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ROUTE ANALYSIS

Route Analysis for the ITC Oneida–Sabine Lake 345 kV Transmission Line

Public-Data Analysis, Route-Wide and Per-Jurisdiction

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PREPARED FOR	Williamstown Locke Corridor Community Alliance, through counsel
PROJECT	ITC Oneida–Sabine Lake 345 kV · MISO LRTP · pre-filing route study
JURISDICTIONS	14 route townships and 2 cities across 3 counties (Eaton County, Ingham County, Livingston County)
STATUS	Preliminary draft; public sources reviewed through September 15, 2026; road data updated September 23, 2026; municipal boundaries September 24, 2026

Reliance and Disclaimer

This document is a desk study based on public data. It applies established geospatial and route-analysis methods to data from ITC Michigan (ITC), the Federal Emergency Management Agency (FEMA), the U.S. Fish and Wildlife Service (USFWS), the U.S. Geological Survey (USGS), the Michigan Department of Environment, Great Lakes, and Energy (EGLE), and the U.S. Census Bureau. The analysis can be reproduced from the same public sources.

Nothing here is engineering design, professional engineering certification, legal advice, an appraisal, or a stamped siting study. Bommarito Consulting LLC prepared this revised report for the Williamstown Locke Corridor Community Alliance under guidance of counsel. The methods, weights, analysis, and conclusions are the author's. Compensation does not depend on any route, regulatory, or litigation outcome. Neither ITC, Burns & McDonnell, nor the Michigan Public Service Commission (MPSC) commissioned or controlled the analysis.

Where the public data is insufficient to complete a step, that limitation is stated explicitly.

Appendix A lists the data sources and their content hashes. Appendix B gives the reproduction steps. A reader can repeat or extend the analysis with the same public sources.

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1 Qualifications and Scope

This report presents a public-data route analysis of the proposed ITC Oneida–Sabine Lake 345 kV transmission line in central Michigan. It is prepared by Michael J. Bommarito II of Bommarito Consulting, LLC, for the Williamstown Locke Corridor Community Alliance (WLCCA), through counsel.

1.1 Scope and limits

Michael J. Bommarito II has 25 years of experience in computational modeling, data analysis, technology, and governance. His work includes reproducible public-data studies used in advisory, regulatory, and dispute settings. He is not a licensed professional engineer; the report does not offer an electrical or structural design opinion.

The report has the following limits:

- It uses *only* public sources, including ITC’s published route information; federal and state environmental, infrastructure, and land records; county parcel, assessment, and GIS records; and relevant township maps, resolutions, and other published records used to check local conditions. The route scores rely on the mapped sources described in Appendix A. County and township records also help confirm local conditions and identify limits in broader public datasets.
- Appendix A summarizes the input inventory. Full source URLs, retrieval timestamps, SHA-256 hashes, and record counts are retained in the machine-readable inventory and provenance records.
- The reported calculations are reproducible from the identified source data and methods (Appendix B).

Its purpose is not to critique ITC or Burns & McDonnell. It provides a public-data comparison that affected parties can examine and compare with the applicant’s eventual filing.

1.2 What this analysis is not

It does not provide an electrical design, engineering certification, appraisal, condemnation-cost estimate, or legal opinion. It addresses route geometry and the environmental, residential-parcel, infrastructure, and jurisdictional footprint of the candidate routes. Planning-cost indicators and design scenarios are identified as such and are not route-specific estimates.

2 Executive Summary

The ITC Michigan (ITC) Oneida–Sabine Lake project is a 345 kV transmission line in central Michigan. It would run approximately 50 miles from the Oneida substation in Eaton County to a new Sabine Lake substation in Livingston County. The project is part of the Midcontinent Independent System Operator's (MISO's) Long Range Transmission Planning portfolio [1, 2]. For Phase 3 public comment, ITC has narrowed its candidate network to **7 named route alternatives** — Blue, Orange, Green, Purple, Yellow, Red, and Pink — published on its public dashboard. The scored routes collectively cross 14 townships and 2 cities across 3 counties (Eaton County, Ingham County, Livingston County).

2.1 Approach

We retrieve ITC's 7 published Phase 3 routes directly from its ArcGIS services. We score each route with factors drawn from Commission practice and the January 2026 voluntary filing guidelines, within Act 30's "feasible and reasonable" framework. Wetlands, wet soils, floodplains, protected areas, and residential proximity increase a route's score. Following existing transmission lines, limited-access freeways, other state roads, or railroads lowers it. A lower score is better. Table 4 gives the full factor set and the adjustable weights. Every input is public and provenance-tracked. The default results assume that House Bill 5940 is enacted, so a route running within a limited-access freeway right-of-way is credited on a par with one following an existing transmission line (Section 7.4). Results under current law are in Appendix D.

2.2 Headline result

Ranking of ITC's published alternatives

Of ITC's 7 Phase 3 routes, the **Orange Route** scores best on the composite objective (57.96 miles, 1,364 acres of combined wetland, floodplain, wet-soil, and protected-area overlap within a 200-foot offset on each side of the centerline), and the Blue Route scores worst. Because those layers can overlap, the acreage is a four-factor indicator rather than a unique land area. Orange has the least mileage near an existing transmission corridor and more direct I-96 mileage than Purple; Blue and Green follow I-96 farther. At the current weights, its environmental and residential-parcel results outweigh Purple's advantage on the mapped transmission-co-location measure by 0.203 points (3.808 against 4.010; lower is better). Under current law Orange also ranks first, by 0.084 points (Appendix D). The full ranking is in Table 5 and Figure 13.

The objective includes selected residential parcels in classes 401 and 407 whose boundaries intersect a 500-foot route buffer across Eaton, Ingham, and Livingston counties. Those classes do not establish occupancy or dwelling location. The report also gives a representative-point proxy and the Commission's 0–100, 101–300, and 301–500-foot bands (Section 7.7).

The weights are adjustable. Related factors share a category weight so that the model does not count the same impact several times (Section 7.5). Across 1,000,000 weightings spanning every factor from one-eighth to eight times its default value, the Orange Route ranks first in 64% and sits in the top three 95% of the time. It finishes last in

0.16% of the draws and has the best average rank (1.76, against 1.87 for Purple). The Purple Route is the principal alternative (31%); it overtakes Orange chiefly where existing-transmission co-location is weighted at about three and a half times its default or residential proximity at less than about one-fifth of its default. The MPSC has called co-location an Act 30 factor that is important but *not* controlling (Section 3.3). The environmentally heaviest routes rank first in fewer than 0.2% of the draws (Appendix C). Under current law the corresponding shares are 53% for Orange and 41% for Purple (Appendix D). Results are also reported per jurisdiction (Section 9).

Route length is reported but is not part of the default composite. Because the final MPSC guidelines list length as engineering scoring data [3], Appendix C shows that adding a min-max-normalized length penalty can change the Orange–Purple order. That added penalty is not wholly independent of the existing score. Ten of the 26 factors measure acreage within a fixed-width route band, four measure shares of route length, and three count features within a fixed distance of the route. Together, those 17 factors carry about 85% of the stated weight. A separate length penalty therefore overlaps existing exposure measures, although it does not duplicate the local conditions they measure. New-ROW acreage remains a conditional scenario because final design and easement information is not public.

The composite rank does not display all of Purple’s relative advantages. It is 4.24 miles shorter, which public planning-level rates would favor, and a design that reuses or widens the Tihart–Oakland 138 kV corridor could avoid substantially more new taking than a separate parallel easement. The length difference is measured from the published routes. The cost and avoided-taking implications remain conditional because ITC has not published final structure, width, lateral-placement, or route-cost assumptions.

As of September 15, 2026, ITC states that it expects to file the construction plan in late fall 2026 and an Act 30 application in the second quarter of 2027. HB 5940, which would allow aboveground transmission lines within limited-access highway rights-of-way, passed the Michigan House 98–0 with immediate effect on August 26, 2026; as of September 24, 2026 it is before the Senate Committee on Energy and Environment [4]. We expect it to be enacted and controlling within the next 30 to 60 days, and the default results assume it (Section 7.4). Results under current law are in Appendix D; Section 8.8 shows how the ranking responds to the weight given to freeway right-of-way.

3 Project Background and Regulatory Context

3.1 The project

The Oneida–Sabine Lake 345 kV line is part of the Midcontinent Independent System Operator’s Long Range Transmission Planning (LRTP) Tranche 2.1 portfolio [1]. As of September 15, 2026, the project is in the pre-filing route-study phase; Burns & McDonnell is conducting the siting GIS work on ITC’s behalf, and the candidate alignment and study area are published through ITC’s public project portal [2]. ITC currently anticipates a construction-plan filing in late fall 2026 and an Act 30 application in the second quarter of 2027.

The siting process has proceeded through public open houses. An initial “Round 1” network of candidate segments was published in late 2025; ITC has since narrowed that network to **7 named route alternatives** — Blue, Orange,

Green, Purple, Yellow, Red, and Pink¹ — which are the subject of the Phase 3 public-comment dashboard. This report evaluates those 7 published alternatives; it does not analyze the superseded Round-1 network.

3.2 Regulatory framework

Transmission siting in Michigan is governed by Public Act 30 of 1995 [5], which requires a Certificate of Public Convenience and Necessity from the Michigan Public Service Commission (MPSC) for lines 5 miles or more in length operating at 345 kV or above. Act 30 states the governing “feasible and reasonable” standard; the more specific route factors used here come from Commission practice and the January 2026 Voluntary Filing Guidelines in Case U-21930 [3]. Two adjacent 345 kV projects — Nelson Road–Oneida (Case U-21471) and Helix–Hiple (Case U-21472) — were approved in a consolidated July 2025 order [6].

House Bill 5940, which would allow aboveground transmission lines within limited-access highway rights-of-way under MDOT and MPSC standards, passed the House 98–0 with immediate effect on August 26, 2026 and was referred to the Senate Committee on Energy and Environment on September 9; as of September 24, 2026 it remains in that committee [4]. We expect it to be enacted and controlling within the next 30 to 60 days. The default objective therefore credits freeway right-of-way (Section 7.4); results under current law are in Appendix D.

3.3 The “feasible and reasonable” standard and existing rights-of-way

The weight given to existing rights-of-way can affect which route is chosen. Act 30 requires the Commission to grant a certificate only if it determines, among four criteria, that “[t]he proposed or alternative route is feasible and reasonable” (MCL 460.568(5)(b)) [5]. The test is conjunctive — a route must be both feasible *and* reasonable — and the Commission construes “reasonable,” by its ordinary meaning, as “fair and proper under the circumstances.” The Commission considers the factors together; no fixed hierarchy makes one factor control every case.

The July 2025 consolidated order certifying the adjacent Oneida–Nelson Road and Helix–Hiple lines applies that standard to existing corridors [6]. The Commission held that “the use of existing utility ROWs to minimize the condemnation of private land is *an important factor* for establishing a reasonable route under Act 30,” and directed applicants to “thoroughly explore” such corridors. But it treated co-location as a weighted consideration, not a controlling one. The credited corridor was an unoccupied, uncleared 130-foot easement with no line on it. Although more land would still have been needed for the proposed 200-foot right-of-way, the alternate reduced the estimated new right-of-way from 938.6 to 817.9 acres, a 120.7-acre reduction. The Commission weighed that benefit against the route’s higher social-evaluation score, including the number of parcels crossed and residences located within 101–500 feet. The order also rejected the applicant’s primary route as “while feasible,... not reasonable given the opportunity to use an existing ROW.” A feasible route can therefore fail the separate reasonableness test. That remains true whether or not the route follows an existing right-of-way.

Existing-route status *supports* a route’s reasonableness but does not *compel* its selection. The Court of Appeals held that MCL 460.568(5)(b) “required only that the PSC find that METC’s proposed route was feasible and reasonable,” not that it was more feasible and more reasonable than any other proposed route [7].

The Commission considered corridor reuse, residential effects, and environmental effects together. It did not

¹ITC’s June 2026 public-comment dashboard relabels the route it had previously shown as “Brown” as “Red”; the alignment is unchanged. This report follows ITC’s current label. The synthetic maximum-freeway route we construct in Section 8.7 is named “Teal” to keep it distinct from ITC’s Red.

reserve residential and environmental harm as a final check after deciding that a route was otherwise reasonable. This report therefore scores each route on engineering, environmental, and social factors. In the Nelson–Oneida record, MPSC Staff used the same three categories and min–max normalization, but did not weight the factors. This report adds weights chosen by the author and states them explicitly (Section 7; Appendix C). A sensitivity result shows how a route responds to those modeling choices. It does not decide which route satisfies the legal standard.

3.4 Why a per-jurisdiction analysis

The scored routes collectively cross 14 townships and 2 cities in 3 counties. Impacts and political accountability are local: a route that is attractive in the aggregate may concentrate its burden in one or two townships. This analysis therefore resolves every metric both route-wide and per jurisdiction.

4 Study Area and Jurisdictions

4.1 Study area

The study area is the union of ITC's candidate route segments and its 7 named Phase 3 routes, with a 2000 ft buffer. Environmental area impacts use a narrower band extending 200 ft from each side of the route centerline, or 400 ft in total. All area and distance calculations use the Michigan GeoRef projected coordinate system, identified in the European Petroleum Survey Group (EPSG) registry as code 3078. Its units are meters, so the analysis converts feet to meters before applying a buffer.

4.2 Jurisdictions on the corridor

The scored routes span three counties (Eaton County, Ingham County, Livingston County). They cross townships and, in two places, incorporated cities. Table 1 reports actual Phase 3 route mileage by jurisdiction.

None of the seven scored Phase 3 routes enters Meridian Charter Township. Figure 1 shows the county and township divisions the routes cross.

4.3 Cities and villages on the routes

ITC's published township layer carries no cities or villages. Measured against it alone, a route's miles inside an incorporated place fall inside the surrounding township's polygon as well, and are credited to the township. This study therefore measures incorporated places separately, from U.S. Census TIGER/Line legal boundaries [8], and nets the city mileage out of the enclosing township so that each column still sums to route length.

Two crossings result. The **City of Potterville** (Eaton County) lies on Blue, Purple, Red for 0.63 miles, inside Benton Township. The **City of Lansing** lies on Orange for 0.27 miles: one of the detached parts of the city, inside Alaiedon Township. Overlaps shorter than 50 m are excluded as disagreement between the Census boundary and ITC's centerline where a route runs *along* a municipal line rather than through it; on these routes the excluded overlaps are about 4 m, against crossings of 1,007 m and 431 m.

Table 1: Phase 3 route mileage by township and city.

Jurisdiction	Blue	Orange	Green	Purple	Yellow	Red	Pink
Alaiedon Township	8.29	9.58	8.29	7.00	8.29	6.59	8.29
Aurelius Township	0.00	4.77	0.00	4.77	0.00	4.77	3.87
Benton Township	4.98	3.91	3.91	5.83	3.91	5.83	3.91
Cohoctah Township	5.09	1.73	5.09	3.20	3.20	3.20	3.20
Conway Township	2.86	6.37	2.86	5.89	5.89	5.89	5.89
Delhi Charter Township	8.45	2.66	8.45	2.66	8.45	2.66	5.03
Eaton Rapids Township	0.00	0.55	0.00	0.55	0.00	0.55	0.55
Handy Township	5.38	5.38	5.38	0.00	0.00	0.00	0.00
Leroy Township	6.24	6.24	6.24	0.00	0.00	0.00	0.00
Locke Township	0.00	0.00	0.00	5.79	5.79	5.79	5.79
Oneida Charter Township	1.28	1.28	1.28	1.28	1.28	1.28	1.28
Wheatfield Township	5.33	5.33	5.33	2.91	1.79	3.93	1.79
Williamstown Township	0.00	0.00	0.00	6.94	6.94	6.94	6.94
Windsor Charter Township	7.20	9.89	9.40	6.29	9.40	6.29	9.89
<i>Incorporated cities and villages</i>							
Lansing city	0.00	0.27	0.00	0.00	0.00	0.00	0.00
Pottersville city	0.63	0.00	0.00	0.63	0.00	0.63	0.00
Total	55.72	57.96	56.21	53.72	54.92	54.34	56.43

Every other cell of Table 1 is unaffected, route totals do not change, and no ranking changes: no jurisdiction measure is a factor in the composite objective (Section 7.5).

The correction goes to standing, not to score

Act 30 requires notice of the application to each affected municipality and to each affected landowner on whose property the line will be built [9], and grants each affected municipality and affected landowner full intervenor status as of right in the contested case [9]. MPSC pre-filing practice is a public meeting in each municipality through which the line would be built [10], with landowners and municipalities within one mile of the proposed right of way also invited [11]. On this data, Pottersville is a municipality the line would be built through on Blue, Purple, Red, and the City of Lansing is one on Orange. Whether a given municipality is “affected” is for counsel and the Commission; what this measurement changes is that the question has to be asked about two cities a township-only reading does not surface.

Table 2 reports, for each route, the municipalities it runs through and those within 1 mile of the centerline. The reach of the MPSC’s one-mile practice ranges from 15 to 21 municipalities depending on which route is filed. Both columns are measured on the published centerline, not on a right-of-way width, and are a description of notice reach rather than a scored quantity.

Table 2: Municipalities each Phase 3 route crosses, and the reach of the MPSC's one-mile pre-filing practice. Townships are Census county subdivisions; cities and villages are Census incorporated places.

Route	Through	of which cities	Within 1 mi only	Total within 1 mile
Blue	11	Potterville city	10	21
Orange	13	Lansing city	5	18
Green	10	—	10	20
Purple	13	Potterville city	2	15
Yellow	10	—	6	16
Red	13	Potterville city	2	15
Pink	12	—	4	16

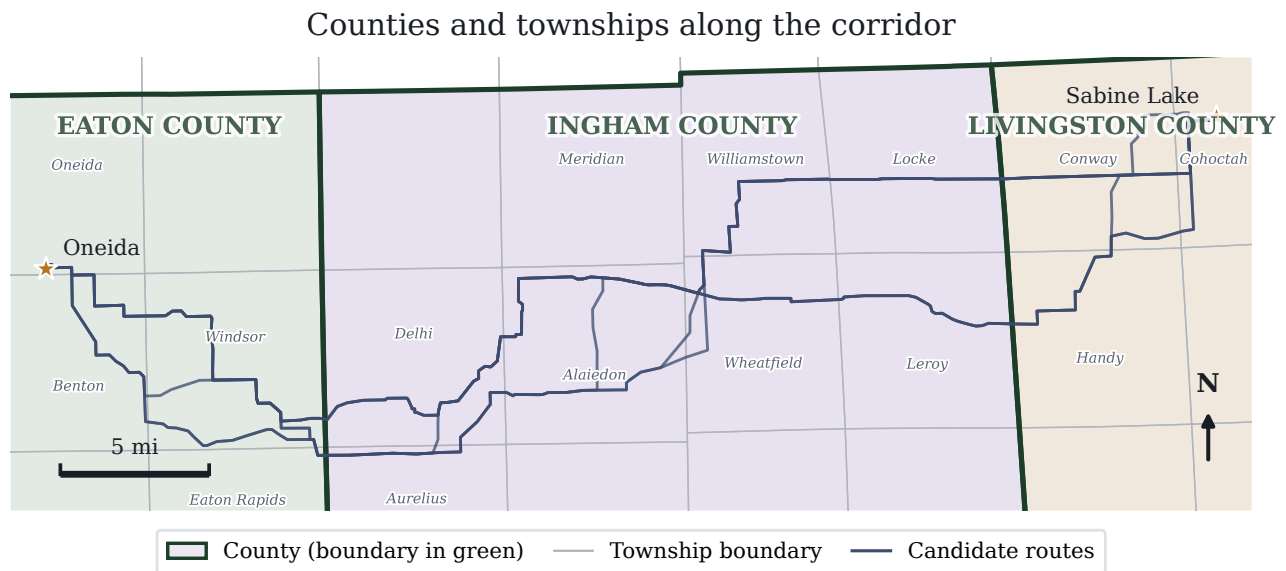


Figure 1: County (heavy green boundaries, tinted) and township divisions along the corridor, with the candidate routes. The corridor runs west to east through Eaton, Ingham, and Livingston counties.

ITC Phase 3 named route alternatives

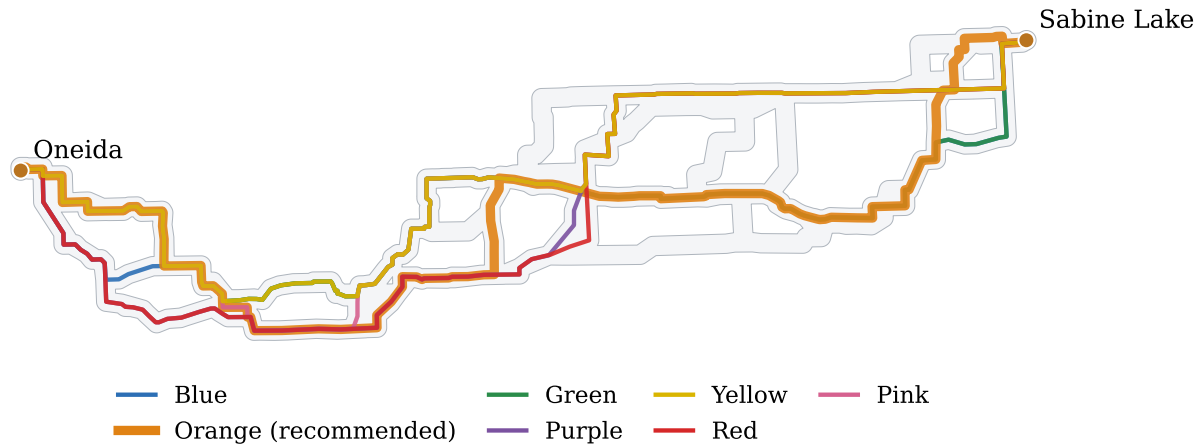


Figure 2: ITC's 7 Phase 3 named route alternatives between the Oneida and Sabine Lake substations, on the study area. The objective-preferred Orange Route is drawn heavier.

5 Corridor Constraints

Before scoring the routes it helps to see what the corridor actually contains. The maps in this section draw the 7 candidate routes — the recommended Orange route in bold, the others in grey — against each constraint that enters the objective, rendered from the same clipped public layers the scoring uses (Section 6). They are a visual companion to the per-route numbers in Section 8: where a route runs through shading, it accrues impact; where it follows an existing line, it earns co-location credit.

5.1 Environmental constraints together

Figure 3 overlays all four environmental penalties — wetlands, floodplain, hydric soils (soils that remain wet long enough to lose most of their oxygen), and protected land. The constrained ground is not evenly spread: it concentrates in the low, wet central reach, which is where the routes diverge most and where the ranking is largely decided.

5.2 Residential density

Figure 4 bins the selected residential parcels (classes 401 and 407) into a density grid. The densest clusters relevant to the scored routes include Williamstown and nearby Ingham County communities; no scored route enters Meridian. The count covers all three counties, including the Livingston tail near the Sabine Lake terminus (Section 7.7).

5.3 Wetlands and floodplain

Wetlands (Figure 5, Michigan EGLE National Wetlands Inventory (NWI) Plus) and the FEMA regulatory floodplain (Figure 6, zones A and AE) are the corridor's two largest mapped water-resource constraints. Both follow the low ground through the central townships, where every candidate route must cross the wet reach between the drier

Environmental constraints along the corridor

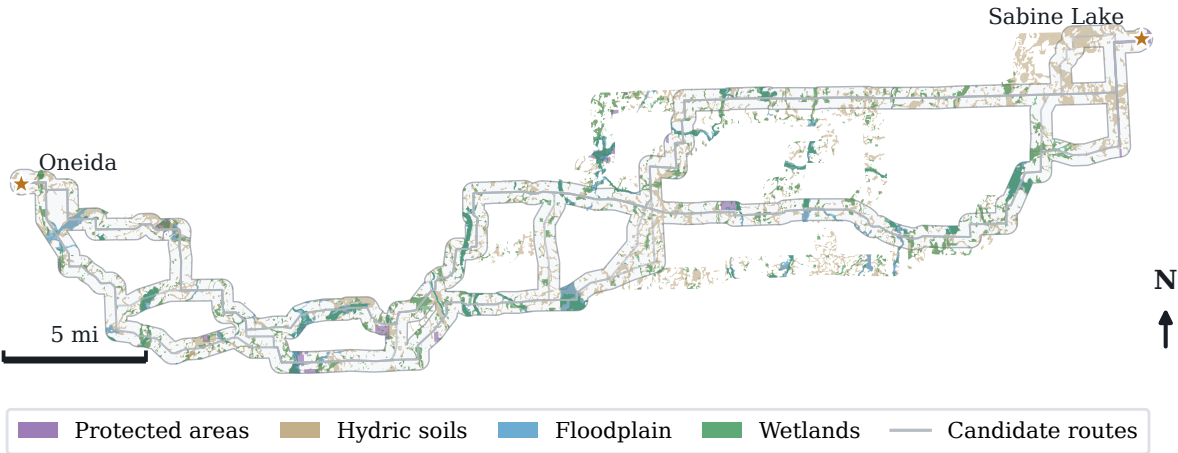


Figure 3: The four environmental constraints along the corridor, with the candidate routes overlaid (recommended route in bold). The reported environmental total is the sum of these four overlap areas.

Residential density along the corridor

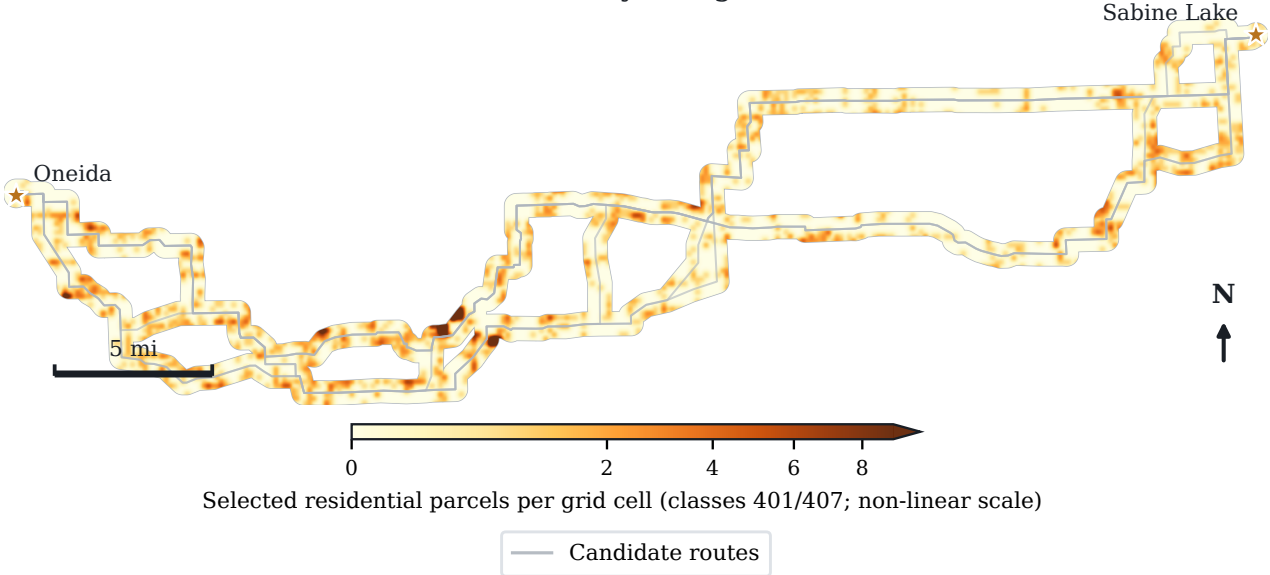


Figure 4: Residential-parcel density (selected classes 401 and 407) as a hex-bin heatmap; 3,175 parcels fall within the study-area corridor.

uplands at each terminus. The routes therefore differ less in *whether* they cross these features than in *how much* of each they intersect. Section 8 lists the acres for each route.

Wetlands along the corridor

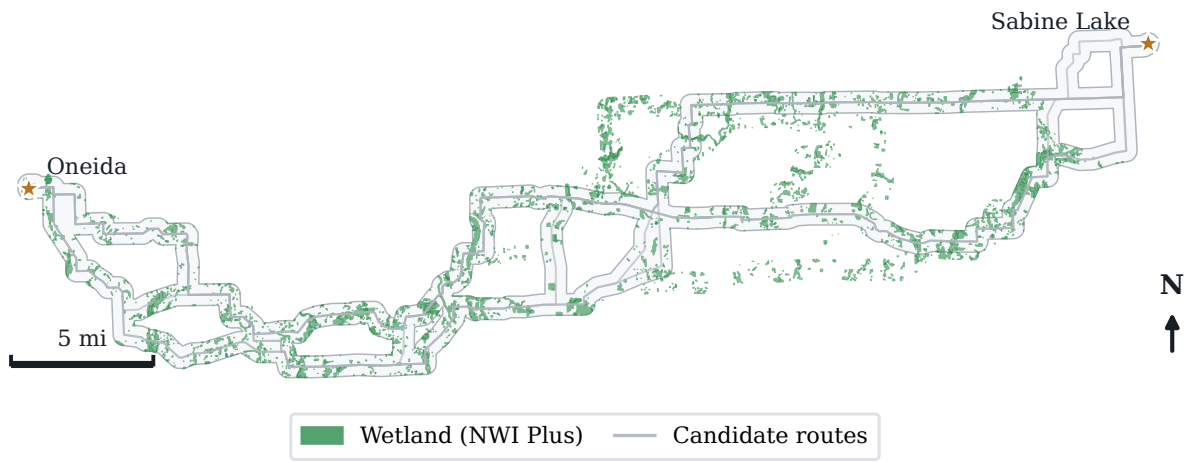


Figure 5: Wetlands (Michigan EGLE NWI Plus) along the corridor.

FEMA floodplain along the corridor

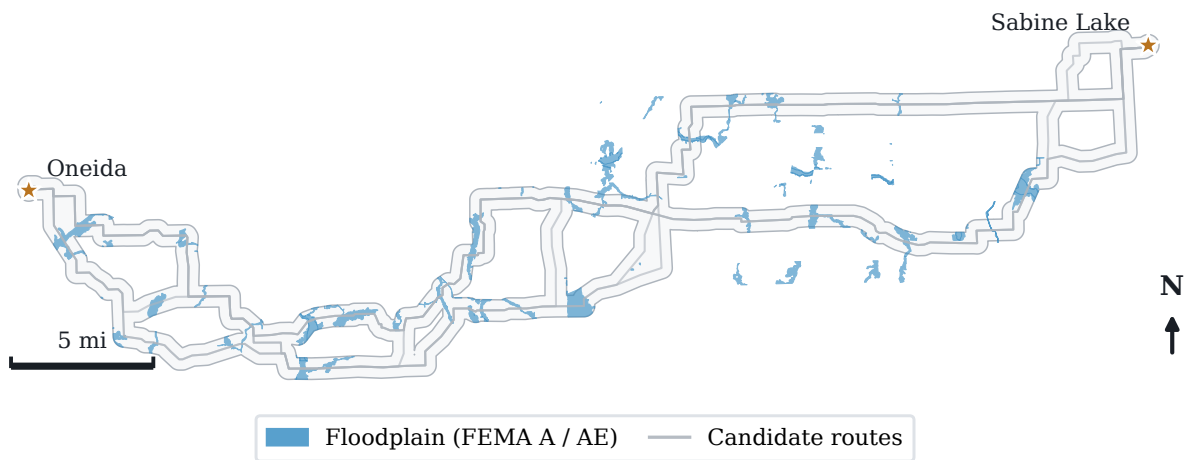


Figure 6: FEMA regulatory floodplain (zones A and AE) along the corridor.

5.4 Hydric soils and protected land

Hydric soils (Figure 7) remain wet long enough to lose most of their oxygen. They cover more land than mapped wetlands and form the largest environmental penalty by area. Their pattern follows the wetlands and floodplains but extends well beyond them. Protected land (Figure 8, USGS PAD-US) is comparatively sparse here, so it separates the routes mainly where one alignment clips a state game or recreation area that the others skirt.

Hydric soils along the corridor

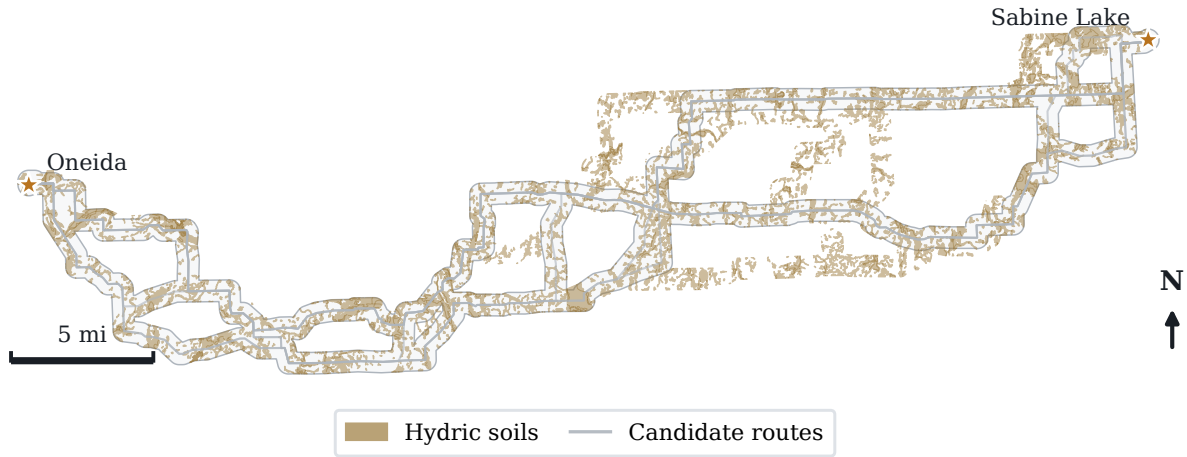


Figure 7: Hydric soils along the corridor — a wetness indicator that tracks, but is broader than, mapped wetlands.

Protected land along the corridor

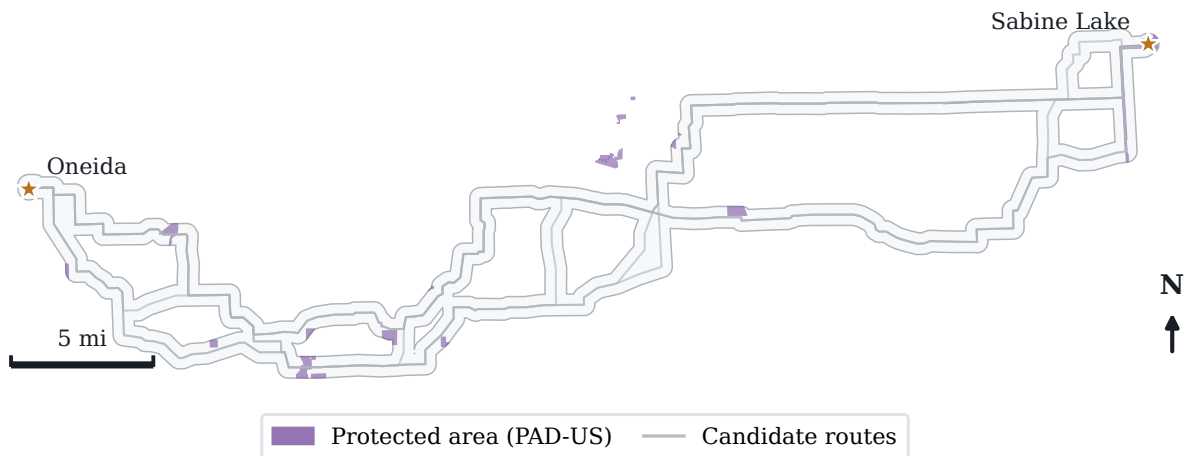


Figure 8: Protected land (USGS PAD-US) along the corridor.

5.5 Land cover

Beyond the discrete water-resource layers, the corridor's land cover (Figure 9, NLCD 2021) sets the agricultural and woodland impact. The corridor is predominantly cultivated cropland, broken by forest blocks and scattered wetland. The objective measures forest, cropland, pasture, and grassland separately from this raster. Routes through forest blocks receive more woodland-clearing impact. Routes through cropland receive more farmland-conversion impact.

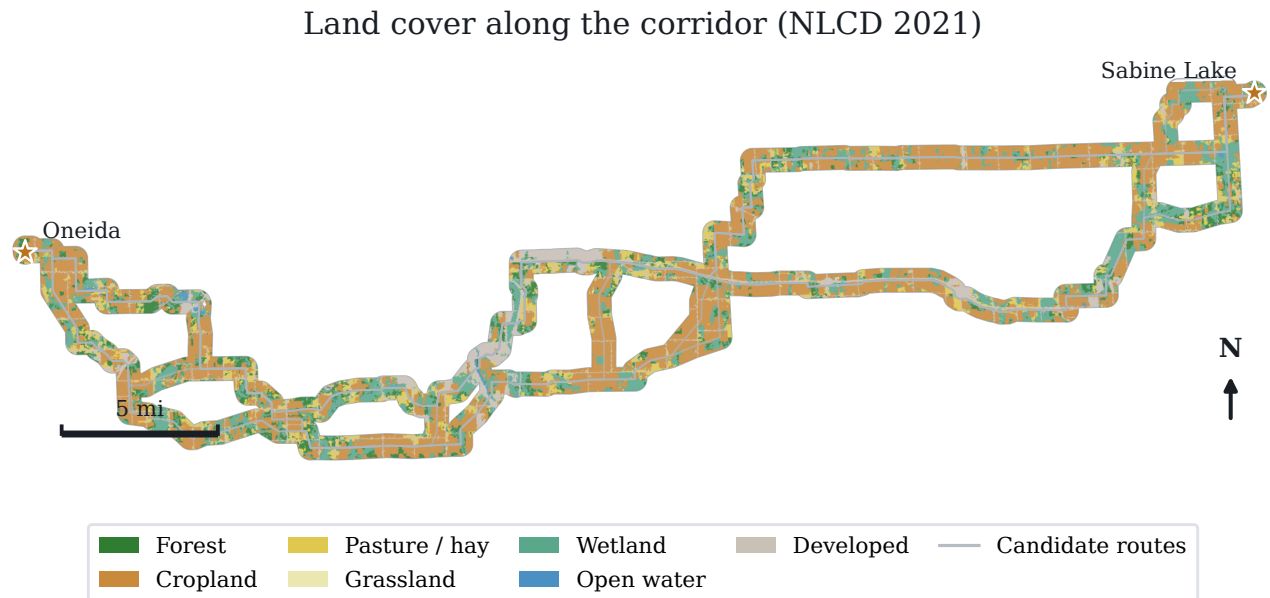


Figure 9: NLCD 2021 land cover along the corridor; forest, cropland, pasture, grassland, wetland, and open water each enter the objective as a separate factor.

5.6 Wellhead protection areas

Wellhead protection areas (Figure 10) mark land where water drains toward public-supply wells. Construction and vegetation maintenance in these areas can affect drinking water. Their overlap with the corridor varies widely across the routes — from roughly 110 to 330 acres — which makes wellhead-protection overlap one of the more discriminating environmental factors.

5.7 Sensitive receptors and cultural resources

Two social point factors round out the picture (Figure 11). *Sensitive receptors* — schools, hospitals, clinics, and places of worship — are screened within 1,000 ft of each route. The receptor layer is drawn from OpenStreetMap and is incomplete; for example, it omits Memorial Lutheran School. It is therefore carried only as a low-weight screening factor. *Cultural and historic resources* (historic sites and cemeteries) are also drawn from OpenStreetMap (OSM), while Michigan State Historic Preservation Office (SHPO) archaeological records are access-restricted. Both remain screening factors pending more complete authoritative facility data. The 1,000-foot display band is broader than the 500-foot facility measures in the final MPSC guidelines [3].²

²As a check on this limitation, the analysis was rerun with both OpenStreetMap screening factors disabled. Every route retained the same rank: Orange first, Purple second, and Red third through Blue seventh. Orange's score changed from

Wellhead protection areas along the corridor

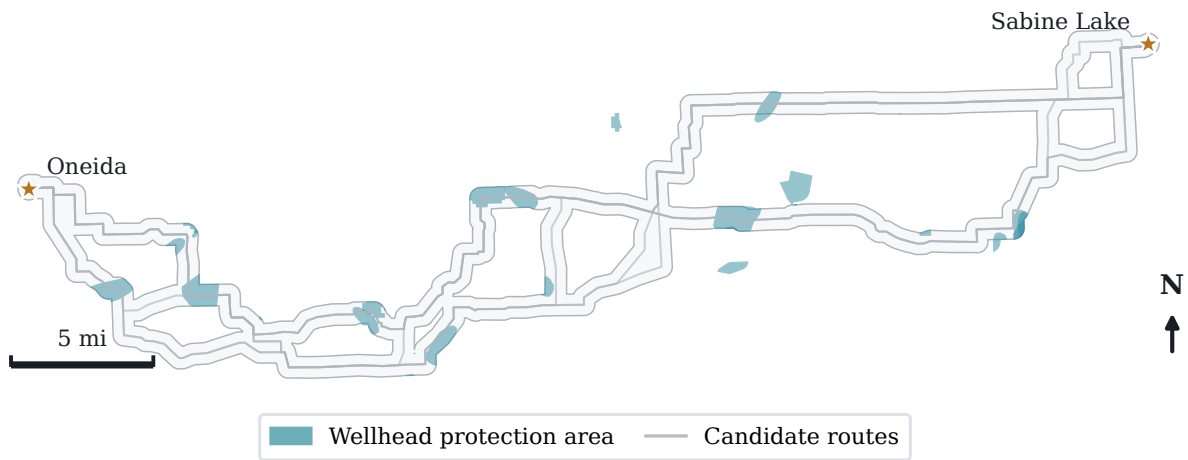


Figure 10: Wellhead protection areas (Michigan EGLE) along the corridor.

Sensitive receptors and cultural resources near the corridor

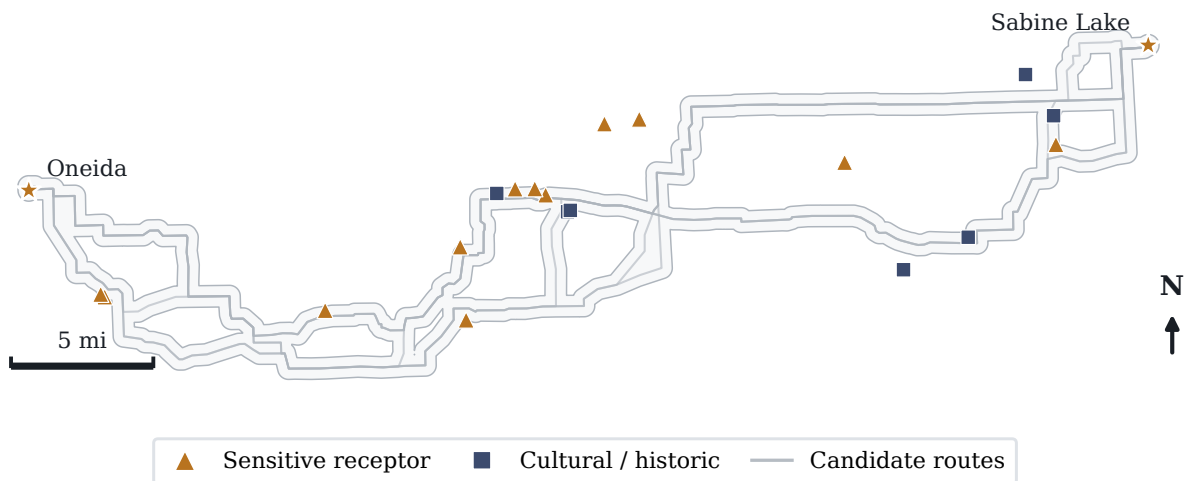


Figure 11: Sensitive receptors (OpenStreetMap: schools, hospitals, clinics, places of worship) and cultural/historic resources (OSM: historic sites and cemeteries) near the corridor.

5.8 Existing transmission

Figure 12 shows the existing transmission lines coloured by voltage. Co-location credit is voltage-weighted (Section 7.6), so the 345 kV corridors — which the new line shares its voltage with — are worth more in the model than the 138 kV lines. The 138 kV alignment relevant to the Purple family is the Tihart–Oakland line. Older federal Department of Homeland Security (DHS) Homeland Infrastructure Foundation-Level Data (HIFLD) used a less specific or outdated ownership name; this report does not rely on that field as a current ownership determination.

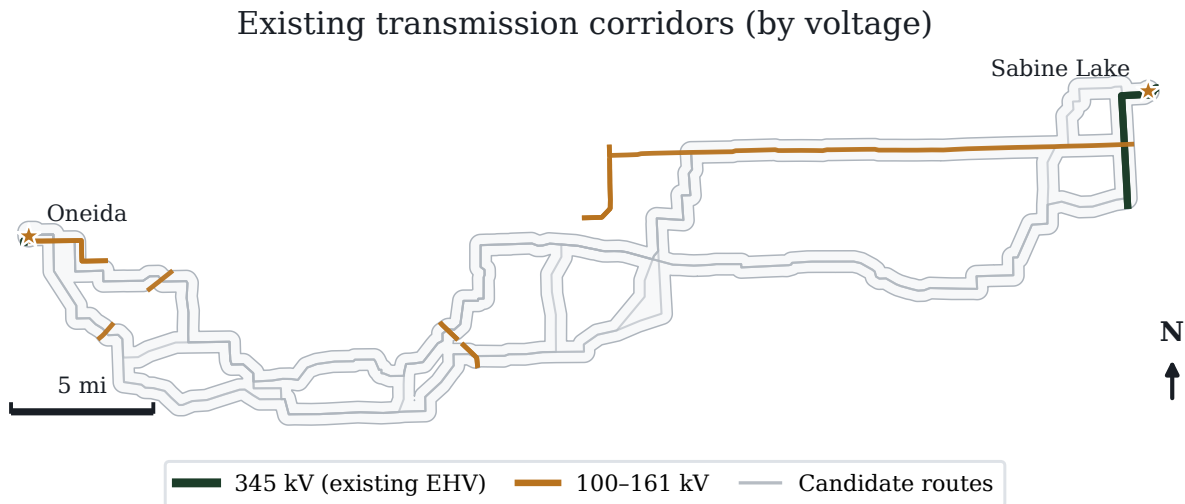


Figure 12: Existing transmission corridors by voltage (nine 138 kV, four 345 kV); the new line is 345 kV.

6 Data Sources and Provenance

6.1 Source layers

The route geometry, study area, structures, and administrative boundaries are retrieved directly from ITC's public ArcGIS FeatureServer endpoints [2]. The environmental, contamination, and infrastructure layers are retrieved from their authoritative public providers through a provenance-tracked retrieval pipeline:

- **Flood zones** — FEMA National Flood Hazard Layer (regulatory zones A and AE; Zone X excluded).
- **Wetlands and hydric soils** — Michigan EGLE Wetlands Map Viewer (NWI Plus and hydric soils).
- **Protected areas** — USGS PAD-US [12].
- **Hydrography** — USGS National Hydrography Dataset mapped stream lines.
- **Contamination** — Michigan EGLE Remediation and Redevelopment Division (RRD): Part 201 sites, underground storage tanks (USTs), and brownfield sites.
- **Transportation** — Michigan Department of Transportation (MDOT) roads and railroads.

3.808 to 3.708; Purple's remained 4.010 because neither screen counts a feature near Purple. The switch is reproducible with `OSA_INCLUDE_SCREENING_FACTORS=false`.

- **Boundaries** — Michigan county and county-subdivision layers.
- **Residential parcels** — Michigan property-class parcels, per-county (Section 6.2).

Data note. When the MDOT state-owned roads layer was queried in June 2026, the State of Michigan's public data service did not return the complete layer. The gap was identified on September 23, 2026, and the missing records were obtained separately from the same source. The road-based measures — road co-location, road crossings, and the I-96 mileage of the synthetic Teal route — were recomputed with the complete layer.

6.2 Residential parcel sources

The residential-parcel factor (Section 7.7) is built from Michigan real-property classes 401 and 407: Residential–Improved and Residential Condominiums. These codes do not establish occupancy or the location of a dwelling. Each county is sourced from its own assessment data, retrieved independently of ITC; Table 3 gives the source and the property-class field for each, with the number of qualifying parcels that fall within the study-area corridor.

Table 3: Residential parcel sources by county (selected classes 401 and 407; “in-corridor” counts parcels within the 2000 ft study area).

County	Source	Class field	Coverage	In-corridor
Eaton	County assessor (local)	CLASSCD	Full county	842
Ingham	County 2025 (ArcGIS)	PROPCLASS	Full county	1,775
Livingston	County GIS + assessor [†]	property_class	Full corridor	558

[†]Livingston County publishes parcel boundaries but does not include property class in that layer. The analysis joins those boundaries from the county's public parcel viewer to property-class records from the county assessor. This supplies the same route-wide category used for Eaton and Ingham counties. Parcel geometry remains only a proxy for structure location.

6.3 Provenance guarantee

Each material source is identified by URL, retrieval date, and SHA-256 content hash in the audit records. Appendix A reproduces the core vector inventory and separately identifies the residential, land-cover, and OpenStreetMap inputs used in the report.

7 Methodology

7.1 Routes evaluated

We retrieve ITC's 7 Phase 3 named routes directly from its public ArcGIS feature service (one polyline per route) and evaluate each as published. Geometries are stored in the World Geodetic System 1984 coordinate system (WGS 84; EPSG:4326). Area and distance calculations use Michigan GeoRef (EPSG:3078), whose units are meters. The calculations explicitly convert feet to meters for buffers and square meters to acres for area.

7.2 Per-route metrics

Each route is buffered 200 ft on each side of its centerline (a 400 ft-wide analytical band) and, for each public regulatory layer clipped to the study area, we compute:

- polygon layers — overlap area in acres (flood zones, wetlands, hydric soils, protected areas);
- line layers — crossing counts (roads, railroads, streams);
- co-location — a 0–1 score per existing-ROW type (existing transmission, limited-access freeways, other state roads, railroads), where 1 means the route runs on or beside that infrastructure.

Each route is also intersected with township boundaries for per-jurisdiction reporting.

7.3 Configurable objective

Routes are ranked by a single composite *impact*. Each factor draws on a per-route metric, carries a weight, and acts either as a *penalty* (minimize — e.g. wetlands, floodplain, selected residential parcels within 500 ft) or as a co-location *reward* (being near existing right-of-way lowers impact). This mirrors factors used in MPSC practice and its January 2026 voluntary filing guidelines within Act 30's statutory framework: environmental and social impacts are penalized; use of existing rights-of-way is rewarded. Penalty metrics are min–max normalized across the 7 routes so factors with different units combine fairly. The active factor set is shown in Table 4.

The spatial measurements do not change when the weights change. The model can therefore test new weights and produce a new ranking without measuring the route geometry again.

7.4 Freeway right-of-way under House Bill 5940

We present results assuming HB 5940 is enacted. Based on our review of the legislative record, we expect the bill to be enacted and controlling within the next 30 to 60 days: it passed the House 98–0 (12 members not voting) with immediate effect; the House Fiscal Agency's analysis records no opposition in committee; support includes ITC itself, the state's residential ratepayer advocate (the Citizens Utility Board of Michigan), a conservative energy organization (the Michigan Conservative Energy Forum), and environmental organizations, and a highway-corridor transmission group testified in support; and MDOT, the agency that would administer it, took a neutral position [13, 4]. Results under current law are reported in Appendix D.

Table 4: Active objective factors, grouped by three routing categories with each category's budget shown at right (the bold total per category), so the per-concept weights can be read against the budget they share.

Preset: act30_hb5940; weights grouped by category (budget at right).

Factor	Direction	Weight / budget
Environmental		3.00 (+ 0.50 screened)
Wetlands	penalty	0.70
Floodplain	penalty	0.40
Hydric soils	penalty	0.15
Open water	penalty	0.10
Wellhead protection area	penalty	0.40
Protected areas	penalty	0.50
Forest / woodland clearing	penalty	0.45
Cropland	penalty	0.20
Pasture	penalty	0.05
Grassland	penalty	0.05
Contaminated (Part 201) sites [†]	penalty	0.10
Leaking / underground storage tanks [†]	penalty	0.10
Brownfields [†]	penalty	0.10
Dams [†]	penalty	0.10
Airports [†]	penalty	0.10
Social		2.40
Selected residential parcels within 500 ft	penalty	1.80
Sensitive receptors (≤ 1000 ft)	penalty	0.50
Cultural / historic (≤ 1000 ft)	penalty	0.10
Engineering & co-location		2.70
Parallel existing transmission	reward	0.70
Parallel other state road (≤ 800 m)	reward	0.30
Parallel railroad	reward	0.20
Stream crossings	penalty	0.25
Road crossings	penalty	0.20
Railroad crossings	penalty	0.15
Heavy-angle structures	penalty	0.20
Within limited-access freeway ROW (≤ 100 m; HB 5940)	reward	0.70

Budgets are the sum of a category's substantive weights. [†]Screened factors are zero across this corridor. New-ROW is computed but omitted from the default and reported separately as a scenario.

Existing law already allows a utility to build longitudinally within a limited-access highway right-of-way under standards approved by the State Transportation Commission and the MPSC, without local consent, but requires the lines to be underground (MCL 247.183(2)). HB 5940 (H-2) strikes the underground requirement and requires the standards to allow “the collocation of projects, including aboveground lines and structures,” in those rights-of-way. A new section 13a has MDOT review requested highway corridors for permissible locations and approve, jointly with the developer, a constructability report before issuing a permit [14, 13].

Once the bill is enacted, limited-access freeway right-of-way is an existing linear corridor legally available to a transmission line. The default objective (act30_hb5940) therefore credits it on a par with existing transmission right-of-way. It splits the act30 road credit in two: *freeway co-location*, the share of route length within 100 m of a limited-access freeway (MDOT functional classes 1 and 2: I-96, I-69, I-496, and freeway US-127), weighted 0.7 like existing-transmission co-location; and *other-road co-location*, the 800 m share against all other state-road features (including freeway ramps, median crossovers, and rest areas), which keeps the act30 road weight of 0.3. Three limits apply. The 100 m distance is a proxy for running inside or at the edge of the right-of-way, because MDOT right-of-way boundaries are not in the public data. ITC’s published routes run beside the freeway rather than inside it, so the factor measures which routes could move into freeway right-of-way, not which routes are designed that way. Placement within the right-of-way remains subject to the MDOT/MPSC standards and a constructability report. Section 8.8 tests the freeway weight, the 100 m proxy, and the other-road definition.

7.5 Weighting: category balance without double-counting

The weights are set by a stated principle, not tuned to a desired ranking. Following the MPSC’s own routing analysis, factors are grouped into three categories — *environmental*, *social*, and *engineering* (including co-location). Each category is given a comparable total *budget* — environmental ≈ 3.0 , social ≈ 2.4 , and engineering/co-location ≈ 2.0 under current law (Table 4, where the per-category budgets are shown at right). The freeway right-of-way credit (0.7) is added to the engineering/co-location category rather than taken from another factor, because under HB 5940 it represents a distinct, legally available corridor; this raises that category’s budget to ≈ 2.7 . Giving residential proximity the largest individual weight is an analyst judgment reflecting its potential effect on residential properties; it is not attributed to a Commission hierarchy.

Some factors measure the same underlying effect. Wetlands, floodplains, and wet soils, for example, often cover the same ground. Giving each one a full weight would count that wet ground several times. The model instead gives each category a total weight and divides it among related factors. Adding another measure of the same effect therefore does not increase that category’s total influence. The report calls this rule *one concept, one budget*. The following examples show how it works:

- **Wet ground.** Wetlands, floodplain, and hydric soils are strongly correlated (hydric soils are, by definition, broader than mapped wetlands). The objective anchors on the regulatory wetland and floodplain layers and gives hydric soils only a small weight, rather than counting the same wet ground three times.
- **Land cover.** Forest, cropland, pasture, and grassland divide the same corridor area into separate classes. Giving all four a full weight would count one land allocation four times. The objective anchors on forest (woodland clearing, the most sensitive) and carries cropland, pasture, and grassland at small weights.
- **New right-of-way.** Estimated new right-of-way is not included in the composite because the public record does not establish final right-of-way width, structure configuration, or lateral placement. It is shown separately as a

design scenario because it was material in U-21471/U-21472 and differs materially between routes under the scenarios in Section 8.6. Co-location remains a planning proxy, not a substitute for that acreage.

Many factors rise and fall together because the 7 routes differ along only a few geographic patterns. Without the category budgets, the model would give extra influence to an effect merely because the data describe it in several ways. Appendix C tests the weights directly.

7.6 Co-location with existing rights-of-way

Following an existing utility or transportation corridor can reduce a new line's added footprint. The model measures the share of each route within 800 m (about half a mile) of an existing right-of-way. It does not use the route's single nearest point because every route touches the 345 kV network at the substations.

For existing transmission, the score also accounts for voltage. As an analyst assumption, the model gives more credit to a higher-voltage line because it may offer more opportunity for corridor reuse. A 345 kV neighbor receives full credit, while a 138 kV neighbor receives 40% credit. All thirteen existing transmission lines in the study area have a reported voltage: nine at 138 kV and four at 345 kV.

The linear voltage adjustment and the 800 m distance are modeling choices, not MPSC standards. Appendix C tests shorter distances and different treatment of the 138 kV segment. These scores do not prove that the Tihart–Oakland corridor can accommodate the project or that its existing right-of-way would avoid a new taking.

The road co-location scores are defined in Section 7.4: freeway co-location within 100 m of a limited-access freeway, and other-road co-location within 800 m of any other state-road feature. Both are distinct from the “direct I-96” mileage in Table 10, which measures route geometry that directly parallels I-96. None of these measures establishes that a route occupies, or has been approved to occupy, MDOT right-of-way.

7.7 Residential proximity

The residential-proximity factor uses Michigan property-class parcels in class 401 Residential–Improved and class 407 Residential Condominiums. These codes do not prove that a building is occupied, and they can omit residences carried under other property classes. The objective counts a selected parcel when its polygon intersects the 500 ft route buffer. Because a building may sit far from the intersecting edge of a large parcel, this is not a dwelling or habitable-structure count. A second proxy places one representative point inside each parcel. Both proxies are reported in mutually exclusive 0–100, 101–300, and 301–500 ft bands.

The joined public data cover all three route counties: Eaton and Ingham from their county assessment parcels, and Livingston from its county GIS public parcel viewer (geometry) joined to the county assessor's property-class records (Section 6.2). This spans the relevant Ingham County stretch (including Williamstown, Alaiedon, and Leroy) and the eastern Livingston tail near the Sabine Lake terminus.

Coverage of the selected 401 and 407 parcel classes is complete across Eaton, Ingham, and Livingston counties.

8 Evaluation of ITC's Published Alternatives

8.1 The seven Phase 3 routes

ITC's Phase 3 dashboard presents 7 named route alternatives. They share a common spine through much of the corridor and diverge in several decision areas (Figure 2). Their lengths range from roughly 54 to 58 miles. We score each on the configurable Act 30 objective (Section 7).

8.2 Ranking

Table 5 ranks the 7 routes by composite objective (lower is better); Figure 13 shows the same ranking. The routes differ in how much they follow existing rights-of-way. Because the model adjusts for voltage, a mile near an existing 345 kV corridor receives more credit than a mile near a 138 kV line (Section 7.6). At the current weights, environmental footprint and residential proximity have more influence. Figure 14 shows the contribution of each factor.

Table 5: ITC's Phase 3 routes ranked on the composite Act 30 objective.

Rank	Route	Length (mi)	Env. (ac)	Parcel proxy*	Objective
1	Orange	57.96	1,364	235	3.808
2	Purple	53.72	1,329	280	4.010
3	Red	54.34	1,356	279	4.026
4	Pink	56.43	1,316	287	4.743
5	Yellow	54.92	1,419	318	5.096
6	Green	56.21	1,620	310	5.352
7	Blue	55.72	1,589	329	5.415

*Residential parcels (class 401/407) within 500 ft; Eaton and Ingham full-county; Livingston covered across the route corridor. Environmental acres sum wetland, floodplain, hydric-soil, and protected-area overlap; overlapping layers are not mutually exclusive.

Table 6 shows the residential measure under both available parcel proxies. The polygon-intersection proxy is used in the objective; the representative-point proxy is shown as a sensitivity check.

Table 6: Selected residential parcels by mutually exclusive distance band and proxy definition.

Route	Parcel-polygon intersection				Representative point			
	0–100	101–300	301–500	0–500	0–100	101–300	301–500	0–500
feet from route centerline								
Orange	62	75	98	235	7	43	62	112
Purple	102	81	97	280	5	61	73	139
Red	105	77	97	279	5	62	73	140
Pink	97	91	99	287	7	72	88	167
Yellow	113	98	107	318	9	75	92	176
Green	92	95	123	310	9	56	94	159
Blue	88	101	140	329	8	55	101	164

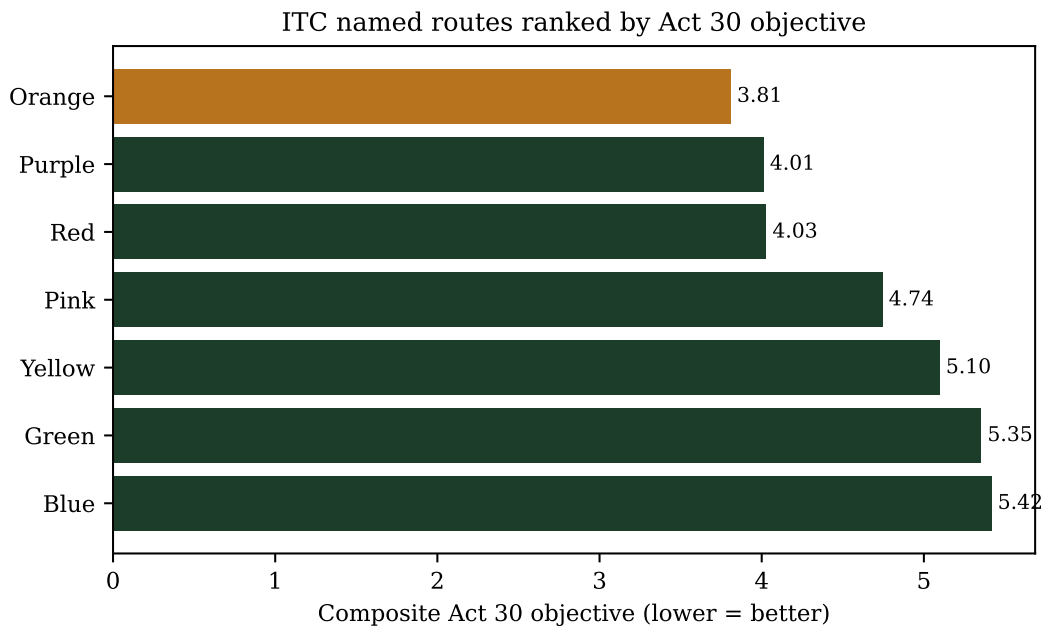


Figure 13: ITC's named routes ranked by the composite Act 30 objective (lower = better); the recommended route is highlighted.

8.3 What drives each route's score

Because the objective is an additive composite, each route's score decomposes exactly into the contribution of every factor. Figure 14 shows that decomposition: environmental and residential penalties push the score up (bars to the right of zero), co-location credits pull it down (bars to the left), and the marker is the net. This makes the trade-offs legible — one can see *why* a route ranks where it does, and which single factor would flip it — rather than collapsing everything into one opaque number.

8.4 Recommended alternative

On the composite Act 30 objective the **Orange Route** ranks first (57.96 miles, 1,364 acres of four-layer environmental overlap within a 200 ft offset on each side of the centerline), with the Purple and Red routes close behind and a clear gap to the rest. Orange also ranks first in most (64%) default-centered weightings. Purple can take first place when existing-transmission co-location receives about three and a half times its default weight or residential proximity less than about one-fifth of its default weight (Appendix C). Under current law, without the HB 5940 freeway credit, Orange still ranks first, by a narrower 0.084 points (Appendix D). The result answers a limited question: which published route best fits the Act 30 factors under the stated method. The weights are adjustable, and the method limits repeated measures of the same effect (Section 7.5). The per-jurisdiction breakdown of the recommended route is in Section 9.

8.5 Focused Orange–Purple comparison

The focused comparison uses the continuous span from the point where Orange and Purple cross near Wheatfield Township to their common junction with the mapped Tihart–Oakland 138 kV corridor near Conway Township. This geometric rule gives both routes the same functional endpoints. The span is reported separately because Purple

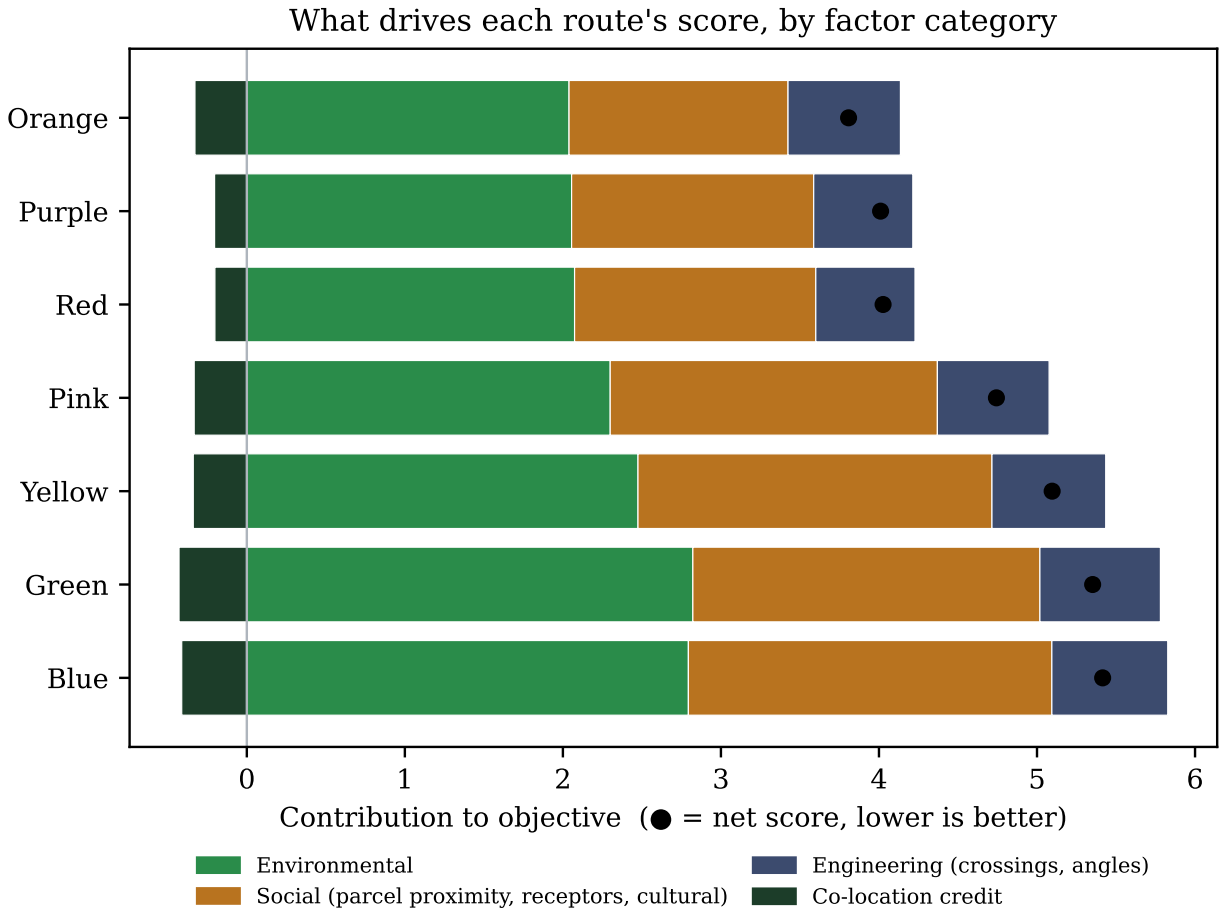


Figure 14: Per-route decomposition of the composite objective. Penalties (environmental, residential, stream crossings) stack to the right of zero; co-location credits (existing transmission, highway, rail) stack to the left; the black marker is the net score (lower is better). Factor weights are configurable (Section 7); the values shown use the active configuration.

passes through Williamstown and Locke Townships, the communities for which WLCCA requested the analysis, while Orange runs 0.00 miles in either; Purple runs 6.94 miles in Williamstown and 5.79 miles in Locke. Table 7 reports both parcel proxies and the Commission-style distance bands. This focused result addresses residential proximity only; it is not a substitute for the route-wide comparison.

Table 7: Orange and Purple in the Williamstown–Locke comparison window.

Route	Miles	Parcel-polygon intersection				Representative point	
		0–100	101–300	301–500	0–500	0–100	0–500
Orange	19.05	19	20	33	72	3	34
Purple	18.00	49	25	26	100	3	57

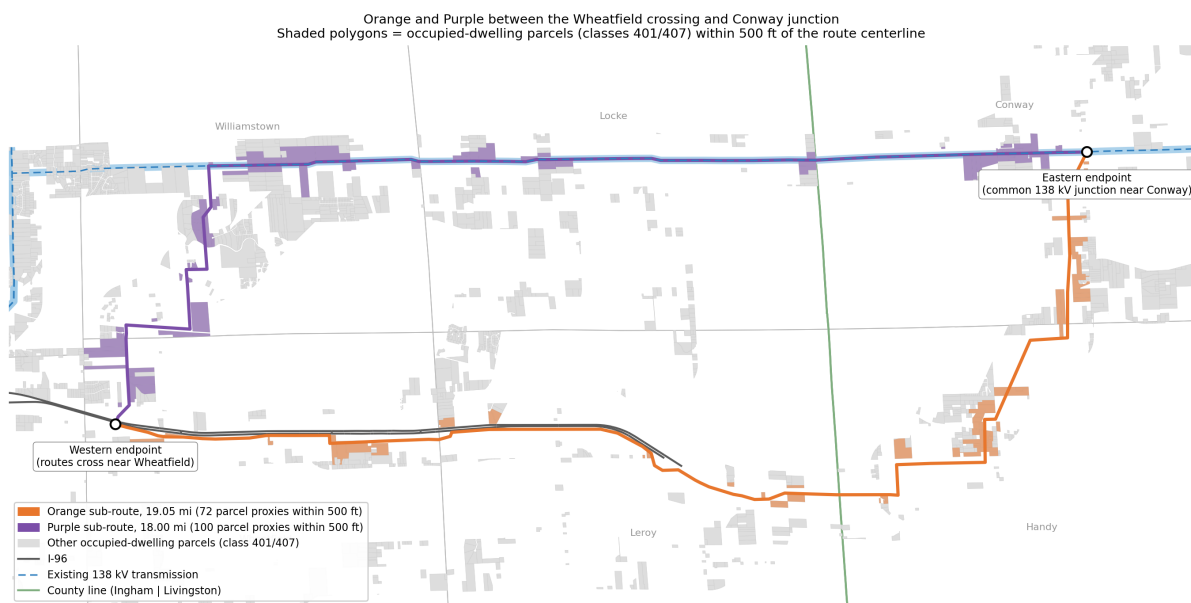


Figure 15: The focused Orange–Purple comparison window and its endpoints. The map is a segment comparison, not a new proposed route.

8.6 Planning-cost and right-of-way scenarios

Purple is 4.24 miles shorter than Orange and has fewer heavy-angle vertices in the public geometry. Applying two published planning rates to length alone produces differences of approximately \$16.1 million at \$3.80 million per mile and \$21.6 million at \$5.10 million per mile [15, 16]. These are planning indicators, not route-specific construction estimates; they exclude unknown design and property-acquisition differences.

Table 8: Orange–Purple planning-cost indicators.

Route	Miles	Heavy angles	At \$3.80M/mi	At \$5.10M/mi
			(\$ millions)	(\$ millions)
Orange	57.96	59	220.2	295.6
Purple	53.72	40	204.1	274.0

Table 9 separately tests two right-of-way assumptions: a new 200-foot taking alongside the mapped Tihart–Oakland 138 kV line, and a shared-structure scenario in which an existing corridor is widened to 200 feet. The existing-width sensitivities are 130 feet (the easement credited in U-21471/U-21472), 150 feet (American Electric Power’s (AEP’s) published 345 kV comparator), and 175 feet (the Midcontinent Independent System Operator’s (MISO’s) planning width for 345 kV lines) [6, 17, 15]. They are parameters, not measurements of the Tihart–Oakland easement. The results are geometric scenarios, not surveyed acreage or an engineering conclusion. ITC has not published the existing width, side of line, lateral placement, or final structure design.

Table 9: Orange–Purple right-of-way sensitivity; acres are modeled, not surveyed.

Route	Existing width (ft)	Total (mi)	Along 138 kV* (mi)	Separate 200 ft modeled new-ROW	Shared/widened acres	Difference
Orange	130	57.96	0.63	1,405.0	1,395.1	9.9
Orange	150	57.96	0.63	1,405.0	1,393.6	11.4
Orange	175	57.96	0.63	1,405.0	1,391.7	13.3
Purple	130	53.72	15.38	1,302.3	1,059.9	242.4
Purple	150	53.72	15.38	1,302.3	1,022.6	279.7
Purple	175	53.72	15.38	1,302.3	976.0	326.3

*“Along 138 kV” is the route mileage within 100 feet of the mapped centerline of a 138 kV line. The threshold identifies the route segment to which the widening parameters are applied; it is distinct from the 800 m transmission co-location score used in the objective.

The Midcontinent Independent System Operator’s (MISO’s) board-approved project definition assigns the same terminal scope at Oneida and Sabine Lake regardless of route: one new 345 kV position at Oneida and a new five-position 345 kV bus at Sabine Lake [18]. The public materials do not identify route-specific intermediate station work. Whether a final design would require intermediate switching, protection, outage, reactive-compensation, relocation, or other intermediate equipment can be answered only by the applicant.

8.7 A synthetic test: the maximum-freeway “Teal” route

The seven published routes do not include an alternative designed to follow I-96 for as much of the corridor as possible. We constructed one as a test. Two of the published routes, Orange and Yellow, run together along I-96 and then split: Orange swings south on a long loop while Yellow grazes I-96 to the west (Figure 17). Because the two are coincident where they rejoin, their *existing* segments can be recombined into a route that maximizes freeway co-location — Yellow’s I-96-grazing western half spliced to Orange’s I-96-hugging eastern half. We call this synthetic alignment the **Teal route** (to avoid confusion with ITC’s published Red route). It is a constructed stress test, not an ITC alternative.

The Teal route does maximize freeway co-location: 18.3 miles on I-96, more than Orange (15.4) or Yellow and equal to Blue and Green, which follow the same I-96 stretches. At 56.39 miles it is shorter than Orange. Yet it is *not* the lowest-impact route (Table 10).

Table 10: The synthetic Teal route against the two routes it is spliced from.

Route	Length (mi)	Direct I-96 (mi)	Wetland (ac)	Floodplain (ac)	Parcel proxy ≤500 ft	Objective
Orange	57.96	15.4	305.8	156.4	235	3.808
Yellow	54.92	6.5	316.6	181.9	318	5.096
Teal	56.39	18.3	353.6	213.9	284	4.954

Maximizing freeway co-location does not minimize impact here

Near Lansing, I-96 runs through river floodplain and developed, residential land, so hugging it more *adds* impact. Relative to Orange, the Teal route picks up 47.8 acres of wetland, 57.5 acres of floodplain, and 49 more selected residential parcels intersecting the 500 ft buffer, and it scores 4.954 against Orange's 3.808. Ranked against ITC's seven, it lands fifth (Figure 16). In this combination, more miles beside the freeway come with more wetland, floodplain, and residential-parcel overlap. It does not establish why ITC selected or rejected any alignment.

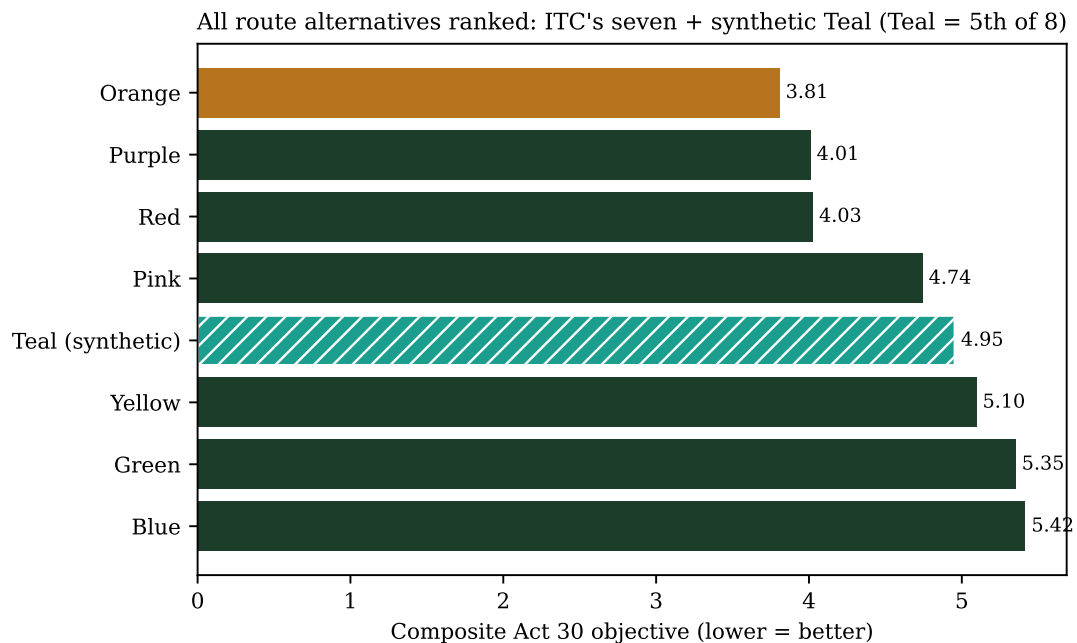


Figure 16: ITC's seven published routes and the synthetic Teal route ranked together on the composite objective (lower is better). Teal (hatched) places fifth — ahead of Yellow, Green, and Blue, behind Orange, Purple, Red, and Pink — so even the maximum-freeway route does not beat the leaders.

8.8 Freeway right-of-way weight (HB 5940)

The default objective credits running within a limited-access freeway right-of-way at 0.7, the same weight as existing-transmission co-location (Section 7.4). Table 11 shows each route's freeway share at the 100 m proxy and a 150 m variant, its other-road share, and its score with the freeway weight set to 0, to the default 0.7, and to 2. A weight of 0 is current law with the road credit split; it gives a lead of 0.050 rather than the

The synthetic Teal route vs Orange, Yellow, and I-96

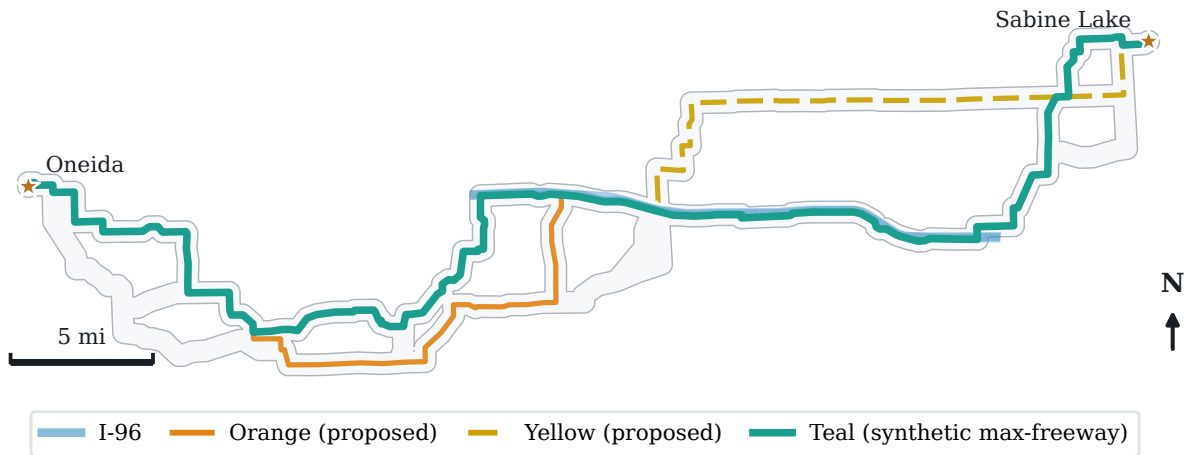


Figure 17: The synthetic Teal route (teal) — Yellow's western half joined to Orange's eastern half — maximizes I-96 co-location but runs wetter and nearer more selected residential parcels than Orange under the polygon-intersection proxy.

current-law 0.084 because freeway ramps and crossovers count as other roads.

Table 11: Freeway-weight sensitivity: freeway-ROW share and objective (lower is better; rank among ITC's seven routes in parentheses) at freeway weights 0, 0.7 (default), and 2.

Route	Freeway share		Other road ≤800 m	Scenario objective (rank)		
	≤100 m	≤150 m		$w = 0$	$w = 0.7$	$w = 2$
Orange	0.226	0.244	0.271	3.966 (1)	3.808 (1)	3.514 (1)
Purple	0.008	0.012	0.107	4.016 (2)	4.010 (2)	3.999 (2)
Red	0.009	0.012	0.106	4.032 (3)	4.026 (3)	4.015 (3)
Pink	0.119	0.127	0.255	4.827 (4)	4.743 (4)	4.588 (4)
Yellow	0.123	0.130	0.251	5.182 (5)	5.096 (5)	4.936 (5)
Green	0.286	0.307	0.348	5.552 (6)	5.352 (6)	4.980 (6)
Blue	0.288	0.309	0.343	5.617 (7)	5.415 (7)	5.041 (7)
<i>Teal</i> [†]	0.285	0.307	0.348	5.154 (–)	4.954 (–)	4.583 (–)

[†]The synthetic Teal route is our construct, not an ITC alternative; it is scored for comparison and not ranked.

Orange leads at every freeway weight tested

Orange ranks first at every freeway weight tested. Its lead over Purple is 0.050 at a freeway weight of 0, 0.115 at 0.3, 0.203 at the default 0.7, 0.268 at 1.0, and 0.486 at 2.0. Purple and Red follow I-96 for less than 1% of their length (a freeway share of 0.008 for Purple against 0.226 for Orange), so the freeway credit mostly accrues to Orange and the I-96 routes. Scanning freeway weights from 0 to 10, the leader never changes; the only change among the top two is that Green passes Purple for second place above a weight of about 5.5 (5.2 with the 150 m proxy). Blue and Green have the highest freeway shares (0.288 and 0.286) but remain behind Orange because of their environmental and residential scores. The synthetic Teal route never scores better than Orange (1.15 points behind at the default weight).

Two definitional choices were also tested, and neither changes the leader. With the 150 m proxy, Orange's lead at the default weight is 0.212. Restricting other-road credit to arterial trunklines, which excludes ramps, crossovers, and rest areas, gives 0.160. Appendix C varies every weight at once, and Appendix D reports the current-law results.

DRAFT

9 Findings and Recommendations

9.1 Findings

Finding 1

Of ITC's 7 published Phase 3 alternatives, the Orange Route ranks first under the stated default weights. It is 57.96 miles long and has 1,364 acres of four-layer environmental overlap within 200 ft of each side of the centerline. The Blue Route ranks last (Table 5). Co-location with existing rights-of-way is voltage-weighted and varies across the routes. The recommended route parallels existing transmission the *least*. At the current weights, environmental footprint and residential proximity govern the ranking, not corridor reuse.

Finding 2

The objective includes selected residential parcels whose polygons intersect the 500 ft route buffer, from Michigan property-class data covering all three route counties, including Livingston (Section 7.7). Classes 401 and 407 do not establish occupancy or dwelling location. It is a parcel proxy, not a count of habitable structures. A representative- point proxy and the 0–100, 101–300, and 301–500 ft bands are reported in Table 6. The recommended route has the fewest parcels under the objective proxy. The top three alternatives remain relatively close. Across the default-centered sensitivity tests, the recommended route ranks first in most weightings (64%). The Purple route takes first place in most of the rest (31%), chiefly when the model gives much more weight to existing-transmission co-location or much less weight to residential proximity (Appendix C). Under current law the recommended route also ranks first, in 53% of weightings (Appendix D). The ranking is a reproducible comparison under stated assumptions, not the Commission's decision.

9.2 Per-jurisdiction view

Because impacts and accountability are local, Table 12 resolves the recommended Orange Route by jurisdiction. Table 1 provides the corresponding comparison for all seven routes and confirms that none enters Meridian Charter Township. The Orange Route also crosses the City of Lansing, which is reported on its own row and is netted out of Alaiedon Township (Section 4.3).

9.3 Recommendations

Recommendation 1

This ranking provides a transparent, reproducible baseline for comparing ITC's 7 published alternatives on the factors used here; it is not a substitute for the Commission's weighing. If the applicant selects a different route, the public record can be compared with these environmental, residential, and co-location results.

Table 12: Recommended (Orange) route: miles within each jurisdiction.

Jurisdiction	Type	Route miles
Windsor Charter Township	Township	9.89
Alaiedon Township	Township	9.58
Conway Township	Township	6.37
Leroy Township	Township	6.24
Handy Township	Township	5.38
Wheatfield Township	Township	5.33
Aurelius Township	Township	4.77
Benton Township	Township	3.91
Delhi Charter Township	Township	2.66
Cohoctah Township	Township	1.73
Oneida Charter Township	Township	1.28
Eaton Rapids Township	Township	0.55
Lansing city	City	0.27

Recommendation 2

Parcel proximity should not be read as a dwelling count unless and until the applicant's habitable-structure inventory is filed and compared with the public-data parcel proxies and all three distance bands. The ranking should be re-evaluated if that structure-level evidence differs materially.

A Data Inventory and Provenance

The core vector datasets used in this analysis are listed in Table 13 with its feature count, geometry type, and the first ten hexadecimal digits of its SHA-256 content hash. The full hashes, source URLs, and UTC retrieval timestamps are recorded in the machine-readable data/inventory.json manifest and in per-file provenance records. Residential parcels, the NLCD 2021 land-cover raster, and the supplemental OpenStreetMap receptor and cultural layers are identified separately after the table because they are assembled or stored outside the core vector inventory. Re-running the retrieval pipeline reproduces these artifacts; a hash mismatch indicates that an input has changed.

Table 13: Retrieved and derived data inventory (SHA-256 truncated).

Dataset	Features	Geometry	SHA-256
boundaries.michigan.counties	83	MultiPolygon, Polyg	e83409f88d
boundaries.michigan.county_subdivisions	1580	MultiPolygon, Polyg	d2205745fd
boundaries.michigan.places	745	MultiPolygon, Polyg	7f2d79d76a
contamination.michigan.brownfields	37	Point	4c509cffda
contamination.michigan.part201	458	MultiPoint	192cc95087
contamination.michigan.usts	939	Point	6cfe8d4ab3
environment.michigan.hydric_soils	4754	MultiPolygon, Polyg	9d4180dc73
environment.michigan.nwi_plus	8618	MultiPolygon, Polyg	c3db03626e
environment.us.fema_flood_zones	797	Polygon	e86a43e5cc
environment.us.nhd_flowlines	713	LineString	fa78667977
environment.us.padus	230	MultiPolygon, Polyg	89a1bb7a47
infrastructure.michigan.airports	487	Point	78fecf3afa
infrastructure.michigan.dams	14	Point	a67ccb40f3
infrastructure.michigan.railroads	650	LineString	7e09e7b554
infrastructure.michigan.roads	63489	LineString	876b8752c1
infrastructure.michigan.wellhead_protection	77	MultiPolygon, Polyg	f7c0426ab8
infrastructure.us.transmission_lines	33	LineString	aa11fa5951
project.itc.county_boundary	6	Polygon	a2871734dc
project.itc.current_alignment	62	LineString, MultiLi	31a907c992
project.itc.eng_point_features	2	Point	091efb6526
project.itc.incorporated_area	29	MultiPolygon, Polyg	fd13bdbabf
project.itc.phase3_routes	7	LineString	0980f811a6
project.itc.routing_buffer	1	Polygon	53b8188d49
project.itc.structures_marked	4116	Point	2dd18032bf
project.itc.survey_study_area	1	Polygon	5b83ebadf6
project.itc.township_boundary	103	MultiPolygon, Polyg	b995d2bd81

Table 14: Supplemental analytical inputs (SHA-256 truncated).

Input	Public source	Coverage	SHA-256
Residential parcels	County assessment records	100,527 features	4d42c01cd3
NLCD 2021 land cover	MRLC / USGS	categorical raster	444d715d5a
Sensitive receptors	OpenStreetMap	340 features	d685437d77
Cultural / historic screen	OpenStreetMap	104 features	6f6a73f41a

B Reproducibility

This report is reproducible end-to-end from a clean checkout of the `oneida-sabine-analysis` repository. The analysis library depends on the shared `geodata` module and is managed with `uv`.

B.1 Pipeline

1. `uv sync` — install dependencies (including the local `geodata` module).
2. `uv run oneida-sabine retrieve --all` — download every source layer (ITC project layers + `geodata` environmental, contamination, transportation, and boundary layers), writing a provenance sidecar per file and aggregating `data/inventory.json`.
3. `uv run oneida-sabine buffers` — build the 2000 ft study-area buffer and the 200 ft offset on each side of the route centerline.
4. `uv run oneida-sabine residential` — build the Ingham and Eaton selected-residential-parcel layers.
5. `uv run oneida-sabine livingston` — complete the three-county residential-parcel layer with the Livingston assessment join.
6. `uv run oneida-sabine receptors` — retrieve the supplemental OpenStreetMap receptor and cultural-resource screening layers.
7. `uv run oneida-sabine clip` — clip metric layers to the study area.
8. `uv run oneida-sabine segments` — compute per-segment, per-township intersection metrics.
9. `uv run oneida-sabine named-routes` — retrieve ITC's 7 Phase 3 named routes, score each on the configurable objective, rank them, and write the per-jurisdiction summary.
10. `uv run oneida-sabine route --preset act30` and `uv run oneida-sabine sweep` — reproduce the Pareto analysis and sensitivity tests.
11. `OSA_INCLUDE_SCREENING_FACTORS=false uv run oneida-sabine named-routes` — repeat the ranking without the incomplete OpenStreetMap receptor and cultural screening factors.
12. `uv run oneida-sabine teal-route` — reproduce the synthetic maximum-freeway stress test.
13. `uv run oneida-sabine hb5940-scenario` — the freeway-weight sensitivity of the default objective (Section 8.8).
14. Set `OSA_OBJECTIVE_PRESET=act30` and `OSA_RESULTS_SUBDIR=current_law`, then run `named-routes`, `teal-route`, and `sweep` — reproduce the current-law results (Appendix D).
15. `uv run oneida-sabine figures` — regenerate report figures.
16. Run `oneida_sabine.reporting.generate.generate()`, then make in the dated report folder to regenerate the tables, macros, figures, bibliography, and PDF.

B.2 Coordinate reference systems

Geometries are stored in the World Geodetic System 1984 coordinate system (WGS 84; EPSG:4326). All area and distance calculations are performed in Michigan GeoRef (EPSG:3078), whose units are meters; acreage

uses the square-meters-to-acres factor and buffer distances use an explicit feet-to-meters conversion.

B.3 Attestation

Every number in this report is generated by `oneida_sabine.reporting.generate` directly from the provenance-tracked JSON artifacts of the pipeline. No figure is hand-entered. The data inventory (Appendix A) records the SHA-256 of every input, so the evidentiary chain from source to finding is verifiable.

C Sensitivity to the Objective Weights

The ranking depends on roughly two dozen factor weights spanning the engineering, environmental, and social categories, and reasonable people will weight the Act 30 factors differently. The default weights balance three categories and avoid counting the same impact more than once (Section 7.5). We tested 1,000,000 alternative weightings and ranked all 7 routes under each one.

The first test is centered on the default weights. It varies each factor independently from one-eighth to eight times its default value on a log-uniform scale. It does not hold the three category totals fixed, so it tests departures from the category-budget design as well as changes within each category. The second test is a more severe stress test that gives every factor an independent random weight unrelated to the default. Both tests can give extra influence to related measures; neither represents a probability distribution over Commission decisions. Both use fixed route metrics; only the weights change. Appendix B gives the reproduction commands.

C.1 The recommendation, and its principal rival

The recommended route ranks first in most weightings; Purple is the main alternative

Across 1,000,000 default-centered weightings, the **Orange Route** ranks first in 64% of them and sits in the top three 95% of the time. It finishes last in 0.16% of the draws. The **Purple Route** is the main alternative (31%): it overtakes Orange chiefly where existing-transmission co-location is weighted much more heavily or residential proximity much less. Under the default-free *uniform* draw, Purple leads (96% to 1%). That result shows how repeated measures of related effects favor Purple when the category limits are removed. It is not a neutral test of the report's weighting method. Five routes rank first in at least 0.1% of the draws (Orange, Purple, Red, Pink, and Blue); Blue does so in 0.14% and Green in fewer than 0.1%. Green and Blue finish last 33% and 59% of the time.

Figure 18 shows each route's finishing ranks under the default-centered test. The routes form stable groups. Orange, Purple, and Red each rank in the top three in at least 95% of the draws. Orange most often ranks first and has the best average rank (1.76, against 1.87 for Purple); when it does not rank first it usually falls to third. Purple ranks first or second in 84% of the draws. Pink is nearly always fourth and rarely reaches the top; Green and Blue remain near the bottom. Blue finishes last in 59% of weightings. Blue and Green each reach the top three in about 1% of the draws.

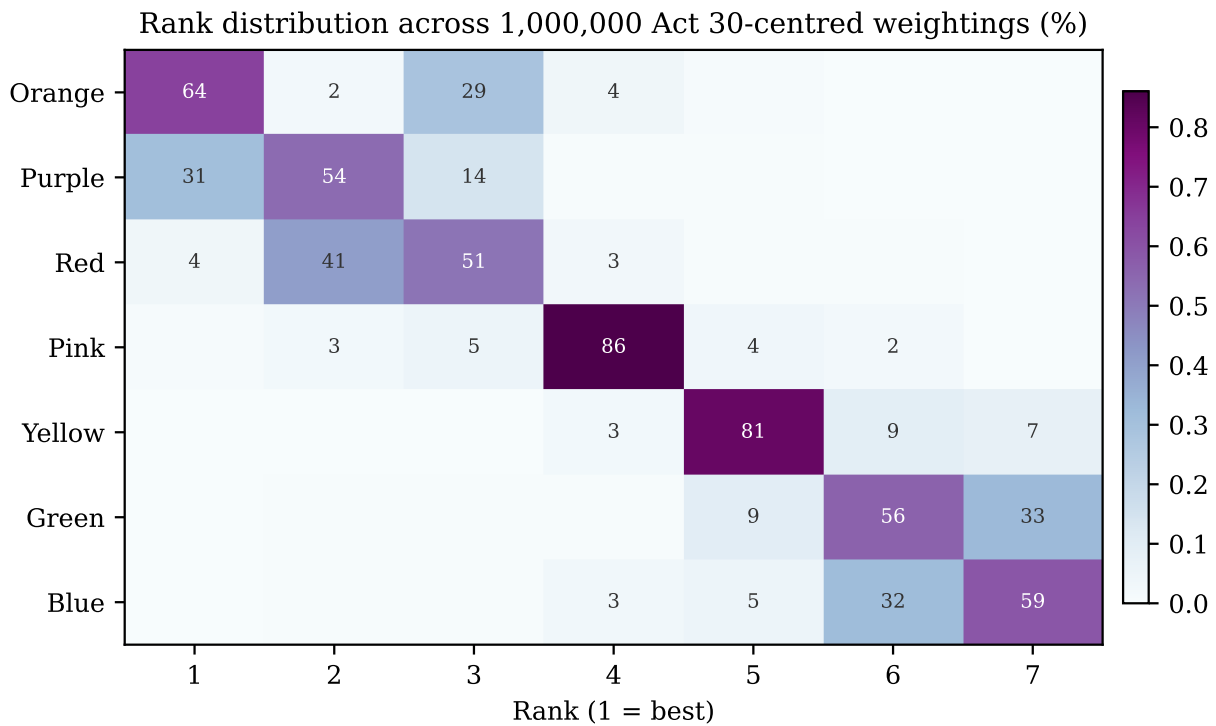


Figure 18: Distribution of each route's finishing rank across 1,000,000 default-centered weightings (row % sums to 100). Routes are ordered by mean rank. Because individual factors vary independently, this is a broad stress test rather than a fixed-category-budget simulation.

C.2 What it would take to change the answer

Figure 19 changes one factor's weight at a time while holding the others at their defaults. Nineteen of the 26 factors do not change the winner, even at eight times their default weight; the figure shows the seven that do. No factor changes the winner within three times its default weight. Cultural resources at 3.04 times its default, wellhead protection at 3.31 times, transmission co-location at 3.52 times, road crossings at 4.81 times, and grassland at 6.23 times put Purple first, as does cutting residential proximity below 0.18 times its default; heavy-angle structures at 4.24 times put Red first. The freeway right-of-way weight does not change the winner anywhere in the tested range. No single-factor change in the tested range moves Green or Blue near the top. The choice between Orange and Purple turns mainly on the weight given to existing-corridor reuse compared with residential and environmental effects. Act 30 leaves that judgment to the Commission, which has called co-location "an important factor" but not a controlling one (Section 3.3).

Orange is the recommended route under the default weights and in most default-centered variations. Purple is the main alternative and can rank first when existing-transmission reuse receives much more weight or residential proximity much less. Under current law, Orange ranks first in 53% of the corresponding draws (Appendix D). The environmentally heavier routes remain near the bottom under the tested weightings.

C.3 Route-length sensitivity

The final MPSC guidelines list route length among the engineering scoring data [3]. Length is reported throughout this study and informs the planning-cost comparison, but it is not part of the default composite.

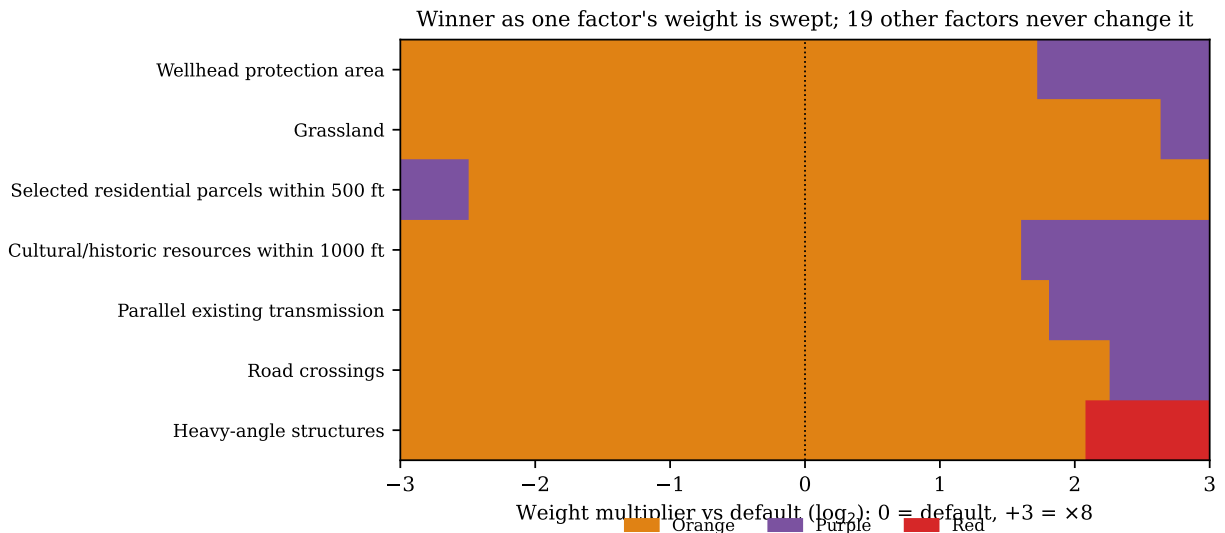


Figure 19: Winner as each factor's weight is swept from one-eighth to eight times its default (others held at default); the dotted line marks the default. Seven of the 26 factors can change the winner, and every flip is to Purple (once to Red); the recommended route holds across the rest.

Table 15 therefore adds a min-max-normalized length penalty to the default score. Length is already present indirectly: 10 factors measure acreage in a fixed-width route band, four measure shares of route length, and three count features within a fixed distance of the route. Those 17 factors carry about 85% of the stated weight. The added penalty therefore overlaps existing exposure measures, though it does not replace their information about local conditions.

This diagnostic does not revise the default. It adds weight without reducing another engineering weight, so it may give route exposure greater influence. Orange is the longest route and Purple the shortest. Their scores tie at an added weight of about 0.203; Purple ranks first above that threshold (about 0.084 under current law).

Table 15: Sensitivity to an additional normalized route-length penalty.

Additional length weight	Winner	Orange score	Purple score
0.000	Orange	3.808	4.010
0.100	Orange	3.908	4.010
0.200	Orange	4.008	4.010
0.203	Tie (Orange = Purple)	4.011	4.010
0.300	Purple	4.108	4.010
0.500	Purple	4.308	4.010

C.4 Co-location distance and voltage assumptions

The default co-location scores measure the share of each route within 800 m of an existing transmission line, other state road, or railroad, and within 100 m of a limited-access freeway. That distance is an analytical screening threshold, not a legal or engineering definition of a shared corridor. Table 16 recomputes the

transmission, other-road, and rail co-location factors at 50, 100, 200, 400, and 800 m while holding the other metrics and weights fixed; freeway co-location keeps its 100 m right-of-way proxy, which Section 8.8 tests separately.

Table 16: Sensitivity to the co-location distance threshold.

Threshold (m)	Winner	Orange score	Rank	Purple score	Rank
50	Orange	3.971	1	4.124	2
100	Orange	3.947	1	4.082	2
200	Orange	3.923	1	4.071	2
400	Orange	3.883	1	4.047	2
800	Orange	3.808	1	4.010	2

The default transmission score also credits a 138 kV segment at 40% of a 345 kV segment. This linear voltage ratio is an analyst assumption. Table 17 brackets it by assigning no credit and full credit to the mapped 138 kV segment. The exercise changes the score margin but not the Orange–Purple order. Under current law, full credit puts Purple first and Orange third (Appendix D).

Table 17: Sensitivity to credit assigned to the mapped 138 kV segment.

138 kV treatment	Orange score	Rank	Purple score	Rank
No credit (0%)	3.811	1	4.090	2
Linear voltage credit (40%)	3.808	1	4.010	2
Full credit (100%)	3.803	1	3.890	2

The OpenStreetMap receptor and cultural layers are incomplete. The default model retains them at their disclosed screening weights. Disabling both leaves the full default rank order unchanged, although it changes score margins and the win shares in the broad random-weight tests. Their 1,000-foot display band is broader than the 500-foot facility measures in the final MPSC guidelines [3].

D Results under current law (if HB 5940 is not enacted)

The body of this report assumes that HB 5940 is enacted (Section 7.4). This appendix reports the same analysis under current law, which requires lines in limited-access highway rights-of-way to be underground. The objective is the act30 preset: the default factors and weights with a single road co-location credit (0.3) for running within 800 m of a major road, and no separate freeway right-of-way credit. All data, route metrics, and methods are otherwise identical.

Table 18: ITC's Phase 3 routes under current law (act30) and under the HB 5940 default: objective (lower is better), rank, and share of 1,000,000 default-centered weightings in which the route ranks first.

Route	Current law (act30)			HB 5940 default		
	Objective	Rank	Wins	Objective	Rank	Wins
Orange	3.945	1	53.2%	3.808	1	64.3%
Purple	4.029	2	41.0%	4.010	2	30.7%
Red	4.044	3	5.3%	4.026	3	4.0%
Pink	4.842	4	0.4%	4.743	4	0.8%
Yellow	5.194	5	0.0%	5.096	5	0.0%
Green	5.526	6	0.0%	5.352	6	0.0%
Blue	5.588	7	0.0%	5.415	7	0.1%

Under current law Orange still ranks first, by a narrower margin

Orange scores 3.945 against Purple's 4.029 and Red's 4.044, a lead of 0.084 points (0.203 under the HB 5940 default). The seven-route order is the same. Across 1,000,000 default-centered weightings, Orange ranks first in 53% and Purple in 41%; Orange is in the top three 94% of the time and last in 0.14% of the draws, and Purple has the better average rank (1.71 against 1.99). Under the default-free uniform draw, Purple leads (97% to 1%).

Under current law, 10 of the 25 factors can change the winner one at a time, and several do so at moderate changes: transmission co-location at 2.05 times its default weight, wellhead protection at 1.97 times, cultural resources at 1.85 times, and residential proximity below 0.66 times its default each put Purple first. An added route-length penalty ties Orange and Purple at a weight of about 0.084. With full credit for the mapped 138 kV segment, Purple ranks first and Orange third (under the HB 5940 default, Orange stays first). With the OpenStreetMap screening factors disabled, Orange's score falls from 3.945 to 3.845 and Purple's is unchanged; the order is unchanged. The synthetic Teal route scores 5.128 and still places fifth against ITC's seven.

The recommendation is therefore the same under current law, but it is less robust: it depends more on the weights given to existing-transmission reuse and residential proximity.

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