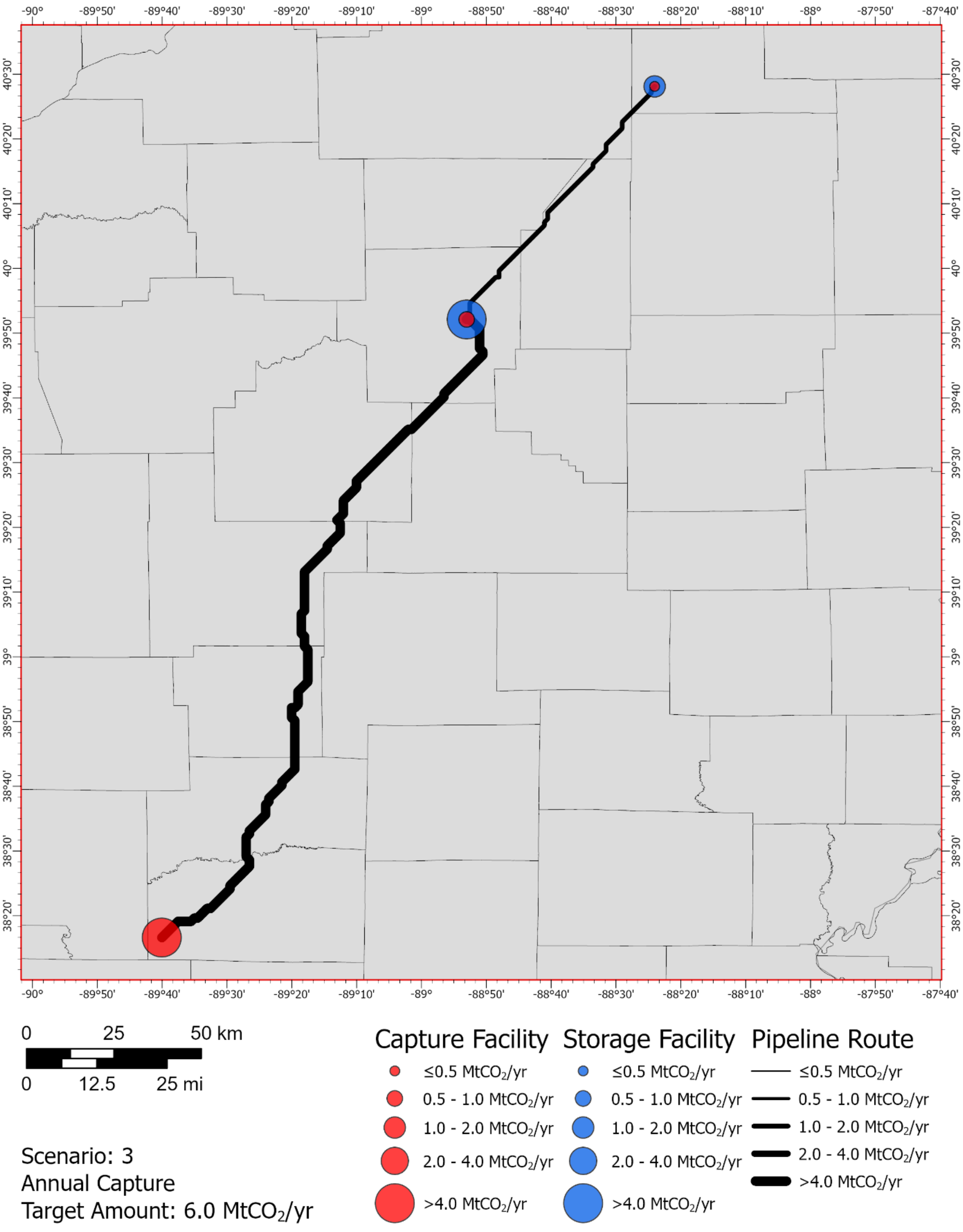
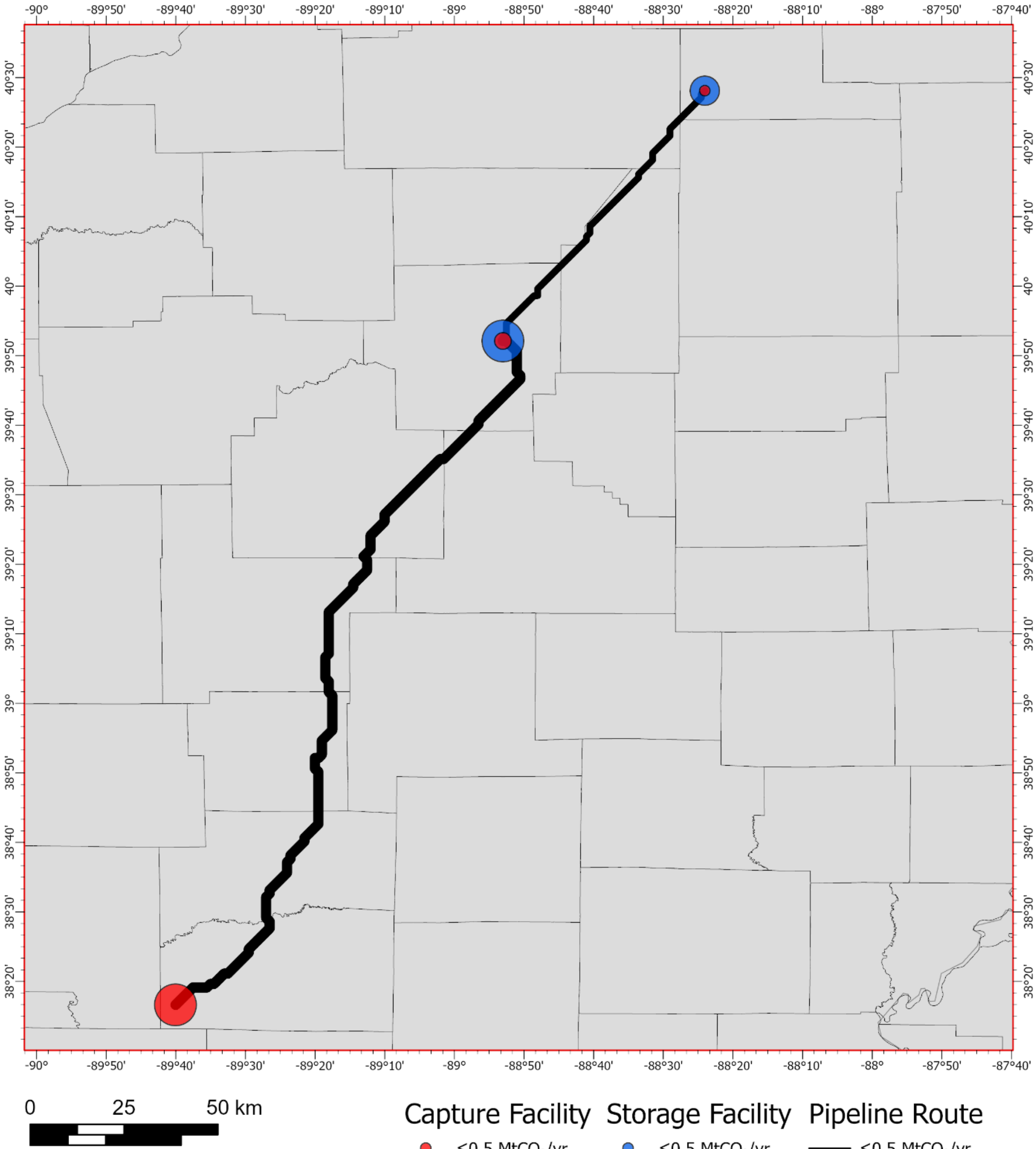
39°30'
39°20'
39°10'
39°
38°50'
38°40'
38°30'
38°20'
0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Storage Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Pipeline Route
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Scenario: 3
Annual Capture
Target Amount: 5.5 $MtCO_2$/yr

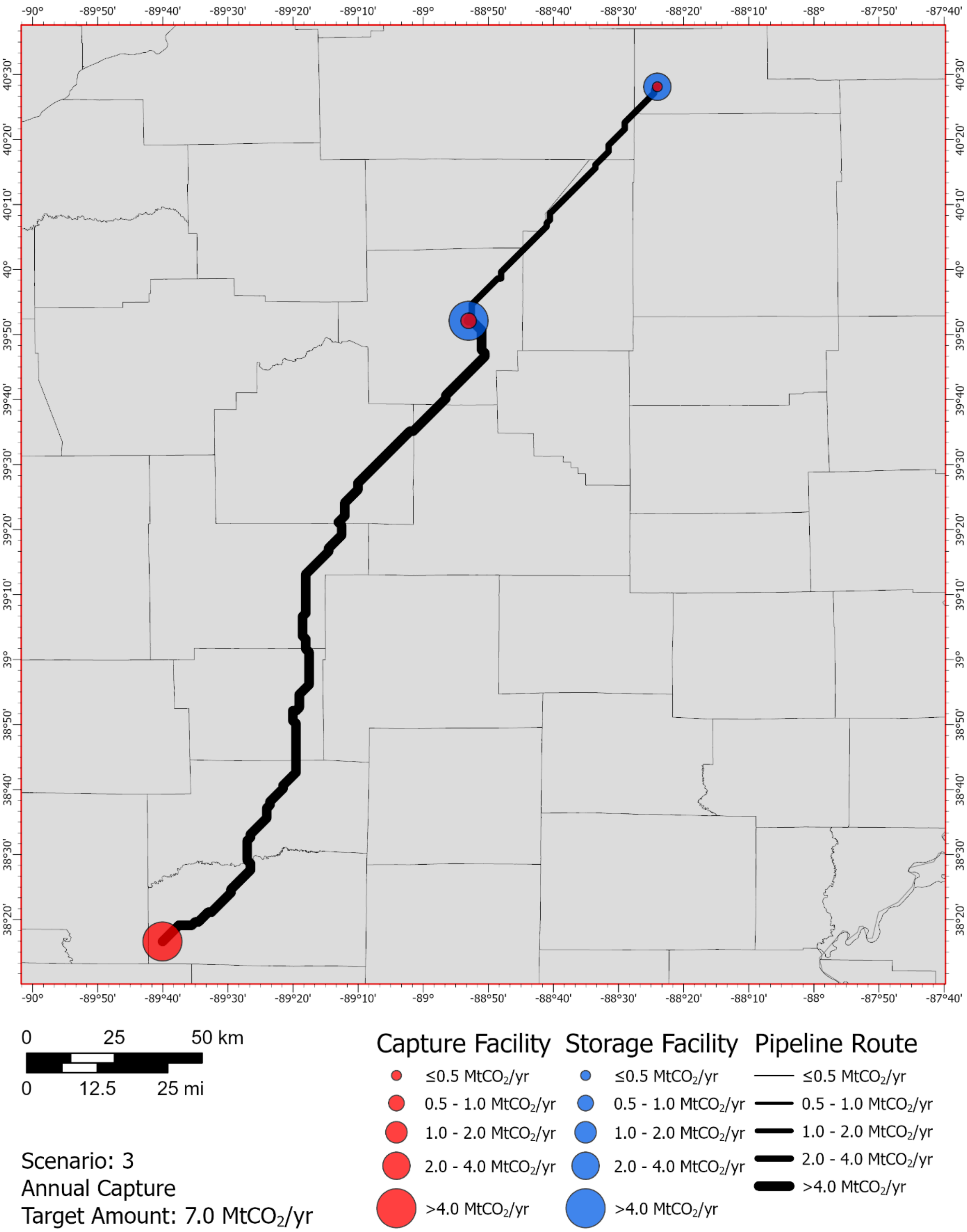


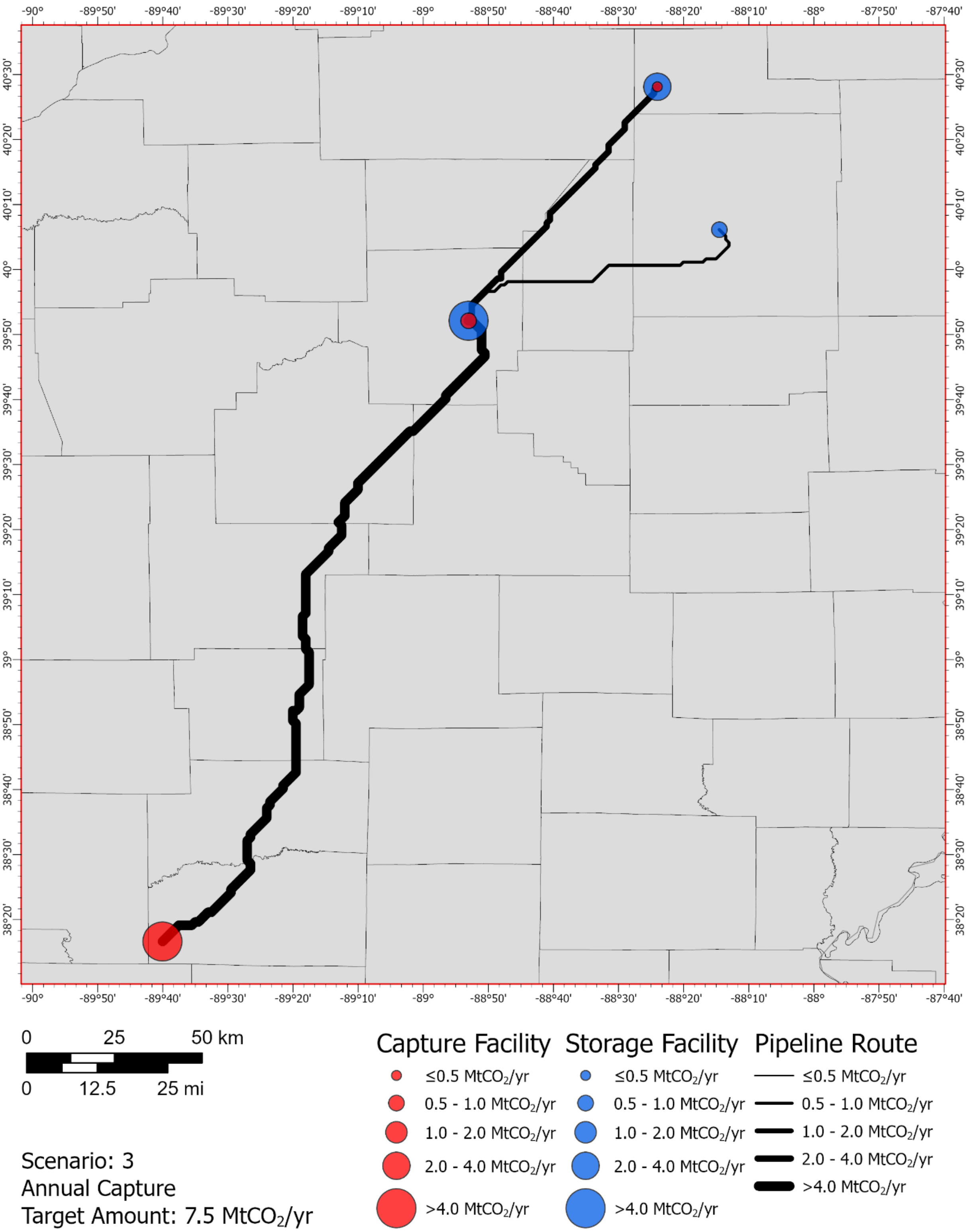
Scenario: 3
Annual Capture
Target Amount: 6.0 $MtCO_2/yr$



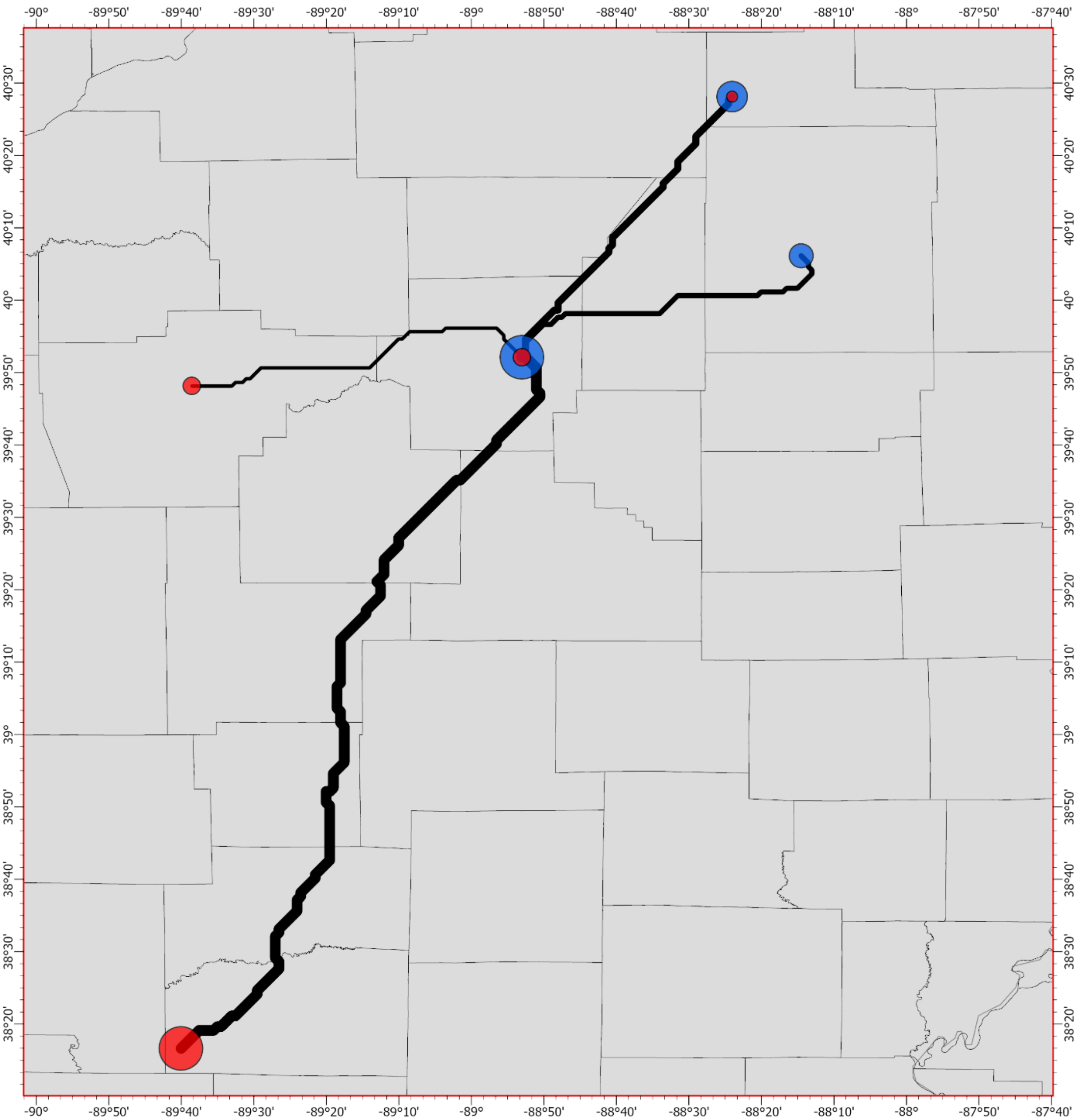
Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

Scenario: 3
Annual Capture
Target Amount: 6.5 $MtCO_2/yr$


0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Storage Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Pipeline Route
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Scenario: 3
Annual Capture
Target Amount: 7.0 $MtCO_2$/yr



Scenario: 3
Annual Capture
Target Amount: 7.5 $MtCO_2$/yr



0 25 50 km

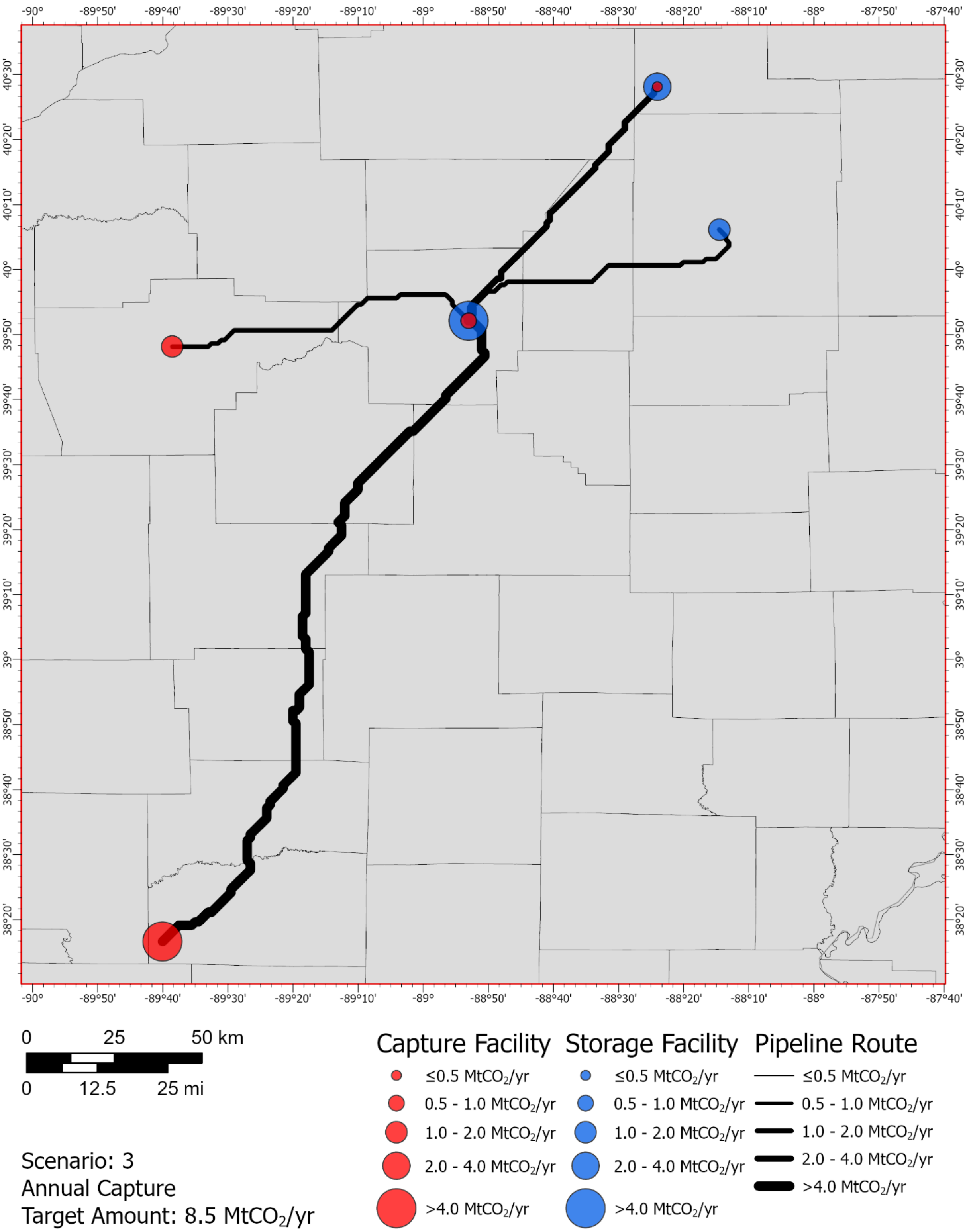
0 12.5 25 mi

Scenario: 3

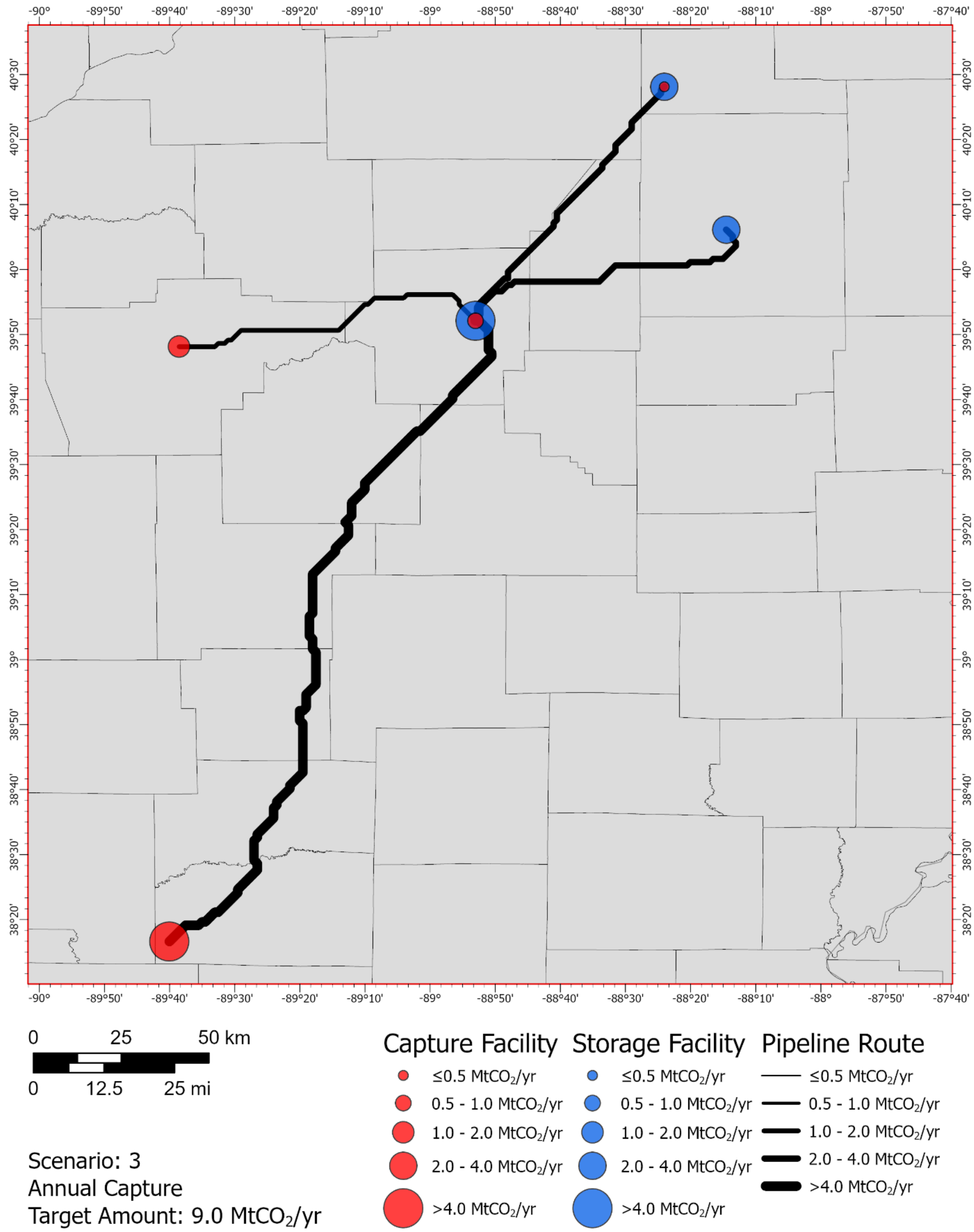
Annual Capture

Target Amount: 8.0 $MtCO_2/yr$

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$



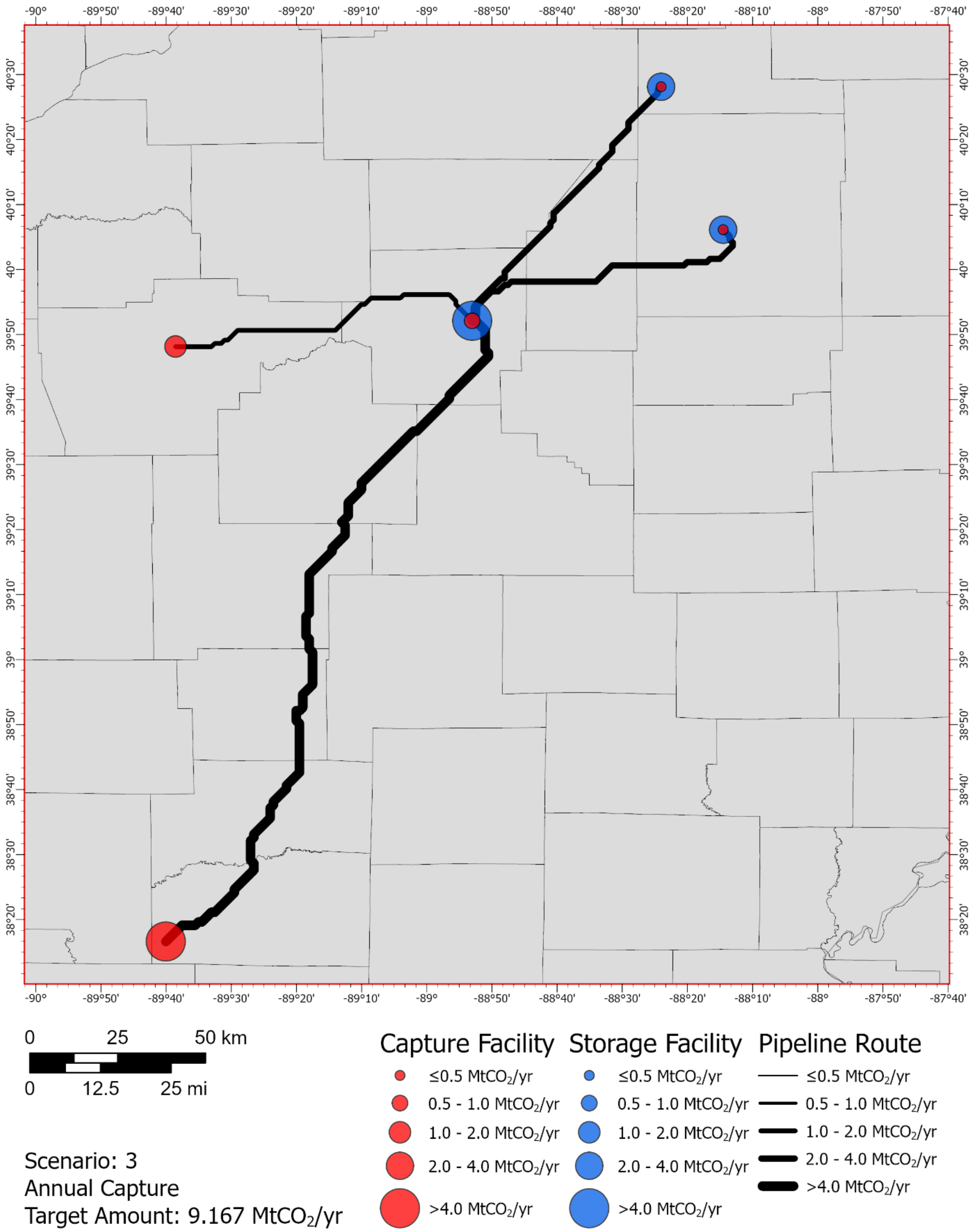
Scenario: 3
Annual Capture
Target Amount: 8.5 $MtCO_2$/yr



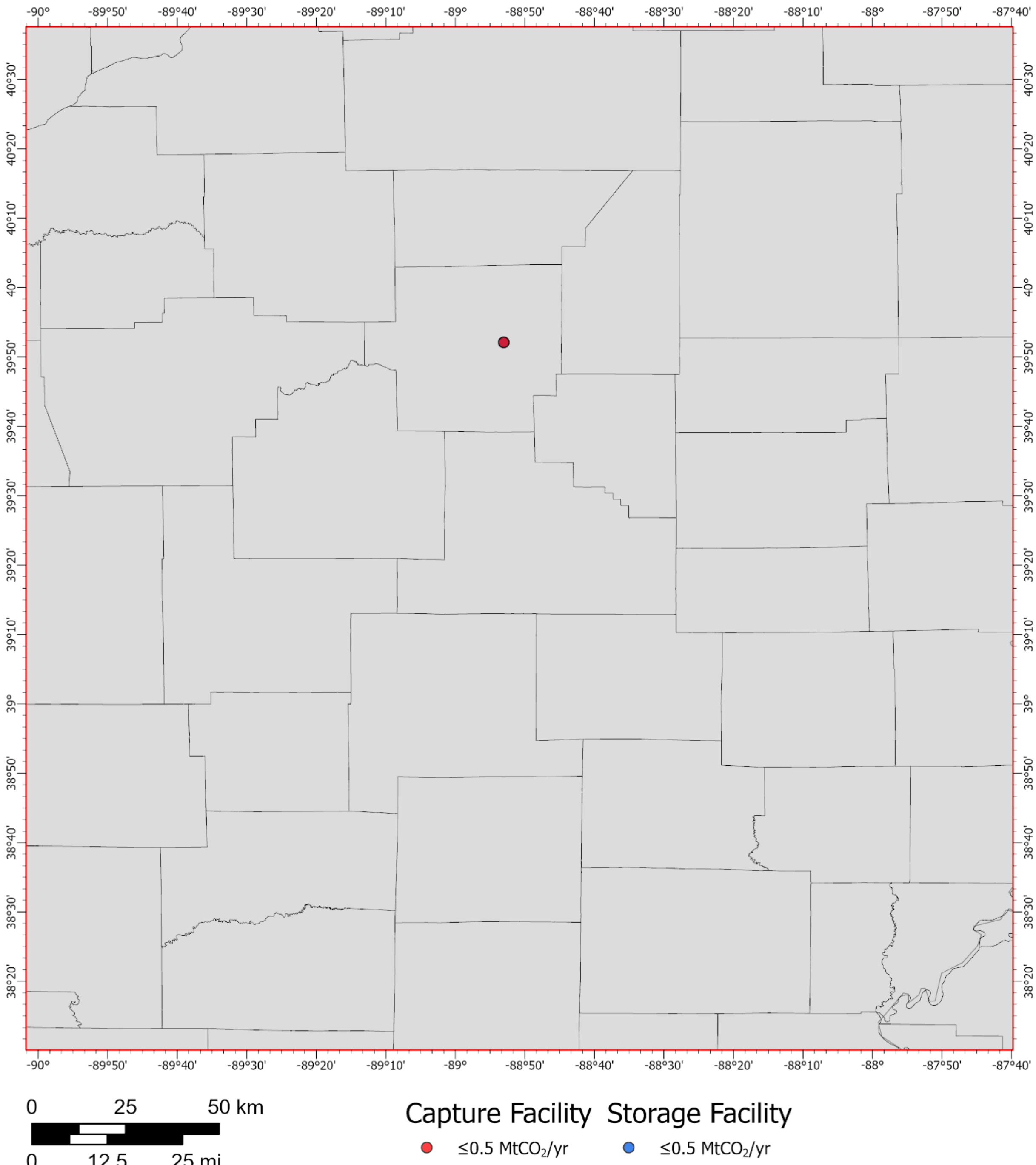
Scenario: 3

Annual Capture

Target Amount: 9.0 $MtCO_2/yr$



Scenario: 3
Annual Capture
Target Amount: 9.167 $MtCO_2/yr$



Capture Facility

≤0.5 $MtCO_2$/yr

0.5 - 1.0 $MtCO_2$/yr

1.0 - 2.0 $MtCO_2$/yr

2.0 - 4.0 $MtCO_2$/yr

>4.0 $MtCO_2$/yr

Storage Facility

≤0.5 $MtCO_2$/yr

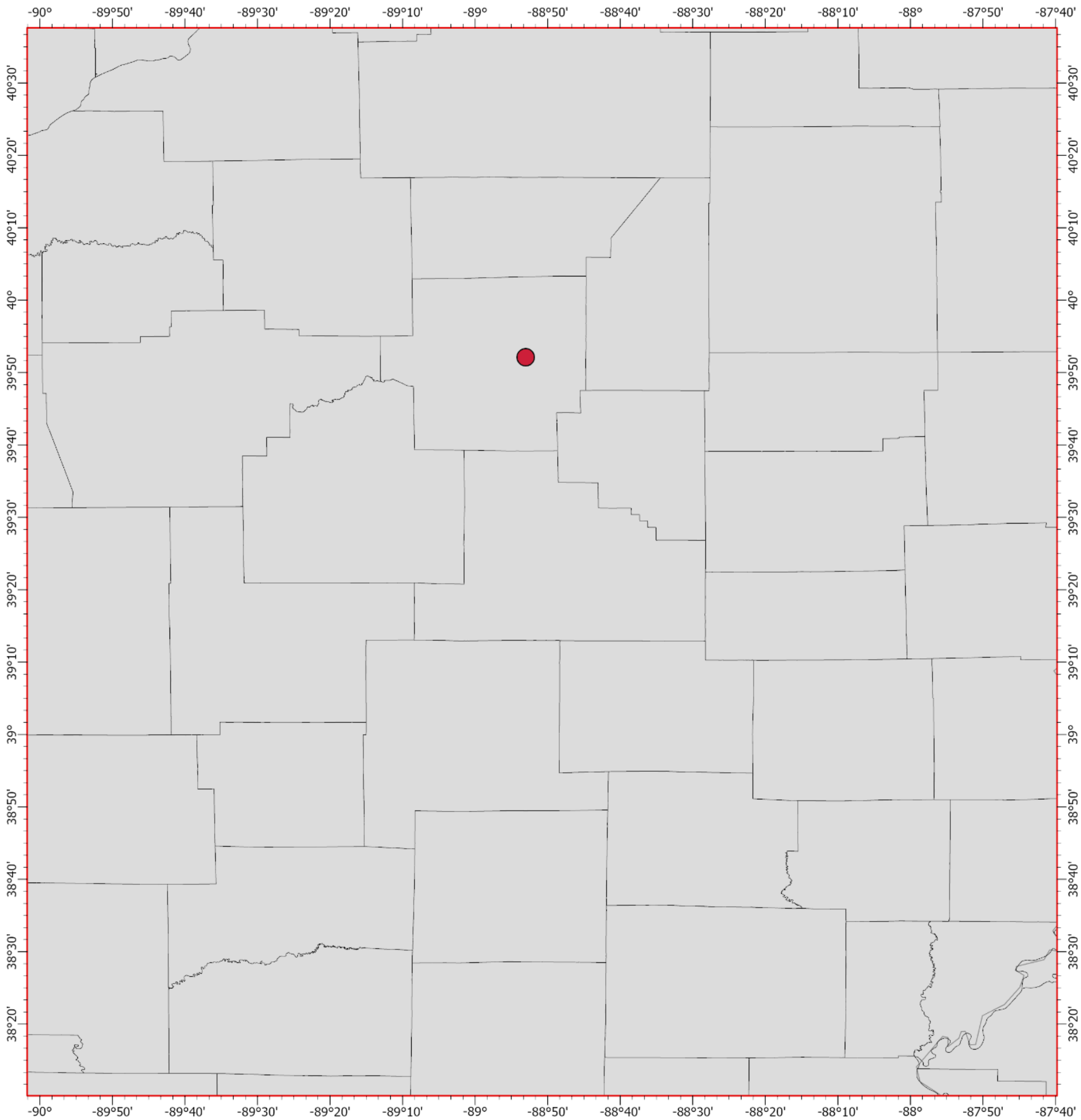
0.5 - 1.0 $MtCO_2$/yr

1.0 - 2.0 $MtCO_2$/yr

2.0 - 4.0 $MtCO_2$/yr

>4.0 $MtCO_2$/yr

Scenario: 4
Annual Capture
Target Amount: 0.5 $MtCO_2$/yr

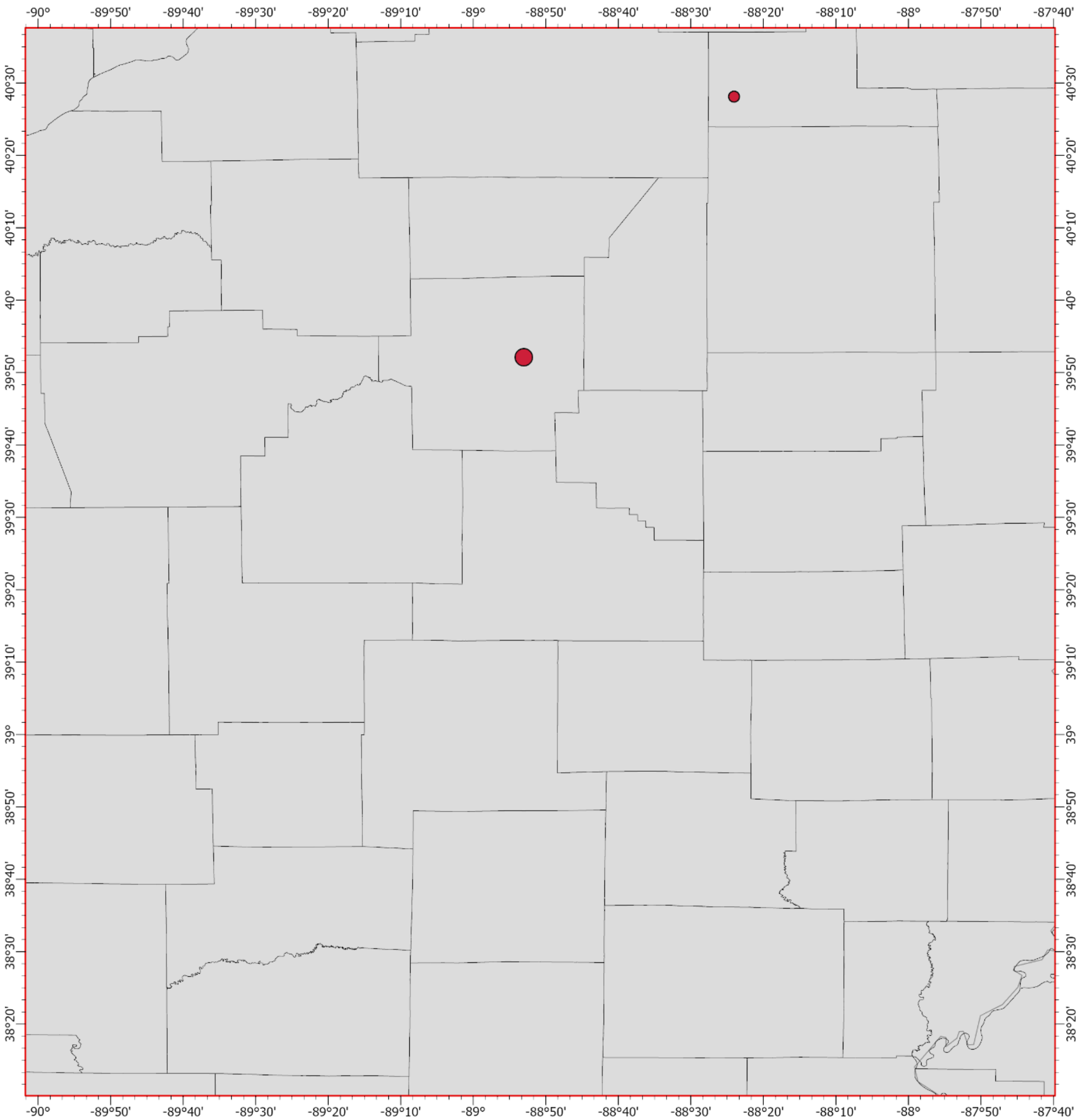


0 25 50 km

0 12.5 25 mi

Scenario: 4
Annual Capture
Target Amount: 1.0 $MtCO_2/yr$

Capture Facility	Storage Facility
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

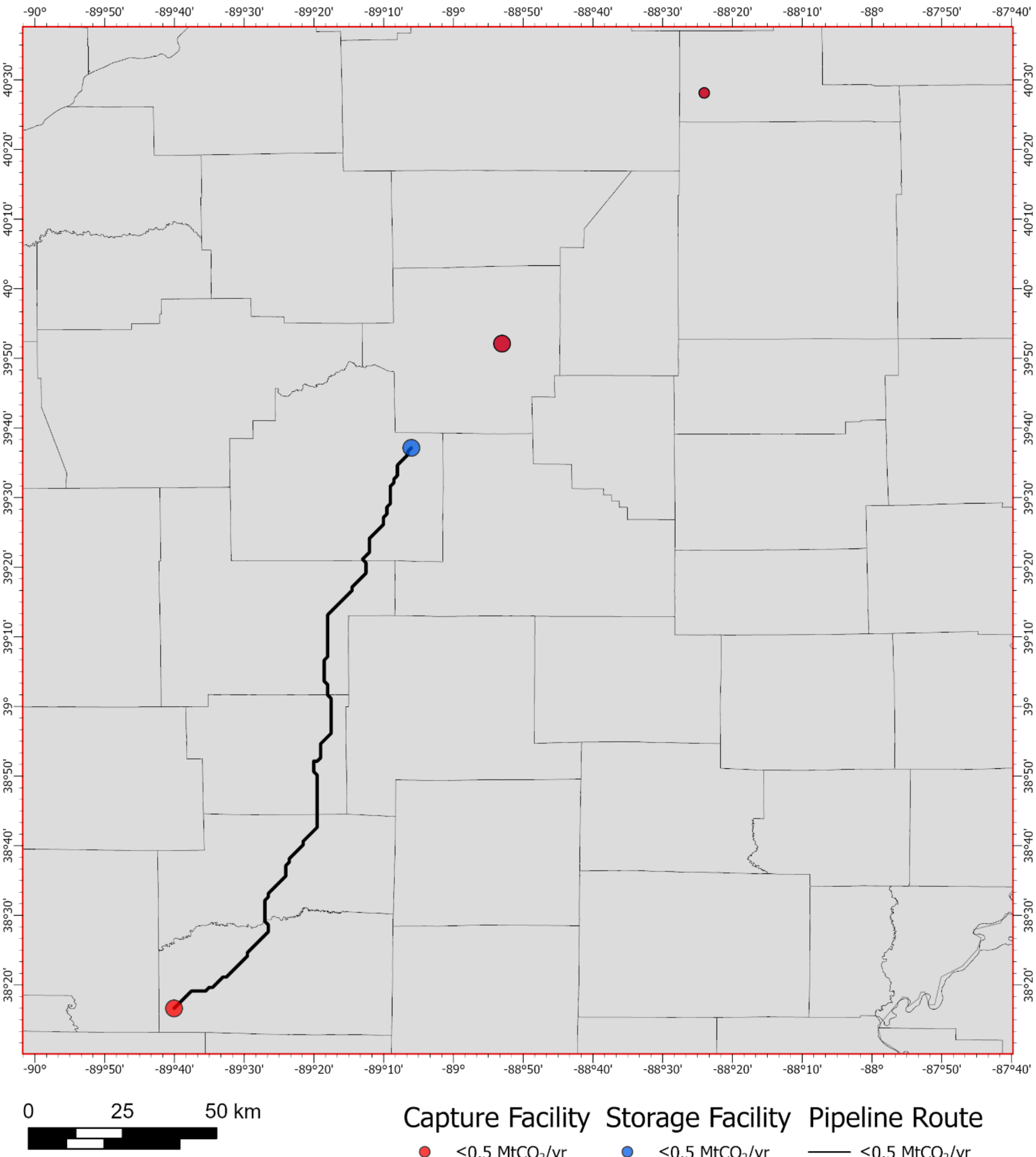


0 25 50 km

0 12.5 25 mi

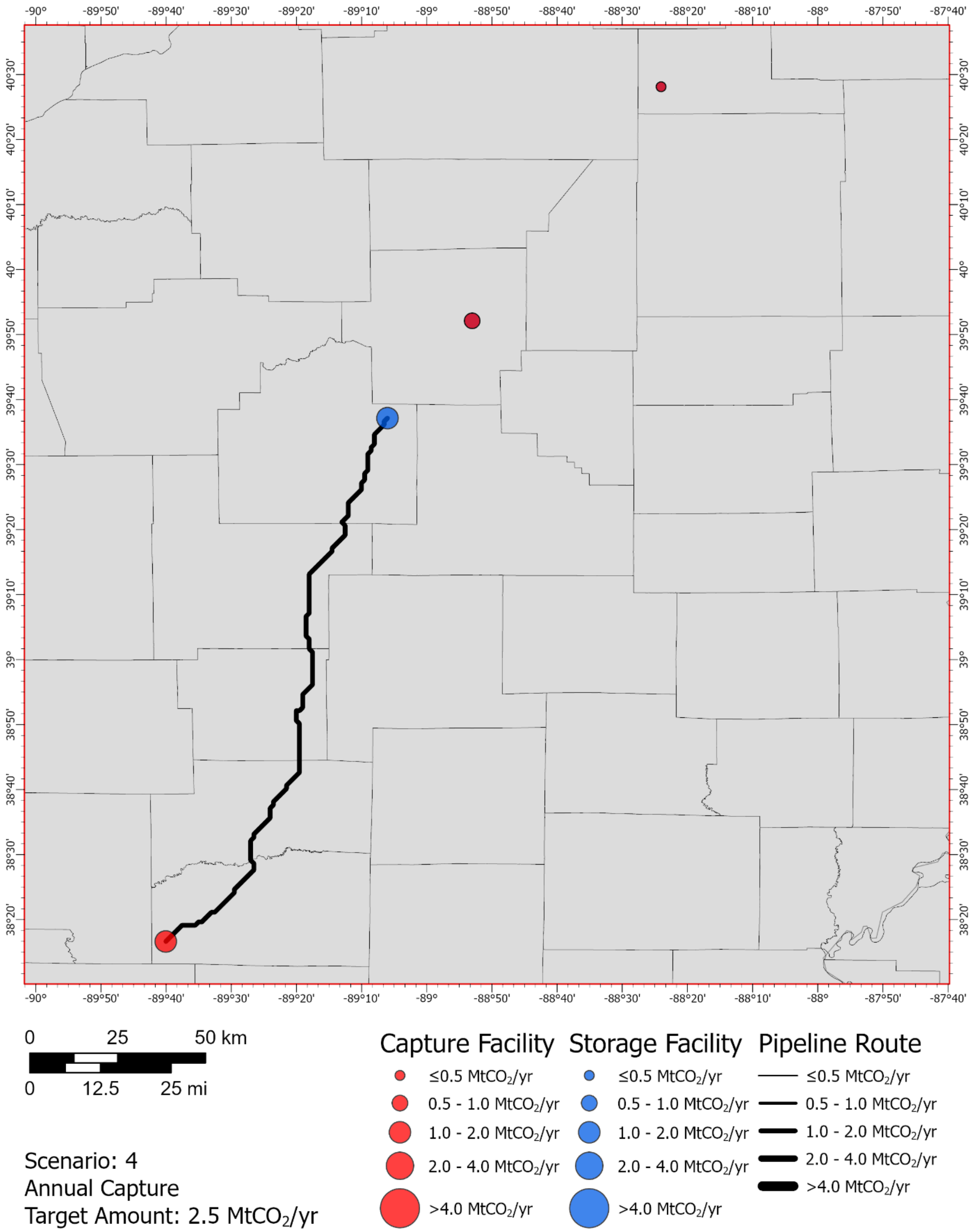
Scenario: 4
Annual Capture
Target Amount: 1.5 $MtCO_2/yr$

Capture Facility	Storage Facility
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$



Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr

Scenario: 4
Annual Capture
Target Amount: 2.0 $MtCO_2$/yr



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39°10'
39°
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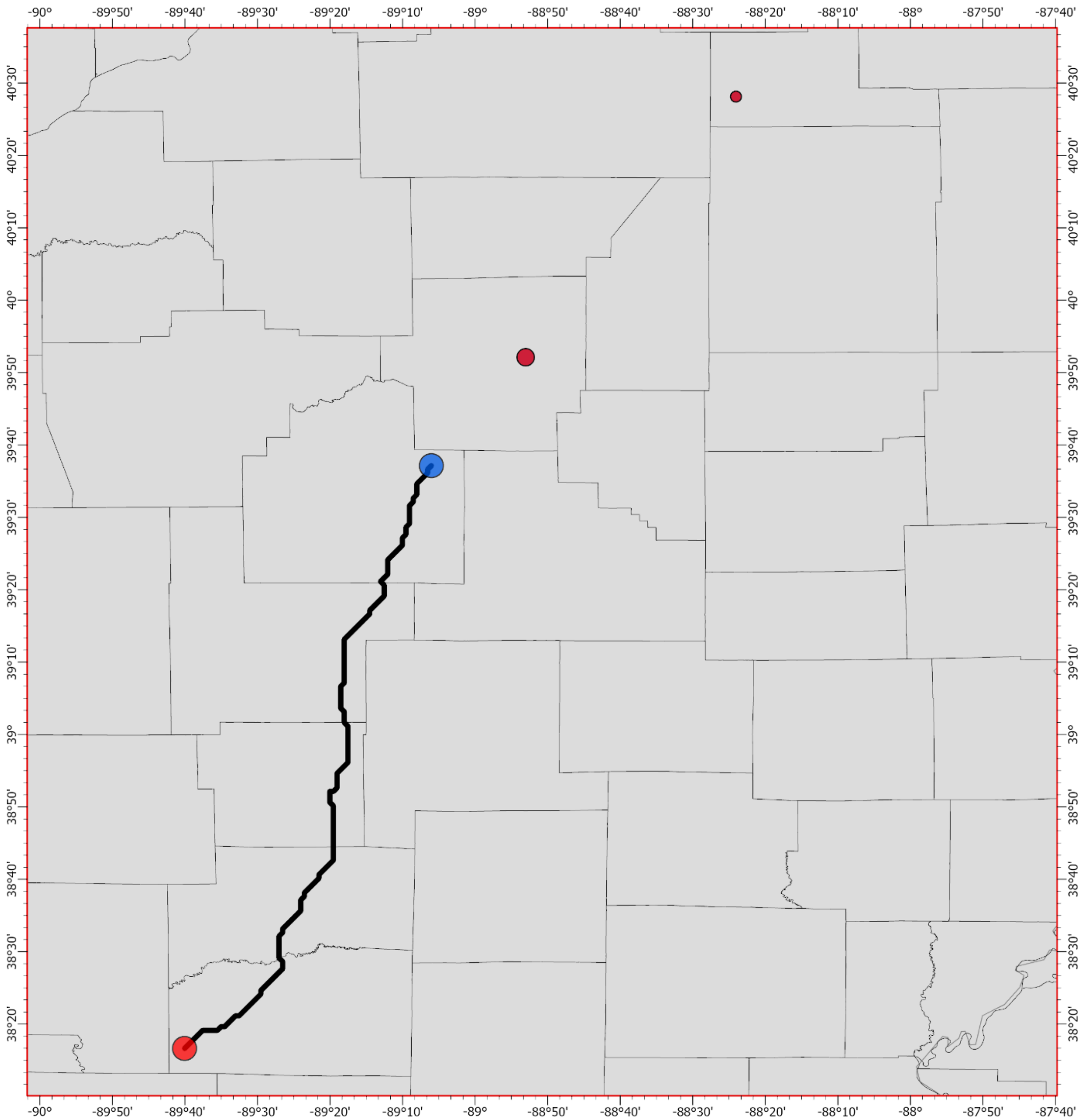
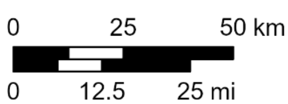
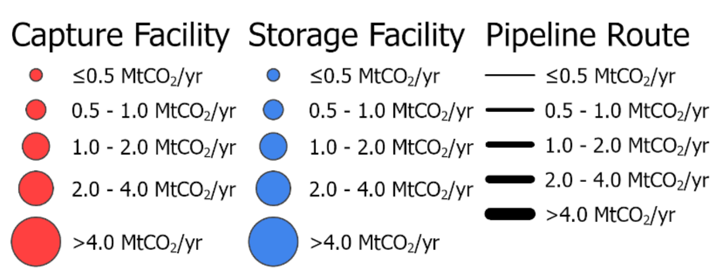
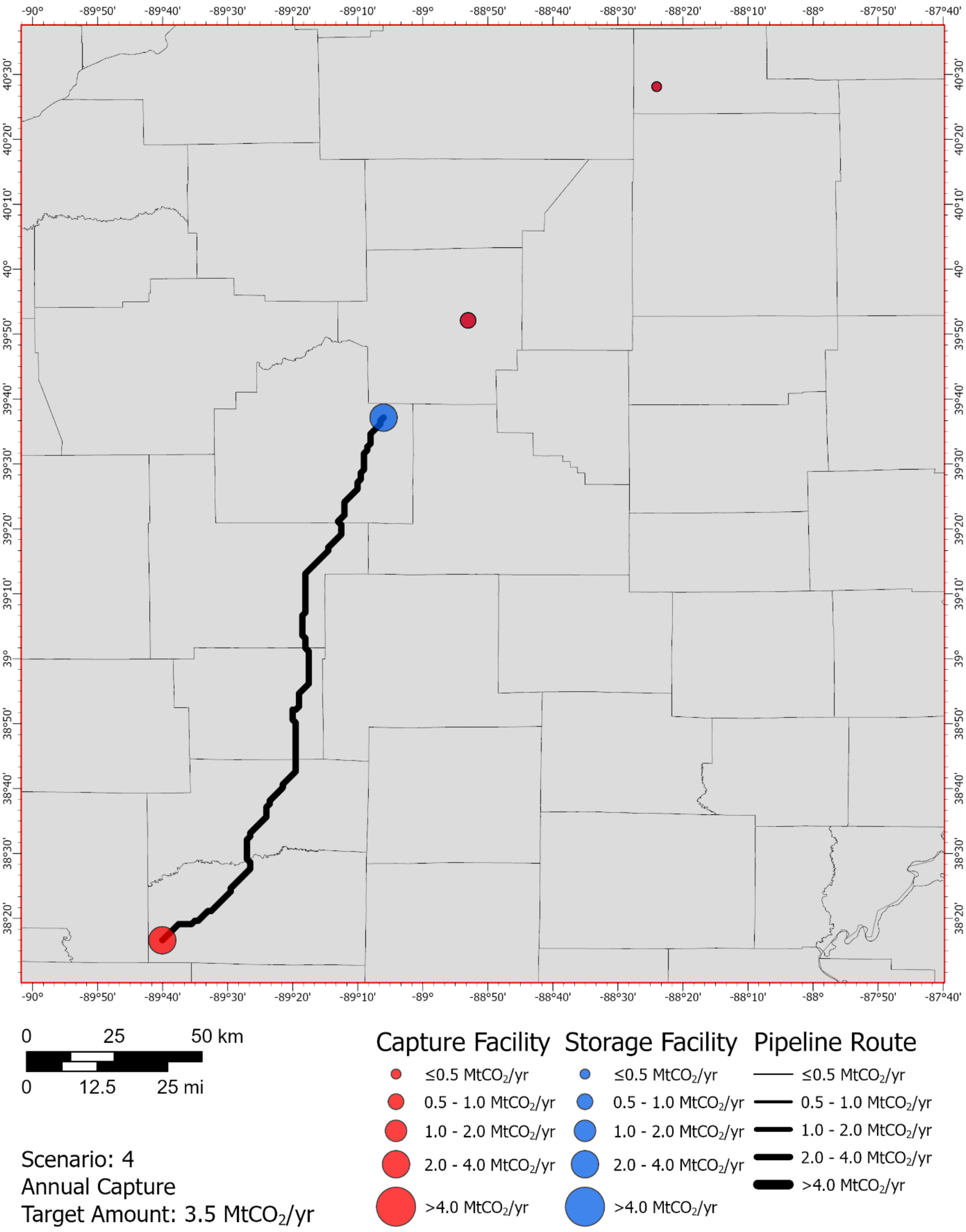
38°20'
0
25
50 km
0
12.5
25 mi
Capture Facility
Storage Facility
Pipeline Route
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Scenario: 4
Annual Capture
Target Amount: 2.5 MtCO2/yr



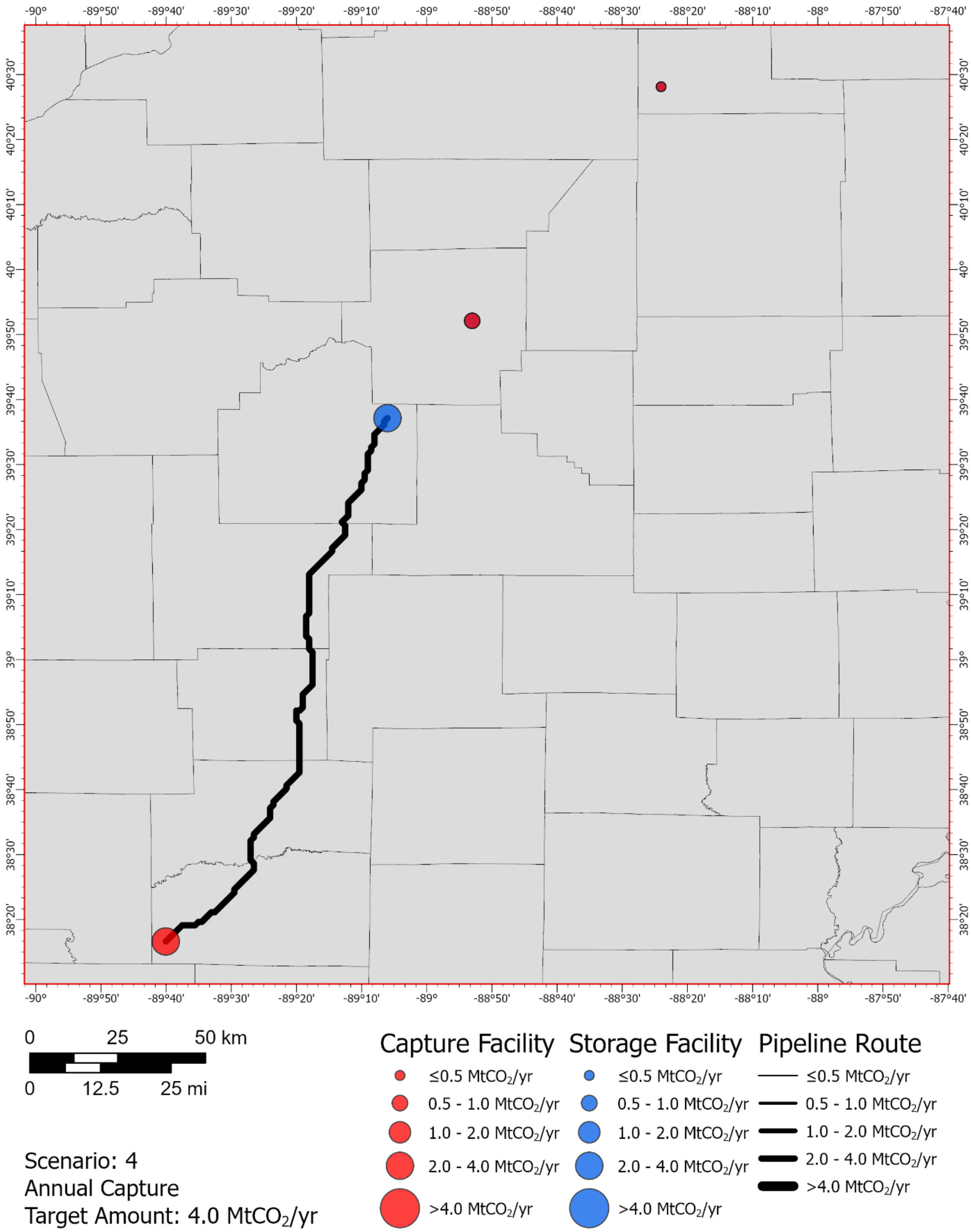




Scenario: 4
Annual Capture
Target Amount: 3.0 $MtCO_2/yr$



Scenario: 4
Annual Capture
Target Amount: 3.5 $MtCO_2/yr$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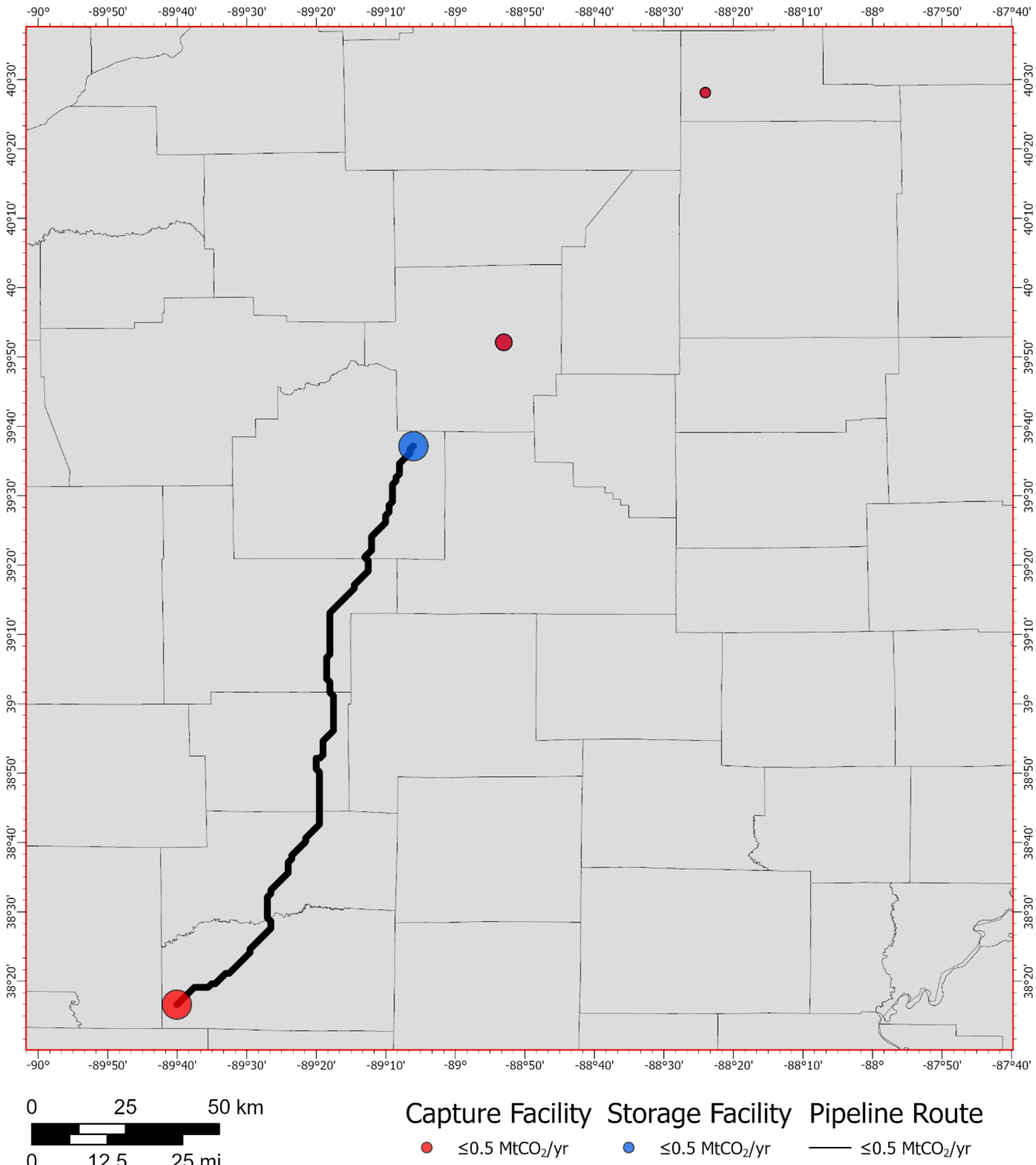
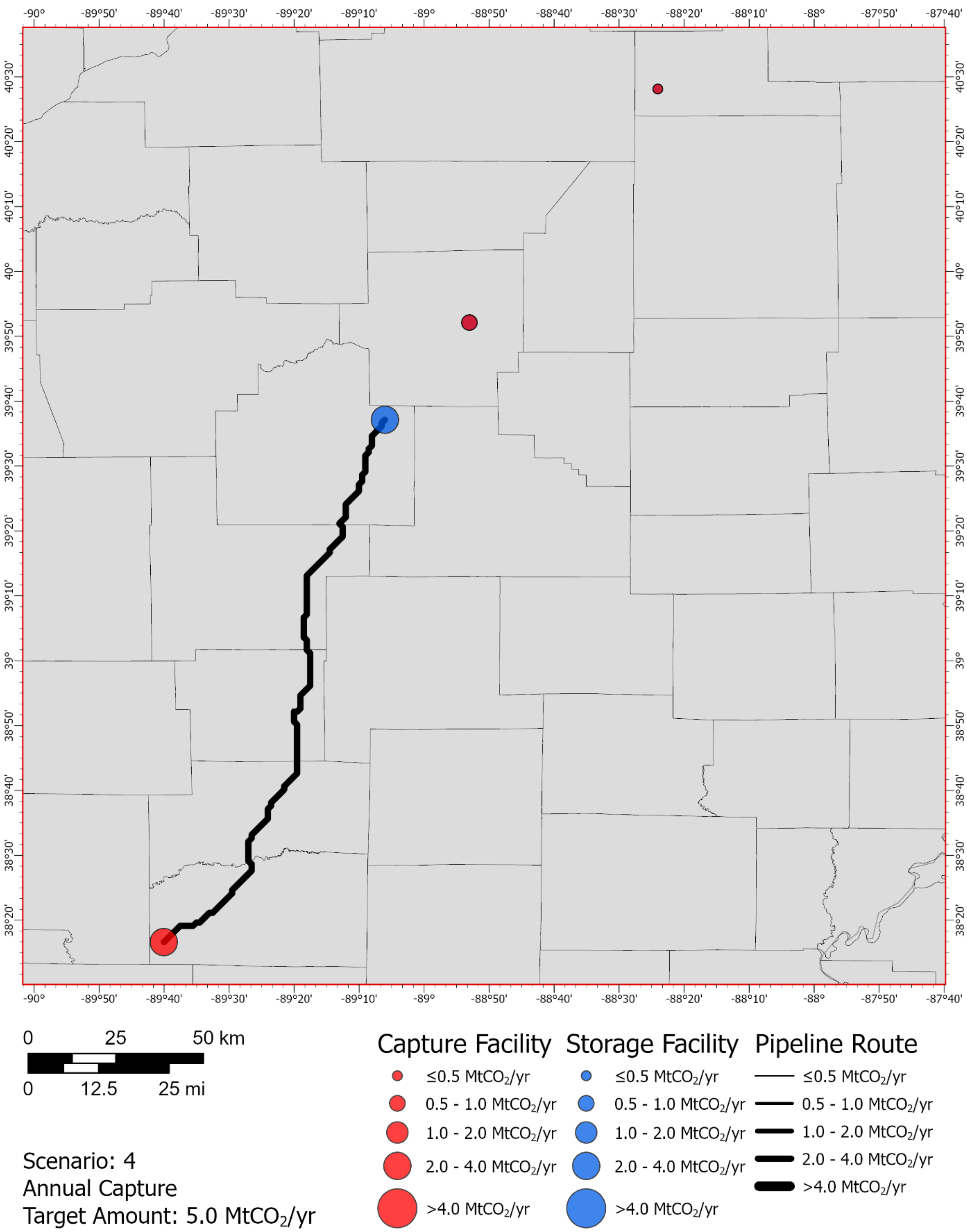
39°10'
39°
38°50'
38°40'
38°30'
38°20'
0
25
50 km
0
12.5
25 mi
Scenario: 4
Annual Capture
Target Amount: 4.0 MtCO2/yr
Capture Facility
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Storage Facility
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr
Pipeline Route
≤0.5 MtCO2/yr
0.5 - 1.0 MtCO2/yr
1.0 - 2.0 MtCO2/yr
2.0 - 4.0 MtCO2/yr
>4.0 MtCO2/yr



Scenario: 4
Annual Capture
Target Amount: 4.5 $MtCO_2$/yr

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr



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39°40'
39°30'
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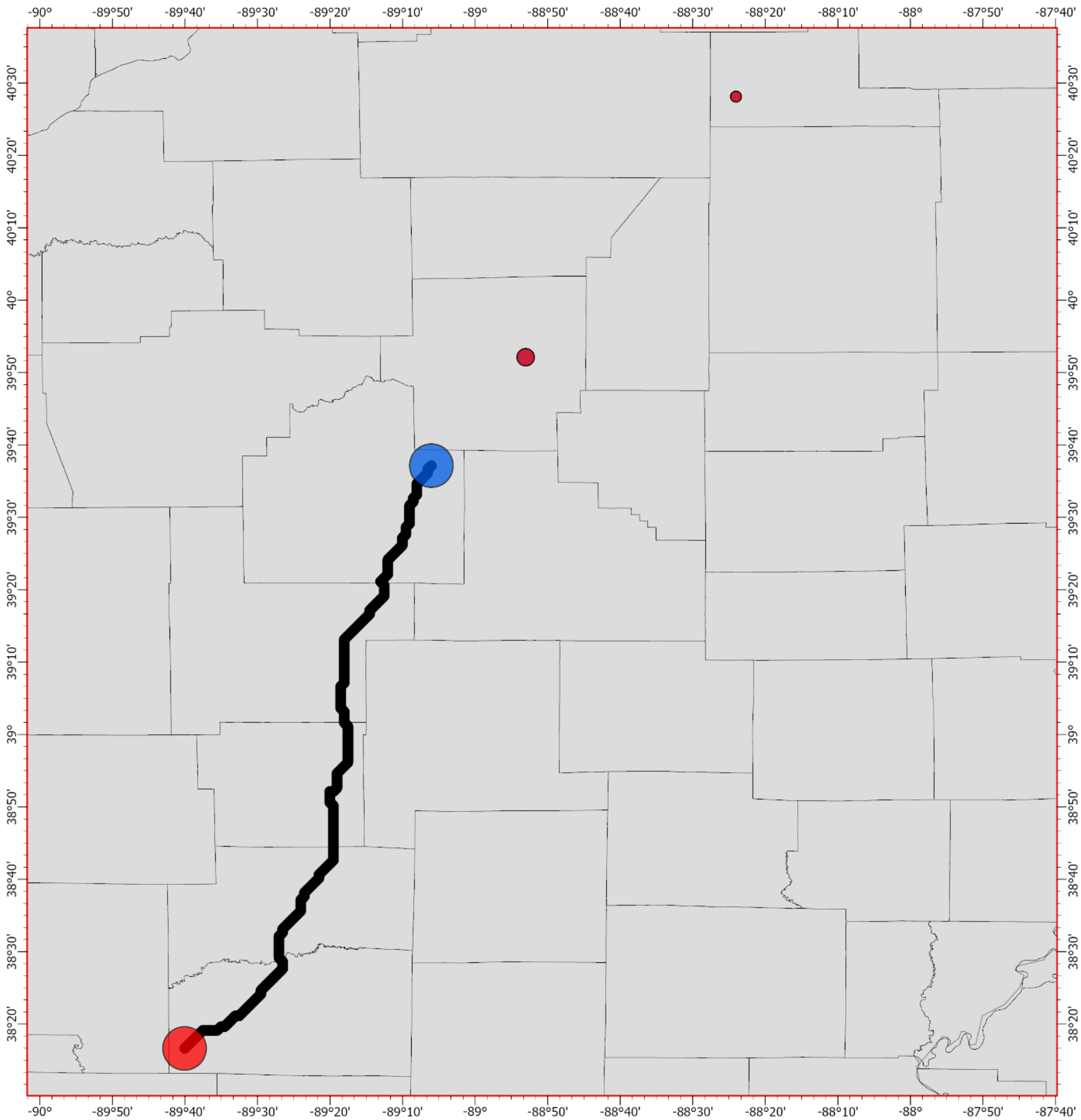
39°10'
39°
38°50'
38°40'
38°30'
38°20'
0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Storage Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Pipeline Route
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Scenario: 4
Annual Capture
Target Amount: 5.0 $MtCO_2/yr$

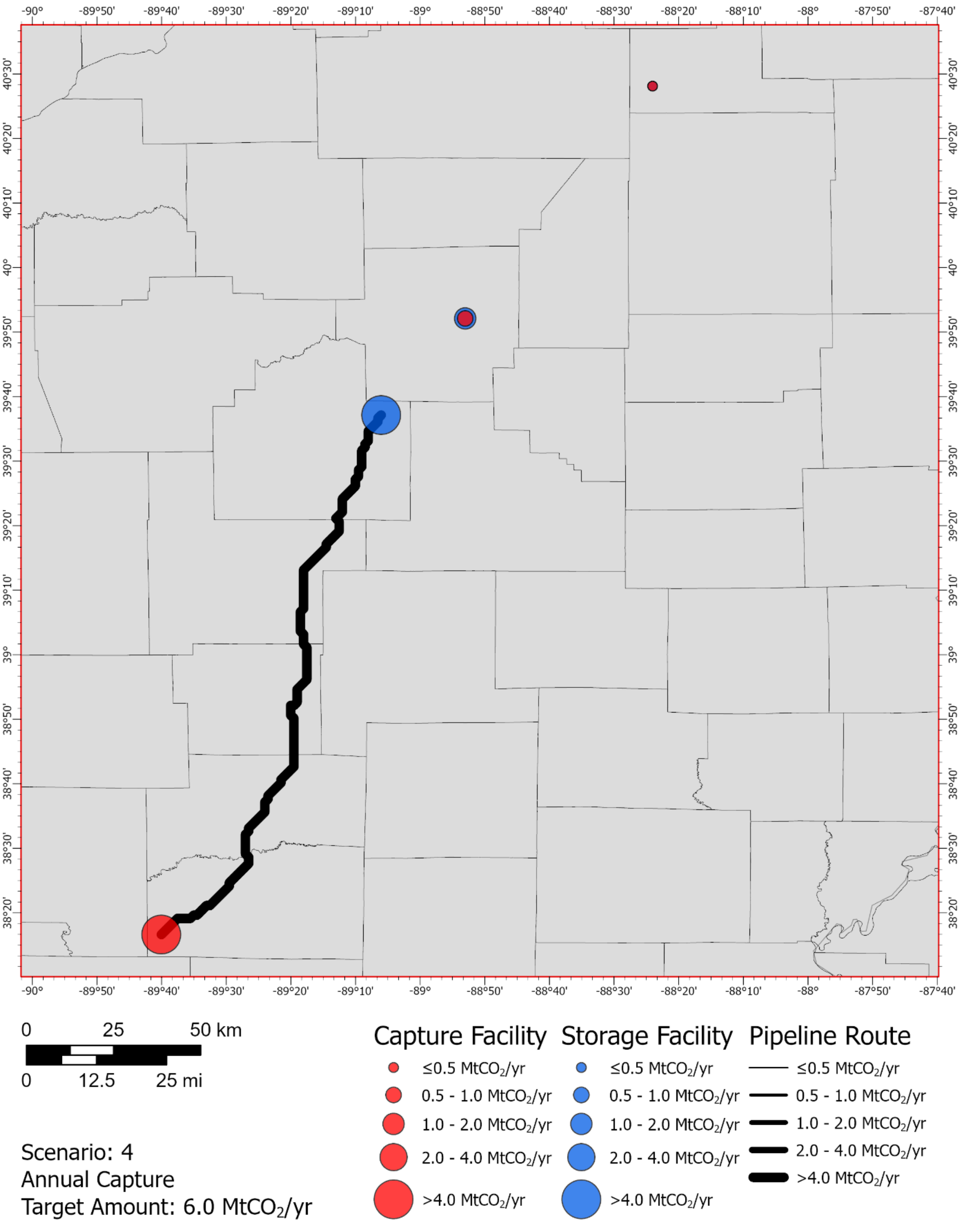


0 25 50 km

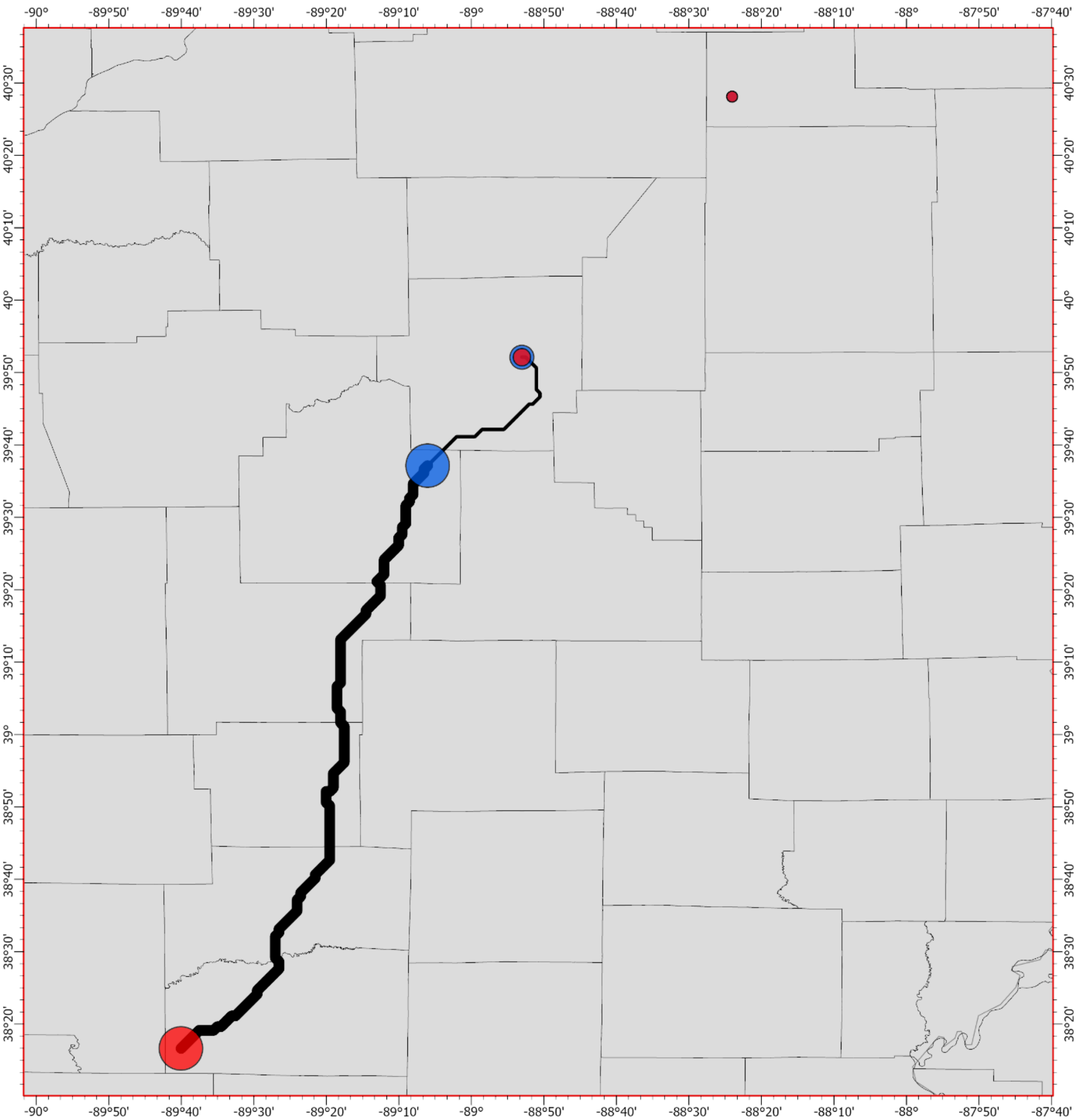
0 12.5 25 mi

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$

Scenario: 4
Annual Capture
Target Amount: 5.5 $MtCO_2/yr$



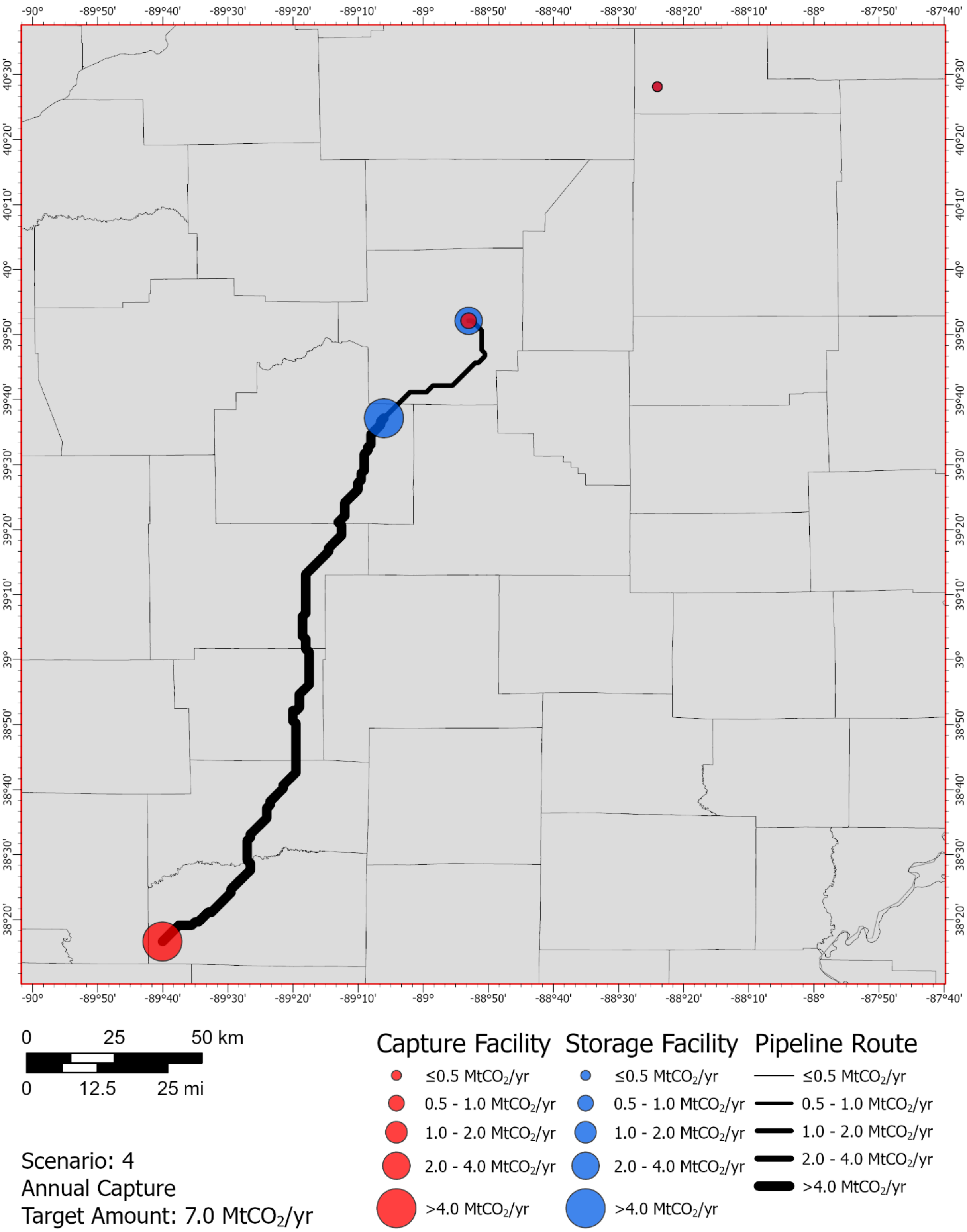
Scenario: 4
Annual Capture
Target Amount: 6.0 $MtCO_2$/yr

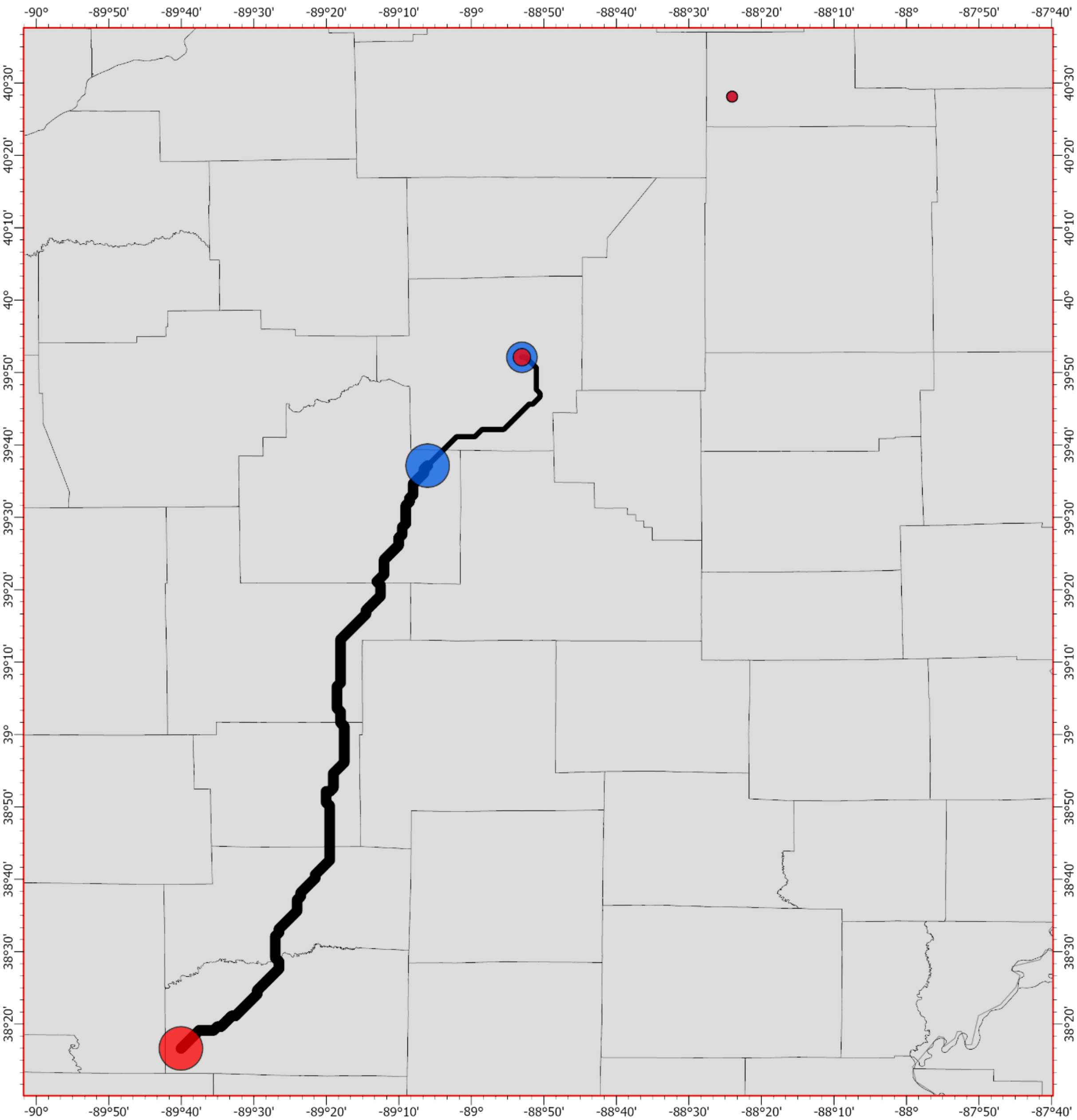


0	25	50 km
0	12.5	25 mi

Scenario: 4
Annual Capture
Target Amount: 6.5 $MtCO_2$/yr

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr	≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr	0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr	1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr	2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr	>4.0 $MtCO_2$/yr


0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Storage Facility
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Pipeline Route
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Scenario: 4
Annual Capture
Target Amount: 7.0 $MtCO_2$/yr

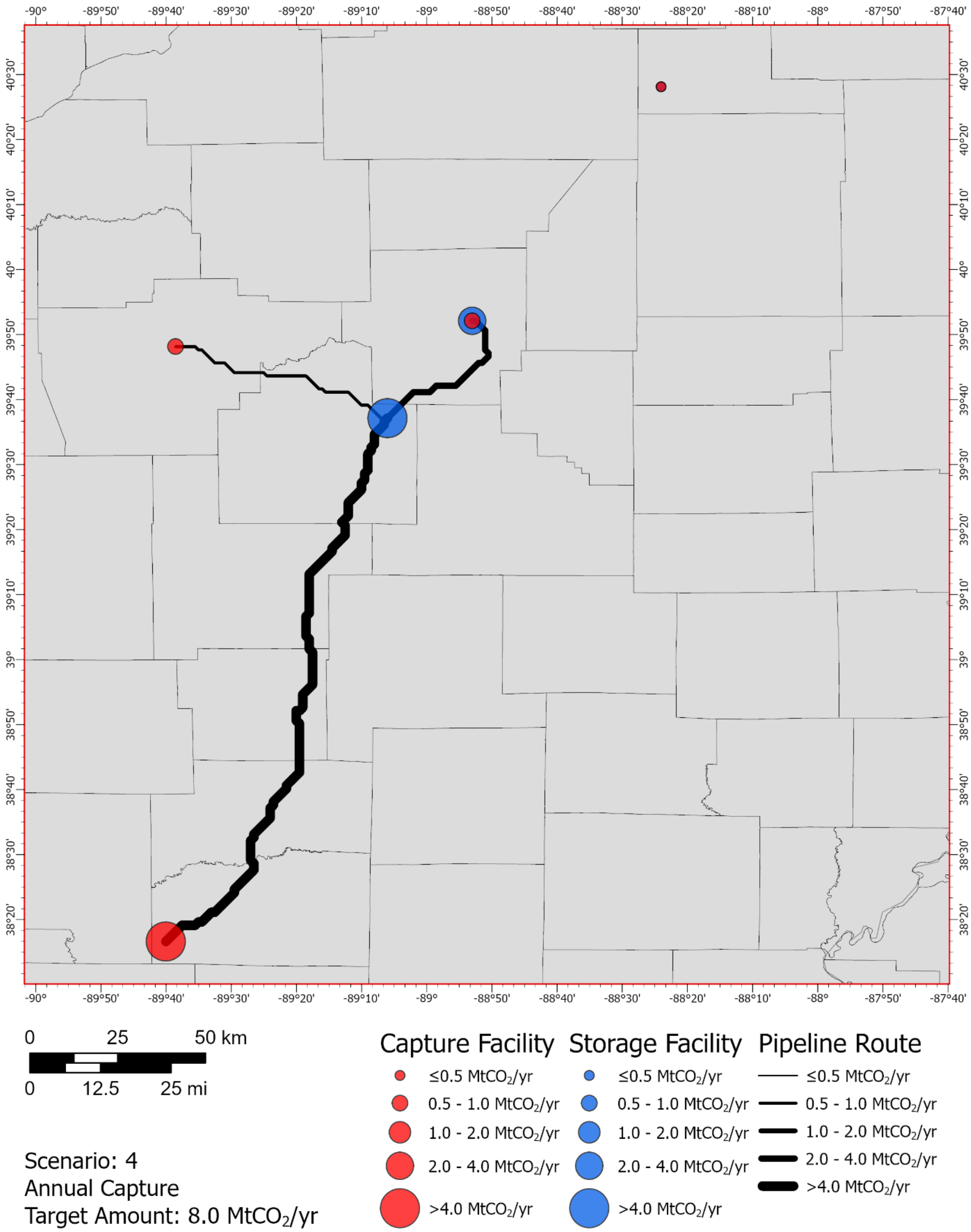


0 25 50 km

0 12.5 25 mi

Scenario: 4
Annual Capture
Target Amount: 7.5 $MtCO_2/yr$

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$



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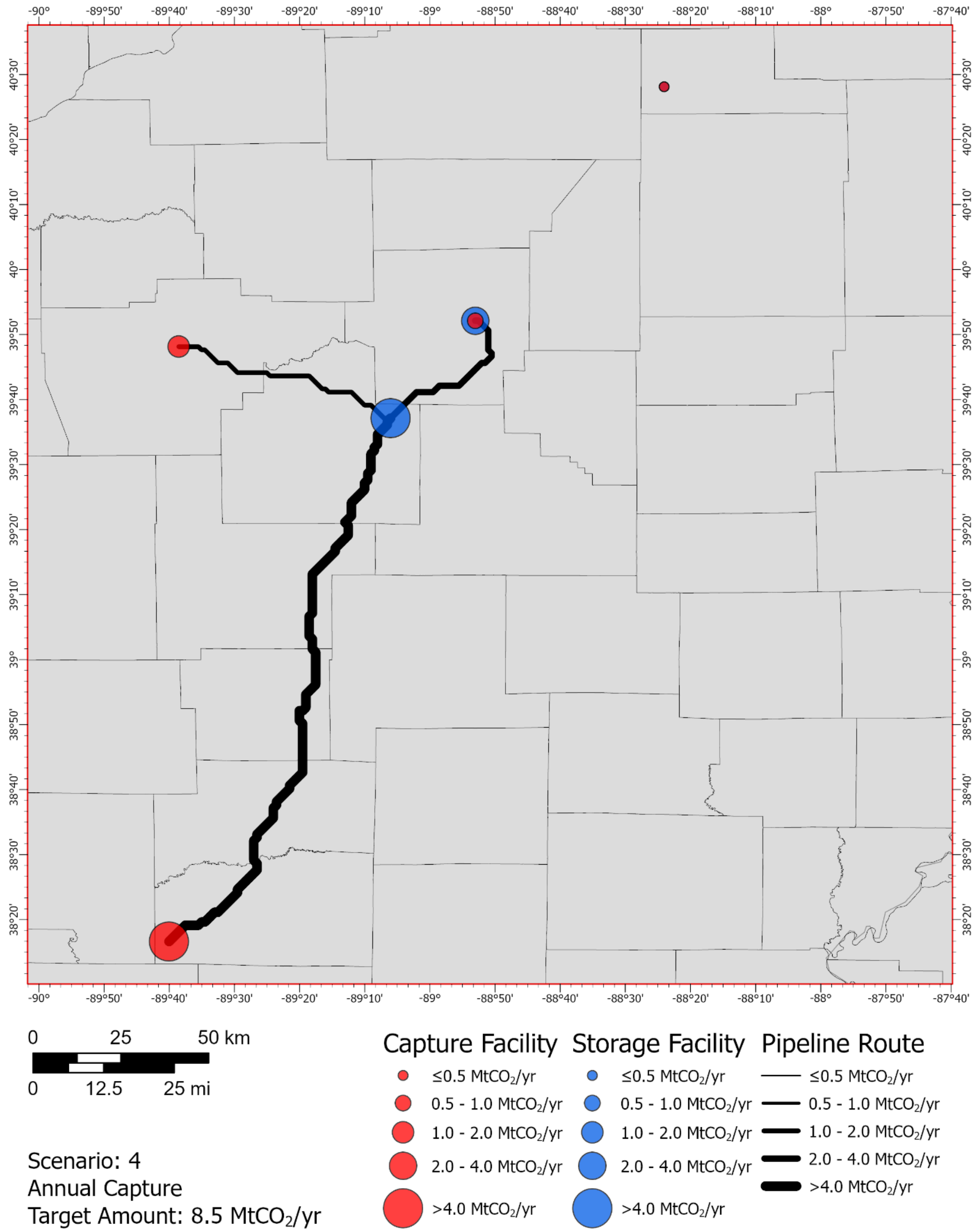
0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Storage Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Pipeline Route
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Scenario: 4
Annual Capture
Target Amount: 8.0 $MtCO_2/yr$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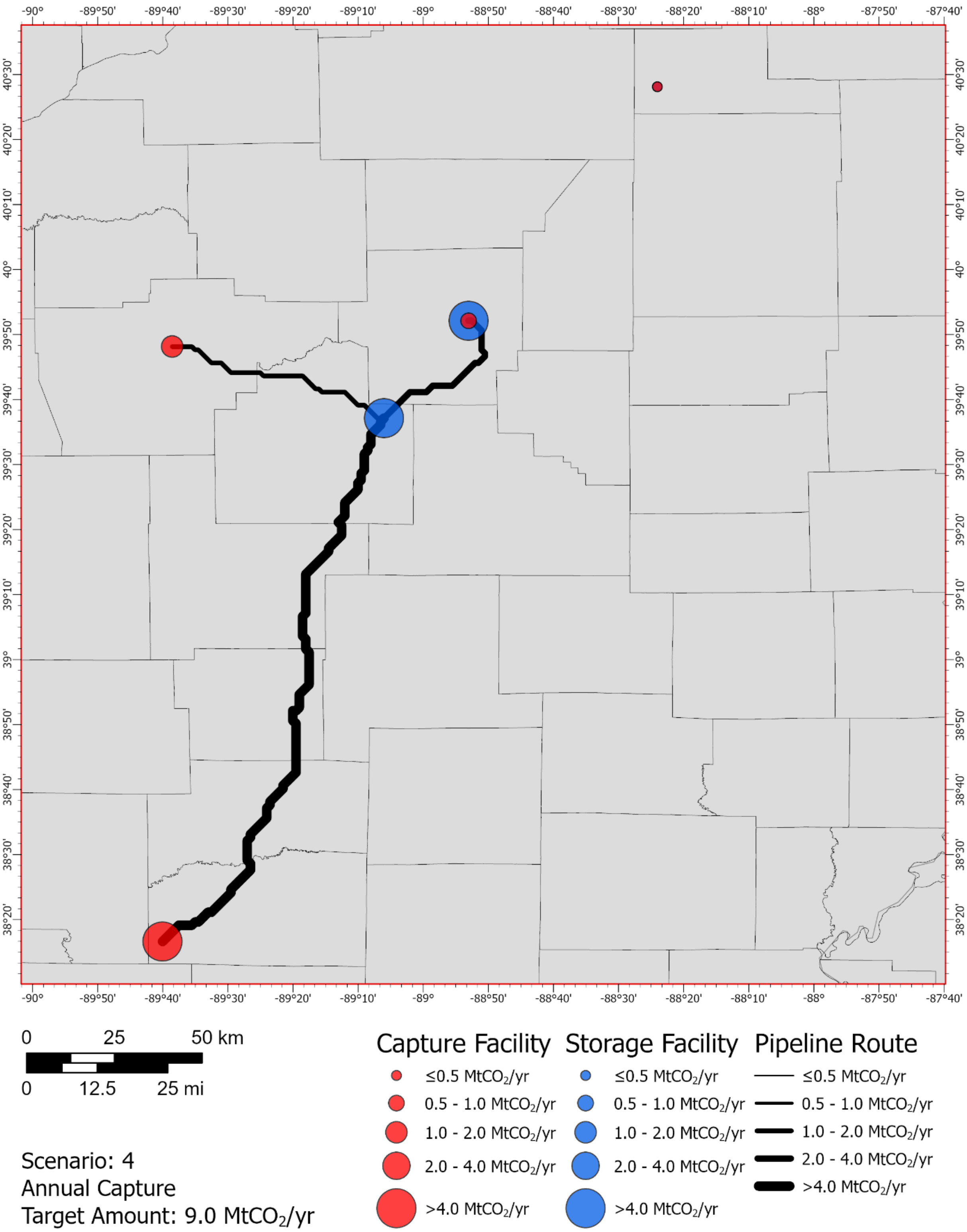
38°20'
0 25 50 km
0 12.5 25 mi
Capture Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Storage Facility
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Pipeline Route
≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$
Scenario: 4
Annual Capture
Target Amount: 8.5 $MtCO_2/yr$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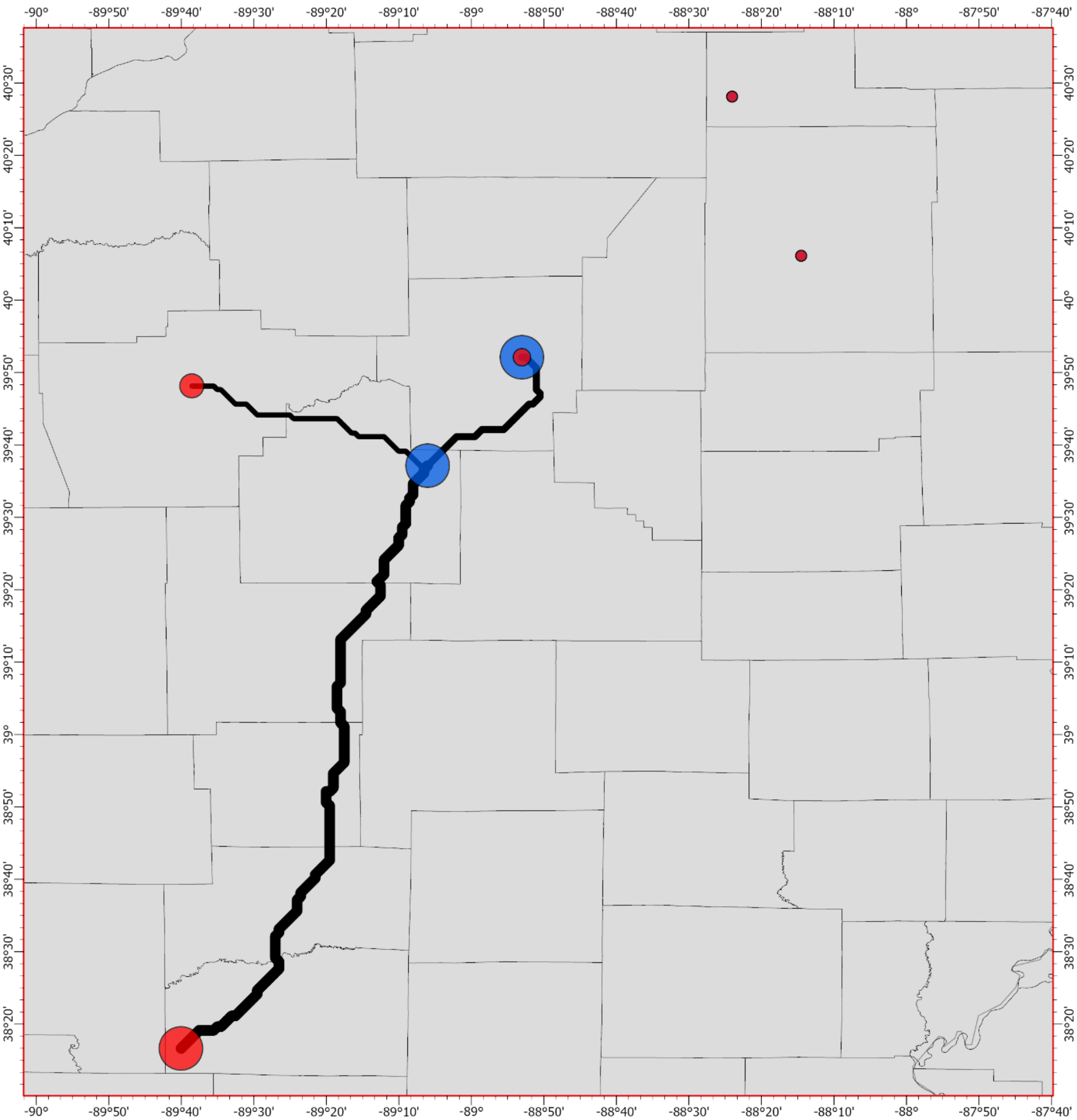
38°20'
0 25 50 km
0 12.5 25 mi
Capture Facility
Storage Facility
Pipeline Route
≤0.5 $MtCO_2$/yr
0.5 - 1.0 $MtCO_2$/yr
1.0 - 2.0 $MtCO_2$/yr
2.0 - 4.0 $MtCO_2$/yr
>4.0 $MtCO_2$/yr
Scenario: 4
Annual Capture
Target Amount: 9.0 $MtCO_2$/yr



0 25 50 km

0 12.5 25 mi

Scenario: 4
Annual Capture
Target Amount: 9.167 $MtCO_2/yr$

Capture Facility	Storage Facility	Pipeline Route
≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$	≤0.5 $MtCO_2/yr$
0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$	0.5 - 1.0 $MtCO_2/yr$
1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$	1.0 - 2.0 $MtCO_2/yr$
2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$	2.0 - 4.0 $MtCO_2/yr$
>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$	>4.0 $MtCO_2/yr$