

Saline Exhibit I-1

MCKENNA



Christopher J. Doozan, AICP, FBCI

PLANNING CONSULTANT

EDUCATION

Master of Science

Community Resource Development
Michigan State University

Bachelor of Science (summa cum laude)

Environmental Studies
Saginaw Valley State University

PROFESSIONAL EXPERIENCE

Community Planning

Prepares comprehensive master plans, zoning ordinances, and community improvement plans for cities, suburban, and rural communities throughout Michigan and Ohio. Provides ongoing planning and zoning advisory services, including site plan review. Prepares capital improvement plans, fiscal impact analyses, and public opinion, population, and housing surveys.

Ordinances and Regulations

Prepares and revises zoning ordinances, sign ordinances, planned unit development regulations, and ordinances for cities, villages and townships. Prepares form-based codes and is certified by the Form-Based Codes Institute. Drafts and enforces site plan review regulations to control out-of-scale homes. Prepares developer agreements to permit construction of gas processing plans, public water and sewer systems, including treatment. Prepares several detailed planned development agreements, based on planning commission and developer input as well as zoning ordinance criteria. Prepares right-of-way ordinances.

Housing

Prepares housing feasibility analysis for older Detroit neighborhoods, including in-depth examination of feasibility of minor and substantial rehabilitation, new housing construction, and moving existing homes. Prepares housing study and cost/benefit analyses of riverfront housing alternatives for central cities. Prepares housing studies for affordable living developments for urban counties. Project manager for state wide Senior Housing Market Study.

Community Development

Provides required documentation for Community Development Block Grant applications, including analysis of target areas for housing rehabilitation programs. Evaluates the CDBG program in major urban counties and prepares three-year plans for allocation of funds to participating communities. Successfully administers CDBG programs in compliance with Federal regulations, including Davis-Bacon and environmental regulations.

Legal Support

Extensive success as expert witness in support of communities in land use and zoning cases. Provides documentation and expertise in federal court case involving restriction of adult entertainment businesses, and various Act 312 arbitration cases. Provided expertise in federal court case involving discrimination against a religious use. Prepared court exhibits and required documentation for court case involving a proposed 800-acre gravel extraction operation.

Recreation

Completes Department of Natural Resources certified recreation plans for both cities and townships. Evaluates recreation-related economic development opportunities in suburban Detroit. Planned and obtained funding for the 10-mile paved Huron Valley Trail in Southeast Michigan.

Annexation

Prepares documentation and successfully fought fights annexation attempts in townships.

Solar and Wind Energy

Assisted townships to conduct thorough and comprehensive reviews for large-scale solar and wind energy projects in Michigan's thumb region, central Michigan, Monroe County, and Muskegon County.



PROFESSIONAL EXPERIENCE

Tax Increment Financing

Establishes authorities and prepares development plans and tax increment financing plans for municipal authorities, including pre-plan economic and fiscal analysis, economic development plan strategy, structuring municipal programs for statutory compliance, public education and communication under the following Michigan acts, as amended: PA 197 of 1975, Downtown Development Authority Act; PA 381 of 1996, Brownfield Redevelopment Financing Act; PA 281 of 1986, Local Development Financing Act; and PA 450 of 1980, Tax Increment Finance Authority Act. Served as executive director of a township Downtown Development Authority.

Economic Development

Prepares commercial and economic development plans and strategies, including tax increment financing plan for multi-million dollar developments, commercial corridor revitalization plans, downtown development plans, and full-scale economic development programs for Michigan counties, townships and cities.

Transportation

Develops analyses of demand for public transportation in major urban counties including the analysis of highway extension alternatives and examination of impact on future travel patterns, land use, and economic development opportunities. Developed plans for a ring road and roundabouts in New Hudson in southwest Oakland County.

PUBLICATIONS

"Graying of America: What It Means For Planners", Co-Author: Michigan Planner.

"Citizen Attitudes About Environmental Issues", Guiding Land Use Decisions, John Hopkins University Press.

"Service Costs: Don't Guess – Plan", Michigan Planner.

PUBLIC SPEAKING AND SEMINARS

Michigan Association of Planning, Spring Institute, May 2005.

"The New Contract Zoning Legislation in Michigan", Walsh College and Grand Valley State University, 2005.

"Decoding Complete Streets" Michigan Association of Planning, Mackinac Island, Michigan, 2014.

TRAINER CERTIFICATION

Mplace Partnership Initiative Placemaking Curriculum

Module 1: People, Places and Placemaking

Module 4: Form Planning and Regulations

CERTIFICATION

American Institute of Certified Planners

Form-Based Codes Institute

MEMBERSHIPS

Michigan Professional Community Planner (I.D. No. 2501000620)

American Planning Association, National and Michigan Chapters

COMMUNITY SERVICE

Board of Directors and editor of monthly newspaper for community organization of 6,000 households in northeast Detroit.

Church Board of Governors, including two terms as Moderator.

Saline Exhibit I-2



T & L Marion Farms

SALINE TOWNSHIP MASTER PLAN WASHTENAW COUNTY

2016



Adopted: December, 2016

Generally, the greatest volume of traffic within the Township is found along Michigan Ave., with smaller traffic counts along Austin Rd., Hack Rd., Jordan Rd., and Goodrich Rd.

Existing Land Use

A basic element in planning the future of Saline Township is the consideration of existing land use types and patterns. The acreage of existing land uses in Saline Township are provided in the table below. This information was developed based upon data analyzed by the Southeast Michigan Council of Governments (SEMCOG).

Table 8. – Existing Land Uses

Existing Land Use Category	Acres	Percent Land Coverage
Agricultural	16,631	74.7%
Single-Family Residential	4,962	22.3%
Commercial	214	1.0%
Industrial	248	1.0%
Institutional	16	0.1%
Parks, Recreation and Open Space	15	0.1%
Transportation , Communications and Utilities	152	0.7%
Water	28	0.1%

Source: SEMCOG, 2015

As demonstrated in the table, the majority of land in Saline Township is agricultural. Moderate residential development has occurred in the last two decades. Most of the higher density development (one-acre lot subdivisions) is concentrated in the vicinity of Macon and Jordan Roads. Other single-family dwellings are found along Mooreville Road east of Macon Road. The River Ridge manufactured home village is located on Michigan Avenue just west of the City of Saline. A significant number of farmsteads are still active within the Township.

Commercial and industrial land uses continue to make up a relatively small portion of the Township's land area. The majority of the Township's commercial uses are located along U.S.12 (Michigan Avenue).

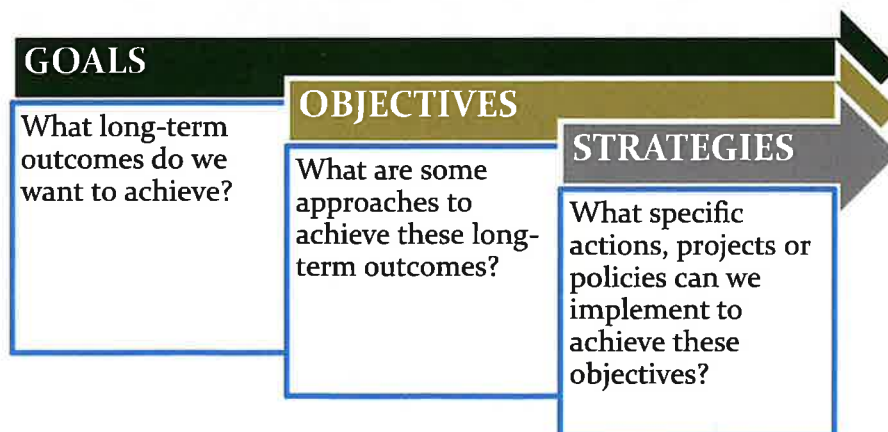
There is significant development pressure on the Township, especially from outward growth from the City of Saline. This is a critical time for the Township in deciding how development will occur in the future. The map on the following page illustrates existing land uses within Saline Township.

CHAPTER 4: GOALS AND OBJECTIVES

The adoption of community goals and objectives is a vital step in the master planning process. The desires and needs of Saline Township residents, property owners and business owners must be properly interpreted so that workable solutions can be achieved. The Master Plan therefore requires careful analysis of the various factors that characterize Saline Township and the specific problems to be faced.

While goals and objectives tend to be general in nature, strategies set forth a particular approach or position to be taken when resolving a planning issue. Strategies are specific actions aimed at achieving particular goals and objectives. Clearly defined statements of strategy can go far to minimize arbitrary decisions and substantiate intelligent, objective decisions.

- Goals** are overall broad statements that provide a focus for future discussions.
- Objectives** are more specific planning statements used to qualify the goals and provide more detailed direction for planning efforts.
- Strategies** are very specific, action-oriented statements that would help achieve the goals and objectives. Strategy statements provide justification to revise or draft new ordinances or regulations or finance specific capital improvements.



These goals and objectives were derived through a review of the existing conditions of the Township, future trends, and the results of a series of joint public meetings.

Summary of Goals

The following statements reflect the primary goals of Saline Township. These are followed by more detailed objectives and strategies on the subsequent pages.

- Preserve and manage natural features.
- Preserve agricultural lands and open space.
- Allow a variety of housing types, located within desirable residential settings, to ensure a maximum choice of dwelling units and a diverse population within the Township.
- Promote the limited development of commercial and industrial uses in appropriate areas of the Township.
- Develop and maintain a safe and efficient transportation system throughout the Township while minimizing the adverse impacts of traffic.
- Limit intense development and municipal sanitary sewer and water service to the urban service area to avoid patterns of sprawl, preserve agricultural and open space areas, and protect the Township's environment.

Preservation of Natural Resources

GOAL

Preserve and manage natural features.

Objective A

Protect the quality of surface water.

Strategies

1. Discourage development within the 100-year floodplain of existing water courses or wetlands.
2. Ensure that new developments preserve surface water, stream corridors, and wetlands in their natural conditions and limit adverse impacts on water features and vegetative buffers
3. Manage storm-water run-off to retain the quantity and quality of water in surface water features.
4. Limit the use of coal-tar sealcoat and promote alternative sealcoats, such as latex and acrylic-based products.
5. Control erosion during and after construction by:
 - a. Limiting stripping of vegetation and soil removal;

- b. Minimizing the duration of exposure and disturbed areas;
- c. Requiring the use of temporary vegetation, mulching, or other techniques to protect exposed areas;
- d. Requiring the establishment of permanent vegetation or other techniques to prevent erosion; and
- e. Requiring the installation of temporary erosion control barriers.

Objective B

Ensure the quality of groundwater by protecting groundwater recharge areas.

Strategies

1. Require delineation of groundwater recharge areas as part of the site plan review process. Require applicants to denote the following additional information:
 - a. On-site septic systems;
 - b. Percent of site covered by impervious surfaces;
 - c. Potential for water contamination from surface use of fertilizers and pesticides;
 - d. Potential for water contamination from spills of hazardous substances;
 - e. Potential for contamination from road de-icing materials.
2. Restrict impervious materials over groundwater recharge areas.
3. Protect surface vegetation where needed to purify or retain stormwater runoff.
4. Encourage land uses that limit the potential for groundwater contamination or harmful impact on the operation of the underground water system.

Objective C

Establish an interconnected system of natural environmental areas, including wetlands, woodlands, and open fields which provide a diverse, viable habitat for wildlife and rare native plants. Protect strategic open space for nature conservation and/or recreational use.

Strategies

1. Plan for land uses that minimize adverse impacts on designated environmentally-sensitive areas

2. Encourage cluster developments that protect designated natural features.
3. Encourage the establishment of easements and deed restrictions that permanently protect designated natural features.
4. Protect environmental features, including wetlands, woodlands, hedgerows, prairies, and meadows that support a viable wildlife habitat.
5. Retain natural links between protected areas within areas to facilitate movement of wildlife.
6. Require the identification of fragile natural features as part of the site plan review process.
7. Coordinate development of public and private open space and recreational uses. Encourage or require the provision of private open space in new developments; said open space shall be a significant feature of the development, especially in planned unit developments.
8. Coordinate the development of pedestrian and bicycle trails.
9. Encourage the establishment of a Township-wide parks and recreation plan.
10. Identify and dedicate strategic properties for open space or recreational use. Properties may include:
 - a. Parks in urban, suburban, and rural residential areas;
 - b. Environmentally sensitive sites that are potentially endangered; and
 - c. Sites to buffer land uses.

Objective D

Protect woodlands, open space areas, and landmark trees.

Strategies

1. Minimize the impact of development on woodlands by:
 - a. Prohibiting high-density residential development in designated woodlands.
 - b. Encouraging cluster developments to minimize the impact of development on woodlands.
 - c. Encouraging permanent protection and expansion of woodlands through the establishment of deed restrictions and easements
2. Protect the diversity and quality of wildlife habitats and their associated flora and fauna, including landmark trees, woodlands and upland brush.

Objective E

Promote attractive natural streetscapes along all Township roads and streets

Strategies

1. Protect existing landmark trees and hedgerows located adjacent to Township roads.
2. Require landscaping along Township roads for all new development, where applicable.
3. Protect and enhance streetscapes along special corridors (i.e. roadways with a recognized scenic or historic character).
4. Coordinate the location of overhead and underground utilities to minimize their impact on existing vegetation and wetlands.

Objective F

Create and protect a buffer with significant areas of nature conservation and low intensity land uses to separate the City of Saline's urban area from Saline Township.

Strategies

1. Encourage low density, open space, and agricultural uses along U.S. 12 between the urban service area and the western border of the Township
2. Cluster areas for development to maintain existing natural features and scenic vistas.
3. Ensure that agriculture remains as the predominant land use within the Township.

Objective G

Protect slopes of 12 percent or greater from adverse impact from development.

Strategies

1. Protect slopes of 12 percent or greater from soil erosion to:
 - a. Maintain slope stability;
 - b. Control amount and velocity of run-off; and
 - c. Maintain existing positive aesthetic qualities.

2. Limit development to low densities in areas of steep slopes and in other sloping areas where soil conditions create serious erosion potential.
3. Maintain or enhance the natural contours, vegetation and drainage patterns when development occurs in areas of steep slopes.

Objective H

Protect strategic open space and designated agricultural lands from development.

Strategies

1. Encourage public, non-profit land trusts to establish deed restrictions.
2. Encourage donation of land to Saline Township or to private land trusts for open space, recreational, or agricultural use.
3. Encourage the donation or sale of deed restrictions, view easements, and development easements to a public or private entity empowered to hold them.
4. Encourage the use of planned unit developments and cluster developments to establish permanent open space easements.

Agricultural Land Use

GOAL

Preserve agricultural and open space land.

Objective A

Maintain existing and promote additional agricultural activities in designated areas of the Township.

Strategies

1. Limit intense development in areas designated for agricultural preservation.
2. Coordinate agricultural preservation goals with those of adjoining communities.
3. Prevent fragmentation of farmlands by division into small parcels.
4. Encourage long-term investment and improvements needed to maintain and expand agricultural production by creating a stable environment for such production.
5. Promote and permit agri-tourism uses such as pumpkin patches, hay rides, and corn mazes that are compatible with agricultural and low-density residential areas.
6. Periodically update list of permitted/special uses within the agricultural district to allow for new agricultural uses or uses compatible with existing agricultural uses.

Objective B

Limit intrusion of non-agricultural uses into agricultural areas.

Strategies

1. Direct non-agricultural uses/more intense development away from areas of the Township reserved for agricultural preservation.
2. Permit residential land uses on agricultural land, given that residential lots are:
 - a. In accordance with the densities contained within the Zoning Ordinance;
 - b. Taken from land unsuited for farming, where available; and
 - c. Clustered to allow continued agricultural use of the remainder of the acreage.

Objective C

Permit ecologically-sound recreational land uses.

Strategies

1. Permit ecologically-sound recreational land uses when such uses provide a buffer between agricultural uses and urban/suburban residential areas.

Objective D

Encourage long-term ownership and/or permanent agricultural and open space preservation.

Strategies

1. Encourage ownership of land by farmers or entities committed to long-term agricultural use of land.
2. Encourage applications for P.A. 116.
3. Encourage the establishment of agricultural/open space deed restrictions or easements to create permanent or open space reserves.
4. Support Township properties to be considered for Purchase of Development Rights (PDR) programs.

Objective E

Appropriately plan for utilities and roads within agricultural areas

Strategies

1. Prohibit the extension of public sewer or water service into lands designated for agricultural preservation.
2. Retain a system of slow-moving, low-traffic roads to permit movement of farm equipment between noncontiguous parcels.
3. Access to new development shall be from existing paved roads wherever feasible.

CHAPTER 5: FUTURE LAND USE

The Future Land Use Plan defines the framework for the future growth of the Township. It begins with a general description of the desired pattern of development for the community and follows with a description of the future land use categories (as illustrated on the future land use map). This chapter serves to translate community goals into a narrative and provide a descriptive rationale as to the reasoning and placement of preferred land uses and density.

The Future Land Use Plan is formulated to serve as the primary policy guide for local government officials regarding land use decisions, investment in public improvements, and coordination of public improvements and private development. The Future Land Use Map, like the rest of the Master Plan, is intended to be a working document that will provide for the orderly development of the Township, assist the community in its effort to maintain and enhance a pleasant living environment, and spark a vision for the future.

In developing policies and a plan for future development within the Township, residents must consider the potential for various types of uses in relation to other identified development goals. Foremost, the potential for future residential, commercial, and industrial development must be examined in relation to the goal of preserving natural resources and the peaceful, agricultural character of the Township.

Determining Factors

Saline Township's Future Land Use Plan involves the integration of several key determining factors that embody the community's vision for the future. The various factors contained within this Plan include:

- Natural Features Protection
- Agricultural Preservation
- Urban Service Area
- Limited Commercial Development
- Coordinated Infrastructure Improvements

Natural Features Protection

Saline Township has a variety of natural features – wooded areas, streams, wetlands and varied topography. It is important that these features be protected and set aside into natural systems throughout the Township as well as integrated into the development pattern so that they will be preserved and properly respected. Due to the location of certain natural features, encroachment from development may be inevitable. However, options are available to integrate existing natural resources into new development patterns.

Planned Unit Developments (PUDs) offer an exceptional opportunity for the Township to seek the placement of conservation easements as a demonstration of a project's benefit to the community. This is especially true since Michigan legislation has allowed open space requirements of a PUD to be offered off-site since 2003; this offers the Township another vehicle by which to preserve designated areas. The Township's PUD Ordinance currently offers a density bonus for off-site open space preservation.

Agricultural Preservation

The continuance of agricultural activity is a critical component to the Township's overall land use strategy. Therefore, it is imperative that the Township's agricultural areas be preserved and protected from encroachment by incompatible development. Agriculture, at least long-term operations, cannot compete successfully with housing for the same land; the presence of only a few suburban residences can adversely affect the stability of an agricultural area. However, there are a number of approaches that can be taken by the Township and individual property owners to facilitate the preservation of agriculture:

Agricultural Zoning

It should be noted that the current Agricultural District within the Zoning Ordinance (A-1) contains a "sliding-scale" format for lot splits which, to an extent, limits the amount of development that can take place within agricultural areas. The Zoning Ordinance sets forth a maximum lot size for lot splits and limits the number of splits that can take place within the agricultural district. This "sliding scale" format shall be modified to comply with the Michigan Land Division Act, PA 591 of 1996 and PA 87 of 1997.

P.A. 116, Farmland and Open Space Preservation Program

Many agricultural properties within the Township are currently enrolled in the tax incentive program created under Public Act 116 of 1974, as amended. Under the P.A. 116 program, farmers can enter into a contract with the State of Michigan to keep their land in farming-use and agree not to develop the land. In exchange for that restriction in land use, the landowner may receive some tax credit.

Legacy Land Conservancy

In Washtenaw County, the Legacy Land Conservancy works with landowners in and around the County to help preserve farmland and other environmentally sensitive lands through conservation easements. Conservation easements limit the type and amount of development on a property and often restrict uses that have the potential to damage natural features. The Legacy Land Conservancy conservation easement is a permanent, voluntary commitment that may provide a financial benefit.

Urban Service Area

The availability of public utilities, namely sewer and water, is a guiding force behind the distribution of land uses and residential densities depicted on the Future Land Use Map. Saline Township has contracted with the City of Saline for water and sewer services through PA 425 agreements. To allow for the orderly, coordinated development of the Township, the Future Land Use Map provides for an “Urban Service Area.” The Urban Service Area is the primary method of managing growth envisioned in this Plan, and is intended to represent the area of the Township with which the water and sanitary sewer systems are anticipated to be extended. Therefore, the proposed Urban Service Area intentionally corresponds with the higher-density areas proposed on the Future Land Use Map.

The Urban Service Area effectively marks the separation between planned rural and urban/suburban areas. Medium to high intensity residential, commercial and light industrial uses are appropriate within the Urban Service Area. Conversely, areas located outside of the Urban Service Area shall be maintained at a low density, and any development within these areas should not adversely impact natural features and agricultural uses.

The boundaries of the Urban Service Area are not intended to be static, but should be evaluated on a regular basis along with other updates to the Master

Complete Streets provide numerous benefits, including:

- Improved safety for all users, including pedestrians, bicyclists, transit riders and drivers.
- Improved human health by encouraging walking and bicycling.
- Decreased car traffic, reducing dependence on gasoline and petroleum products, and improved air quality.
- Provides more transportation options.
- Fosters livable communities.

Future Land Use Categories

Specific land use categories are identified and illustrated on the future land use map (Map 7). A summary of the future land use classifications illustrated in the Future Land Use Map is provided as follows:

AGRICULTURAL/RESIDENTIAL DESIGNATIONS

Agricultural Land Use

Intent: The intent of the Agricultural designation is to protect existing agricultural land uses, maintain rural character, minimize population density, and preserve open spaces. Accordingly, the Agricultural land use designation is intended to allow low-density residential development only when it promotes open space preservation and is compatible with existing agricultural operations.

Description: Agricultural areas are those lands characterized as primary crop and/or livestock production lands. These lands should not be considered land banks for future development. In this area, the focus shall be on open space preservation and any future residential development shall cluster residential units on the most suitable portions of the site, with remaining areas permanently dedicated as open space. The clusters of residences are intended to be small and integrated into significant amounts of open space.

Although these general areas are primarily comprised of active agricultural lands, there are also natural resources consisting of woodlands, wetlands, stream corridors, and scattered residential dwellings.

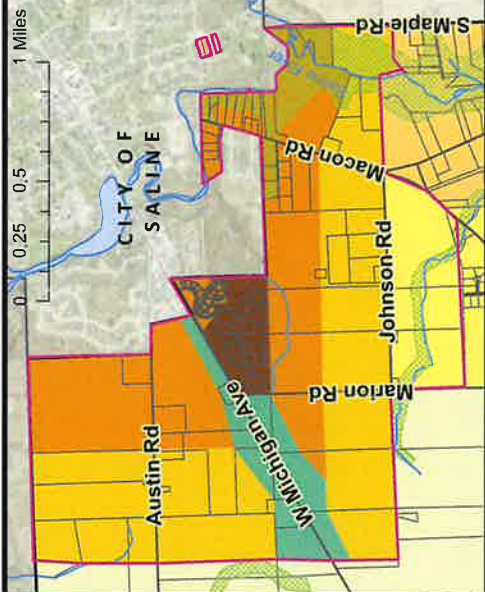
Compatible Land Uses: Desirable land uses and elements of the Agricultural designation include:

- Farming operations and similar uses of land;
- Agri-business and agri-tourism uses.
- Low-density, clustered single-family residential development where a minimum of fifty percent (50%) of the buildable area is permanently preserved as dedicated open space (see below);
- Single-family dwellings on parcels five (5) acres in size or larger;
- Landscape features such as orchards, out-buildings such as silos and barns, fences and sound farm structures;
- Scenic views consisting of natural features; and
- Ecologically-sound recreational land uses, parks, open spaces and conservation areas.
- Public/Quasi-public uses.

Residential Land Uses in Agricultural Areas: Efforts shall be made to direct non-agricultural uses away from areas of the Township designated for Agricultural uses and preservation. However, residential uses may be permitted on agricultural lands with the stipulation that, in order to preserve agricultural activities, residential lots shall be:

- In accordance with the standards contained within the A-1 Agricultural zoning district regarding sliding-scale densities;
- Taken from land unsuited for farming, where available;
- Allowed through rezoning to PUD as specified within the Zoning Ordinance; and
- Clustered to allow continued agricultural use of the remainder of the acreage.

Compatible Zoning Districts: Based upon the above criteria, the A-1, Agricultural-Conservation zoning district is the most appropriate zoning district for lands designated for agricultural use.

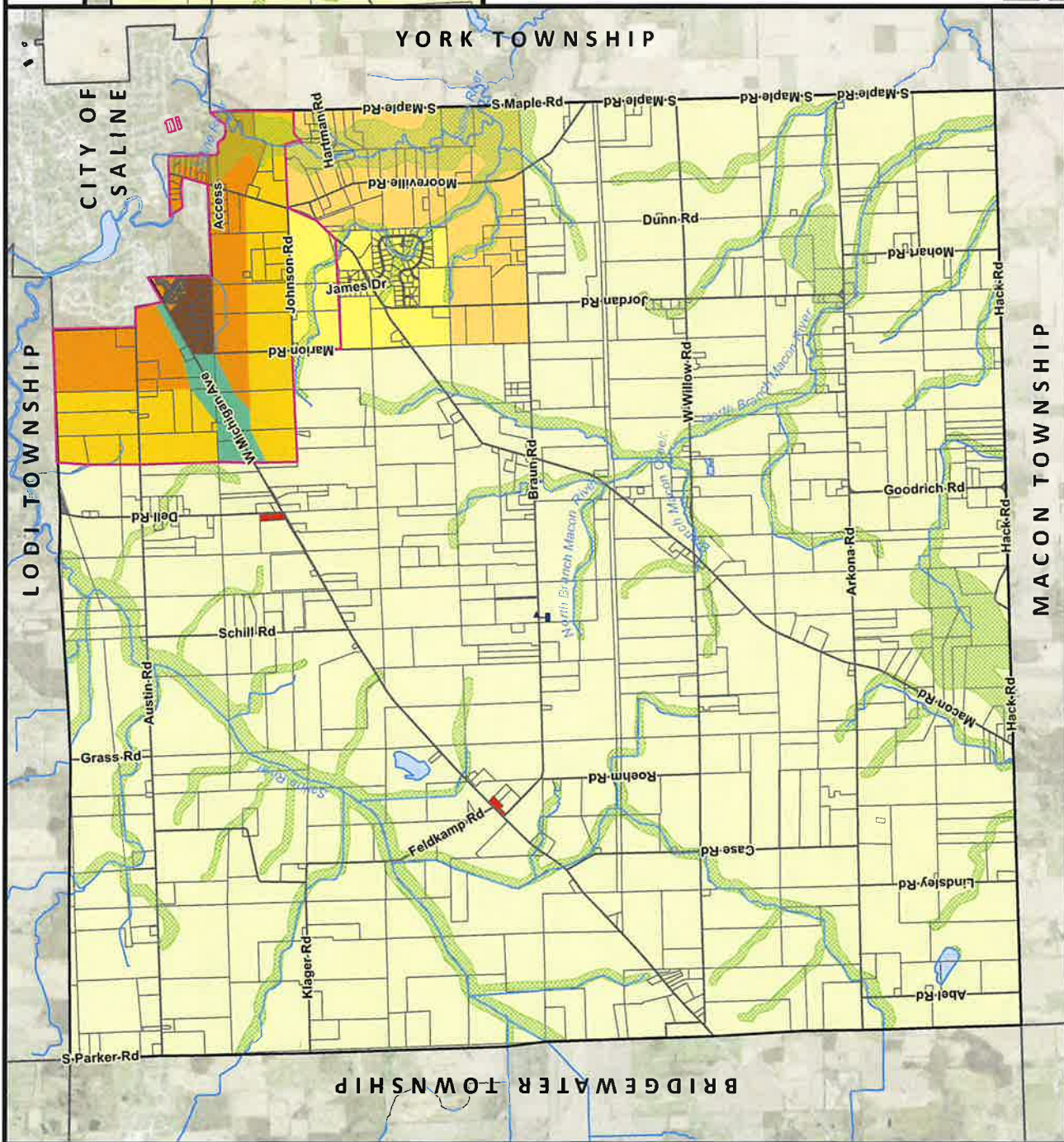


Urban Service Area

- Agriculture
 Estate residential
 Rural residential
 Suburban residential
 Urban residential
 Local commercial
 Manufactured Housing Park
 Mixed use
 Light industrial/research
 Open space system
 UrbanServiceBoundary
 Lakes and Ponds
 Rivers and Streams

Miles
SEMCOG
7-5-2016
Michigan Open GIS
Source: Washtenaw County GIS
Carlisle/Worthman Associates

Miles



Saline Exhibit I-3

Draft Date: February 1, 2008

Article 8
Screening and Land Use Buffers

ARTICLE 8

SCREENING AND LAND USE BUFFERS

Section 8.01 Purpose.

Screening and land use buffers are necessary for the protection and enhancement of the environment, and to ensure reasonable compatibility between land uses of differing intensity or impacts. Screening elements enhance the visual environment; preserve natural features; protect property values; alleviate the impact of noise, traffic, and more intensive land uses; and minimize visual impacts of parking lots, loading areas and storage areas. Screening and buffering also contribute to a healthy development pattern, and increase the level of privacy for residential uses in the Township.

The purposes of this Article are to establish minimum standards for the design, installation, and maintenance of screening elements and plant materials; and to establish reasonable standards for transition strips between uses of a significantly different scale or character, and screening of parking lots, storage areas and similar activities from road rights-of-way and adjacent lots. It is the intent of this Article that required screening and buffering elements shall be immediately effective in achieving the purpose of this Article, and shall maintain that effectiveness as the plant materials mature.

Section 8.02 Scope.

The standards of this Article shall apply to all uses, lots, and sites altered, developed or expanded after the effective date of this Ordinance that are subject to review per Section 12.01 (Site Plan Review), condominium site plan approval per Article 13 (Condominium Regulations) or planned unit development approval per Article 14 (Planned Unit Developments). Uses and activities exempt from site plan approval per Section 12.01 (Site Plan Review) shall be exempt from the requirements of this Article.

The standards of this Article shall be considered the minimum necessary to achieve the purposes of this Article and Ordinance. No provision of this Article shall preclude a developer and the Township from agreeing to more extensive landscaping or screening. Where existing sites have been developed without adequate screening or buffering, the purposes of this Article shall be achieved through improvements that are in reasonable proportion to the scale and scope of proposed building improvements, expansions, and other site improvements.

Section 8.03 General Standards.

The following standards shall apply to all landscaping and screening elements required by provisions of this Ordinance or determined necessary by the Planning Commission as part of site plan approval:

Draft Date: February 1, 2008

Article 8
Screening and Land Use Buffers

A. Design Standards.

1. **Visibility.** Landscaping and screening materials and layout shall conform to the requirements of Section 3.208 (Corner Clearance Areas), and shall not conflict with visibility for motorists or pedestrian access.
2. **Plantings near utility lines and fire hydrants.** Required plant materials and screening shall be arranged to avoid conflicts with underground and overhead utility lines, and access to or visibility of fire hydrants. The anticipated height at maturity of trees planted near overhead utility lines shall not exceed the line height above grade.
3. **Protection.** Where pavement and landscape areas interface, concrete curbing or similar measures shall be provided to protect plants from vehicle encroachment.
4. **Irrigation.** To assist in maintaining plant materials in a healthy condition and ensure compliance with Section 8.09 (Maintenance), the property owner or developer may provide an automatic irrigation system for landscaped areas. All automatic irrigation systems shall be designed to minimize water usage, and shall be capable of being manually shut off during water emergencies or water rationing periods.

B. Plant Material Standards.

1. **General.** The following shall apply to all plant materials:
 - a. All plant material shall conform to size and description set forth in the current edition of "American Standard for Nursery Stock" sponsored by the American Association of Nurserymen, Inc. and approved by the American National Standards Institute, Inc. (ANSI 260.1, 1996).
 - b. All plant material shall be true to name in conformance to the current edition of "Standardized Plant Names" established by the American Joint Committee on Horticultural Nomenclature, or other source accepted by the Township.
 - c. All plant material shall be nursery grown; hardy to the climate of Michigan; appropriate for the soil, climatic and environmental conditions; and resistant to disease and insect attack.
 - d. Artificial plant material shall be prohibited within required screening areas.
2. **Groundcovers.** The following shall apply to all groundcover materials:
 - a. Lawn areas shall be planted in species of grass normally grown as permanent lawns in Michigan. Grass may be sodded or hydro-seeded,

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Article 8
Screening and Land Use Buffers

provided that adequate measures are taken to minimize soil erosion. Sod or seed shall be clean and free of weeds and noxious pests or disease.

- b. The creative use of groundcover alternatives is encouraged. Groundcover used in lieu of grass shall be planted to present a finished appearance after one (1) complete growing season. Prairie grass and natural wildflower and grass mix may be used where appropriate.
 - c. Synthetic materials shall not be used as a permitted groundcover. Use of stone and gravel as a groundcover shall be limited to decorative accents within a planting bed, subject to Planning Commission approval.
3. **Mulch.** Planting beds shall present a finished appearance; with shredded hardwood bark mulch or similar natural material at a minimum depth of three (3) inches. Mulch used around trees and shrubs shall be a minimum of four (4) inches deep, and shall be pulled one (1) inch away from tree trunks. An effective edge treatment shall be provided to contain and prevent migration of the mulch.
4. **Topsoil.** A minimum four (4) inches of topsoil shall be provided for all lawn areas, ground covers and planting beds.

C. Standards for Size and Variety of Plant Materials.

To ensure adequate variety, and to avoid monotony and uniformity within a site, required plant materials shall not include more than thirty percent (30%) of any single plant species, and shall comply with the following schedule for minimum sizes at planting:

Screening Materials	Minimum Size at Installation
Deciduous Shade Trees	2½ - 3 caliper-inches diameter
Evergreen Trees	6.0 feet overall height
Deciduous Ornamental Trees	2.0 caliper-inches diameter or 6 feet overall height
Shrubs	30 inches in height or 24 inches in spread

D. Existing Plant Materials.

Healthy existing trees and other plant materials on a site may be used to satisfy specific screening standards of this Article, subject to Planning Commission approval and the following:

- 1. The location, size, and species of individual trees and other plant materials to be preserved shall be identified on the site plan.

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Screening and Land Use Buffers

2. The Planning Commission may require Township inspection of existing plant materials prior to or as a condition of site plan approval to determine the health and desirability of such materials. Such inspections shall be performed by qualified Township staff or consultants.
3. Where plant materials are to be preserved as part of a proposed development, prior approval shall be obtained by the property owner from the Township Planner or Zoning Inspector prior to any delimbing, root pruning, or similar work.
4. During land preparation and construction, protective fencing shall be placed at the drip-line of existing trees, and around the perimeter of other preserved plant materials. Details of proposed protective measures shall be noted on the final site plan for the development. No vehicle or other construction equipment shall be parked or stored within protected areas.
5. In the event that trees or other plant materials identified to be preserved on an approved final site plan are destroyed or damaged, as determined by the Township Planner or Zoning Inspector, the owner, developer or contractor shall replace the plant material with a comparable size, amount, and species.

Section 8.04 Methods of Screening.

Required landscaping and screening elements shall be provided by one (1) or more of following methods as best suited to the existing conditions, subject to Planning Commission approval:

A. Greenbelt Buffer.

The purpose of this method is to establish a buffer between adjacent land uses, or between uses and adjacent road rights-of-way. This method is intended to provide a partial visual screen, particularly where the adjacent uses (including uses that are adjacent across a road right-of-way) are less intense than the use of the subject site. Greenbelt buffers shall consist of the following (see illustration):

1. Greenbelts shall have a minimum width of ten (10) feet, and may be interrupted only to provide for pedestrian or vehicular access.
2. Greenbelts shall be sodded, hydro-seeded, or planted with appropriate groundcovers.
3. A mixture of deciduous shade trees, ornamental trees, evergreen trees, and shrubs shall be planted along the greenbelt buffer at a minimum concentration of one (1) tree and three (3) shrubs per 15 linear feet of greenbelt length.
 - a. Such required plant materials may be placed at uniform intervals, at random or in groupings.
 - b. The greenbelt length shall be measured along the centerline of the greenbelt for its entire length, inclusive of all driveways.

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B. Hedgerow.

The purpose of this method is to visually screen parking lots, adjacent uses, and road rights-of-way. This method is intended to create an effective obscuring screen within a limited land area. This method shall consist of shrubs planted and maintained as a continuous visual screen, subject to the following (see illustration):

1. The maximum permitted spacing between individual plants shall not exceed three (3) feet on-center, unless a different separation distance is determined by the Township Planner to be more appropriate for the type of shrub proposed.
2. Maintained plant height at maturity shall be adequate for the intended screening function.
 - a. Low height shrubs [two (2) to four (4) feet in height] shall be used to provide necessary ground-level screening to block headlight glare or similar low level impacts.
 - b. Larger shrubs [exceeding four (4) feet in height] shall be used to establish a landscaped barrier between land uses of differing intensities, or to provide more complete screening.

C. Fence.

The purpose of this method is to visually screen parking lots, outdoor storage areas, and similar uses where the predominant impacts are at or below eye level. This method shall consist of an ornamental, rail or privacy fence constructed along the lot or zoning district boundary, or around the perimeter of the area to be screened, subject to the following (see illustration):

1. Required fences shall have a minimum height of three (3) feet, and shall not exceed six (6) feet in height above grade unless a higher fence height is determined by the Planning Commission to be necessary to provide adequate screening.
2. Such fences shall conform to the standards of Section 6.102 (Fences).
3. The fence materials, height, location, and design shall be consistent with existing fences on adjacent lots, and shall be subject to Planning Commission approval.

D. Berm.

The purpose of this method is to effectively screen visual and noise impacts using natural-appearing landforms. This method is intended to provide an obscuring screen to block noise and light from adjacent uses or road rights-of-way, or to create a buffer between developed and undeveloped areas of a site. Berms shall consist of a combination of a sculpted earth mound and plantings, which shall meet the following standards (see illustration):

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1. Berms shall have side slopes no steeper than four (4) feet horizontal to one (1) foot vertical (4:1 ratio).
2. Berms shall have a minimum height of three (3) feet above the grade elevation. Overall berm height shall be adequate for the intended screening function. Grade elevation shall be the ground elevation at the nearest lot line adjacent to the proposed berm.
3. The interior face of the berm may be constructed as an earthen slope, or may be retained by means of a wall, terrace or similar means acceptable to the Planning Commission.
4. The berm shall be designed and graded to blend with existing topography, and sodded, hydro-seeded or planted with appropriate groundcovers.
5. The Planning Commission may require greenbelt plantings on the berm, per Section 8.04A (Greenbelt Buffer). For the purpose of determining any required plant materials, the length of any required berm shall be measured from one toe of the berm (the farthest point at one end of the berm's long dimension where the berm height equals the surrounding grade level) along the berm's centerline to the toe at the opposite end of the berm.

E. Evergreen Screen.

The purpose of this method is to create a dense obscuring screen that meets the objectives of this Article. This method is intended to establish a year-round screening barrier between land uses of differing intensities, to effectively block noise and light, or to completely separate developed and undeveloped portions of a site.

This method shall consist of closely spaced evergreen trees with year-round screening characteristics. Such trees shall be planted a maximum of 15 feet apart in at least two (2) staggered rows (see illustration).

F. Masonry Wall.

The purpose of this method is to create a solid, year-round barrier and obscuring screen to effectively block noise, light, and other impacts between land uses of differing intensities. Such walls shall be subject to the following (see illustration):

1. Masonry walls shall have a minimum height of two (2) feet, and shall not exceed six (6) feet in height above grade unless a higher wall height is determined by the Planning Commission to be necessary to provide adequate screening.
2. Walls shall be solid in character, and capped with a stone or concrete cap.
3. Wall materials shall be coordinated with the principal building materials on the site. The Planning Commission may require that decorative masonry (brick, stone, or decorative block) materials be incorporated into the wall design and construction.

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Section 8.05 Standards for Specific Areas.

The following standards are intended to address the specific screening and buffering needs of particular areas or portions of a site, in accordance with the purpose and objectives of this Article:

A. Parking Lot Landscaping and Perimeter Screening.

Parking lot landscaping and perimeter screening shall be arranged to improve the safety of pedestrian and motorists; guide traffic movement; define egress/ingress points, traffic circulation, and fire lanes; and improve the appearance of the parking area. Parking lot landscaping and perimeter screening shall be subject to the following:

1. **Perimeter screening.** Parking lots shall be screened from all abutting RURAL USES, RESIDENTIAL USES, residential zoning districts, and road rights-of-way per Section 8.04 (Methods of Screening).
2. **Snow storage area.** Adequate snow storage area shall be provided within the site. Plant materials in snow storage areas shall be hardy, salt-tolerant species characterized by low maintenance requirements.
3. **Landscaping within parking lots.** Planting islands shall be installed within parking lots that exceed 20 parking spaces or 6,000 square feet of paved surface area. Not more than 20 parking spaces shall be permitted in a continuous row without being interrupted by landscaping. Such planting islands shall be subject to the following (see illustration):
 - a. Planting islands shall have a minimum width of ten (10) feet, and a minimum area of 160 square feet.
 - b. A minimum of one (1) deciduous shade tree or ornamental tree shall be provided for each planting island. Shrubs and live groundcover plantings shall be used to cover all unplanted areas of the island.
 - c. Planting islands shall be located at the ends of each parking row.
 - d. All landscaping and perimeter screening, except designated snow storage areas, shall be protected from vehicle encroachment with concrete curbing or similar permanent means.

B. Loading, Storage, and Service Area Screening.

Loading, storage, and service areas, public utility and essential service uses and structures, ground equipment shelters, ground-mounted transformers, generators, and HVAC units, electric sub-stations, gas regulator stations, and similar facilities shall be screened from road rights-of-way and adjacent uses in accordance with Section 8.04 (Methods of Screening).

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C. Outdoor Trash Storage Area Screening.

Outdoor trash storage areas shall be screened and secured in accordance with the following:

1. Outdoor trash storage areas shall be screened by a six (6) foot high masonry wall enclosing three (3) sides of the storage area, subject to the standards of Section 8.04F (Masonry Wall).
2. The enclosure shall be secured by steel-reinforced and lockable gates designed to obscure visibility into the enclosure.
3. Concrete-filled bollards or similar protective devices shall be installed at the opening and to the rear of any storage area to prevent damage to the walls.
4. A concrete pad shall be provided under the trash storage area, extending out a minimum of ten (10) feet in front of the enclosure's gates.
5. Such storage area shall be located and arranged as to minimize visibility from adjacent road rights-of-way and RESIDENTIAL USES. In no instance shall any trash storage area be located in a front yard.
6. Outdoor trash storage shall be limited to normal refuse collected on a regular basis and maintained in a neat, orderly and sanitary condition. In no instance shall any refuse be visible above required screening.

D. Detention and Retention Basin Screening.

Where a detention or retention basin, or similar stormwater management facility is required, such facilities shall comply with the following:

1. To the extent possible, basin configurations shall be incorporated into the natural topography. Where this is not practical, the basin shall be shaped to emulate a naturally formed or free form depression. The basin edge shall consist of sculptured landforms to filter and soften views of the basin.
2. Basins shall be designed to avoid the need for perimeter fencing. Where such fencing is necessary, the location and design shall be subject to Planning Commission approval.
3. Basins shall be planted with a mixture of groundcover and wetland-based plantings native to Michigan, such as native grasses or wildflowers.
4. A perimeter greenbelt buffer shall be provided in accordance with Section 8.04A (Greenbelt Buffer) and the following:
 - a. Plantings shall be clustered around the basin to achieve a variety of plant materials, and to replicate a natural environment. Deciduous shade trees shall be clustered around the south and west sides of the basin to provide shade and minimize solar heating of the water.

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- b. Trees shall be planted above the freeboard line of the basin. Any plantings proposed below the freeboard line shall be tolerant of wet or moist soil conditions. The location of plant materials shall take into consideration the need to provide access for routine basin maintenance.

E. Front Yard Landscape Strips and Street Tree Plantings.

Front yard setback areas along road rights-of-way shall be landscaped to enhance the visual character of Township roads and minimize adverse impacts of vehicular traffic on adjacent uses, shall be subject to the following:

1. **Street trees.** Street tree plantings shall be required along the margins of road rights-of-way for all development projects subject to site plan approval, subject to the following (see illustration):
 - a. Street trees shall consist of deciduous shade trees planted at a minimum concentration of one (1) street tree per 40 linear feet of right-of-way. Required trees may be planted at regular intervals or in groupings.
 - b. Where such plantings are not permitted within a road right-of-way, required street trees shall be planted within the front yard setback area, or at an alternative location approved by the Planning Commission.
 - c. Existing trees near or within road rights-of-way may be used to satisfy this requirement, and shall be preserved where feasible.
 - d. Permits may be required by the Township, or county or state road authorities for installation of street trees within rights-of-way under their jurisdiction.
2. **Front yard landscape strip.** Where a front yard setback area is required by Article 3 (Dimensional Standards), the area shall be improved with landscaping materials in accordance with the standards of this Article. Existing vegetation or required parking lot or other screening may be used to satisfy this requirement.
3. **Groundcover plantings.** Road rights-of-way and disturbed areas of a development site shall be planted with grass or other suitable ground cover to prevent erosion.
4. **Maintenance of right-of-way landscaping.** Landscaping within rights-of-way shall be maintained by the owner of the abutting lot(s).

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Section 8.06 Transition Strip.

A transition strip, where required by this Section or Ordinance, shall be provided in accordance with the following:

A. Location.

A transition strip shall be required along any side or rear lot boundary within a subject parcel that abuts a zoning district or permitted use as specified in the following table:

Zoning District or Use	
Subject Parcel	Abutting Parcel
C-1 (Local Commercial) District	A-1 (Agricultural-Conservation) District; or any RURAL USES or RESIDENTIAL USES
C-2 (Special Commercial) District	
I-1 (Industrial-Research) District	
Multiple-Family Housing, Townhouses, and Stacked Flats	A-1 (Agricultural-Conservation) District; or any RURAL USES
Any OFFICE, SERVICE OR COMMUNITY USES; COMMERCIAL USES; INDUSTRIAL, RESEARCH, AND LABORATORY USES; or OTHER USES	A-1 (Agricultural-Conservation) District; or any RURAL USES or RESIDENTIAL USES

B. Width.

The width of a required transition strip shall not be included as part of any required setback from the same lot boundary. Where a transition strip is required, the setback shall be measured from the near edge of the transition strip, rather than the lot boundary. The minimum width of a transition strip shall be in accordance with the following:

Zoning District or Use on the Subject Parcel	Required Minimum Width
C-1 (Local Commercial) District	10 feet
C-2 (Special Commercial) District	10 feet
I-1 (Industrial-Research) District	20 feet
Multiple-Family Housing, Townhouses, and Stacked Flats	10 feet
OFFICE, SERVICE OR COMMUNITY USES	10 feet
COMMERCIAL USES	10 feet
INDUSTRIAL, RESEARCH, AND LABORATORY USES; or OTHER USES	20 feet

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C. Materials and Design.

The transition strip shall be improved with a landscaped greenbelt, evergreen screen or combination thereof in accordance with Section 8.04 (Methods of Screening). Where the transition strip abuts a required side or rear yard setback area, the landscaped greenbelt, evergreen screen or combination thereof shall be extended to include the combined width of the transition strip and setback area.

D. Modifications.

The Planning Commission shall have the authority to:

1. Permit the substitution of a hedgerow, fence or wall in accordance with the standards of Section 8.04 (Methods of Screening) for the required transition strip. Such action shall be based upon a determination that the alternative would equal the performance of the transition strip, or that the lot is too limited in dimension or area to reasonably accommodate the transition strip.
2. Waive the requirement for a transition strip, upon determination that a pending or probable change in land use or zoning classification of an abutting parcel will render the transition strip unnecessary.

Section 8.07 Prohibited Plant Materials.

The following trees are not considered desirable plant materials because of various problems, except where removal of existing trees would result in a loss of screening or buffering, or where noted below:

Species	Common Name
Acer negundo	Box Elder
Ulmus x	Elm varieties; except disease-resistant cultivars, such as 'Regal', 'Pioneer', 'Homestead', 'Jacan' and 'Accolade'
Aesculus x	Horse Chestnut; except for use in greenbelts and transition zones between developed and un-developed areas of a site
Populus x	Poplar varieties
Elaeagnus x	Olive varieties
Salix x	Willow varieties; except in appropriate wetland ecosystems
Catalpa x	Catalpa varieties
Ailanthus altissima	Tree of Heaven
Ginkgo biloba	Ginkgo (female); male trees are acceptable
Robinia pseudoacacia	Black locust
Morus alba	Mulberry (white)

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Species	Common Name
Acer saccharinum	Silver Maple
Fraxinus x	Ash varieties

Section 8.08 Installation.

All screening elements and plant materials shall be installed in a manner consistent with the standards of the American Association of Nurserymen, the approved site plan, and the following:

1. **Deadline for installation.** Installation of required screening elements and plant materials shall be completed within 365 calendar days from the date of site plan approval for the project.
2. **Extension.** The Township Planner or Zoning Inspector may extend the deadline to allow installation of required plant materials by the end of the next planting season, upon determination that weather conditions, development phasing, or other factors would jeopardize required plant materials and prevent their installation by the deadline specified in this Section.
3. **Performance guarantee.** The Township Planner or Zoning Inspector may require submittal of a performance guarantee, per Section 1.08 (Fees and Performance Guarantees), to cover the cost of installing required screening elements and plant materials. After installation has been completed, the Township Planner or Zoning Inspector shall conduct an inspection of the plant materials before the guarantee may be released.

Section 8.09 Maintenance.

All screening elements and plant materials shall be maintained in accordance with the approved site plan, and the following:

1. Maintenance procedures and frequencies to be followed shall be specified on the site plan, along with the manner in which the effectiveness, health, and intended functions of the screening elements and plant materials on the site will be ensured.
2. Adequate provisions shall be made to regularly supply water to all required plant materials as necessary to ensure proper growth and development.
3. Plant materials shall be kept in a neat, orderly and healthy growing condition, free from weeds, debris and refuse. Tree stakes, guy wires and tree wrap shall be removed after one (1) year.
4. Pruning of plant materials shall be limited to the minimum necessary to ensure proper maturation of plants to achieve their intended purpose.

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5. All required screening elements and plant materials shall be planted and maintained in accordance with an approved site plan. Failure to maintain required screening, including the removal and replacement of dead or diseased plant materials, shall be a violation of this Ordinance.
6. The replacement or removal of plant materials in a manner not consistent with an approved site plan shall be a violation of this Ordinance.

Section 8.10 Modifications.

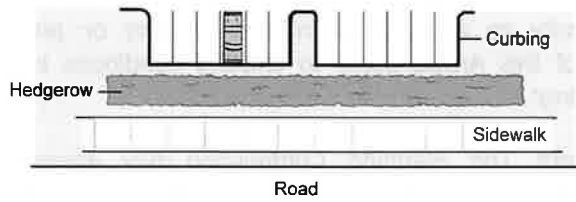
The Planning Commission shall have the authority to approve alternative designs or plant materials, and to determine how the standards of this Article apply to existing conditions and redevelopment sites in accordance with the following:

1. **Alternative designs or materials.** The Planning Commission may approve alternative landscape designs or plant materials upon determination that the alternative would meet the purpose and objectives of this Article.
2. **Existing conditions.** The Planning Commission shall have the authority to determine that requirements of this Article have been satisfied by existing topography, vegetation or other means acceptable to the Planning Commission.
3. **Redevelopment sites.** Where an existing building is undergoing renovation, expansion, or change in use, required landscaping and screening improvements shall be in reasonable proportion to the size and configuration of the site and the scale of proposed improvements, as determined by the Planning Commission in accordance with the purpose and objectives of this Article.

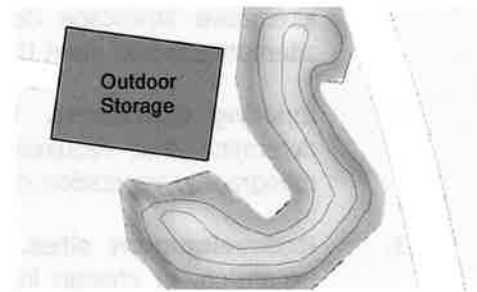
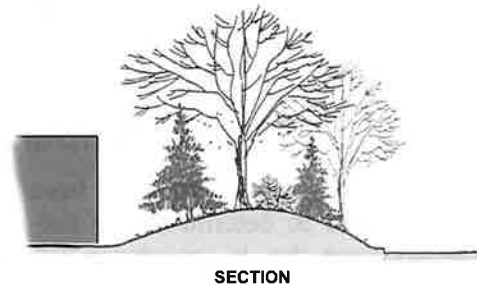
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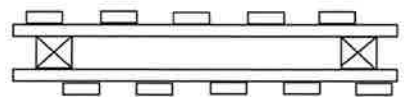
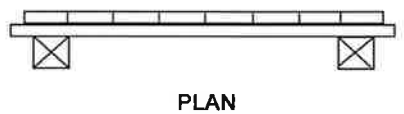
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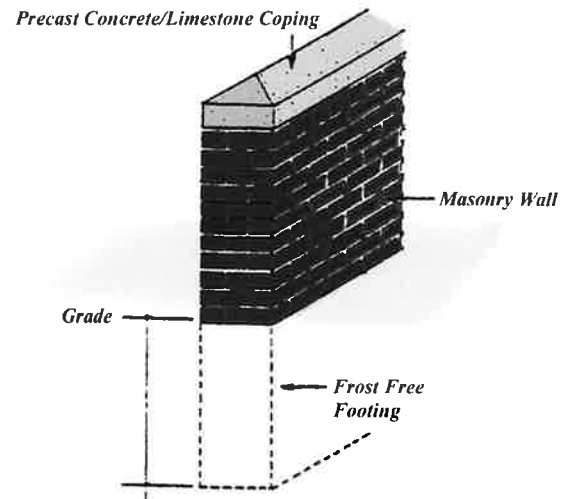
Hedgerow



Berm



Fence

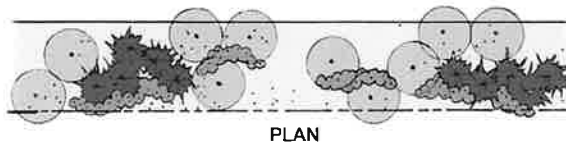


Screen Wall

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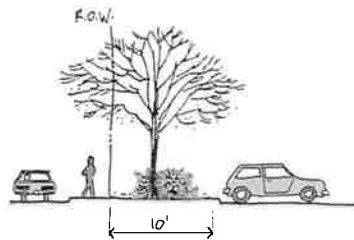
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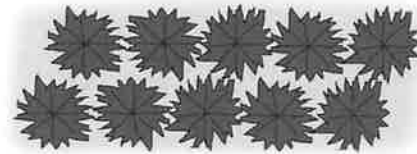


ELEVATION



SECTION

Greenbelt Buffer



PLAN

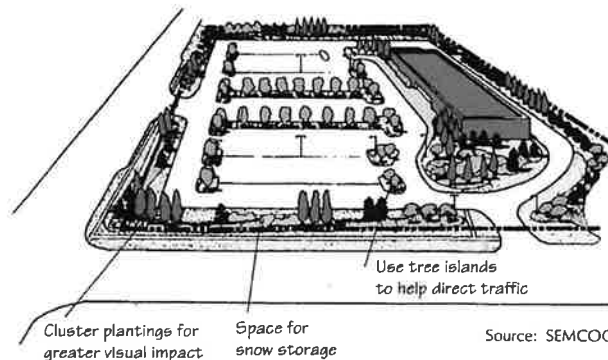
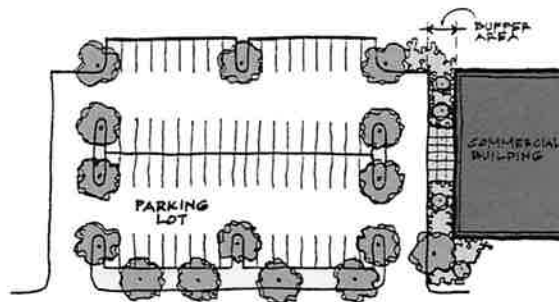


ELEVATION



SECTION

Evergreen Screen



Landscaping Within Parking Lots

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supply well approved by the Washtenaw County Environmental Health Division (WCEHD); or to a public water supply system, where available. Use of on-site private wells for potable water shall be prohibited in areas in which public water supply service is available.

Section 11.05 Natural Resources Protection.

This Section is intended to establish minimum regulations necessary to preserve natural resources on sites being developed in the Township. The preservation of natural resources is essential to maintain the continued character and quality of life for current and future Township residents and visitors. Protection of the natural features of the Township will promote the general public health, safety and welfare, encourage the use of lands in accordance with their character and adaptability, protect the natural environment, and conserve natural resources and energy.

An essential part of the character and quality of life in Saline Township and the surrounding region is the variety of natural features that remain largely undisturbed by land development. As the Township's General Development Plan specifies, the policy of the Township is that these natural features need to be protected and preserved to the maximum extent possible when land is developed.

A. Scope.

The standards of this Section are intended to protect natural features from destruction and misuse, and shall be considered the minimum necessary to achieve the intents and purposes of this Section and Ordinance. This Section shall apply to all development projects and parcels subject to a development approval application per Section 12.01 (Site Plan Review), condominium site plan approval per Article 13 (Condominium Regulations), planned unit development approval per Article 14 (Planned Unit Developments), or subdivision plat approval in accordance with the Land Division Act (P.A. 288 of 1967, as amended) and any Township subdivision regulations.

B. Development Plan Requirements.

Conformance with the applicable standards of this Section shall be demonstrated in conceptual form on the preliminary site plan or equivalent preliminary development plan required by the applicable development approval process. The final site plan or equivalent final development plan for the project shall contain sufficient details and information necessary to demonstrate conformance with this Section, to the satisfaction of the Planning Commission.

C. Watercourses and Wetlands.

The following watercourse and wetland protection standards shall apply to all developments subject to this Section:

1. **Setback area.** The following setbacks from wetlands and watercourses shall apply:

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- a. A minimum 50-foot open space setback shall be maintained from the ordinary high water mark of any river, stream, pond, lake or other watercourse, provided that no development shall be permitted within the 100-year floodplain.
- b. A minimum 25-foot open space setback shall be maintained from the edge of any wetland, as defined in Section 18.02 (Definitions).
- c. A minimum 25-foot open space setback shall be maintained from the boundary of any dedicated county drain easement, or a minimum of 50 feet from the centerline of any county drain without a dedicated easement.

Detention basins and similar stormwater management facilities may be constructed within a required setback, provided that appropriate replacement plantings are provided and maintained.

2. **General standards.** In any zoning district, no river, stream, watercourse, wetland or drainage way, whether filled or partly filled with water or dry in certain seasons, shall be obstructed or altered in any way at any time by any person, except when done in conformance with local, state, and federal law and standards.
 - a. No person shall alter, change, transform or otherwise vary the edge, bank or shore of any lake, river or stream except as provided in for in state law and in accordance with Michigan Department of Environmental Quality (MDEQ) regulations.
 - b. No person shall drain, remove, fill, change, alter, transform or otherwise vary the area, water level, vegetation or natural conditions of a marsh, swamp or wetland except after receiving final development approval in accordance with applicable Township standards. Any such alteration shall conform to applicable local, state, and federal requirements.

D. Floodplains.

The following floodplain protection standards shall apply to all developments subject to this Section:

1. Development shall be prohibited within the 100-year floodplain of any existing watercourse or wetland.
2. It shall be the applicant's responsibility to delineate the 100-year floodplain boundaries. Where there is any uncertainty, contradiction, or conflict as to the location of the floodplain boundaries, the final determination of the boundaries shall be made by the Township Engineer or designated wetlands consultant after referral from the Planning Commission.

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E. Steep Slopes and Unusual Topographic Features.

No development shall be permitted within any critical area of highly erodible soils, and steep slopes as defined in Section 18.02 (Definitions). The Planning Commission may place reasonable restrictions or use limitations on development within areas that have one (1) or more of the following characteristics:

1. Unusual topographic features;
2. Slopes of twelve percent (12%) or more where the slope is adjacent to a wetland or watercourse, where the soil is highly erodible; or
3. Slopes of eighteen percent (18%) or more where the area of the slope contains other natural features, such as woodlands, natural stands of large trees, or natural habitat areas.

Such restrictions or use limitations may include requiring permitted dwelling units to be clustered to preserve all or part of such slopes in a natural state, inclusion of all or part of such areas within proposed recreation areas or open space, and limiting grading that would adversely impact the unusual topographic features or related natural features.

F. Groundwater Recharge Areas.

The following groundwater recharge area protection standards shall apply to all developments subject to this Section:

1. The development shall be designed to protect groundwater resources.
2. Stormwater management facilities shall be designed to retain the natural retention and storage capacity and function of any wetland, water body or watercourse.
3. Site plans shall delineate the location and extent of any contaminated soils or groundwater on the site or that may affect the proposed development.
4. The applicant shall demonstrate how the proposed site design and layout of uses on the development site will:
 - a. Preserve the groundwater recharge areas and the infiltration capacity of the soils;
 - b. Prevent polluted materials from infiltrating into groundwater;
 - c. Minimize impervious areas through site planning that makes most efficient use of paved, developed space and that maximizes open space areas; and
 - d. Manage stormwater runoff to maximize on-site infiltration and provide adequate pre-treatment and filtering of sediments and other impurities.

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5. The Planning Commission may require the use of buffer zones to protect surface vegetation or the installation and use of such other techniques it deems necessary to mitigate or retain stormwater runoff.

G. Woodlands and Landmark Trees.

The following woodlands and landmark tree preservation and mitigation standards shall apply to all developments subject to this Section:

1. **Tree removal.** Except as otherwise provided in this Section, any development subject to this Section shall not:
 - a. Remove, transplant, damage, or destroy any tree or similar woody vegetation of any diameter at breast height (D.B.H.) in a woodland currently existing or that has existed on the subject site within the last five (5) years.
 - b. Remove, transplant, damage or destroy any tree or similar woody vegetation including individual deciduous trees of six (6) inch D.B.H. or larger and individual evergreen trees six (6) feet in height or higher, which are not located in a woodland.
 - c. Conduct any land clearing or grubbing activities within a woodland area.
2. **Requirements.** Except as provided elsewhere within this Section, the developer shall be subject to the following requirements:
 - a. Preserve and leave standing a minimum of thirty-five percent (35%) of the total number of individual deciduous trees of six (6) inch D.B.H. or larger and individual evergreen trees six (6) feet in height or higher within the development that have existed on the subject site within the last five (5) years.
 - b. If existing preserved trees do not average 30 trees per acre, additional trees shall be planted to equal a minimum average ratio of 30 trees per acre, at a minimum D.B.H. of 2.5 inches for deciduous trees and a minimum of six (6) feet in height for evergreen trees within any development subject to the provisions of this Section. Species and spacing of trees shall be subject to the approval of the Planning Commission. The required mitigation of trees shall be counted towards this ratio.
 - c. Where a developer has submitted and obtained approval of a development, as required under this Section, such tree preservation designation, together with any additional terms and conditions attached to the approval, shall satisfy the requirements of this Section.
3. **Tree relocation and replacement.** The intent of this Section is to replace removed species with similar species in appropriate habitats. Whenever the

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removal of individual deciduous trees of six (6) inch D.B.H. or larger and individual evergreen trees six (6) feet in height or higher, is deemed necessary from the site, such trees shall be replaced or relocated in accordance with this Section. If removed trees are to be replaced as provided within this Section, replacement trees may be used to satisfy preservation percentage requirements of this Section, but may not be used to satisfy landscaping requirements of the Zoning Ordinance.

4. **Replacement species standards.** Replacement trees shall be of the same species as the removed tree, except where prohibited by Section 8.07 (Prohibited Plant Materials). Species native to Michigan may be substituted for non-native or prohibited species. All replacement tree species shall be suitable for the habitat in which they will be located.
5. **Landmark tree standards.** A landmark tree, as regulated by this Section, shall be considered to be any tree that has a D.B.H. of 24 inches or greater, or that is of a type and D.B.H. equal to or greater than shown on the following list:

Landmark Tree Common Name	Landmark Tree Species	Diameter at Breast Height (D.B.H.)
Basswood	<i>Tilia americana</i>	18 inches
Beech	<i>Fagus grandifolia</i>	18 inches
Buckeye, Ohio	<i>Aesculus glabra</i>	18 inches
Catalpa	<i>Catalpa</i> spp.	18 inches
Cedar of Lebanon	<i>Cedrus</i> spp.	18 inches
Cherry, Black	<i>Prunus serotina</i>	18 inches
Cottonwood	<i>Populus deltoides</i>	18 inches
Elm, American	<i>Ulmus americana</i>	18 inches
Fir	<i>Abies</i> spp.	18 inches
Fir, Douglas	<i>Pseudotsuga menziesii</i>	18 inches
Kentucky Coffee Tree	<i>Gymnocladus dioicus</i>	18 inches
Pine	<i>Pinus</i> spp.	18 inches
Spruce	<i>Picea</i> spp.	18 inches
Sycamore or London Plane	<i>Platanus</i> spp.	18 inches
Tulip-tree	<i>Liriodendron tulipifera</i>	18 inches
Walnut, Black	<i>Juglans nigra</i>	18 inches
Hickory, various	<i>Carya</i> spp.	16 inches
Locust, Honey	<i>Gleditsia triacanthos</i>	16 inches
Maple	<i>Acer</i> spp.	16 inches

Draft Date: **February 1, 2008**

Article 11
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Landmark Tree Common Name	Landmark Tree Species	Diameter at Breast Height (D.B.H.)
Oak	Quercus spp.	16 inches
Cedar, White (Arborvitae)	Thuja occidentalis	Twelve (12) inches
Cedar, Red	Juniperus virginiana	Twelve (12) inches
Baldcypress	Taxodium distichum	Twelve (12) inches
Birch	Betula spp.	Twelve (12) inches
Black Tupelo	Nyssa sylvatica	Twelve (12) inches
Cherry	Prunus spp.	Twelve (12) inches
Crabapple	Malus spp	Twelve (12) inches
Dawn Redwood	Metasequoia glyptostroboides	Twelve (12) inches
Ginkgo	Ginkgo biloba	Twelve (12) inches
Hackberry	Celtis occidentalis	Twelve (12) inches
Hawthorn	Crataegus spp.	Twelve (12) inches
Hemlock, Eastern	Tsuga canadensis	Twelve (12) inches
Larch/Tamarack	Larix laricina	Twelve (12) inches
Pear	Pyrus spp.	Twelve (12) inches
Persimmon	Diospyros virginiana	Twelve (12) inches
Poplar (Aspen)	Populus spp. (except alba, deltoides)	Twelve (12) inches
Sassafras	Sassafras albidum	Twelve (12) inches
Sweetgum	Liquidambar styraciflua	Twelve (12) inches
Yellowwood	Cladrastis lutea/kentukea	Twelve (12) inches
Cedar	Juniperus spp.	eight (8) inches
Redbud	Cercis canadensis	eight (8) inches
Dogwood, Flowering	Cornus florida	eight (8) inches
Hornbeam, Blue Beech	Carpinus spp.	eight (8) inches
Ironwood	Ostrya virginiana	eight (8) inches
Maple, Mountain/Striped	Acer spicatum/pensylvanicum	eight (8) inches
Pawpaw	Asimina triloba	eight (8) inches
American Chestnut	Castanea dentata	six (6) inches
Butternut	Juglans cinerea	six (6) inches

Draft Date: February 1, 2008

Article 11
Special Development Provisions

6. **Replacement ratio.** Removed trees shall be relocated or replaced in accordance with the following schedule:

Size of Removed Tree	Replacement Ratio (number of replacement trees per removed tree)
Coniferous (height)	
Six (6) to ten (10) feet	one to one
Ten (10) to 14 feet	1.5 to one
More than 14 feet	two to one
Landmark coniferous tree	one per four (4) feet of removed tree height
Deciduous (D.B.H.)	
Six (6) to ten (10) inches	one to one
Ten (10) to 14 inches	1.5 to one
More than 14 inches	two to one
Landmark deciduous tree	one per four (4) inches of removed tree D.B.H.

7. **Replacement tree standards.** Replacement tree plantings shall conform to the requirements of Section 8.03 (General Standards) and the following:
- a. **Location.** The location of any replacement tree shall be on the same parcel as the removed tree wherever feasible, as determined by the Township.
 - (1) If the tree replacement on the same parcel is not feasible, the Township may designate another planting location for the replacement tree within the Township.
 - (2) If tree relocation or replacement is not feasible either on the parcel or on another approved location within the Township, the Township may allow a deposit into a tree planting fund maintained by the Township in an amount determined to be acceptable by the Township for tree replacement on a per tree basis based upon the current market value for tree replacement that would otherwise be required. These funds shall be utilized for the planting, maintenance, and preservation of trees and woodland areas within the Township.
 - b. **Installation and maintenance.** Installation and maintenance of replacement trees shall conform to the requirements of Section 8.08 (Installation) and Section 8.09 (Maintenance) of this Ordinance.

Draft Date: February 1, 2008

Article 11
Special Development Provisions

H. Protection of Natural Features During Construction.

Natural features to be preserved as part of an approved development project shall be protected during construction in accordance with the following:

1. Prior to any development, clearing, or other activity for which a permit is required, temporary construction fences shall be installed in the following locations to restrict access to protected natural features:
 - a. At the limits of soil disturbance adjacent to natural features.
 - b. At the perimeter of the critical root zone of landmark trees which are located within a disturbance area. Where encroachments into the critical root zone are allowed as part of an approved site plan or plat, the fencing must be located at least 10 feet from the trunk of the tree at all points.
 - c. At the edge of the natural features identified to be protected under this regulation and in compliance with the required exterior limits of natural features setbacks as defined within this Ordinance
2. No filling, depositing, excavating, or storage of materials, debris, or equipment shall take place within the protected area.
3. Temporary construction fencing shall be maintained in place in good condition until all construction activity has been completed for the area or development phase.
4. Any landmark tree that is determined to be dead, dying, or severely damaged due to on-site construction activity during construction or within three (3) years following completion of the development shall be replaced by the developer in the amount specified in the requirements for mitigation of landmark trees. To ensure replacement of trees that are damaged, dead, or dying, the developer may be required by the Township to post a performance guarantee, in accordance with Section 1.08C (Performance Guarantees), in an amount calculated to cover the cost of the total replacement.

I. Inspection.

To ensure compliance with this Section, the Township may perform periodic inspections of subject lots or parcels, at such times determined to be necessary, during all phases of construction and development as well as for up to three (3) calendar years after completion of the development project.

Saline Township
Washtenaw County, Michigan
Ordinance No. 2025-_____

An ordinance to amendments to the Saline Township Zoning Ordinance to establish standards for Battery Energy Storage Systems (BESS), Solar Energy Systems (SES), and Wind Energy Systems (WES) within the Township.

Section 1. Amendment to Article 4

Article 4 of the Saline Township Zoning Ordinance is amended as follows:

Continued on Following Page

ARTICLE 4

LAND USE TABLE

Section 4.01 Key Designations in Table of Uses.

SYMBOL	KEY	
P	Permitted Uses in the Zoning District	Principal Use
S		Special Use
A		Accessory Use
[Blank]	Prohibited Use in the District	

Section 4.02 Table of Permitted Uses by District.

The uses of land in the following table have been organized, for ease of use and convenience, into use groups based upon certain characteristics that the grouped uses may share. These use groups are described below:

1. **RURAL USES.** These uses primarily involve the keeping, breeding or use of animals; production or distribution of produce and farm-related products; and associated uses of a rural character or intensity.
2. **RESIDENTIAL USES.** These uses primarily involve housing of various types and densities, and associated uses typically found in a residential neighborhood.
3. **OFFICE, SERVICE, AND COMMUNITY USES.** Community uses are public-owned or operated uses; uses of a not-for-profit nature; uses that involve benefits or services generally provided to a significant portion of the population; or uses that serve as focal or gathering points for the community. Office or service uses are private-owned or operated uses; or uses of a for-profit nature, such as personal service establishments, medical and professional offices, workshops and studios, and similar associated uses.
4. **COMMERCIAL USES.** These are uses of a generally for-profit nature, and may include retail sales, food service, entertainment, repair services and similar associated uses.
5. **INDUSTRIAL, RESEARCH, AND LABORATORY USES.** These are uses of a light manufacturing, research, warehousing or wholesaling character; or that involve compounding, processing, packaging, assembly, storage or treatment of materials.
6. **OTHER USES.** These are uses that, because of unusual character, intensity or nuisance factors, do not fit well into the

preceding use groups.

Type of District	Zoning District Name	Symbol
Rural	Agricultural-Conservation	A-1
Rural Residential	Estate Residential	R-1
	Rural Residential	R-2
Residential	Suburban Residential	R-3
	Urban Residential	R-4
	Manufactured Housing Park	MHP
Business	Local Commercial	C-1
	Special Commercial	C-2
	Industrial-Research	I-1
Other	Public/Semi-Public Services	PSP

	SYMBOL	KEY		DISTRICTS										USE STANDARDS	
	P	Permitted Uses in the Zoning District	Principal Use												
	S		Special Use												
	A		Accessory Use												
[Blank]	Prohibited Use in the Zoning District														
USES				A-1	R-1	R-2	R-3	R-4	MHP	C-1	C-2	I-1	PSP		
RURAL USES															
Agricultural Service Establishments				S									P		Section 5.104
Bulk Feed and Fertilizer Supply Outlet				S							P				Section 5.102
Conservation Area or Open Space				P	P	P	P	P	P	P	P	P	P	P	
Farms for Production of Food, Feed or Fiber				P	P	P	P	P	P	P	P	P	P	P	
Farm-Based Tourism or Entertainment Activities				S											Section 5.101
Farm Implement Sales or Repair				S							P				Section 5.102
Farm Market				S							P			P	Section 5.102
Farm Products Direct Marketing Business				P	A	A	A	A	A	A	P	A	A	A	Section 5.103
Greenhouse				P	A	A	A	A	A	A	P	A	A	A	Section 5.105
Hunting Preserve				S										S	Section 5.305
Kennel				S	S	S					S				Section 5.106
Nursery or Tree Farm				P	A	A	A	A	A	A	A	A	A	A	Section 5.105
Ponds for Farming, Landscaping or Recreation				P	P	P	P	P	P	P	P	P	P	P	Section 5.107
Private Riding Arena or Boarding Stable				P	A	A	A	A	A	A	A	A	A	A	Section 5.108
Public or Commercial Riding Stable				S										P	Section 5.109
Roadside Stand				A	A	A	A	A	A	A	A	A	A	A	Section 5.110
Sportsman’s Club or Gun Range				S										S	Section 5.305
Sod Farm				S											
Utility Scale Solar Energy Uses				S							P				Section 11.07
Veterinary Clinic or Animal Hospital				P							P				Section 5.112

	SYMBOL	KEY		DISTRICTS										USE STANDARDS	
	P	Permitted Uses in the Zoning District	Principal Use												
	S		Special Use												
	A		Accessory Use												
	[Blank]	Prohibited Use in the Zoning District													
USES				A-1	R-1	R-2	R-3	R-4	MHP	C-1	C-2	I-1	PSP		
RESIDENTIAL USES															
Accessory Dwelling	A	S	S	S	S		A								Section 5.201
Adult Foster Care Family Home or Small Group Home	P	P	P	P	P	P									
Adult Foster Care Large Group Home	S	S	S	S	P										Section 5.302
Bed and Breakfast Inn	S	S	S	S	S										Section 5.202
Child Day Care Home, Family	P	P	P	P	P	P									
Child Day Care Home, Group	S	S	S	S	S	S									Section 5.302
Child Foster Family Home or Family Group Home	P	P	P	P	P	P									
Elderly and Senior Housing - Independent						P									Section 5.206
Elderly Housing - Assisted Living Facilities						P		S							
Elderly Housing – Dependent, Nursing or Convalescent Care						P		P							
Farm Labor Housing	S					P									Section 5.203
General Outdoor Storage	S														Section 5.504
Home Occupations listed in Section 5.204	A	A	A	A	A	A									Section 5.204
Home Occupations not listed in Section 5.204	S	S	S	S	S	S									Section 5.204
Manufactured Housing Parks							P								Section 5.205
Multiple-Family Housing, Townhouses, and Stacked Flats						P									Section 5.206
Single Family Dwellings, Detached	P	P	P	P	P	P									Section 5.207
Two-Family (Duplex) Dwellings				S	P										Section 5.206
State-Licensed and Other Managed Residential Facilities not otherwise listed in this table					S										

	SYMBOL	KEY		DISTRICTS										USE STANDARDS
	P	Permitted Uses in the Zoning District	Principal Use											
	S		Special Use											
	A		Accessory Use											
[Blank]	Prohibited Use in the Zoning District													
USES				A-1	R-1	R-2	R-3	R-4	MHP	C-1	C-2	I-1	PSP	
OFFICE, SERVICE, AND COMMUNITY USES														
Ambulance Station	S	S	S	S	S	S	P	P	P	P				
Barber Shop, Beauty Salon or Nail Care							P	P						
Cemetery	S									P	Section 5.301			
Day Care Center - Child or Adult							P			P	Section 5.302			
Fire and Police Stations	S	S	S	S	S	S	P	P	P	P				
Funeral Parlor or Mortuary							P	P			Section 5.303			
Government Offices							P	P		P				
Health Club or Fitness Center					A	A	P	P						
Hospital or Urgent Care Center							P	P		P				
Institutional Uses							P			P	Section 5.304			
Medical, Osteopathic, Chiropractic, Optical or Dental Office, Clinic or Laboratory; Massage Therapist or Physical Therapy Facility							P	P	A	A	Section 5.307			
Offices for Professional, Service or Administrative Uses							P	P	A	A				
Public Utility and Essential Service Uses	P	P	P	P	P	P	P	P	P	P				
Recreational Facilities – Private Membership or Restricted Access		S	S	S	S	S				P	Section 5.305			
Recreational Facilities - Publicly-Owned or Unrestricted Access		P	P	P	P	P				P				
Recreational Vehicle Parks and Campgrounds										P	Section 5.306			
Tattoo Parlor or Body Piercing Salon							S	P						
Utility Scale Solar Energy Systems										S	Section 11.09			
Workshop or Studio	A						P	P	A		Section 5.308			

	SYMBOL	KEY		DISTRICTS										USE STANDARDS	
	P	Permitted Uses in the Zoning District	Principal Use												
	S		Special Use												
	A		Accessory Use												
	[Blank]	Prohibited Use in the Zoning District													
USES				A-1	R-1	R-2	R-3	R-4	MHP	C-1	C-2	I-1	PSP		
COMMERCIAL USES															
Amusement Center, Indoor											P	P			
Amusement Center, Outdoor											S	P			Section 5.401
Bakeries											P	P	P		Section 5.402
Bank, Credit Union or Similar Financial Institution											P	P	A		
Big Box COMMERCIAL USES (50,000+ square-foot gross floor area)											S	P			Section 5.403
Car Wash											S	P			Section 5.404
COMMERCIAL USES not otherwise listed in this table											S	P			
Dealership Showroom for Sale or Rental of Recreational Vehicles, Motor Vehicles, Construction Machinery or Similar Durable Goods											P	P			
Drive-In or Drive-Through Facilities											S	P			Section 5.406
Hardware, Home Improvement, or Building Supply Store											P	P			
Hotel or Inn											P	P			
Laundromat or Dry Cleaners											P	P	A		Section 5.405
Manufactured Housing Sales									P		S	P			Section 5.410
Motion Picture Cinema, Indoor											P	P			Section 5.407
Motion Picture Cinema, Outdoor											S	P		S	Section 5.407
Motor Vehicle Fueling Station											S	P	P		Section 5.408
Motor Vehicle Repair Station											S	S	P		Section 5.408
Motor Vehicle Service Center											S	P	P		Section 5.408
Open Air Business, Outdoor Display Area, Garden Center or Dealership Sales Lot											S	P			Section 5.410

	SYMBOL	KEY		DISTRICTS										USE STANDARDS	
	P	Permitted Uses in the Zoning District	Principal Use												
	S		Special Use												
	A		Accessory Use												
	[Blank]	Prohibited Use in the Zoning District													
USES				A-1	R-1	R-2	R-3	R-4	MHP	C-1	C-2	I-1	PSP		
COMMERCIAL USES (continued)															
Outdoor Café or Eating Area											P	P			Section 5.409
Pharmacies, Drugstores and Medical Supply Stores											P	P	A	A	Section 5.405
Restaurants and Food Service Establishments											P	P	A		
Retail Stores											P	P			
Showroom for Display or Sales of Products Created On-Site											P	P	A		Section 5.405
Tavern, Pub, Brewpub, Cocktail Lounge or Night Club											S	P			
INDUSTRIAL, RESEARCH, AND LABORATORY USES															
Blacksmithing, Furniture or Cabinet Repair or Manufacture, Woodworking Shops, and Similar Uses				S							A	A	P		Section 5.501
Blast Furnaces, Incinerators, Lumber Mills, Power Generation Plants, and Similar Uses													S		Section 5.503
Crematorium											S	S	P		Section 5.501 Section 5.503
Distribution Facilities and Truck Terminals													S		Section 5.504
Dry Cleaning - Central Cleaning/Processing Plant													S		Section 5.503
Feed or Flour Mills, Smoking, Curing or Packing Plants and similar Food and Farm Product Processing Uses													P		Section 5.104
Electroplating, Paint Mixing or Spraying, Metal Casting, Smelting, Plating, Dyeing or Similar Uses													S		Section 5.503

	SYMBOL	KEY		DISTRICTS										USE STANDARDS	
	P	Permitted Uses in the Zoning District	Principal Use												
	S		Special Use												
	A		Accessory Use												
	[Blank]	Prohibited Use in the Zoning District													
USES				A-1	R-1	R-2	R-3	R-4	MHP	C-1	C-2	I-1	PSP		
INDUSTRIAL, RESEARCH, AND LABORATORY USES (continued)															
Fabrication or Assembly of Motor Vehicles, Recreational Vehicles, Boats, Trailers, Bicycles, Electronic Components and Equipment, Manufactured/Modular Housing, and Similar Products													P		
Hazardous Materials Storage													S		Section 5.502
Machine, Welding, and Sheet Metal Shops, Stone Finishing and Carving, and Similar Uses													P		
Manufacture, Compounding, Processing, Packaging, or Treatment of Pharmaceuticals, Toiletries, Hardware, and Similar Products													P		
Manufacture of Products from Metal, Clay, Fabric, Glass, Tile, Terra Cotta, Bone, Leather, Paper, Plastics or Similar Materials													P		
Manufacture, Processing, Production or Wholesale Storage of Chemicals, Petroleum or Paper Products, Cement, Lime, Gypsum, Glue, Soap, Soda, Compound, Salt, Potash or Similar Materials													S		Section 5.503
Outdoor Storage, General												S	P		Section 5.504
Outdoor Storage of Recreational Vehicles or Similar Items				S							S	S	P		Section 5.506
Outdoor Storage Yard for Motor Vehicles, Construction or Farming Machinery, Manufactured Houses or Similar Items													S		Section 5.505
Outdoor Dismantling or Recycling Yard for Motor Vehicles, Machinery, Manufactured Houses or Similar Items													S		Section 5.505
Research and Development Facilities and Testing Laboratories				S							S	S	P		Section 5.501

	SYMBOL	KEY		DISTRICTS										USE STANDARDS	
	P	Permitted Uses in the Zoning District	Principal Use												
	S		Special Use												
	A		Accessory Use												
	[Blank]	Prohibited Use in the Zoning District													
USES				A-1	R-1	R-2	R-3	R-4	MHP	C-1	C-2	I-1	PSP		
INDUSTRIAL, RESEARCH, AND LABORATORY USES (continued)															
Self-Storage Warehouses				S							S	S	P		Section 5.506
Slaughterhouse, Rendering Plant or Similar Facility													S		Section 5.507
Stamping Plants; Rolling Mills; Injection Molding Facilities, and Shearing, Punching, and Automatic Screw Machines													S		Section 5.503
Utility Scale Solar Energy Systems													S		Section 11.09
Warehouses and Non-Farm Bulk Indoor Storage													P		
OTHER USES															
Adult Entertainment Uses and Sexually-Oriented Businesses												S			Section 5.601
Aircraft Landing Strips				S										P	Section 5.602
Composting Centers				S									S	S	Section 5.603
Extractive Operations, Sand and Gravel Pits				S											Section 5.604
Private Off-Road Courses				S											Section 5.605
Public Works or Road Maintenance Yards													S	P	Section 5.504
Racetracks														S	Section 5.606
Recycling Collection Facility													P	P	Section 5.504
Temporary Structures for Construction Purposes				P	P	P	P	P	A	P	P	P	P	P	
Topsoil Removal or Stockpiling on Sites Under Development				S	A	A	A	A	A	A	A	A	A	A	Section 5.607
Small-Scale Energy Equipment				A	A	A	A	A	A	A	A	A	A	A	Section 11.10
Utility-Scale Energy Facilities				S									S	S	Section 11.10

Section 2. Repeal Section 11.09, Solar Energy Systems.

Section 11.09 of the Saline Township Zoning Ordinance is repealed in its entirety.

Section 3. Repeal and Readopt Section 11.10

Section 11.10 of the Saline Township Zoning Ordinance is repealed and re-adopted as Section 11.10, Energy Systems and Facilities as follows:

Section 11.10 Energy Systems and Facilities

A. Intent.

It is the intent of Saline Township to regulate the siting, design, installation, and operation of energy systems and facilities, which include Battery Energy Storage Systems (BESS), Solar Energy Systems (SES), and Wind Energy Systems (WES). These standards permit the efficient and effective operation of energy systems and facilities within the Township while mitigating their potential negative impacts and ensuring their compatibility with adjacent land uses in order to protect public health, safety, and welfare. BESS, SES, and WES, as defined herein, are only permitted as authorized by this Section.

B. Definitions.

As used in this Section the following terms shall have the meanings indicated:

Aircraft Detection Lighting System: A sensor-based system designed to detect aircraft as they approach a wind energy facility and that automatically activates obstruction lights until they are no longer needed.

ANSI: American National Standards Institute

A-Weighted Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighting network, as expressed as dB(A) or dBA.

Battery(ies): A single cell or a group of cells connected together electrically in series, in parallel, or a combination of both, which can charge, discharge, and store energy electrochemically. For the purposes of this law, batteries utilized in consumer products are excluded from these requirements.

Battery Energy Storage Management System: An electronic system that protects energy storage systems from operating outside their safe operating parameters and disconnects electrical power to the energy storage system or places it in a safe condition if potentially hazardous temperatures or other conditions are detected.

Battery Energy Storage System (BESS): One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time, not to include a stand-alone 12-volt car battery or an electric motor vehicle.

Building Code: Stille-DeRossett-Hale Single State Construction Code Act (Act No. 230, P.A. 1972, as amended)

Cell: The basic electrochemical unit, characterized by an anode and a cathode, used to receive, store, and deliver electrical energy.

Commissioning: A systematic process that provides documented confirmation that a energy facility functions according to the intended design criteria and complies with applicable code requirements.

Construction: Any substantial action taken constituting the placement, erection, expansion, or repowering of an energy facility

Dark Sky-Friendly Lighting Technology: A light fixture that is designed to minimize the amount of light that escapes upward into the sky.

dBA: The sound pressure level in decibels using the "A" weighted scale defined by the American National Standards Institute (ANSI)

Decibel: A unit used to measure the intensity of a sound or the power level of an electric signal by comparing it with a given level on a logarithmic scale.

Dedicated Use building: A building that is built for the primary intention of housing battery energy storage system equipment, is classified as Group F-1 occupancy as defined in the Building Code, and complies with the following:

1. The building's only use is battery energy storage, energy generation, and other electrical grid-related operations.
2. No other occupancy types are permitted in the building.
3. Occupants in the rooms and areas containing battery energy storage systems are limited to personnel that operate, maintain, service, test, and repair the battery energy storage system and other energy systems.
4. Administrative and support personnel are permitted in areas within the buildings that do not contain battery energy storage system, provided the following:
 - a. The areas do not occupy more than 10 percent of the building area of the story in which they are located.
 - b. A means of egress is provided from the administrative and support use areas to the public way that does not require occupants to traverse through areas containing battery energy storage systems or other energy system equipment.

Fire Code: 2021 Edition of the International Fire Code, the Appendix chapters, including the reference standards” as published by the International Code Council, as adopted by the Township of Saline in the State of Michigan.

Independent Power Producer (IPP): A person that is not an electric provider but owns or operates facilities to generate electric power for sale to electric providers, the state, or local units of government.

Leq: The equivalent average sound level for the measurement period.

Light Intensity Dimming Solution Technology: Obstruction lighting that provides a means of tailoring the intensity level of lights according to surrounding visibility.

Light-Mitigating Technology System: An aircraft detection lighting system, a light intensity dimming solution technology, or a comparable solution that reduces the impact of nighttime lighting while maintaining night conspicuity sufficient to assist aircraft in identifying and avoiding collision with the wind energy facilities.

Maximum Blade Tip Height: The nominal hub height plus the nominal blade length of a wind turbine, as listed in the wind turbine specifications provided by the wind turbine manufacturer. If not listed in the wind turbine specifications, maximum blade tip height means the actual hub height plus the actual blade length.

Maximum Tilt: The maximum angle of a solar array (i.e. most vertical position) for capturing solar radiation as compared to the horizon line.

Nameplate Capacity: The designed full-load sustained generating output of an energy facility. Nameplate capacity shall be determined by reference to the sustained output of an energy facility even if components of the energy facility are located on different parcels, whether contiguous or noncontiguous.

Nationally Recognized Testing Laboratory (NRTL): A U.S. Department of Labor designation recognizing a private sector organization to perform certification for certain products to ensure that they meet the requirements of both the construction and general industry OSHA electrical standards.

NEC: National Electric Code.

NFPA: National Fire Protection Association.

Non-participating Property: A property that is adjacent to a battery energy storage facility and that is not a participating property.

Outdoor Installations: Outdoor installations are battery energy storage systems that are not Dedicated Use-Buildings.

Participating Property: Real property that either is owned by an applicant or that is the subject of an agreement that provides for the payment by an applicant to a landowner of monetary

compensation related to a battery energy storage facility regardless of whether any part of that energy facility is constructed on the property.

Repowering: The replacement of all or substantially all of the energy facility for the purpose of extending its life. Repowering does not include repairs related to the ongoing operations that do not increase the capacity or energy output of the energy facility.

Shadow Flicker: Alternating changes in light intensity caused by the moving blade of a WES casting shadows on the ground and stationary objects, such as but not limited to a window at a dwelling.

Small-Scale Energy Equipment: A battery energy storage system (BESS), solar energy system (SES), or wind energy system (WES) with a nameplate capacity below the threshold to meet this Ordinance's definition of a Utility-Scale BESS, SES, or WES.

Sound Pressure: The difference at a given point between the pressure produced by sound energy and the atmospheric pressure, expressed as pascals (Pa).

Sound Pressure Level: Twenty times the logarithm to the base 10 of the ratio of the root-mean-square sound pressure to the reference pressure of micro pascals, expressed as decibels (dB). Unless expressed with reference to a specific weighing network (such as dBA), the unit dB shall refer to an unweighted measurement.

Solar Energy System (SES): A system that captures and converts solar energy into electricity. A solar energy system includes, but is not limited to, the following equipment and facilities: photovoltaic solar panels; solar inverters; access roads; distribution, collection, and feeder lines; wires and cables; conduit; footings; foundations; towers; poles; crossarms; guy lines and anchors; substations; interconnection or switching facilities; circuit breakers and transformers; overhead and underground control; communications and radio relay systems and telecommunications equipment; utility lines and installations; generation tie lines; solar monitoring stations; and accessory equipment and structures.

Utility-Scale Energy Facility: A facility or equipment that meets this Ordinance's definition of a utility-scale battery energy storage system (BESS), utility-scale solar energy system (SES), or utility-scale wind energy system (WES). Utility-scale BESS, SES, and WES may be collocated at a single facility. A utility-scale energy facility may be located on more than 1 parcel of property, including noncontiguous parcels, but shares a single point of interconnection to the grid.

Utility-Scale Battery Energy Storage System: A Battery Energy Storage System (BESS) that has an aggregate energy capacity greater than 600kWh or is comprised of more than one battery storage technology in a room or enclosed area.

Utility-Scale Solar Energy System (SES): Utility-Scale SES shall mean a solar energy system that meets one or more of the following:

1. Primarily used for generating electricity for sale and distribution to an authorized public utility; and/or
2. The total surface area of all solar collector surfaces exceeds 1,500 square feet; and/or
3. Does not serve as an accessory use or structure.

Utility-Scale Wind Energy System (WES): A WES with a nameplate capacity of 1 MW or more for the primary purpose of off-site use through the electrical grid or export to the wholesale market.

Wind Energy System (WES): A system that captures and converts wind into electricity. Wind energy system includes, but is not limited to, the following equipment and facilities: wind towers; wind turbines; access roads; distribution, collection, and feeder lines; wires and cables; conduit; footings; foundations; towers; poles; crossarms; guy lines and anchors; substations; interconnection or switching facilities; circuit breakers and transformers; overhead and underground control; communications and radio relay systems and telecommunications equipment; monitoring and recording equipment and facilities; erosion control facilities; utility lines and installations; generation tie lines; ancillary buildings; wind monitoring stations; and accessory equipment and structures.

C. Applicability

1. The requirements of this Section shall apply to all BESS, SES, and WES installed or modified in Saline Township after the effective date of this Section, excluding general maintenance and repair.
2. Modifications to, retrofits, or replacements of an existing BESS, SES, and WES that increase the nameplate capacity shall be subject to this Section.

D. General Requirements

1. **BESS System Certification System Certification.** Battery energy storage systems and equipment shall be listed by a Nationally Recognized Testing Laboratory to UL 9540 (Standard for battery energy storage systems and Equipment) or approved equivalent, with subcomponents meeting each of the following standards as applicable:
 - a. UL 1973 (Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail Applications),
 - b. UL 1642 (Standard for Lithium Batteries),
 - c. UL 1741 or UL 62109 (Inverters and Power Converters),

- d. Certified under the applicable electrical, building, and fire prevention codes as required.
 - e. Alternatively, field evaluation by an approved testing laboratory for compliance with UL 9540 (or approved equivalent) and applicable codes, regulations and safety standards may be used to meet system certification requirements.
- 2. **Installation and Maintenance.** All BESS, SES, and WES shall be installed, maintained, and used only in accordance with the manufacturer's directions. A copy of such directions shall be submitted with the application for the certificate of zoning compliance, site plan, or special land use approval from the Township as applicable.
 - 3. **Site Maintenance.** Site access shall be maintained at all sites where a BESS, SES, and WES are located, including snow removal at a level acceptable to the Township and the Saline Area Fire Department.
 - 4. **Visual Impact.** All BESS, SES, and WES shall not have a significant adverse impact on the natural features or neighborhood character of the surrounding area and shall be located to maximize its distance and visibility from adjacent properties and roadways.
 - 5. **Noise.** The 1-hour average noise generated from a BESS, SES, and WES, components, and associated ancillary equipment shall not exceed a noise level of fifty-five (55) dBA as measured at any point along any property line where the system is located. Applicants may submit equipment and component manufacturer's noise ratings to demonstrate compliance. The Zoning Inspector or Planning Commission may require an applicant to provide an acoustic assessment or sound study prepared by a licensed engineer from a reasonable number of sampled locations at the perimeter of the BESS, SES, or WES to demonstrate compliance with this standard.
 - 6. **Code Compliance.** All BESS, SES, and WES, all Dedicated Use Buildings, and all other buildings or structures that (1) contain or are otherwise associated with a BESS, SES, and SES and (2) subject to the Building Code shall be designed, erected, and installed in accordance with all applicable provisions of the Building Code, all applicable state and federal regulations, and industry standards as referenced in the Building Code and the Saline Township Zoning Ordinance.
 - 7. **Compliance with Additional Codes.** BESS, SES, and WES, and the installation and use thereof, shall comply with the Building Code, Fire Code, and other applicable Township, County, and State codes. Installation of a BESS, SES, and WES shall not commence until all necessary permits have been obtained.

E. Small-Scale Energy Equipment

A property owner shall obtain a certificate of zoning compliance prior to the installation and use of a small-scale BESS, SES, or WES, unless otherwise exempted by this Ordinance. Small-scale BESS, SES, and WES may be permitted as accessory uses/structures according to the following standards.

1. **Application for Zoning Compliance.** Certificate of Zoning Compliance applications for small-scale BESS, SES, and WES shall include the following information.
 - a. Photographs of the property's existing conditions.
 - b. Product specifications of the proposed BESS, SES, or WES.
 - c. Plot/sketch plan to indicate where the BESS, SES, or WES is to be installed on the property, or, if building-mounted, the system's location on a permanent building), including its setbacks from the property lines.
 - d. Elevations of the BESS, SES, or WES, including the associated building wall or support structure if building-mounted.
2. **Exemptions.** The following situations do not require a certificate of zoning compliance, but shall still comply with all other standards of this Section:
 - a. The installation of a solar energy system to power a single device or specific piece of equipment such as a lawn ornament, lights, weather station, clock, well pump, or other similar device, provided that the solar energy system is no larger than four (4) square feet and the device itself is not subject to zoning compliance approval.
 - b. Repair and replacement of existing small-scale BESS, SES, or WES, provided that there is no expansion of the size or capacity of the existing system. This Section does not exempt applicants from obtaining building permits as applicable.
3. **Small-Scale Battery Energy Storage Systems (BESS)**
 - a. Small-scale BESS are permitted as an accessory use/structure in all zoning districts.
 - b. Where feasible, small-scale BESS shall be located inside of a building. All small-scale BESS that are located outside of a building shall be screened to the maximum extent possible without posing a fire risk. All small-scale BESS must be placed in a secure container or enclosure meeting the requirements of the Building Code and, when no longer in use, shall be disposed of in accordance with applicable laws and regulations.

- c. **Setbacks.** In all zoning districts, ground-mounted small-scale BESS shall be located only in the rear or side yard and shall conform to the setback requirements of Article 3 (Dimensional Standards).
- d. **Height.** Ground-mounted small-scale BESS shall not exceed sixteen (16) feet in height, measured from the ground at the base of the system to its highest point.
- e. **Ground-Mounted Systems.** Ground-mounted small-scale BESS shall be permanently and safely attached to the ground. Proof of the safety and reliability of the means of attachment shall be submitted to the Zoning Inspector prior to installation. The Township Zoning Inspector may require an additional certification by a professional engineer or other qualified person prior to installation.
- f. **Building-Mounted Systems.** Building-mounted small-scale BESS shall only be installed if they can be safely supported by the structure. Proof of the safety and reliability of the means of attachment shall be submitted to the Zoning Inspector prior to installation. The Township Zoning Inspector may require an additional certification by a professional engineer or other qualified person prior to installation.

4. Small-Scale Solar Energy Systems (SES)

- a. Requirements for building-mounted small-scale SES.
 - i. Building-mounted small-scale SES are permitted as an accessory use/structure in all zoning districts.
 - ii. Building-mounted small-scale SES shall be incidental and subordinate to a use on the same parcel.
 - iii. Building-mounted small-scale SES that are mounted on a wall shall not project above the wall.
 - iv. Building-mounted small-scale SES shall not be required to comply with the maximum building height requirements for the respective zoning district. When mounted on a pitched roof, solar energy systems shall be mounted parallel to the roofline and shall not exceed a height of two (2) feet above the roofline. When mounted on a flat roof, SES shall not exceed a height of ten (10) feet above the roofline.
 - v. Building-mounted small-scale SES shall not project horizontally beyond the eaves of the roof.

- vi. Building-mounted small-scale SES shall not be mounted on a building wall that is parallel to an adjacent public right-of-way.
 - vii. Building-mounted small-scale SES that are mounted on a building wall shall not project into the required setback of the respective zoning district.
 - viii. SES mounted on the roof of a building shall be only of such weight as can safely be supported by the roof and the weight of snow and/or ice that they collect. Proof thereof, in the form of certification by a professional engineer or other qualified person, shall be submitted to the Zoning Inspector prior to installation; such certification shall be subject to the Zoning Inspector's approval.
 - ix. Building-mounted SES shall be permanently and safely attached to the building or structure. Proof of the safety and reliability of the means of such attachment shall be submitted to the Zoning Inspector prior to installation; such proof shall be subject to the Zoning Inspector's approval.
- b. Requirements for ground-mounted small-scale SES.
- i. Ground-mounted small-scale SES are permitted as an accessory use/structure in the A-1, C-1, C-2, I-1, and PSP districts.
 - ii. Ground-mounted small-scale SES shall only be located in the rear or side yard and shall conform to the setback requirements of Article 3 (Dimensional Standards).
 - iii. Ground-mounted small-scale SES shall not exceed a maximum of twenty-five (25) feet above ground when the arrays are at maximum tilt.
 - iv. The area of a ground-mounted small-scale SES shall not exceed fifty (50%) percent of the square footage of the ground floor area of the principal building on the property unless it is sited over required parking, in which case there is no maximum lot coverage for the ground-mounted solar energy system.
 - v. Ground-mounted small-scale SES shall not count towards the maximum square footage of accessory structures allowed on site or maximum impervious surface area limits if the ground under the solar energy system is pervious.

- vi. If the ground under the ground-mounted small-scale SES is impervious, the total area of ground-mounted solar energy systems shall be included in the calculation of the maximum permitted lot coverage requirement for the parcel of land.

c. Small-Scale Wind Energy Systems (WES)

- i. Small-scale WES are permitted as an accessory use/structure in the A-1, C-1, C-2, I-1, and PSP districts.
- ii. Ground-mounted small-scale WES shall only be located in the rear or side yard and shall conform to the setback requirements of Article 3 (Dimensional Standards).
- iii. Ground-mounted small-scale WES shall not exceed the maximum permitted height of principal structures.
- iv. Roof-mounted small-scale WES shall not exceed a maximum of fifteen (15) feet above the finished roof.

F. Utility-Scale Energy Facilities

Utility-Scale BESS, SES, and WES Energy Facilities may be permitted as a special land use subject to the following standards.

- 1. Prior to the construction of a Utility-Scale Energy Facility, an application for a special use permit must be filed and approved according to the procedures established in Section 12.02.
- 2. The construction and operation of all Utility-Scale Energy Facilities shall comply with all applicable local, state and federal requirements.
- 3. No Utility-Scale Energy Facility shall be constructed, installed, or modified as provided in this section without first obtaining all applicable permits.
- 4. Applications to build a Utility-Scale Energy Facility in Saline Township must be accompanied by the fees required for a special use permit and site plan review.
- 5. Utility-Scale Energy Facilities shall not be approved until evidence has been provided to the Planning Commission that the property owners and applicable utility authorities have authorized the proposed system.

G. Application Requirements

Applications for the installation, replacement or renewal, or commissioning of a Utility-Scale Energy Facility shall be accompanied by the following information, in addition to all of the information required for special uses and site plans. The Planning Commission shall have the authority to modify any of the following requirements based on information provided by applicants or recommendations of the Township Engineer, Saline Area Fire Department, or Township staff. All of the following documents must be prepared by an engineer licensed by the State of Michigan.

1. General Application Information.

- a. The planned date for the start of construction and the expected duration of construction.
- b. A description of the energy facility, including a site plan as described in Section 224 of the Clean and Renewable Energy Waste Reduction Act, 2008 PA 295, MCL 460.1224. The following items must be shown on the site plan:
 - i. A map of all properties upon which any component of a facility or ancillary feature would be located, and for wind energy systems, all properties within two thousand (2,000) feet of such properties, and for solar energy or battery energy storage systems, all properties within one thousand (1,000) feet. This should indicate the location of all existing structures and shall identify such structures as occupied or vacant.
 - ii. Lot lines and required setbacks shown and dimensioned.
 - iii. Size and location of existing and proposed water utilities, including any proposed connections to public, or private community sewer or water supply systems.
 - iv. A map of any existing overhead and underground major facilities for electric, gas, telecommunications transmission within the facility and surrounding area
 - i. The location and size of all surface water drainage facilities, including source, volume expected, route, and course to final destination.
- c. A description of the expected use of the energy facility.
- d. Expected public benefits of the proposed energy facility.

- e. The expected direct impacts of the proposed energy facility on the environment and natural resources and how the applicant intends to address and mitigate these impacts.
- f. Information on the effects of the proposed energy facility on public health and safety.
- g. A description of the portion of the community where the energy facility will be located.
- h. A statement and reasonable evidence that the proposed energy facility will not commence commercial operation until it complies with applicable state and federal environmental laws, including, but not limited to, the Natural Resources and Environmental Protection Act, 1994 PA 451, MCL 324.101 to 324.90106.
- i. Evidence of consultation, before submission of the application, with the Department of Environment, Great Lakes, and Energy and other relevant state and federal agencies before submitting the application, including, but not limited to, the Department of Natural Resources and the Department of Agriculture and Rural Development.
- j. The Soil and Economic Survey Report under Section 60303 of the Natural Resources and Environmental Protection Act, 1994 PA 451, MCL 324.60303, for the county where the proposed energy facility will be located.
- k. Interconnection queue information for the applicable regional transmission organization.
- l. If the proposed site of the energy facility is undeveloped land, a description of feasible alternative developed locations, including, but not limited to, vacant industrial property and brownfields, and an explanation of why they were not chosen.
- m. If the energy facility is reasonably expected to have an impact on television signals, microwave signals, agricultural global position systems, military defense radar, radio reception, or weather and doppler radio, a plan to minimize and mitigate that impact. Information in the plan concerning military defense radar is exempt from disclosure under the Freedom of Information Act, 1976 PA 442, MCL 15.231 to 15.246, and shall not be disclosed by the commission or the electric provider or independent power producer except pursuant to court order.

- n. A stormwater assessment and a plan to minimize, mitigate, and repair any drainage impacts at the expense of the electric provider or IPP. The applicant shall make reasonable efforts to consult with the county drain commissioner before submitting the application and shall include evidence of those efforts in its application.
 - o. A sound study and site plan details that include modeled sound isolines extending from the sound source to the property lines to demonstrate compliance with this Ordinance.
2. **Construction documents.** Construction documents shall include the following plans, manuals, and specifications:
- a. Location and layout diagram of the room or area in which the energy equipment is to be installed.
 - b. Details on the hourly fire-resistance ratings of assemblies enclosing the energy equipment.
 - c. The quantities and types of energy equipment to be installed.
 - d. Manufacturer's specifications, ratings and listings of the energy equipment.
 - e. Description of energy management systems and their operation.
 - f. Location and content of required signage.
 - g. Details on fire suppression, smoke or fire detection, thermal management, ventilation, exhaust and deflagration venting systems, if provided.
 - h. Support arrangement associated with the installation, including any required seismic restraint.
3. **Operation and Maintenance Manuals.** Documents that describe continuing energy equipment maintenance and property upkeep, as well as design, construction, installation, testing and commissioning information and shall meet all requirements set forth in the Fire Code, Building Code, and other applicable standards.
4. **Commissioning Plan.** Such plan shall document and verify that the system and its associated controls and safety systems are in proper working condition per requirements set forth in the Fire Code, Building Code, or applicable standard.
5. **Emergency Operations Plan.** A copy of the approved Emergency Operations Plan shall be given to the system owner, the local fire department, and local fire code official. A

permanent copy shall also be placed in an approved location to be accessible to facility personnel, fire code officials, and emergency responders. The emergency operations plan shall include the following information:

- a. Procedures for safe shutdown, de-energizing, or isolation of equipment and systems under emergency conditions to reduce the risk of fire, electric shock, and personal injuries, and for safe start-up following cessation of emergency conditions.
- b. Procedures for inspection and testing of associated alarms, interlocks, and controls.
- c. Procedures to be followed in response to notifications from the Energy Management System, when provided, that could signify potentially dangerous conditions, including shutting down equipment, summoning service and repair personnel, and providing agreed upon notification to fire department personnel for potentially hazardous conditions in the event of a system failure.
- d. Emergency procedures to be followed in case of fire, explosion, release of liquids or vapors, damage to critical moving parts, or other potentially dangerous conditions. Procedures can include sounding the alarm, notifying the fire department, evacuating personnel, de-energizing equipment, and controlling and extinguishing the fire.
- e. Response considerations similar to a safety data sheet (SDS) that will address response safety concerns and extinguishment when an SDS is not required.
- f. Emergency response measures by contingency.
- g. Evacuation control measures by contingency.
- h. Community notification procedures by contingency.
- i. An identification of potential approach and departure routes to and from the facility site for police, fire, ambulance, and other emergency vehicles.
- j. A commitment to review and update the ERP with fire departments, first responders, and county emergency managers at least once every three (3) years.
- k. Procedures and schedules for conducting drills of these procedures and for training local first responders on the contents of the plan and appropriate response procedures.

- I. Other procedures as determined necessary by Saline Township to provide for the safety of occupants, neighboring properties, and emergency responders.
6. **Decommission plan.** A decommissioning plan that is consistent with agreements reached between the applicant and other landowners of participating properties and that ensures the return of all participating properties to a useful condition similar to that which existed before construction, including removal of above-surface facilities and infrastructure that have no ongoing purpose. The decommissioning plan shall include, but is not limited to, financial assurance in the form of a bond, a parent company guarantee, or an irrevocable letter of credit, but excluding cash. The amount of the financial assurance shall not be less than the estimated cost of decommissioning the energy facility, after deducting salvage value, as calculated by a third party with expertise in decommissioning, hired by the applicant.
7. For energy storage systems, evidence of compliance with NFPA 855 including, but not limited to:
 - a. Commissioning Plan (NFPA 855 Chapters 4.2.4 & 6.1.3.2)
 - b. Emergency Operation Plan (NFPA 855 Chapter 4.3.2.1.4)
 - c. Hazard Mitigation Analysis (NFPA 855 Chapter 4.4)

H. **Standards for Utility-Scale Energy Facilities**

All Utility-Scale Energy Facilities shall comply with the following:

1. **Fencing.** All Utility-Scale Energy Facility equipment, including all mechanical equipment, shall be enclosed by a fence with a self-locking gate to prevent unauthorized access unless housed in a dedicated-use building and not interfering with ventilation or exhaust ports. A minimum of 24 feet of clearance shall be maintained on both sides of the perimeter fence in order to provide emergency vehicle access.
2. **Lighting.** Utility-Scale Energy Facilities shall be illuminated according to the standards of Article 10 of the Zoning Ordinance. Unless otherwise permitted by this Ordinance, lighting of a Utility-Scale Energy Facility shall be limited to that minimally required for safety and operational purposes and shall be reasonably shielded and downcast from abutting properties. Utility-Scale Energy Facilities shall implement dark sky-friendly lighting solutions.
3. **Noise:** The sound pressure level of a Utility-Scale Energy Facility and all ancillary equipment shall not exceed 55 dBA (Leq (1-hour)) as measured at any point along any property line where the system is located. Decibel modeling shall use the A-weighted sound level meter as designed by the American National Standards Institute.

4. **Screening and Noise Barriers.** Utility-Scale Energy Facilities shall be landscaped according to the standards of Article 8 of the Zoning Ordinance. The facility shall use architectural features, earth berms, landscaping, or other screening methods that will visually screen the facility from adjacent properties and function as a sound barrier. These elements shall be designed to harmonize the facility with the surrounding area but shall not interfere with any ventilation or exhaust ports.
5. **Utility Connections.** Utility connections and/or connection transmission lines shall not require a separate land use approval, but connection/transmission lines may be either determined and approved at the time of a Utility-Scale Energy Facility special land use approval process, or, if not finalized at the time of such approval, such lines may be approved by way of site plan approval, so long as such lines connect to an approved Utility-Scale Energy Facility project.
6. **Maximum Ground Floor Coverage.** For purposes of density and/or Maximum Ground Floor Coverage, Outdoor Installations shall be exempt from such calculation, although any Dedicated-Use Building shall be included in such calculation.
7. **Signs.** Utility-Scale Energy Facilities shall post signs in compliance with ANSI Z535 and shall include the type of technology associated with the facility, any special hazards associated, the type of suppression system installed (if any), and 24-hour emergency contact information, including reach-back phone number. As required by the NEC, disconnect and other emergency shutoff information shall be clearly displayed on a light reflective surface. A clearly visible warning sign concerning voltage shall be placed at the base of all pad-mounted transformers and substations.
 - a. Additional signs may be permitted subject to the requirements of Article 9 of the Zoning Ordinance.

I. Standards for Utility-Scale Battery Energy Storage Systems

1. **Setbacks.** Utility-Scale BESS shall be set back at least 300 hundred feet from road right-of-way lines and all property lines.
2. **Height.** Utility-Scale BESS enclosures shall comply with the building height limitations for principal structures of the underlying zoning district.
3. **Michigan Public Service Commission Requirements.** Utility-Scale BESS shall comply with any more stringent requirements adopted by the MPSC after determining that such requirements are necessary for compliance with state or federal environmental regulations as provided in MCL 460.1226(8)(c)(v).

J. Standards for Utility-Scale Solar Energy Systems (SES).

1. **Setbacks.** Utility-Scale SES shall be set back at least 600 hundred feet from road right-of-way lines and all property lines.
2. **Height.** Total height for a Utility-Scale SES shall not exceed a maximum of 25 feet above ground when the arrays are at maximum tilt.
3. **Michigan Public Service Commission requirements:** Utility-Scale SES shall comply with any more stringent requirements adopted by the MPSC after determining that such requirements are necessary for compliance with state or federal environmental regulations as provided in MCL 460.1226(8)(a)(vi).

K. Standards for Utility-Scale Wind Energy Systems (WES).

1. **Setbacks.** Setback distance shall be measured from the stated location below to the center of the base of the wind tower as follows:
 - a. Occupied community buildings and residences on non-participating properties: A horizontal distance equal to 2.1 times the maximum blade tip height from the nearest point on the outside wall of the structure.
 - b. Residences and other structures on participating properties: A horizontal distance equal to 1.1 times the maximum blade tip height from the nearest point on the outside wall of the structure.
 - c. Non-participating property lines: A horizontal distance equal to 1.1 times the maximum blade tip height from the property line.
 - d. Public road right of way: A horizontal distance equal to 1.1 times the maximum blade tip height from the center line of the public road right-of-way;
 - e. Overhead communication and electric transmission, not including utility service lines to individual houses or outbuildings: A horizontal distance equal to 1.1 times the maximum blade tip height from the center line of the easement containing the overhead line.
2. **Height.** Total height, measured at the wind tower blade tip, for a Utility-Scale WES shall not exceed the height allowed under a Determination of No Hazard to Air Navigation by the Federal Aviation Administration under 14 CFR Part 77.
3. **Lighting.** Utility-Scale WES shall be equipped with functioning light-mitigating technology. To allow proper conspicuity of a wind turbine at night during construction, a turbine shall be lighted with temporary lighting until the permanent lighting configuration, including the light-mitigating technology, is implemented. A temporary exemption from the requirements of this section may be granted if installation of

appropriate light-mitigating technology is not feasible. A request for a temporary exemption must be in writing and state all of the following:

- a. The purpose of the exemption;
 - b. The proposed length of the exemption;
 - c. A description of the light-mitigating technologies submitted to the Federal Aviation Administration;
 - d. The technical or economic reason a light-mitigating technology is not feasible.
4. **Shadow Flicker.** Shadow flicker shall not exceed 30 hours per year under planned operating conditions as indicated by industry standard computer modeling and measured at the exterior wall of an occupied community building or non-participating residence.
5. **Signal Interference.** Utility-Scale WES shall meet any standards concerning radar interference, lighting, or other relevant issues as determined by the Michigan Public Service Commission in any implementation or rule-making process.
6. **Michigan Public Service Commission requirements.** Utility-scale WES shall comply with any more stringent requirements adopted by the MPSC after determining that such requirements are necessary for compliance with state or federal environmental regulations as provided in MCL 460.1226(8)(b)(vii).

L. Issuance and Compliance with Permit.

1. Construction of an approved Utility-Scale Energy Facility shall not begin until the permit holder has completed the following:
 - a. Submitted the funds for site decommissioning and stabilization in the full amount specified in the approved decommissioning plan in a form acceptable to the Township (bond, parent company guarantee, or an irrevocable letter of credit, but excluding cash).
 - b. Executed a development agreement, in a form approved by the Township, specifying all the terms and understandings relative to the construction and operation of the Utility-Scale Energy Facility, the permit holder's responsibilities according to this Ordinance, and the conditions of the special use permit. Development agreements following the approval of Utility-Scale Energy Facility shall be at the Township's discretion. All costs incurred by the Township, including attorney fees, in drafting and approving the development agreement shall be paid by the permit holder. The content of the agreement shall outline

the specifics of the proposed Utility-Scale Energy Facility, but shall at a minimum provide the following terms:

- i. A survey of the acreage involved in the proposed development.
 - ii. A description of the ownership of the subject property.
 - iii. General description the Utility-Scale Energy Facility and all associated site improvements.
 - iv. The anticipated life of the Utility-Scale Energy Facility.
 - v. Mechanisms to ensure the continued maintenance of the Utility-Scale Energy Facility, and that maintenance is assured by means satisfactory to the Township.
 - vi. The method of ensuring that funds will be available for site decommissioning and stabilization in the amount determined after each annual review as required by this Ordinance.
 - vii. Requirements that the applicant maintain insurance coverage during development in amounts established by the Township, naming the Township as an additional insured, and required insurance provisions after the development is completed.
 - viii. The approved site plan and special use permit shall be incorporated by reference and attached as an exhibit.
 - ix. Description of the timing to complete the development of the facility. If the facility is to be developed in phases, a timeline to complete the construction of each phase.
 - x. A listing of any contingencies for removing an intact operational energy storage system from service, and for removing an energy storage system from service that has been damaged by a fire or other event.
- c. Construction of an approved Utility-Scale Energy Facility must begin within five (5) years after approval is granted. The Township Board may extend this timeline at the request of the applicant without requiring a new application.
- d. Approved Utility-Scale Energy Facilities shall remain in compliance at all times with the standards identified for approval of the special use permit and all documentation submitted with and affirmations made in the application, including, but not limited to, the site plan, decommissioning plan, fire response

plan, and emergency plan. No changes may be made to the permit by the Utility-Scale Energy Facility owner/operator without the written agreement of the Township. The Utility-Scale Energy Facility must further comply with all local ordinances, state and federal laws and regulations except as otherwise provided in Section MCL 460.1231. The Township shall not revoke a permit except for material noncompliance with the special use permit by the owner/operator.

- e. A review of the amount of the decommissioning fund based on inflation, salvage value, and current removal costs shall be completed every year, for the life of the project, and approved by the Township Board.
- f. Approved Utility-Scale Energy Facility special use permits may be transferred to another owner/operator upon the filing with the Township of an attestation by the transferee that it accepts the terms of the permit and acknowledges that it is subject to this Ordinance.
- g. The permit holder shall enter into a host community agreement with the Township within 90 days after issuance of the permit. The host community agreement shall require that, upon commencement of any operation, the energy facility owner must pay the Township \$2,000.00 per megawatt of nameplate capacity located within the Township. The payment shall be used as determined by the Township for police, fire, public safety, or other infrastructure, or for other projects as agreed to by the Township and the permit holder within said 90 days.

2. Performance guarantees.

A corrective action plan shall be developed for any open or continuing issues that are allowed to be continued after commissioning. A report describing the results of the system commissioning and including the results of the initial acceptance testing required in the Fire Code and Building Code shall be provided to the Zoning Inspector prior to final inspection and approval and maintained at an approved on-site location.

3. Changes to Approved Utility-Scale Energy Facilities

Minor changes to an approved Utility-Scale Energy Facility may be reviewed and approved by the Township Zoning Inspector or their designee. The Township Zoning Inspector may, at their discretion, determine that a proposed amendment constitutes a major change that requires a new special use and site plan approval.

- a. The following changes shall be considered minor:
 - i. Technical changes to the following application documents:

1. Construction documents
 2. Fire Safety Compliance Plan
 3. Operation and Maintenance Manual
 4. Emergency Operations Plan
- ii. Modifications to, retrofits or replacements of an existing Utility-Scale Energy Facility that do not substantially increase the total Utility-Scale Energy Facility nameplate capacity or increase the system lot coverage.
- b. All other changes to an approved Utility-Scale Energy Facility shall be considered major and shall require a new special land use and site plan approval.

M. Enforcement

Any violation of this Section shall be subject to the same enforcement requirements, including the civil and criminal penalties, provided for in the Saline Township Code of Ordinances.

N. Severability

The invalidity or unenforceability of any section, subsection, paragraph, sentence, clause, provision, or phrase of the aforementioned sections, as declared by the valid judgment of any court of competent jurisdiction to be unconstitutional, shall not affect the validity or enforceability of any other section, subsection, paragraph, sentence, clause, provision, or phrase, which shall remain in full force and effect.

Section 4. Amend Section 18.02, Definitions

The following definitions listed in Section 18.02 are amended as follows:

191. **Essential Services.** The erection, construction, alteration or maintenance, by public utilities or municipal departments, of underground, surface or overhead gas, electrical, steam, fuel or water transmission or distribution systems or collection, communication, supply or disposal systems therewith that are reasonably necessary for the furnishing of adequate service for the general health, safety and welfare.
 - a. Poles, wires, mains, drains, sewers, pipes, conduits, transformers, splice boxes, cables, towers, fire alarm boxes, police call boxes, traffic signals, hydrants or similar equipment and accessories associated with an essential service shall be considered essential services under this Ordinance.
 - b. Wireless communication facilities, private community wastewater treatment and disposal systems (PCWS), privately owned energy systems and facilities as defined by this Ordinance (Battery Energy Storage Systems (BESS), Solar Energy Systems

(SES), and Wind Energy Systems (WES)), utility buildings, and storage yards shall not be considered essential services under this Ordinance.

192. **Utility, Private.** A person, firm, corporation or private entity duly authorized to furnish and furnishing, under federal, state or municipal regulations or franchise agreements, to the public: gas, steam, electricity, communication, telegraph or transportation. Such uses as community wells, private community wastewater treatment and disposal systems (PCWS), radio stations, privately owned energy systems and facilities as defined by this Ordinance (Battery Energy Storage Systems (BESS), Solar Energy Systems (SES), and Wind Energy Systems(WES)), and wireless communication facilities shall be considered private utilities under this Ordinance.
193. **Utility, Public.** A governmental entity or municipal department, board or commission duly authorized to furnish and furnishing, under federal, state, or municipal regulations, electricity, gas, steam, communications, telegraph, or transportation to the public. Such utility shall be regulated by a governmental pricing structure, have the right of eminent domain, be a single entity as designated by Federal or State government to provide a specified service or product, and provide a service considered essential to a public need.
- a. Publicly owned and operated or municipal water distribution and sanitary sewer systems, and stormwater drainage facilities under the jurisdiction of the Washtenaw County Drain Commissioner, shall also be considered public utilities.
 - b. Such uses as community wells, private community wastewater treatment and disposal systems (PCWS), radio stations, privately owned energy systems and facilities as defined by this Ordinance (Battery Energy Storage Systems (BESS), Solar Energy Systems (SES), and Wind Energy Systems(WES)), and wireless communication facilities shall not be considered public utilities under this Ordinance.

Section 5. Severability

If any court of law of equity within the State of Michigan determines that any provision within this ordinance is unconstitutional, void, voidable, or unenforceable, the remaining provisions of the same section and other sections of this ordinance shall be deemed separate, distinct and valid in all respects from said provision.

Section 6. Repeal

All ordinances or parts of ordinances in conflict with this ordinance are hereby repealed.

Section 7. Effective Date

This Ordinance shall become effective seven (7) days after its publication (or publication of a summary thereof) in a newspaper in general circulation within Saline Township.

This Ordinance was offered for adoption by _____ and
was seconded by _____, the vote being as follows:

YEAS:

NAYS:

ABSENT:

Ordinance declared adopted on October 15, 2025.

James Marion
Township Supervisor
Township of Saline

Certificate of Adoption and Publication

I, Kelly Marion, the duly elected Clerk of the Township of Saline certify that the foregoing ordinance is a true and correct copy of the ordinance enacted by the Township Board of the Township of Saline on October 15, 2025 and published in the Sun Times a newspaper circulated in Saline Township on _____.

Kelly Marion
Township Clerk
Township of Saline

Saline Exhibit I-4

Zhenshan Chen — CV

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<https://scholar.google.com/citations?hl=en&user=JNmtCMkAAAAJ>

Fields of Concentration

Primary: Nonmarket Valuation, Policy Evaluation, Applied Microeconometrics

Secondary: Flood, Renewable Energy, Land Use, Fishery

Education

Dept. of Agricultural and Resource Economics, UConn <i>Ph.D.</i> Major in Agricultural and Environmental Economics	Storrs <i>Sept.2015–Aug.2021</i>
Dept. of Agricultural and Resource Economics, UConn <i>M.S.</i> Major in Agricultural and Environmental Economics	Storrs <i>Jan.2014–Feb.2015</i>
Dept. of Economics, Ocean University of China <i>M.S.</i> Majored in Economics	Qingdao <i>Sept.2012–June.2014</i>
Dept. of Physics and Engineering, Sun Yat-sen University <i>B.S.</i> Majored in Physics	Guangzhou <i>Sept.2007–June2011</i>

Professional Experience

Dept. of Agricultural and Applied Economics, Virginia Tech <i>Assistant Professor</i>	Blacksburg <i>Aug.2022–present</i>
Dept. of Agricultural Economics, Mississippi State University <i>Postdoctoral Associate</i>	Starkville <i>Aug.2021–July 2022</i>

Publication

Note: * suggest an advisee student. The corresponding authors, if different from the first author, are in bold.

- “Impact of Large-scale Solar on Property Values in the US: Diverse Effects and Causal Mechanisms” Hu, N.*, **Chen, Z.**, Liu, P., Zhang, W., He, X., & Bosch D. *Proceedings of the National Academy of Sciences*, 122(24), e2418414122 (2025)
- “Heterogeneous Flood Zone Effects on Coastal Housing Prices - Risk Signal and Mandatory Costs” Chen, Z., Towe, C., & He, X. *Journal of Environmental Economics and Management*, 131, 103153 (2025)
- “The Value of Oyster Reef Restoration” Petrolia, D., Enyetornye, F., Chen, Z., & Yun, S.

Marine Resource Economics, 40(1), 45-64 (2025)

- "Revealed Preference from Voluntary Contributions" Chen, Z., & Swallow, S. K. *Journal of the Association of Environmental and Resource Economists*, 11(4), 1031-1063 (2024)
- "Pricing Ocean Amenities and Flood Hazards." Chen, Z., & Towe, C. A. *Land Economics*, 100(1), 109-126 (2024)
- "The Impact of Recreational Homes on Agricultural Land Use." Towe, C., & Chen, Z. *Land Economics*, 99(1): 17-37 (2023)
- "The Influence of Projected Outcomes on Preferences over Alternative Regulations: Evidence from a Recreational Fishery." Chen, Z., Liu, P., Schultz, E. T., Kasper, J. M., & Swallow, S. K. *Land Economics*, 98(4):599-617 (2022)
- "Weather, Cropland Expansion, and Deforestation in Ethiopia." He, X., & Chen, Z. *Journal of Environmental Economics and Management*, Volumn 111 (2022)
- "Nonparticipation and Heterogeneity in Stated Preference: A Double Hurdle Latent Class Approach for Climate Change Adaptation Plans and Ecosystem Services" Chen, Z., Swallow, S. K., & Yue, I. T. *Environmental and Resource Economics*, Volumn 77, 35-67 (2020).

Working papers

"Sorting over the Dual Risk of Coastal Housing Market - Who Surfs the Tide, Who Bears the Blunt?" *with Charles Towe and Junjie Wu*

Work in Progress

- "Observational evidence of the impacts of cover crop on yield, fertilizer use, and insurance payments in the United States." *with Xi He*
- "Causal Machine Learning for Policy Evaluation with Housing Transaction Data." *with Klaus Moeltner*
- "The Housing Market Impacts of Noise Pollution: Evidence from a Natural Experiment" *with Michele Baggio and Charles Towe*
- "The Effect of Raising and FEMA Compliance on Housing Prices" *with Nancy Bockstael and Charles Towe*

Teaching

AAEC3014 Analytical Methods in Applied Economics	Spring 2024
<i>Department of Agricultural and Applied Economics, Virginia Tech</i>	<i>Spring 2023, 2024, 2025</i>
AAEC5824 Advanced Applied Economic Analytics	Fall 2023
<i>Department of Agricultural and Applied Economics, Virginia Tech</i>	<i>Fall 2022, 2023</i>
EEC535 Environmental Economics, TE: 4.3	Spring 2021
<i>College of Environmental and Life Sciences, University of Rhode Island</i>	<i>Jan. 2021-May. 2021</i>

Grants

USDA NIFA AFRI (Pending)	USD 511,164
<i>Co-PI, PI: Kurt Stephenson, Co-PI: Zachery Easton et al.,</i>	<i>4/1/2025-3/31/2028</i>

"Quantifying the Impact of the Distribution of Farm Level Mass Balances on Nonpoint Source Program Outcomes"

USDA NIFA AFRI (Pending) USD 650,000

PI, Co-PI: John Ignosh, Wendong Zhang et al., 7/1/2025-6/30/2028

"Eliciting Landowner and Public Values and Preferences regarding Agrivoltaics: Inform Localities, Policymakers, and Solar Designers"

DOE EERE SETO SEEDS4 USD 2,000,000

Co-PI, PI: Douglas Bessette VT Co-PI: Ron Meyers, Ralph Hall 1/1/2025-12/31/2028

"Fast and Fair: Are rapid and equitable processes for LSSPV development mutually exclusive?"

Connecticut Sea Grant College Program (Funded) USD 150,000

Leading draft, PI: Pengfei Liu Co-PI: Eric Schultz Stephen Swallow 2/1/2018-1/31/2020

"Bio-economic Outcomes under Alternative Management Strategies with Human Choice and Behavior"

Connecticut Sea Grant Development Award (Funded) USD 2,500

PI, Leading draft, PI: Zhenshan Chen Co-PI: Eric Schultz Stephen Swallow 12/1/2020-

"Effect of a Pandemic on Long Island Sound Anglers' Practices and Views"

Ongoing Projects

"Toward a Performance-based Cover Crop Program"

- Building Farm-level Indicators and Assessing the Potential Benefits

A USDA Hatch project

"Fast and Fair: Are rapid and equitable processes for LSSPV development mutually exclusive?"

Subcontract from Michigan State University, PI: Douglas Bessette

A DOE SEEDS4 project

Presentations

AERE Conference, Santa Ana Pueblo, NM Oral

"Effects of Cover Crop on Yield and Fertilizer Use in the United States" Mar 2025

AAEA Conference, New Orleans, LA Oral

"Evaluation for Coastal Risk Policies based on a Dynamic Sorting Model" July 2024

AERE Conference, Washington, DC Oral

"Coastal Policy Simulation with a Flood-risk-based Dynamic Sorting Model" May 2024

NCSU Department of Agricultural and Resource Economics Seminar, Raleigh, NC Oral

"Sorting over the Dual Risk of Coastal Housing Market" April 2024

Xiamen University Virtual Brownbag Seminar

"Revealed Preferences from Voluntary Contributions" Mar 2024

AAEA Conference, Washington, DC Poster

"Impact of COVID-19 Pandemic on Preference for Recreational Tautog Fishing" July 2023

NAREA Conference, Annapolis, MD Oral

"Revealed Preferences from Voluntary Contributions" June 2023

ZTRAX Special Issue Workshop, online Oral

"Pricing Coastal Amenities" Aug 2022

SAEA Conference, New Orleans, LA Oral

"Flood Zone in the Coastal Housing Market" Feb 2022

MSstate AgEcon Seminar, Starkville, MS	Oral
<i>"Accessing the Coastal Flood Risk Effect - Quasi-experiment vs. Sorting"</i>	Oct 2021
AAEA Conference	Oral
<i>"Sorting over the Dual Risk of Coastal Housing Market"</i>	Aug 2021
AERE Virtual Conference	Oral
<i>"Sorting over the Dual Risk of Coastal Housing Market"</i>	June 2021
URI ENRE Seminar, Kingston, RI	Oral
<i>"Accessing the Coastal Flood Risk Effect - Quasi-experiment vs. Sorting"</i>	Feb 2021
AAEA Virtual Conference	Oral
<i>"How Does the Coastal Housing Market View Flood zone?"</i>	Aug 2020
NAERE Virtual Conference	Oral
<i>"How Does the Coastal Housing Market View Flood Zone?"</i>	June 2020
AERE Virtual Conference	Oral
<i>"How Does the Coastal Housing Market View Flood Zone?"</i>	June 2020
AERE Virtual Conference	Oral
<i>"Anglers' Preference under Alternative Management Strategies"</i>	June 2020
UConn WFCC Megalab Meeting, Storrs, CT	Oral
<i>"Anglers' Preference under Alternative Management Strategies"</i>	Feb 2020
SocioEconomic Aspects in Stock Assessments Workshop, New Orleans, LA	Oral
<i>"Anglers' Preference under Alternative Management Strategies"</i>	Feb 2020
Graduate Research Forum, CAHNR, UConn	Oral
<i>"Recreational Homes' Impact on Agricultural Land Use"</i>	April 2019
AAEA Meeting, Washington D.C.	Poster
<i>"Learning the Flood Risk"</i>	Aug 2018
NAREA Annual Meeting, Philadelphia, PA	Oral
<i>"How does SNAP Affect Diet Quality?"</i>	June 2018
12th CT Conference on Natural Resources, Storrs, CT	Oral
<i>"Climate Change-induced Retreat from Flood Zones and Real Estate Values"</i>	March 2018
Agricultural and Applied Economics Association Meeting, Chicago, IL	Poster
<i>"What Drives Household Healthy Food Choices? Evidence from FoodAPS"</i>	August 2017
Graduate Research Forum, CAHNR, UConn	Poster
<i>"Recreational Home Owners' Impact on Agricultural Land Use"</i>	March 2017
Agricultural and Applied Economics Association Meeting, Boston, MA	Poster
<i>"Secondhome Owners' Impact on Agricultural Land Use"</i>	July 2016

Professional Service

Journals Referee Service: Journal of Environmental Economics and Management (4); American Journal of Agricultural Economics (1); Marine Resource Economics (1); Environmental and Resource Economics (1); Journal of the Agricultural and Applied Economics Association (1); Land Economics (2), and PLOS ONE (1)

Other Experience

Shenwan Hongyuan Secruities Ltd

Internship

Assistant in issuing enterprise bonds

Beijing/Shandong

May.2015–Aug.2015

Key Lab of Display Material and Technology in Guangdong

Undergrad Research Assistant

Experiments on growing display materials

Guangzhou

Sept.2009–Nov.2011

Software

Proficient: Stata, Python, R, ArcGIS

Other: L^AT_EX, Qualtrics, Google Earth Engine, Matlab, Netlogo

Scholarships and Awards

Fall 2020: Doctoral Dissertation Fellowship, Graduate School, UConn

Spring 2020: Predoctoral Fellowship, ARE, UConn

Fall 2019: Nathan Koenig AG/EC Student Fund Award, ARE, UConn

Spring 2018: Nathan Koenig AG/EC Scholarship, ARE, UConn

2017: Outstanding Poster Presentation, Graduate Student Research Forum, CAHNR, UConn

Fall 2017: Nathan Koenig AG/EC Scholarship, ARE, UConn

2017: Predoctoral Fellowship, Graduate School, UConn

Spring 2017: Nathan Koenig AG/EC Scholarship, ARE, UConn

2016: Paul Putnam Travel Award, ARE, UConn

2016: Stewart Johnson Scholarship, ARE,UConn

2013: Academic Scholarship, Ocean University of China

2011: Outstanding Undergraduate Dissertation, Sun Yat-sen University

Saline Exhibit I-5

Property Value and Agricultural Impact Assessment:

Washtenaw Solar Project

Submitted to

Saline Township, Washtenaw County, Michigan

PI: Zhenshan Chen, Assistant Professor

Senior Personnel: Matthew Mair, Ph.D. Student

Department of Agricultural and Applied Economics
Virginia Tech



COLLEGE OF AGRICULTURE AND LIFE SCIENCES
**AGRICULTURAL AND
APPLIED ECONOMICS**
VIRGINIA TECH.

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1 Executive Summary

1.1 Background and Purpose

The Washtenaw Solar Project is a proposed utility-scale solar facility in Saline Township, Washtenaw County, Michigan. Township officials have requested an independent, evidence-based assessment of potential impacts on nearby residential property values and local agricultural production. This report provides such an assessment using comparable operating solar farms in the Midwest and state-of-the-art econometric methods.

Direct evaluation of impacts is not possible for the Washtenaw site because the facility is a proposed project; consequently, no post-installation property transaction prices exist. To address this, we identify comparable operating solar developments in the region and analyze real estate transactions surrounding those sites. These observed patterns are used to infer the likely impact on property values surrounding the proposed Washtenaw project.

1.2 Methodology

To ensure the findings are directly applicable to the Washtenaw context, the research team identified 29 operating utility-scale solar projects in the Midwest that closely resemble the proposed site in terms of capacity, residential density, distance to major metropolitan areas, political leaning, and local demographics. The property value analysis relies on a dataset comprising over 4,000 sample properties within one mile and over 93,000 sample properties (i.e., properties with sales) within six miles of these matched facilities. The agricultural impact assessment draws on the [USDA \(2024\)](#) Cropland Data Layer and the [USDA \(2022\)](#) Census of Agriculture for Washtenaw County.

1.3 Key Findings

- **Geographic Extent of Impact:** The measurable negative impact on property values is concentrated within a 2.5-mile radius of the solar facility. The impact diminishes substantially beyond 3.5 miles.
- **Average Property Value Loss:** On average, residential properties located within the 2.5-mile impact zone are projected to sell for approximately **6.6% less** after the facility becomes operational (statistically significant at the 5% level).
- **Impact on High-Value Homes:** The depreciation effect is larger for high-value properties (market values exceeding \$400,000). These homes are projected to experience a **10.5% decline** in value (significant at the 10% level).

- **Duration of Impact:** A negative price impact appears immediately upon facility operation and persists for approximately 10 years, with consistently negative post-operation effects.
- **Annualized Property Loss:** The total annualized loss for existing residential properties within 2.5 miles is estimated at **\$1.24 million per year**.
- **Net Present Value (NPV) of Property Losses:** Using conservative assumptions, the present-day economic cost of property losses within 2.5 miles over the 10-year duration is between **\$9.31 million** (7% discount rate) and **\$10.04 million** (5% discount rate).
- **Agricultural Impact:** The proposed solar site would remove approximately 2,402 acres from agricultural production, resulting in estimated annual losses of **\$1.42 million** in agricultural product value, with a total lifetime loss over 35 years of approximately **\$49.7 million** (not discounted).

At a Glance: Residential properties within **2.5 miles** face a projected **6.6%** average value decline (high-value homes: **10.5%**). The aggregate NPV of property losses over 10 years ranges from **\$9.31M** to **\$10.04M**. Agricultural losses total **\$1.42M/year** (**\$49.7M** over 35 years).

2 Approach and Contribution

2.1 Conceptual Approach and Objectives

Economic assessments of property value impacts typically compare observed sales near a new infrastructure project (treated properties) with similar properties farther away (control properties). Lacking an operational Washtenaw facility, we have constructed a comparative framework for identifying similar solar installations based on observable characteristics. The details of this matching strategy are outlined in Section 4.1.

Across these comparable sites, we examine 83,982 residential transactions to conduct our property value impact analysis, organized into four integrated components:

1. **Spatial Impact Assessment:** Determine the geographic extent of any measurable property value effects by examining how impacts vary with distance.
2. **Average Impact Analysis:** Estimate the mean property value effects across all affected properties and assess how impacts differ across distance-based proximity groups.
3. **Temporal Impact Analysis:** Evaluate how property value impacts evolve following project operation, including whether effects diminish, persist, or change over time.
4. **Total Impact Analysis:** Evaluate the aggregated property value impacts based on properties near the proposed Washtenaw project and the results of the above analyses.

In addition to the property value analysis, we conduct an agricultural impact assessment to quantify the loss of cropland productivity and associated economic value resulting from the solar site's land conversion.

This integrated approach provides the conceptual foundation for our study and ensures that the resulting findings are grounded in robust, replicable, and geographically relevant evidence.

2.2 Improvements Over Existing Analysis

The analysis exceeds the standard of conventional property value impact reports used for siting purposes in several key respects:

- Instead of assuming impacts are limited to adjacent properties, we empirically detect the true geographic footprint of influence.
- Our analysis incorporates all available residential transactions around 29 comparison sites, rather than relying on a small set of selected observations.

- We report estimated impacts and confidence intervals from formal models, providing quantifiable uncertainty rather than binary judgments.
- All procedures—including comparable site identification, data screening, proximity definitions, and analytical models—are fully documented in the Technical Appendix. With approval from the township, code will be made available in a public data repository.

3 Results

3.1 Washtenaw Solar

The Washtenaw Solar Project is a proposed utility-scale solar facility located in Saline Township, Washtenaw County, Michigan. It covers a total area of 2411.56 acres within Saline Township. As illustrated in Figure 3.1, the project boundary spans a set of parcels in the central portion of Saline Township, situated roughly midway between the city of Saline to the north and the Lenawee County border to the south. The site lies approximately 5 to 8 miles southwest of the Ann Arbor metropolitan area, placing it within commuting distance of a major urban center. Residential properties (shown as green dots) are dispersed throughout the surrounding rural landscape, with higher concentrations near Saline City to the northeast.

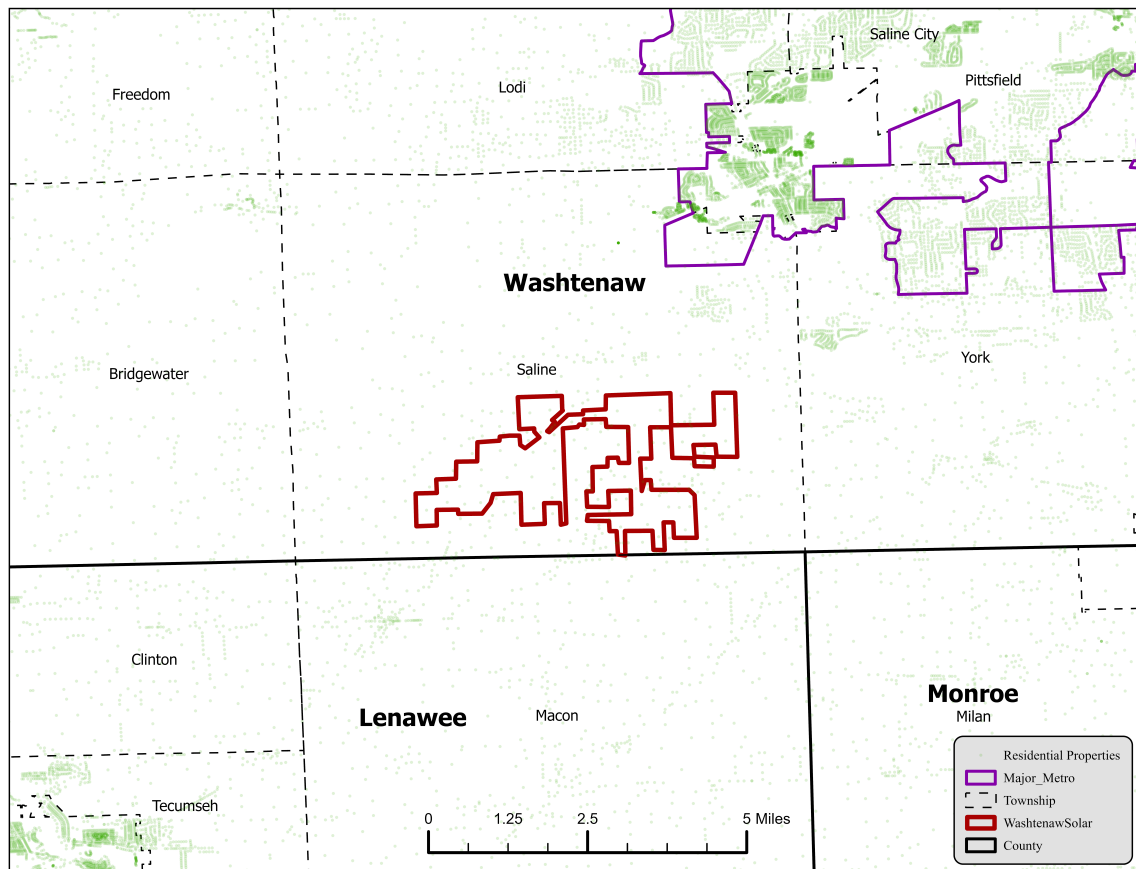


Figure 3.1. Location of the proposed Washtenaw Solar Project (red boundary) within Saline Township, Washtenaw County, Michigan. Green dots represent residential properties. The purple boundary delineates the nearest major metropolitan area (Detroit/Ann Arbor). Dashed lines indicate township boundaries; solid lines indicate county boundaries.

3.2 Comparative Site Summary

Since Washtenaw solar is a proposed project, no post-installation transaction data exist. We therefore identify comparable operating solar developments in the region and analyze surrounding real estate transactions to infer the likely property value impacts at the Washtenaw site.

We identified 29 operating utility-scale solar projects in the Midwest (IN, MI, MN, WI) that most closely resemble Washtenaw in capacity, residential density, income, political leaning, distance to a major metropolitan area, and whether or not they were sited in Michigan (see Section 4.1 for details of the matching process). The selected sites provide more than 4,000 sampled properties within 1 mile and more than 93,000 within 6 miles. Capacity ranges from 5.0 to 28.6 MWac with a median of 8.6 MWac - given that the proposed Washtenaw site is considerably larger (150 MWac), it is important to note that property value impacts are being extrapolated beyond the capacity range of the available dataset¹. The average census tract median household income across selected sites is approximately \$90,900. A list of selected sites is provided in Technical Appendix Table C2.

3.3 Spatial Extent & How the Effect Changes with Distance

To assess the geographic extent of the property value impact, we employed a distance decay version of the Difference-in-Differences (DID) approach. Figure 3.2 illustrates the resulting distance decay of impacts. The negative impact is most pronounced within the first 2.5 miles and diminishes substantially beyond 3.5 miles.

The results of our spatial analysis inform the specification of “treated” and “control” units for subsequent analyses. Properties within **2.5 miles** are assigned to the treatment group; properties between **3.5 and 6 miles** serve as the control group.

¹Although there are reasons to believe that sites with larger capacity may impose higher property value impact, we generally do not observe direct evidence. In order to investigate whether larger capacity increases or decreases the property value impact, the analysis involves currently studied states (IN, MI, MN, WI) as well as CO, NY, and VA to include more large-capacity sites. The results show that a larger capacity does not significantly change the impact estimate (i.e., the corresponding interaction coefficient is .025 with a standard error of .035, statistically insignificant).

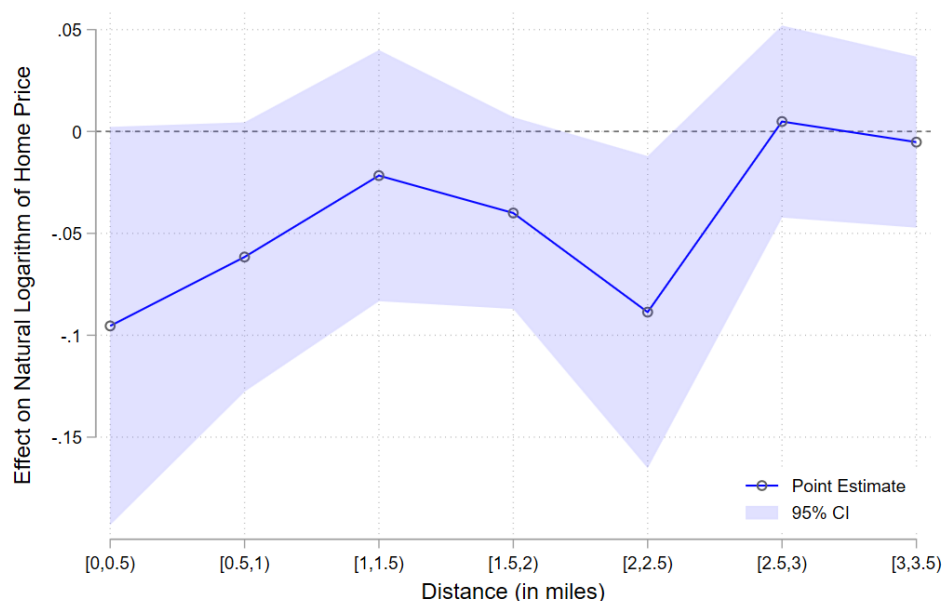


Figure 3.2. Effect on log home price by distance band (3.5-mile window). Shaded area indicates the 95% confidence interval.

3.4 Average Effect Estimates and Effect by Home Value Category

Using these 29 matched sites, we estimate the average property value impact, with the treatment design suggested in Section 3.2. Results show that homes within 2.5 miles of the solar site will sell for about **6.6% less** on average (coefficient = -0.0659^* , $p < 0.05$). High-value properties (above \$400,000) experience a larger effect (-10.5% , $p < 0.10$), while the effect for low-value properties (-4.8%) is not statistically significant at conventional levels.

Table 3.1. Average Property Value Impact Estimates. Standard errors in parentheses. $^+p < 0.10$, $^*p < 0.05$.

Specification	(1) DID: Proximity	(2) DID: By Home Value
Treatment $\times$ Post	-0.0659^* (0.0280)	
Treatment $\times$ Post $\times$ High-value ($> \$400k$)		-0.1050^+ (0.0539)
Treatment $\times$ Post $\times$ Low-value ($\leq \$400k$)		-0.0478 (0.0328)
Observations	83,982	83,982

3.5 Effect Over Time

Our event study analysis reveals how the facility's impact evolves over time. With no clear pre-existing trend difference between treated and control groups, we can be

reasonably confident that the effects are not driven by unobserved factors. Prices of nearby homes drop immediately upon operation and remain lower for about a decade.

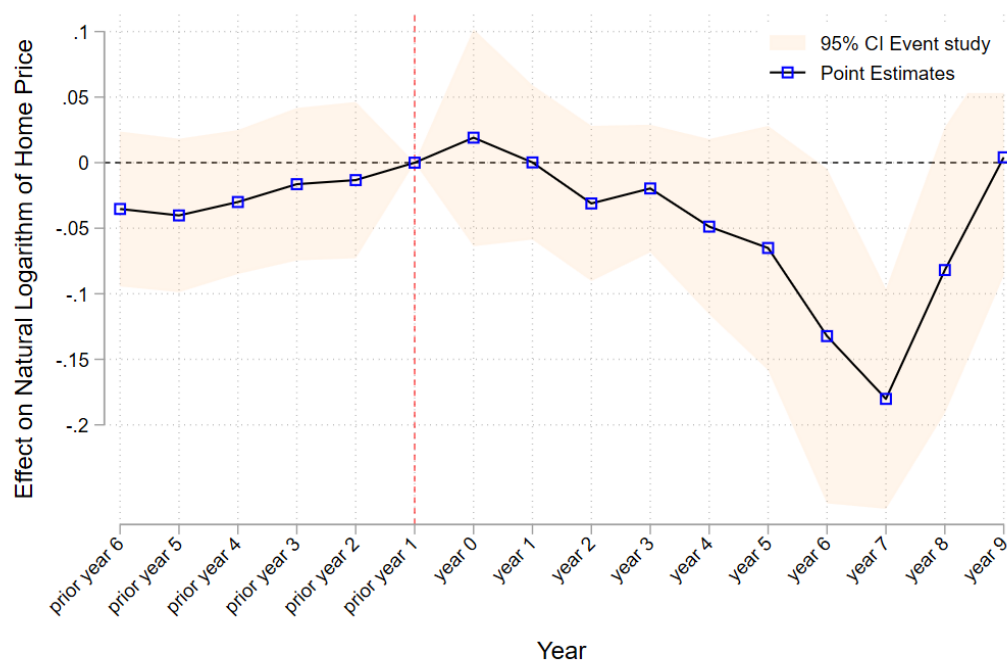


Figure 3.3. Dynamic price effects before and after solar farm construction. Year 0 is the first year the facility is operational. Shaded area indicates the 95% confidence interval.

The strongest projected impact occurs around year 7, and the impact diminishes thereafter. One possible explanation for this delayed impact is that some negative impacts of solar site developments, such as soil erosion and dust pollution, take time to manifest. Another possible explanation is residential sorting. People averse to solar sites may wish to move away, but house sales take time to complete, and it may take time for sellers to accept a lower valuation.

3.6 Total Property Value Impact Estimates

With conservative assumptions (see Section 4.6), we calculate the total property value impact using the coefficient estimates above. Using a standard 5% capitalization rate, the sum of annualized property losses for all residential properties within 2.5 miles is **\$1.24 million**. To show how the total impacts differ in different counties near the solar project, Table 3.2 also presents total value impact estimates by county.

Based on the ten-year impact timeline from the event study, the NPV of this annualized loss is **\$9.31 million** (7% discount rate) and **\$10.04 million** (5% discount rate). Section 4.6 presents a detailed explanation of capitalization rates, NPV, and discount rates used here.

Table 3.2. Total Residential Property Value Impact Estimates by County (2025 USD)

Radius	# Res. Props.	Annualized Loss	NPV (7%)	NPV (5%)
Panel A: Washtenaw County				
1 mile	169	\$216,777	\$1,629,132	\$1,757,592
2.5 miles	723	\$997,800	\$7,498,702	\$8,089,988
Panel B: Lenawee County				
1 mile	59	\$54,654	\$410,739	\$443,126
2.5 miles	284	\$226,380	\$1,701,296	\$1,835,446
Panel C: Monroe County				
1 mile	0	—	—	—
2.5 miles	16	\$14,232	\$106,955	\$115,389
All Counties Combined				
1 mile	228	\$271,432	\$2,039,871	\$2,200,719
2.5 miles	1,023	\$1,238,412	\$9,306,953	\$10,040,823

3.7 Agricultural Impact

In addition to its effects on residential property values, the Washtenaw Solar Project would convert approximately 2,402 acres currently in agricultural production. Using the [USDA \(2024\)](#) Cropland Data Layer (CDL) satellite imagery and the [USDA \(2022\)](#) Census of Agriculture for Washtenaw County, we estimate the economic losses associated with this land conversion.

3.7.1 Land Use Composition

Table 3.3 presents the acreage breakdown by crop type within the proposed project boundary. These projections are based on the 2024 USDA CDL satellite imagery. The three dominant categories are soybeans (755 acres), corn (667 acres), and winter wheat (343 acres), together accounting for approximately 74% of the total project acreage. Notably, the project would remove 3.99% of all winter wheat acreage in Washtenaw County and 15.4% of winter wheat acreage in Saline Township.

Table 3.3. Undeveloped Land Category within the Washtenaw Solar Project Area

CDL Crop Category	Acres in Project	Share of County (%)	Share of Township (%)
Soybeans	755.03	1.38	10.38
Corn	666.74	1.79	14.46
Winter Wheat	343.03	3.99	15.39
Deciduous Forest	313.48	0.33	10.66
Woody Wetlands	169.34	0.23	8.05
Alfalfa	81.37	0.92	9.38
Herbaceous Wetlands	60.07	0.10	9.41
Barren	3.41	0.28	4.48
Other Crops	9.44	—	—
Total	2,401.91	0.69	11.50

Notes: Cropland acreage derived from USDA NASS Cropland Data Layer 2024 (10-meter resolution). “Other Crops” aggregates clover/wildflowers, oats, barley, rye, fallow/idle cropland, switchgrass, tomatoes, and miscellaneous categories.

3.7.2 Estimated Annual Agricultural Losses

Table 3.4 presents estimated annual losses in agricultural product value by crop. Loss values are calculated by multiplying converted acreage by per-acre production value, derived from market values reported in the 2022 Census of Agriculture for Washtenaw County and adjusted to 2026 dollars. Corn and soybeans together account for over \$1.15 million of the \$1.42 million annual total.

Table 3.4. Estimated Annual Losses of Agricultural Products by Crop (2026 USD)

CDL Crop Category	Annual Loss Value (\$)
Corn	\$659,644
Soybeans	\$492,311
Winter Wheat	\$246,643
Other Crops	\$21,992
Annual Total	\$1,420,590

Notes: Product value losses are based on market values reported in the 2022 Census of Agriculture for Washtenaw County, adjusted to 2026 dollars. Losses assume production homogeneity across the county.

3.7.3 Lifetime Agricultural Impact Summary

Table 3.5 summarizes estimated losses across multiple economic dimensions over the assumed 35-year project lifetime. Beyond direct product value, land conversion affects net farm cash income, government payments, and agricultural production expenses in the broader local farm economy.

Table 3.5. Estimated Agricultural Losses: Annual and 35-Year Lifetime (2026 USD)

Value Measure	Annual Total	Lifetime Total (35 yrs)
Loss in Ag Product Value	\$1,420,590	\$49,720,657
Loss in Net Farm Cash Income	\$169,721	\$5,940,219
Loss in Government Payments	\$25,623	\$896,803
Loss in Ag Production Expenses	\$1,398,636	\$48,952,274

Notes: Raw values based on the 2022 Census of Agriculture for Washtenaw County, adjusted to 2026 dollars. Government Payments refer to direct payments received by farm operators from federal (and sometimes state/local) government agricultural programs. Loss values are calculated by multiplying base values by the proportional loss in agricultural production attributable to the solar site.

The agricultural impact estimates indicate that the Washtenaw Solar Project would remove a substantial portion of productive cropland from the local agricultural economy. The annual loss in agricultural product value is about 1.42 million, comparable in magnitude to the annual residential property value loss estimated in Section 3.5. Over the 35-year project lifetime, the loss in agricultural product value alone is estimated at nearly **\$49.7 million**.

4 Methods

Below we outline the methodology used in this analysis. Our approach is based on state-of-the-art econometric techniques (Banzhaf, 2021; Kuminoff et al., 2010), and informed by recent impact analyses of renewable energy siting (Hu et al., 2025; Guo et al., 2024). For detailed equations, please refer to the corresponding sections in the Technical Appendix.

4.1 Comparative Site Selection

We identify utility-scale solar projects whose characteristics resemble the Washtenaw Solar Project, drawing from a national dataset of large-scale solar photovoltaic (LSSPV) sites compiled by Fujita et al. (2023) using EIA data.

Sites are filtered by: (1) installation before 2021, to allow sufficient post-installation transaction data; (2) location in IN, MI, MN, or WI; (3) constructed on greenfields; (4) AC capacity ≥ 5 MW (EIA utility-scale definition); (5) at least 30 sampled properties within a 2-mile radius; and (6) not in a metropolitan area. This process yielded 79 comparison sites.

We then develop a “similarity score” matrix for all the sites that passed our filters, involving Euclidean distances based on observable characteristics and associated weights. Table 4.1 shows the site features and associated weights used in the similarity scores, relative to the proposed Washtenaw site. These site features and characteristics were chosen based on key indicators from Hu et al. (2025), a national-level study of the property value impacts of utility-scale solar developments. Additional characteristics such as distance to a major metropolitan area and the Michigan indicator were included to select sites that reflect Washtenaw Solar’s geographic location and Michigan’s unique regulatory environment for renewable energy siting.

The resulting sites from the similarity score ranking are listed in the technical appendix. For the property value impact analysis, we choose 29 sites that are most like the Washtenaw site (see Table C2 in the Technical Appendix), providing just over 4,000 sampled properties within a 1-mile radius of these sites.

Table 4.1. Factors and Weights in the Similarity Score

Factors	Weights	Rationale
Michigan Indicator	3.0	Michigan’s unique regulatory environment warrants an explicit factor
Distance to Major Metro (miles)	3.0	Urban–rural interface affects property markets and public perception
Presidential Voting share (Percentage Dem.)	3.0	Political leaning strongly influences regulatory cost and community opposition
Site Capacity (MWac)	2.0	Facility size may shape visual impact and public perception
Population change % (2020–2024)	1.0	Growth trajectories affect permitting risk and community response
Tract Median Household Income (\$)	1.0	Income levels drive both property values and public perception
No. of Sampled Properties within 1 mile	0.5	Captures immediate neighborhood exposure
No. of Sampled Properties within 6 miles	0.5	Controls for residential density and the nature of the community

4.2 Property Data Collection and Screening

Property data come from CoreLogic through a data agreement. Following [Hu et al. \(2025\)](#), we retain small-lot (i.e., <5 acres) residential homes within 6 miles of the nearest solar site, exclude non-arm’s-length transactions, new builds, and same-property transactions within 120 days (to remove flipping events). Transactions from 2008–2010 are excluded to avoid Great Recession confounding. We retain transactions up to 15 years before solar installation and all subsequent transactions. All prices are inflation-adjusted. Properties within 2.5 miles are assigned to the treatment group; properties between 3.5 and 6 miles serve as the control group. Properties within the 1-mile buffer zone between treated and control units are dropped. The final analysis contains 83,982 residential transactions.

4.3 Spatial Extent Assessment

To determine the geographic reach of property value effects, we use a distance decay DID approach with the log of price as the outcome and half-mile proximity bins (0–3.5 miles) as treatment variables, compared against a control group (3.5–6 miles). Property-level controls, census tract fixed effects, and county-by-year fixed effects address potential confounders.

4.4 Estimating Average Property Value Impacts

Based on the spatial extent results, the treatment group is defined as properties within 2.5 miles and the control group as properties in the 3.5–6 mile bin. A generalized DID approach (Banzhaf, 2021) estimates the average treatment effect. High-value properties (market value > \$400,000, approximately the 67th percentile within 6 miles of the Washtenaw site) are identified via a binary indicator, which is interacted with the treatment-post term to differentiate value-tier effects.

4.5 Temporal Dynamics Analysis

We conduct event studies using properties within 2.5 miles as the treatment group. The post-installation binary variable is replaced with a series of relative-year indicators (e.g., one year before, three years after), allowing estimation of time-varying treatment effects.

We analyze the results relative to "prior year 1" to account for anticipation effects; given the public processes required for permitting and development, the property value impacts may already come into effect before the site is operational. Since the confidence interval includes zero for all the years leading up to the site's operation, we can be reasonably confident there is no pre-existing difference in price trends between treated and control groups.

4.6 Total Property Value Loss Estimate

All residential properties located within a 6-mile radius of the Washtenaw site are identified and assigned treatment status, encompassing properties in Washtenaw, Lenawee, and Monroe Counties. Using the average treatment effect coefficients in Table 3.1, we estimate annualized losses via a 5% capitalization rate and compute 10-year NPVs at 7% and 5% discount rates.

The capitalization rate is the ratio between the annual rental income (or potential rental income) produced by a real estate asset and its current market value; a rate of 5% is standard in valuation research. Net present value (NPV) translates a stream of future costs and benefits into terms comparable to present-day values. This conversion relies on a discount rate, which reflects the principle that costs and benefits occurring in the future are worth less than those occurring today. A higher discount rate assigns relatively less weight to future costs and benefits. When the analysis centers on costs such as property value impacts, a higher discount rate will therefore yield a lower NPV. Discount rates of 5% and 7% are commonly used in environmental valuation research.

The market value distribution for properties within 6 miles is shown in Figure 4.1. The median is approximately \$250,000 and the 67th percentile falls near \$400,000, which defines the high-value threshold.

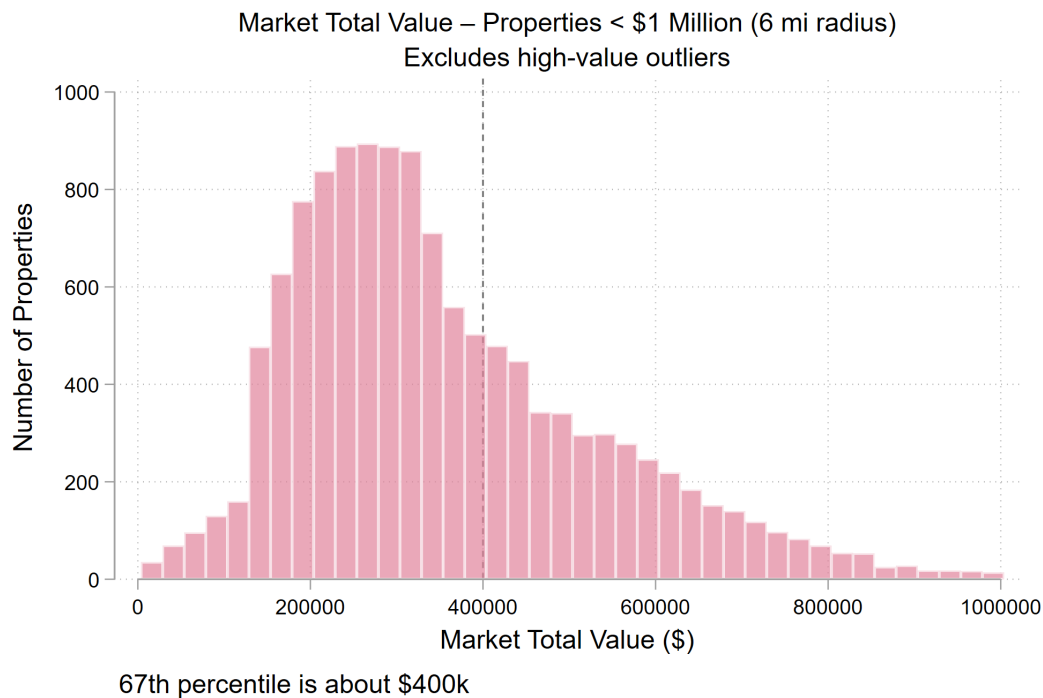


Figure 4.1. Market value distribution for Washtenaw County residential properties within a 6-mile radius of the Washtenaw Solar site (properties below \$1 million). The dashed vertical line marks the \$400,000 threshold (67th percentile), which defines high-value homes.

Two reasons rationalize a total impact calculation based on annualized home values. First, the event study suggests that the impact likely diminishes to zero after ten years. Second, even homeowners who do not sell their homes bear some welfare losses (i.e., the root cause for home price drop). An assessment based annualized home values allows us to estimate the welfare impact, independent of whether or not the owner sells the property after the site installation. Such an approach allows us to quantify the aggregate home-associate welfare impact without knowing who sell their homes after the installation.

4.7 Agricultural Impact Assessment

The agricultural impact assessment proceeds in two steps. First, we use the [USDA \(2024\)](#) NASS Cropland Data Layer (CDL), a satellite imagery product with 10-meter resolution, to identify the land use composition within the proposed Washtenaw Solar project boundary, distinguishing crop types and other land categories. Second, we estimate the economic value of lost agricultural production by multiplying the lost acreage of each crop type by per-acre production values derived from the 2022 Census of Agriculture for Washtenaw County, adjusted to 2026 dollars. This calculation relies on the assumption of homogeneity among crop production values within Washtenaw County. In other words, an acre of corn within the project boundary is assumed to be

as monetarily productive as an acre of corn elsewhere in the county. Lifetime losses are calculated by multiplying annual losses by the assumed 35-year project lifespan². Net farm cash income, government payment, and production expense impacts are estimated in a similar way - we multiply the lost acreage of total cropland by corresponding county statistic (from the 2022 Census of Agriculture for Washtenaw County) and adjust results to 2026-dollar value. As opposed to the property value impact assessment, we do not discount future costs.

²We present total value across the project lifetime rather than NPV, since landowners are typically compensated with annual rental payments. On the other hand, we present NPV for property value impact because the associated compensation is typically calculated or paid as an upfront lump sum.

References

- H. S. Banzhaf. Difference-in-differences hedonics. *Journal of Political Economy*, 129(8): 2385–2414, 2021.
- K. S. Fujita, Z. H. Ancona, L. A. Kramer, M. Straka, T. E. Gautreau, D. Robson, C. Garrity, B. Hoen, and J. E. Diffendorfer. Georectified polygon database of ground-mounted large-scale solar photovoltaic sites in the united states. *Scientific Data*, 10(1):760, 2023.
- W. Guo, L. Wenz, and M. Auffhammer. The visual effect of wind turbines on property values is small and diminishing in space and time. *Proceedings of the National Academy of Sciences*, 121(13):e2309372121, 2024.
- C. Hu, Z. Chen, P. Liu, W. Zhang, X. He, and D. Bosch. Impact of large-scale solar on property values in the united states: Diverse effects and causal mechanisms. *Proceedings of the National Academy of Sciences*, 122(24):e2418414122, 2025.
- N. V. Kuminoff, C. F. Parmeter, and J. C. Pope. Which hedonic models can we trust to recover the marginal willingness to pay for environmental amenities? *Journal of environmental economics and management*, 60(3):145–160, 2010.
- USDA. Census of Agriculture: Washtenaw County, Michigan. *United States Department of Agriculture National Agricultural Statistics Service*, 2022.
- USDA. Cropland Data Layer. *United States Department of Agriculture National Agricultural Statistics Service*, 2024.

Technical Appendix

Property Value and Agricultural Impact Assessment Washtenaw Solar Project

Submitted to

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A. Property Data Collection and Screening

To ensure the highest level of accuracy in assessing property value impacts, we utilized transaction-level real estate data from CoreLogic Solutions, LLC. CoreLogic maintains a comprehensive database of property characteristics and historical transaction records across the United States. The dataset includes transactions spanning from 15 years prior to the installation of a solar facility through the present, capturing fair market value trends before, during, and after project construction. Following the methodology of [Hu et al. \(2025\)](#), we establish a set of filters to only include transaction prices that reflect fair market values.

First, consistent with [Hu et al. \(2025\)](#), we categorize properties into "Residential Homes" (defined as properties under five acres with residential structures) and "Large-Lot Homes" (properties over five acres). To analyze the impact on residential home value, we only include Residential Homes in our analysis. This distinction is critical as large-lot homes may derive value from potential future solar leasing, offsetting amenity impacts.

Second, a critical step in accurate property valuation is isolating "arm's-length" transactions—sales between a willing buyer and a willing seller where the price reflects fair market conditions, unaffected by distress or pre-existing relationships. We applied a rigorous screening process using CoreLogic's proprietary transaction indicators. CoreLogic provides a proprietary indicator of "arm's-length" transactions; properties lacking this indicator were excluded from the sample. To further ensure validity, we excluded transactions flagged as short sales, foreclosures, sales between relatives, bulk investor purchases, sales for new builds, or sales with incomplete records.

Beyond the arm's-length filters, we applied additional screens to remove market anomalies and statistical outliers that could bias the results. To prevent price distortions from speculative "flipping" (where a property is bought and resold quickly), we removed any transaction occurring within 120 days of a previous sale of the same property. To avoid the confounding effects of the 2008 financial crisis, which created severe market disequilibrium unrelated to solar development, we excluded all transactions occurring between 2008 and 2010. Finally, to diminish the influence of extreme outliers, we excluded transactions falling in the bottom 1st percentile and top 99th percentile of the price distribution.

For the impact analysis, we screened the data to keep only residential homes located within a 6-mile radius of the nearest solar site. All transaction prices were adjusted for inflation using the Consumer Price Index (CPI) to reflect constant dollar values (i.e., 2026 USD in this analysis).

B. Summary of Residential Properties around Washtenaw Solar

The proposed Washtenaw Solar Project is a 150MWac utility-scale solar facility located in Saline Township, Washtenaw County, Michigan. The project is situated approximately 5 to 8 miles southwest of the Ann Arbor metropolitan area. Because the facility is not yet operational, realized post-construction transaction data is not available. Therefore, this assessment relies on identifying the inventory of existing residential stock surrounding the proposed site to apply impact estimates derived from comparable operating sites (see Section C).

To characterize the residential housing stock surrounding the Washtenaw Solar project, we utilized property assessment and transaction data from CoreLogic. We implemented the same screening process outlined in Section A.

The residential stock surrounding the Washtenaw Solar project includes a diverse range of property values. Figure A1 (corresponds to Figure 4.6 in the Main Report) and Figure A2 illustrate the distribution of market total values for properties within the 6-mile radius.

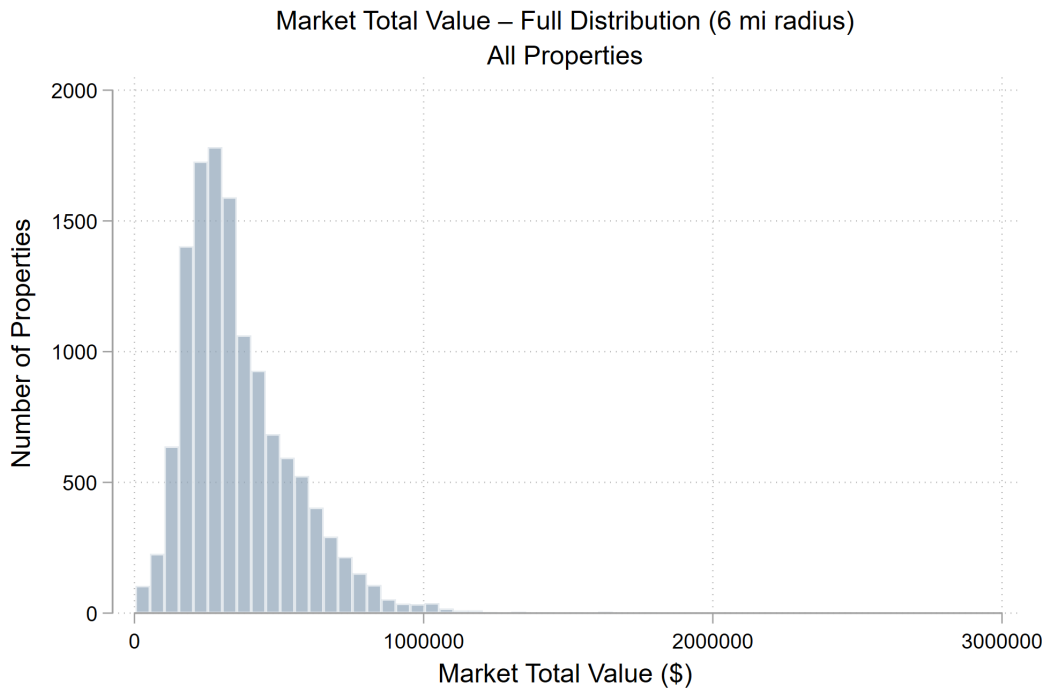


Figure B.1. Distribution of market total values (in 2026 dollar) for all properties within a 6-mile radius of the proposed Washtenaw Solar development. The properties are located across three counties: Washtenaw, Lenawee, and Monroe.

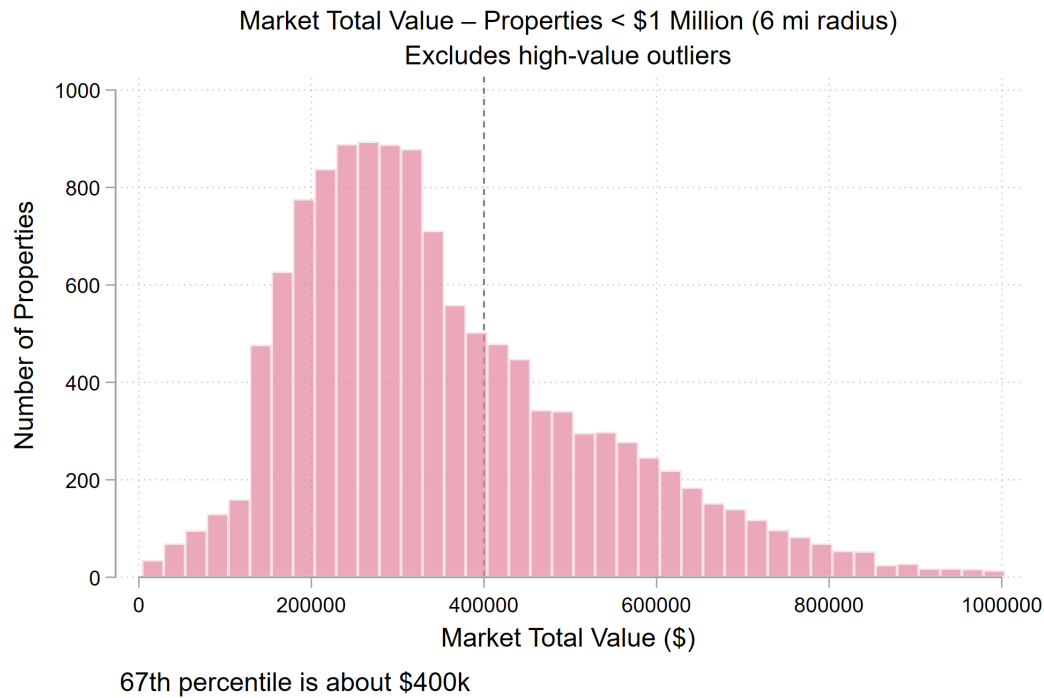


Figure B.2. Distribution of market total values (in 2026 dollar) for all non-outlier properties within a 6-mile radius of the proposed Washtenaw Solar development. This figure excludes 168 properties with a total market value exceeding \$1,000,000.

Given the specific demographics of Saline Township and the surrounding area, we differentiate between "standard" and "high-value" properties in our impact analysis. Properties with a market value above \$400,000, which correspond to approximately the 67th percentile of the local market distribution, are classified as "high-value". Heterogeneity analysis (detailed in Section E) indicates that higher-value properties may experience differential impacts compared to the average housing stock. The distribution data confirms a significant cluster of high-value homes, likely attributable to proximity to Ann Arbor and associated amenities.

C. Comparative Site Selection

To estimate the potential property value impacts of the proposed Washtenaw Solar Project, we identified operating utility-scale solar projects in the Midwest with characteristics most similar to the Washtenaw site. Our data source is a national dataset of large-scale solar photovoltaic (LSSPV) sites compiled by [Fujita et al. \(2023\)](#) using data from the US Energy Information Administration (EIA).

Our first step involves filtering out sites that do not meet key matching criteria. Sites that did not meet the following criteria were not used in the analysis. As a first step, we only select sites that were installed in 2021 or before, to ensure sufficient post-construction transactions to observe market responses over time. We also restricted the search to neighboring and Midwestern states with similar agricultural and residential landscapes: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin. We filtered for sites built on "greenfields". These are sites that occupy "land that may have previously been wildland, urbanized, cultivated, or reclaimed" ([Fujita et al., 2023](#)). Sites developed on brownfields (e.g., landfills, Superfund sites) were excluded because their redevelopment often improves property values by remediating a disamenity, which is fundamentally different from converting farmland to solar use.

Additionally, we filter for sites that have an AC capacity of 5 MWac or greater, consistent with the Energy Information Administration (EIA) definition of "utility-scale". While the proposed Washtenaw facility is large (150MWac), existing solar sites of this magnitude in the Midwest are typically located in unpopulated areas. Restricting the sample to sites over 100 MWac (or even 50MWac) would yield insufficient data for statistical analysis.

To ensure statistical validity, a site must be surrounded by an active real estate market. We applied a secondary filter requiring candidate sites to have more than 30 "sampled properties" (residential properties sold during the study period) within a 2-mile radius. This ensures that the econometric models have enough observed price points to detect reliable impact estimates. This filter also addresses our concern of comparing sites located in isolated, rural areas to the Washtenaw Solar site.

From the pool of 79 sites passing the initial filters, we selected the final comparison group using a Similarity Score Matrix. This process calculates the Euclidean distance between the standardized characteristics of the proposed Washtenaw site and each candidate site, applying specific weights to prioritize the most relevant factors. The following site and community features, and their accompanying weights, were used to evaluate the similarity scores, relative to the proposed Washtenaw solar site:

Table C.1. Factors and Weights in the Similarity Score

Factors	Weights	Rationale
Michigan Indicator	3.0	Michigan’s unique regulatory environment warrants an explicit factor
Distance to Major Metro (miles)	3.0	Urban–rural interface affects property markets and public perception
Presidential Voting share (Percentage Dem.)	3.0	Political leaning strongly influences regulatory cost and community opposition
Site Capacity (MWac)	2.0	Facility size may shape visual impact and public perception
Population change % (2020–2024)	1.0	Growth trajectories affect permitting risk and community response
Tract Median Household Income (\$)	1.0	Income levels drive both property values and public perception
No. of Sampled Properties within 1 mile	0.5	Captures immediate neighborhood exposure
No. of Sampled Properties within 6 miles	0.5	Controls for residential density and the nature of the community

We assign a high weight to the Michigan indicator, since Michigan’s regulatory environment for renewable energy siting is unique. Distance to a major metropolitan area and political leaning are also heavily weighted since these factors significantly influence property markets and community responses to solar developments. Voting share also receives a high weight because a community’s political leaning can influence the levels of opposition to renewable energy development, which in turn may drive relocation patterns and regulatory costs (Hu et al., 2025). Site capacity is the next most important characteristic since giant sites like Washtenaw Solar (i.e., 150 MWac) are likely to have different challenges and impacts than smaller sites, even within the utility scale class (i.e., >5 MWac). Hu et al. (2025) observe significant differences in treatment effects across county median household income, so we include this feature to account for potential demographic differences. The percentage change in population helps account for underlying property value trajectories (i.e., whether people are moving into or out of a region). Finally, the number of sampled properties nearby is included as a weight to help us match to solar sites that impact a large number of nearby properties, as is the projected case with Washtenaw Solar.

We selected 29 sites with the highest similarity score (Table C2). This number of sites was selected since it provides at least 4,000 sampled properties within 1 mile. This sample size enables robust estimation of site development impacts and is consistent with the methodology of (Hu et al., 2025). Additionally, these sites provide more than 93,000 sampled properties within 6 miles.

Table C.2. Comparable Sites Based on Similarity Score

#	Site Name	State	Year	AC Cap.	1 Mi	6 Mi
	Washtenaw Solar	MI	2026	150	36	1098
1	Demille Solar Farm	MI	2017	28.56	0	391
2	Bingham Solar, LLC	MI	2020	20	116	1094
3	Turrill Solar Farm	MI	2017	19.57	0	404
4	O'Brien Solar Fields	WI	2021	20	0	10956
5	St. Joseph Solar	IN	2021	20	66	1631
6	Delta Solar Power II	MI	2018	15.9	191	6948
7	Logansport Solar	IN	2021	16	205	759
8	Delta Solar Power I	MI	2018	8.1	8	5403
9	IND Community Solar Farm 1st Phase	IN	2013	10	0	3727
10	Dane County Airport Solar	WI	2020	9	0	7518
11	Indy Solar I, LLC	IN	2013	10.1	149	4045
12	Indy Solar III, LLC	IN	2013	8.6	222	4784
13	Indianapolis Motor Speedway Solar PV	IN	2014	8.82	1443	15512
14	West Waconia Solar	MN	2016	8.5	193	767
15	Crawfordsville 5 Solar Park	IN	2020	9.8	2	602
16	Peru 2	IN	2021	9.5	17	415
17	IND Solar Farm (Phase IIA)	IN	2014	7.5	0	3759
18	Richmond 5	IN	2021	9	199	1582
19	IMPA Anderson Solar Park 2	IN	2017	8.1	199	2275
20	Lake Pulaski Solar	MN	2016	7.5	201	2932
21	Connexus Solar Stanford 1STF	MN	2021	7.3	41	1303
22	Tatanka Wi	MN	2017	7.11	52	3112
23	Corcoran (CSG)	MN	2019	5	38	1203
24	B.R. Corcoran (CSG)	MN	2017	5	75	1285
25	Crawfordsville 2 Solar Park	IN	2019	7.9	119	606
26	West Faribault Solar	MN	2016	5.5	288	3065
27	Eastwood Solar	MN	2016	5.5	3	4845
28	Athens MN CONX	MN	2018	6.62	22	2208
29	Dodge Center Solar	MN	2016	6.5	213	547

Notes: The sites are ranked by similarity score, with those most similar to Washtenaw Solar appearing highest. "Year" indicates the year the site became operational and "AC Cap." shows capacity in MWac. The "1 Mi" and "2 Mi" columns indicate the number of valid sales (see Section A for filtering criteria) within 1 mile and 2 miles, respectively, after the site development.

The capacity of these sites ranges from 5.0 to 28.6 MWac, with a median of 8.6 MWac. Most of the sites are in communities with slightly growing populations. The average census tract median household income of these sites is about \$90,900.

D. Spatial Impact Assessment

To determine the geographic extent of property value impacts and rigorously define the boundary between "treated" and "unaffected" properties, we employed a spatial distance decay model within a Difference-in-Differences (DID) framework (as suggested by Guo et al. (2024) and Hu et al. (2025)). Instead of assuming a uniform impact radius, this method empirically tests how price effects change as the distance from the solar facility increases. By analyzing impacts in granular distance bands (0.5-mile intervals), we identify the specific threshold where the impact on property values becomes statistically indistinguishable from zero. For the distance-decay model shown in Fig. 3.2 (Main Report), a series of proximity intervals (the 0.5-mile bins) are used as treatment variables. Properties in the interval between 3.5 and 6 miles serve as the control group, which serve as the counterfactual baseline, representing local market trends for properties that are sufficiently distant to be unaffected by the facility's direct externalities.

The spatial extent of the impact is estimated using the following regression equation:

$$\begin{aligned} \ln(P_{it}) = & \beta_0 + \beta_1 Post_{it} + \sum_{m=1}^{M-1} \beta_2^m T_i^m + \sum_{m=1}^{M-1} \beta_3^m Post_{it} \times T_i^m \\ & + \sum_{k=1}^K \delta_k X_{it}^k + \sum_{k=1}^K \gamma_k (Post_{it} \times X_{it}^k) + \tau_c + \varepsilon_{it}, \end{aligned} \quad (D.1)$$

where:

- $\ln(P_{it})$: The natural logarithm of the transaction price for property i in year t .
- $Post_{it}$: A binary indicator equal to 1 if the transaction occurred after the solar facility's installation date, and 0 otherwise.
- T_i^m : A series of binary indicators representing specific proximity intervals (distance bands) from the solar site. For this analysis, we utilized 0.5-mile intervals ranging from 0 to 3.5 miles (e.g., 0–0.5 mi, 0.5–1.0 mi, etc.).
- $Post_{it} \times T_i^m$: The key interaction terms. The coefficients β_3^m represent the estimated percentage impact on property values for each specific distance band after the solar facility becomes operational.
- X_{it}^k : Vector of property controls: total bedroom number, total bathroom number, building age, and natural logarithms of distances to the nearest transmission line, the nearest primary road, and the nearest metropolitan area.
- τ_c : Fixed effects at the census tract and county-by-year levels. These absorb time-invariant location characteristics and time-varying local economic shocks, ensuring the estimates isolate the solar facility's impact.

- ε_{it} : Error term.

All standard errors are two-way clustered at the census tract and year level. The results of this spatial model (presented in Section 3.2 of the Main Report) reveal that negative price impacts are statistically significant and most pronounced within the first 2.5 miles. Beyond 3.5 miles, the coefficient estimates become statistically indistinguishable from zero. Consequently, for the subsequent Average Impact Analysis and Total Impact calculations, the "Treatment Zone" is defined as the area within 2.5 miles of the facility.

E. Estimating Average Property Value Impacts

We employ a widely used generalized DID approach to investigate the effects of LSSPV installation on nearby property values (Kuminoff et al., 2010; Banzhaf, 2021). Intuitively, this approach compares the change in property values before and after installation for properties close to the LSSPV site (i.e., the treatment group) against the value change for properties farther away but still within the defined vicinity (i.e., the control group).

Based on the results of the spatial assessment (Section D), the groups for this analysis are defined as follows:

- **Treatment Group** ($T_i = 1$): Residential properties located within 2.5 miles of the solar facility.
- **Control Group** ($T_i = 0$): Residential properties located between 3.5 miles and 6 miles from the solar facility.
- **Buffer Zone**: Properties located between 2.5 and 3.5 miles are excluded from this specific estimation to ensure a clear distinction between affected and unaffected market segments.

The general DID framework of our residential home study is as follows:

$$\begin{aligned} \ln(P_{it}) = & \beta_0 + \beta_1 Post_{it} + \beta_2 T_i + \beta_3 Post_{it} \times T_i \\ & + \sum_{k=1}^K \delta_k X_{it}^k + \sum_{k=1}^K \gamma_k (Post_{it} \times X_{it}^k) + \tau_c + \varepsilon_{it}, \end{aligned} \quad (E.1)$$

where the parameter definitions remain the same as in Equation (1), except we use a single binary treatment as defined above, and the average treatment effect will be given by β_3 . The control variables in the DID estimation are identical to those outlined in Section D. All standard errors are two-way clustered at the census tract and year level.

Our DID model relies on the assumption that the LSSPV siting process is independent of the price trends over time conditional on the covariates (i.e., the parallel trends assumption). We conduct pre-trend tests using an event study framework, where any pre-existing divergence between groups would signal a violation of the parallel trends assumption.

The preliminary data analysis for the Washtenaw area indicated a significant presence of high-value homes near the project site. To account for potential variation in how different market segments react to solar development, we also extended the DID model to differentiate impacts by property value.

A binary indicator, $HighVal_i$, is defined as equal to 1 if a property's market total value exceeds \$400,000 (representing the 67th percentile of the local distribution), and 0

otherwise. We then modified the baseline equation to replace the $Post_{it} \times T_i$ term with triple-interaction terms involving $HighVal_i$:

$$\begin{aligned} \ln(P_{it}) = & \dots + \beta_{high}(Post_{it} \times T_i \times 1.HighVal_i) \\ & + \beta_{low}(Post_{it} \times T_i \times 0.HighVal_i) \dots, \end{aligned} \quad (E.2)$$

so that the high-value average impact is given by β_{high} while the low-value impact given by β_{low} . This specification allows us to empirically test whether premium properties are more sensitive to the disamenities associated with utility-scale solar infrastructure. The results are highlighted in Table 3.1 in the Main Report.

F. Temporal Dynamics Analysis

To ensure that the estimated impacts are caused by the solar facility and not by pre-existing market trends, we employed an Event Study framework. This analysis serves two critical functions:

1. **Testing for Pre-Trends:** Verifies the "Parallel Trends Assumption" by checking if property values in the treatment and control groups were moving in sync before the solar facility was built. Statistically insignificant estimates in the years prior to construction support our assumption that the control group is a valid counterfactual.
2. **Establishing Impact Duration:** Empirically tracks how the impact evolves year-by-year after installation, establishing the specific time horizon (persistence) of the economic loss.

We replaced the single "Post" indicator from the standard DID model with a series of binary variables representing specific years relative to the facility's installation date. The model is specified as follows:

$$\ln(P_{it}) = \alpha_0 + \alpha_1 T_i + \sum_{j \neq -1}^J \beta_j YrRel_j + \sum_{j \neq -1}^J \gamma_j (T_i \times YrRel_j) + \delta X_{it} + \eta(Post_{it} \times X_{it}) + \tau_c + \varepsilon_{it}, \quad (F.1)$$

where:

- T_i : Binary indicator for the treatment group (properties within 2.5 miles).
- $YrRel_j$: A set of "event study" dummy variables indicating the transaction year t relative to the installation year ($j = -3$ implies 3 years before operation; $j = 2$ implies 2 years after).
- $T_i \times YrRel_j$: Interaction terms of interest. The coefficients γ_j capture the percentage difference in property values between the treatment and control groups for each specific year j .
- Reference Year: The year immediately prior to installation ($j = -1$) is excluded to serve as the baseline for comparison.

The results of this analysis (presented in Section 3.4 of the Main Report) confirm the validity of the study design:

- **Pre-Installation Phase** ($j < 0$): The coefficient estimates for the years leading up to construction are statistically indistinguishable from zero. This confirms that there

were no pre-existing downward trends in the treatment zone properties compared to the control group.

- **Post-Installation Phase** ($j \geq 0$): Property value impacts manifest immediately upon the facility becoming operational (Year 0).

The event study reveals distinct temporal dynamics that define the "impact life cycle" for the Washtenaw assessment. Prices in the treatment zone drop immediately upon operation. The negative effect persists for approximately a decade, with the strongest projected impact occurring around year 7. The negative impact becomes statistically insignificant after Year 10. Based on these empirical findings, the Total Impact Calculation (detailed in the subsequent section) utilizes a defined 10-year time horizon for determining the Net Present Value (NPV) of property losses, rather than assuming a perpetual loss.

G. Total Property Value Loss Estimate

To provide a comprehensive estimate of economic impact, we convert the "stock" measure of property value depreciation into a "flow" measure of annual welfare loss. Market value represents the present value of the future stream of housing services (amenities, utility, and shelter) a property provides. Therefore, a reduction in market value implies a proportional reduction in the annual flow of these services. By "annualizing" the loss, we estimate the yearly economic cost borne by homeowners, independent of whether they choose to sell the property. This ensures the assessment captures the total welfare loss to the community, not just the realized financial loss of those who transact.

We calculate the annualized loss for each residential property i located within the 2.5-mile Treatment Zone using a standard capitalization rate with the following formula:

$$AnnualLoss_i = MarketValue_i \times ImpactCoeff_i \times CapRate, \quad (G.1)$$

where:

- **Market Value (V_i):** The current total market value of the property derived from CoreLogic assessment data.
- **Impact Coefficient (β):** The estimated percentage loss derived from the Average Impact Analysis (Section E).
- **Capitalization Rate (5%):** We utilize a 5% capitalization rate. This standard benchmark implies that a property's annual housing services are valued at roughly 5% of its capital value (e.g., a \$300,000 home yields \$15,000 in annual services).

The total annualized impact is calculated as the summation of $AnnualLoss_i$ across all residential properties within 2.5 miles of Washtenaw solar.

Finally, to express future losses in present-day dollars, the total impact is reported as the Net Present Value (NPV) of these annualized losses over the duration of the impact. Based on the Temporal Dynamics Analysis (Section F), which indicates that price effects persist for approximately one decade before dissipating, we define the impact horizon (T) as 10 years. We denote the discount rate with r , and NPV is calculated using two standard regulatory benchmarks (5% and 7%) to provide a sensitivity range. In summary, NPV is calculated using the following formula:

$$TotalNPV = \sum_{i=1}^N \sum_{t=0}^9 \frac{AnnualLoss_i}{(1+r)^t}, \quad (G.2)$$

where:

- N is the total number of residential properties in the 2.5-mile Treatment Zone (1,023 properties).

- The summation runs for 10 periods (Years 0 to 9), reflecting the immediate onset of impacts identified in the event study.

We also calculate the NPV of annualized losses for properties within a 1-mile radius. The results of our total average impact analysis are reported in Table 3.2 in the Main Report.

This calculation likely represents a conservative lower-bound estimate of the total welfare loss for several reasons. First, the Generalized DID model estimates direct transaction price changes which is a lower bound of a proper welfare loss measure ([Banzhaf, 2021](#)). It does not explicitly capture non-market values (e.g., existence values of local ecosystems) unless they are capitalized into housing prices. Additionally, the 5% rate may be lower than gross rental yields in some Midwest markets; a higher capitalization rate would result in a higher estimated annual welfare loss. Furthermore, compared to Washtenaw Solar, many sampled sites have lower capacity or lower housing values, thus perceived amenity impact for Washtenaw solar might be larger. Finally, impacts beyond 2.5 miles are assumed to be zero for this calculation, even though minor residual effects may exist just beyond the boundary.

References

- H. S. Banzhaf. Difference-in-differences hedonics. *Journal of Political Economy*, 129(8): 2385–2414, 2021.
- K. S. Fujita, Z. H. Ancona, L. A. Kramer, M. Straka, T. E. Gautreau, D. Robson, C. Garrity, B. Hoen, and J. E. Diffendorfer. Georectified polygon database of ground-mounted large-scale solar photovoltaic sites in the united states. *Scientific Data*, 10(1):760, 2023.
- W. Guo, L. Wenz, and M. Auffhammer. The visual effect of wind turbines on property values is small and diminishing in space and time. *Proceedings of the National Academy of Sciences*, 121(13):e2309372121, 2024.
- C. Hu, Z. Chen, P. Liu, W. Zhang, X. He, and D. Bosch. Impact of large-scale solar on property values in the united states: Diverse effects and causal mechanisms. *Proceedings of the National Academy of Sciences*, 122(24):e2418414122, 2025.
- N. V. Kuminoff, C. F. Parmeter, and J. C. Pope. Which hedonic models can we trust to recover the marginal willingness to pay for environmental amenities? *Journal of environmental economics and management*, 60(3):145–160, 2010.