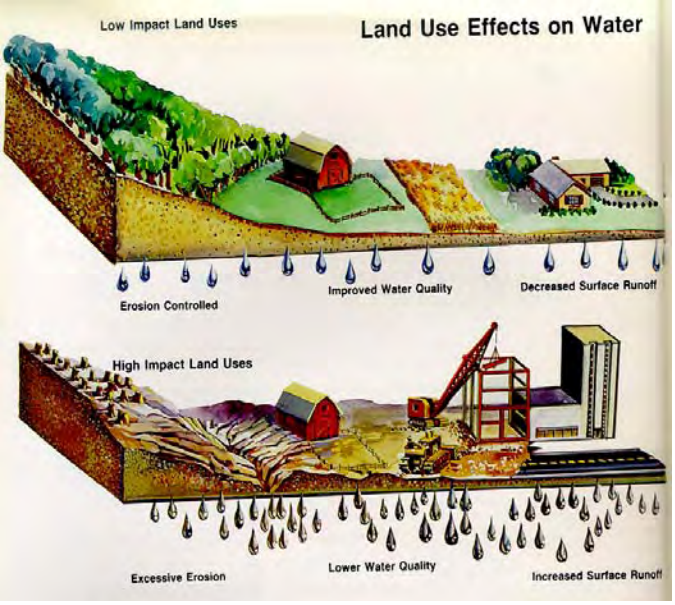
Appendix D

Zoning Ordinance Recommendations

Produced by:
Langworthy, Strader, LeBlanc, and Associates Inc.

D-1 Dalton Township Zoning Ordinance Recommendations



Water Quality Protection Measures

Dalton Township Zoning Ordinance Recommendations

As we discussed previously, following are eight important measures that communities can take to protect both water quality and rural character. Following each one of the zoning techniques is the specific language we are recommending be inserted in Dalton Township's zoning ordinance.

1. Control the direct discharge of storm water runoff into surface water with site plan review standards.

Recommendation:

#1 Add the following language to section 17.4(E):

> *Drainage design shall recognize existing natural drainage patterns. Stormwater removal shall not adversely affect neighboring properties or the public storm drainage system. Provisions shall be made to accommodate stormwater on-site wherever practical, and prevent direct discharge into surface waters.*

2. Require and undisturbed vegetation strip adjacent to water bodies (buffer strip) of 25 feet and a waterfront setback of 100 feet for structures and septic fields.

Recommendations:

#1. Add the following definition to Chapter 2, Section 2.20.

> *5) Setback, waterfront: The minimum horizontal distance prescribed by this ordinance as the minimum distance between the bank or high water line and the nearest structure.*

#2 Add the following to the following districts as a new district regulation. RC, section 5.4; R1, section 6.4; R2, section 7.4; MHC, section 8.4; C1, section 10.4; C2, section 11.4; and I, section 12.4.

> *Waterfront setback: structures and septic systems shall not be located within one hundred (100) feet of the bank or high water line of any water body. Within this waterfront setback, a minimum of a twenty-five (25) foot buffer strip shall be maintained parallel and immediately adjacent to the bank or high water line. Within the buffer strip, a space of no greater then ten (10) feet in width may be selectively trimmed and pruned to allow for the placement of walkways, and/or for a view of the waterway, with the approval of the Zoning Administrator. The walkway shall be perpendicular to the water. Individual trees may also be removed which are in danger of falling and damaging structures or blocking a navigable waterway.*

3. Evaluate parking and paving standards so the Township is not promoting excessive pavement.

Recommendation: The parking ratios seem reasonable as presented. Where reasonable, the township may want to consider tying the square foot-based ratios to usable floor area (i.e., less storage areas) instead of total floor area.

4. Consider deferred parking and imposing maximum parking standards.

Recommendations:

#1 Add a new paragraph D, after Section 14.3(C) to read as follows:

> *D. **Maximum Parking**. To minimize excessive areas of pavement which can reduce water quality, increase erosion and detract from community aesthetics, no parking lot shall exceed the minimum parking space requirements of Section 4.3(B) by more than ten percent (10%).*
>
> *In granting additional space, the zoning administrator or planning commission as appropriate, shall determine that the parking will be required, based on documented evidence of actual use and demand provided by the applicant or as justified through a specific parking study conducted by a professional qualified in the field.*

#2 Add the following language after Section 14.9 (which already addresses deferred parking):

> (g) *Stormwater calculations shall be provided to verify adequate stormwater storage capacity if an expansion is necessary.*

5. Put a cap on the percentage of impervious or hard surfaces (pavement, structures, etc.) a site can have.

Recommendation: Add the following language Section 2.13 (10) the draft definition of "lot coverage"

> **Lot Coverage -** The part or percent of a lot occupied by buildings, accessory buildings *parking areas, driveways, patios, decks and other impervious surfaces.*

The percentages of lot coverage should be increased with the addition of all impervious surfaces in the definition.

District	Existing Lot Coverage	*Proposed lot coverage*
R-1 Low Density Residential District	15%	*20%*
R-2 Medium Density Residential	15%	*20%*
C-1 Regional Commercial District	50%	*60%*
D-1 Industrial District	35%	*75%*

6. Use open space preservation design to protect surface waters, wetlands and natural drainage areas.

Recommendations:

#1. Insert the following language in section 4.45(D) (Open Space development)

> *The parallel plan shall consider unbuildable portions of the parcel(s) including those areas in a floodway, slopes greater than 15%; wetlands, and areas of the tract utilized for storm water management facilities.*

#2 Insert the following language at the end of section 4.45:

G. *Open space area developments shall adhere to the following design standards:*

1) *The landscape and natural features shall be preserved, insofar as practical, by removing only those areas of vegetation or making those alterations to the topography which are reasonably necessary to develop the site. Particular care should be taken with natural drainage areas.*

2) *The development shall be set back a minimum of two hundred (200) feet from a public road. No vegetation shall be removed from this setback, nor any grading or changes in topography occur, except that necessary for entrance roads, required utilities or drainage improvements. The Planning Commission may require additional plantings to augment natural vegetation in cases where the setback has limited vegetation for screening.*

3) *No building shall be sited on slopes steeper than fifteen percent (15%).*

4) *Structures and septic systems shall not be located within one hundred (100) feet of any stream bank or high water line.*

5) *An undisturbed natural vegetation buffer of twenty-five (25) feet in width shall be maintained immediately adjacent and parallel to any wetland, lake or stream bank or high water line.*

6) *Where an open space development abuts a lake or stream, at least fifty percent (50%) of the shoreline, as well as reasonable access to it, shall be a part of the common open space land.*

7) *At least one-third (1/3) of the common open space shall be usable open space. The open space and access to it shall be permanently marked and designed so individuals in the development are not forced to trespass to reach recreational or common open spaces.*

8) *Common open space in any one(1) residential cluster shall be laid out, to the maximum extent feasible, to connect with other open space existing or proposed.*

9) *Open space areas may not include golf courses, marinas, parking areas, the area within a platted lot or condominium unit, street rights-of-way, or utility easements.*

10) *Open space areas shall have minimum dimensions of fifty (50) feet on all sides.*

#3 Add the following language to 4.45 (E)

Bonus density. The Planning Commission may permit an increase in the number of dwelling units permitted in an open space development in accordance with the table below for additional amenities provided by the developer. In no case shall the density bonus total more than fifty percent (50%).

Preservation of wetlands	*5%*
10% Additional open space provided	*5%*
10% Additional common waterfront frontage provided	*5%*
Trails and formal recreation space provided	*5%*
Wildlife habitat augmented (per Soil Conservation Service Standards)	*5%*
Community wastewater disposal system	*20%*
Community water service system	*20%*

#4 Add the following language after Section 13.5(F) (Planned Unit Development).

G. *Natural Features Protection.*

1) *The landscape and natural features of the site shall be preserved, insofar as practical, by removing only those areas of vegetation or making those alterations to the topography which are reasonably necessary to develop the site. Particular care should be taken with natural drainage areas.*

2) *No building shall be sited on slopes steeper than fifteen percent (15%).*

3) *Structures and septic systems shall not be located within one hundred (100) feet of any lake or stream bank or high water line.*

4) *An undisturbed natural vegetation buffer of twenty-five (25) feet in width shall be maintained parallel and immediately adjacent to any wetland, lake or stream from the bank or high water line.*

#3 Add the following definition to Chapter 2:

Open Space, Usable: That portion of the common open space which due to its slope, drainage characteristics and soil conditions can be used for active recreation.

7. Adopt site plan review standards which include:

- **landscaping requirements**
- **tree preservation requirements**
- **slope preservation requirements**
- **secondary containment**
- **wetland protection measure**

Recommendations:

#1 Add the following definitions to Section 2.

Section 2.4(6) Clearing Land: The removal of vegetation from any site, parcel or lot except when land is cleared and cultivated for bona fide agricultural or garden use in a district permitting such use. Mowing, trimming, pruning or removal of vegetation to maintain it in a healthy, viable condition is not considered clearing.

Section 2.15(1) Natural Features: Natural features shall include, but not be limited to; soils, wetlands, woodlots, floodways, landmark trees, overgrown fence rows, water bodies, topography, vegetative cover, geologic formations, or other features deemed by the Planning Commission or Township board.

Section 2.13(1) Landmark Trees: Trees of over thirty six (36) inches in diameter
.

#2 Add the following language to section 4.30:

Unless associated with a bona fide public works project, it shall be unlawful for any person, individual, partnership, corporation, association or other legal entity to engage in land clearing, including the stripping and removal of topsoil, from any site, parcel, or lot within the Township without first receiving appropriate development approval.

#3. Insert the following language in section 4.37 as a new (1)…. (Landscaping)

1) The landscape and natural features shall be preserved, insofar as practical, by removing only those areas of vegetation or making those alterations to the topography which are reasonably necessary to develop the site. The zoning administrator or Planning Commission, as appropriate, may waive requirements for landscaping and screening if the existing vegetation to be retained on site meets or exceeds ordinance standards.

#4 Insert the following language to address hazardous materials after 17.4(G):

1) Hazardous materials associated with the land use shall be stored a minimum of two hundred (200) feet from any wetland, lake or stream.

2) General purpose floor drains shall not be connected to septic systems.

3) Secondary containment facilities shall be provided for all hazardous materials of sufficient size to hold the entire volume of the materials. Containment areas shall be designed and constructed so that hazardous materials cannot escape from the immediate storage area by gravity flow through drains, soil or to surface waters.

4) Wells shall be properly maintained and sealed and abandoned wells shall be plugged and capped according to state requirements.

8. Place stringent development standards on special land uses which greatly affect water quality.

Recommendations: Add the following language to Chapter 16 of the ordinance.

#1 add 16.19(B)(8): *All wash bays shall be at least one hundred (100) feet from any wetland or water body.*

#2 add to 16.27(B)(7): *Tees, greens and fairways shall be arranged in a manner to limit chemical runoff into wetlands or surface waters. An undisturbed natural vegetative buffer strip of 35 feet shall be provided immediately adjacent to wetlands or water bodies.*

#3 add to 16.28(B)(4):

Soil and gravel stockpiles shall not be located within two hundred (200) feet of wetlands or water bodies.

Extraction operations shall not occur within one hundred (100) feet of a wetland or water body.

An undisturbed natural vegetative buffer strip of thirty five (35) feet shall be provided immediately adjacent to wetlands or water bodies during excavation activities.

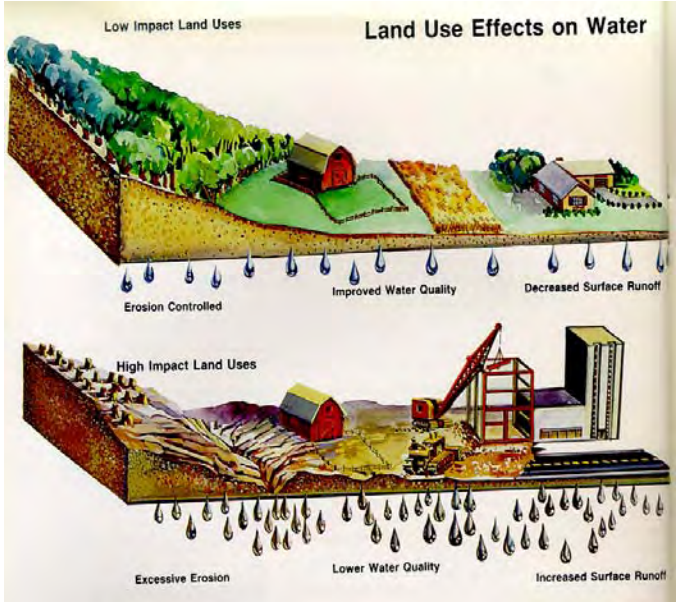
#4 Add to 16.32(B)(4): water well,…*wetland or surface water body.*

#5 Add 16.33(B)(10): *Kennel areas shall be a minimum of twenty-five (25) feet from any property line and fifty (50) feet from any wetland or surface water body.*

#6 Add to 16.44(B) – *Storage shall not be permitted within one hundred (100) feet of a wetland or surface water body.*

Word/projects/wetlands/Muskconsdist/Dalton/zorecommendations

D-11 Cedar Creek Township Zoning Ordinance Recommendations



Muskegon Conservation District/LSL Planning

Cedar Creek Township Zoning Ordinance Recommendations Water Quality Protection Measures

As previously discussed, following are eight important measures that the Township can take to protect both water quality and its rural character. Specific language is included for possible insertion in Cedar Creek Township's zoning ordinance.

1. Control the direct discharge of storm water runoff into surface water with site plan review standards.

Recommendation:

#1 Add the following language to Section 14.1, D, 1, Site Plan Review Standards, as a new subparagraph g:

g. Drainage design shall recognize existing natural drainage patterns. Stormwater removal shall not adversely affect neighboring properties or the public storm drainage system. Provisions shall be made to accommodate stormwater on-site wherever practical, and prevent direct discharge into surface waters. Stormwater calculations shall be provided to verify adequate stormwater storage capacity for the entire site, including deferred parking areas.

2. Require and undisturbed vegetation strip adjacent to water bodies (buffer strip) of 25 feet and a waterfront setback of 100 feet for structures and septic fields.

Recommendations:

#1 Section 3.25 of the Ordinance addresses setbacks for all structures from all water bodies (nice work!). Augment the Section to also reference septic systems and require a 25-foot greenbelt adjacent to the water (see *italic* and underlined language below). Restate and re-letter as follows:

A. A one hundred (100) foot *waterfront* setback shall be required for *septic systems and* all structures in any zoning district on lots adjacent to a lake, river, creek or stream. Such setback shall be measured form the ordinary high water level of said body of water to the nearest point of the structure. *All structures* must also meet all applicable state and federal regulations.

B. Within this waterfront setback, a minimum twenty-five (25) foot greenbelt shall be maintained parallel and immediately adjacent to the bank or ordinary high water level. Within the greenbelt, the Zoning Administrator may approve clearing of a space of no greater then ten (10) feet in width, selectively trimmed and pruned to allow for the placement of walkways, and/or for a view of the waterway. The walkway shall be perpendicular to the water. Individual trees may also be removed which are in danger of falling and damaging structures or blocking a navigable waterway.

Note: the Township ordinance already has a definition for "*greenbelt*" so this term was used in the proposed language.

#2 For clarity, add the following definition to Section 2.19, "Definitions S" after the definition for Setback:

SETBACK, WATERFRONT*: The minimum horizontal distance prescribed by this ordinance as the minimum distance between the bank or ordinary high water level and the nearest structure.*

3. Evaluate parking and paving standards so the Township is not promoting excessive pavement.

Recommendation:

Several uses have higher than necessary parking requirements. Consider changing the following parking standards in Section 14.2(C), Off Street Parking Requirements (Commercial and Offices):

Open air businesses	*One (1) space for each eight hundred (800) square feet of lot area used of the open air business, plus parking for any principal use building and associated accessory uses.* (Separate the uses to keep the standard the same as it is for roadside stands.)
Personal Service Establishments	*Two (2) spaces for each service provider*
Retail stores not otherwise specified	*One (1) space for each three hundred (300) square feet. of usable floor area*
Video rental stores	*One (1) space for each three hundred (300) square feet. of usable floor area*
Banks, credit unions, savings and loan associations and other similar uses	*One (1) space for each four hundred (400) square feet. of usable floor area*
Medical and dental offices and clinics	*One (1) space for each four hundred (400) square feet. of gross floor area*
Offices not otherwise specified	*One (1) space for each three hundred (300) square feet. of usable floor area*

4. Consider changing the deferred parking provision and imposing a maximum parking requirement.

Recommendation:

#1 Section 14.2, A, 7 addresses deferred parking (nice work!). However, since the Planning Commission reviews most site plans, consider allowing them to be the approving authority for deferred parking. This would simply involve a change to the opening paragraph of Section 14.2, A, 7 from the Township Board to the Planning Commission.

#2 Add a new paragraph 8 to Section 14.2, A to read as follows; renumber existing paragraph 8 to 9:

8. Maximum Parking.

a. To minimize excessive areas of pavement which can reduce water quality, increase erosion and detract from community aesthetics, no parking lot shall exceed the minimum parking space requirements of Section 14.3, C, 3 by more than ten percent (10%) unless evidence is presented by the applicant that the additional space is needed .

b. In granting additional space, the Zoning Administrator or planning commission as appropriate, shall determine that the parking will be required, based on documented evidence of actual use and demand provided by the applicant or as justified through a specific parking study conducted by a professional qualified in the field.

c. Additional spaces may be held in deferred parking areas

5. Consider a change to lot coverage definition to include maximum percentage coverage of impervious or hard surfaces (pavement, structures, etc.) in addition to buildings.

Recommendations

#1 Add the following to the definition of "lot coverage," Section 2.13, *"Definitions L"*
LOT COVERAGE - The part of the lot occupied by any building, including accessory buildings, *parking areas, driveways, patios, decks and other impervious surfaces*.

#2 Increase the percentage of maximum lot coverage for each District to provide a more reasonable number.

Section 5.4 (Agricultural District Site Development Requirements) from 30% to 40%.
Section 6.4 (Forest-Recreation District Site Development Requirements) from 25% to 35%.
Section 7.4 (Low Density Residential District Site Development Requirements) from 20% to 30%.
Section 8.4 (High Density Residential District Site Development Requirements) from 25% to 35%.

Section 10.4 (General Commercial District Site Development Requirements) from 50% to 60%.
Section 11.4 (Industrial District Site Development Requirements) from 50% to 75%.

6. Use open space preservation design to protect surface waters, wetlands and natural drainage areas.

#1 Add the following definition to Chapter 2, Section 2.16:

***OPEN SPACE, USABLE**: That portion of the common open space which due to its slope, drainage characteristics and soil conditions can be used for active recreation.*

#2 Add the following provisions to Sections 12.9, D, 4 and 12B.9, D, 4:

a. Where an open space development abuts a lake or stream, at least fifty percent (50%) of the shoreline, as well as reasonable access to it, shall be a part of the common open space land.

b. At least one-third (1/3) of the common open space shall be usable open space. The open space and access to it shall be permanently marked and designed so individuals in the development are not forced to trespass to reach recreational or common open spaces.

c. Open space areas may not include golf courses, marinas, parking areas, the area within a platted lot or condominium unit, street rights-of-way, or utility easements.

d. Open space areas shall have minimum dimensions of fifty (50) feet on all sides.

#3 Add - a new # 8 and renumber the existing #8 to #9 to Sections 12.9, D and 12B, 9, D to require open space adjacent to the road, as follows:

8. To buffer the development and retain rural character, the Township Board may require that the development be set back a minimum of two hundred (200) feet from a public road. No vegetation shall be removed from this setback, nor any grading or changes in topography occur, except that necessary for entrance roads, required utilities or drainage improvements. The Township Board may require additional plantings to augment natural vegetation in cases where the setback has limited vegetation for screening.

#4 Replace Section 12.9, M (Standards for approval for Planned Unit Developments) with more definitive criteria:

M. The landscape and significant natural features shall be preserved, insofar as practical, by removing only those areas of vegetation or making those alterations to the topography which are reasonably necessary to develop the site. Particular care should be taken with natural drainage areas.

#5 Replace Section 12.B9, J (Standards for approval for Open Space Developments) with more definitive criteria:

J. The landscape and significant natural features shall be preserved, insofar as practical, by removing only those areas of vegetation or making those alterations to the topography which are reasonably necessary to develop the site. Particular care should be taken with natural drainage areas.

#6 Add new Sections 12.10 and 12B.10 after Sections 12.9 and 12B.9 and renumber the last two sections of the Chapter:

SECTION 12.10 (and 12B.10) BONUS DENSITY

A. The Township Board, upon recommendation by the Planning Commission, may permit an increase in the number of dwelling units permitted in an approved development in accordance with the table below for additional amenities provided by the developer.

Preservation of non-state regulated wetlands	*5%*
Each 10% additional open space provided	*5%*
10% additional common waterfront frontage provided	*5%*
Trails and formal recreation space provided	*5%*
Wildlife habitat augmented (per Soil Conservation Service Standards)	*5%*
Community wastewater disposal system	*25%*
Community water service system	*25%*

B. In no case shall the density bonus total more than fifty percent (50%).

7. Include general site development standards which require proper approvals before land can be cleared and expand the definitions to reinforce the description of significant natural features the Township wants to protect.

<u>Recommendations:</u>

#1 Add the following definitions to Chapter 2, Definitions:

Add to Section 2.4, Definitions - C

CLEARING LAND *- The removal of vegetation from any site, parcel or lot except when land is cleared and cultivated for bona fide agricultural or garden use in a district permitting such use. Mowing, trimming, pruning or removal of vegetation to maintain it in a healthy, viable condition is not considered clearing.*

Add to the end of the definition of " Significant Natural Feature," Section 2.19 "

...including woodlots, landmark trees, overgrown fence rows, vegetative cover, or other features that contribute to the rural character of the Township.

Add to Section 2.13, Definitions – L

***LANDMARK TREES** - Trees having a caliper of thirty six (36) inches or greater.*

#2 Add the following language to Chapter 3, General Provisions, creating a new Section 3.27:

SECTION 3.27 CLEARING OF LAND

Unless associated with a bona fide public works project, such as the installation of utilities or other similar activities conducted by, or on behalf of the state, federal government, county, or the Township, it shall be unlawful for any person to engage in land clearing in excess of a total site area of one (1) acre, including the stripping and removal of topsoil or existing vegetation, from any site, parcel, or lot within the Township without first receiving appropriate development approval.

#4 Hazardous Materials: Insert a new paragraph h to Section 14.1, D (this assumes that previous Recommendations have been inserted):

h. Facilities using hazardous materials shall meet the following:

(1) Hazardous materials associated with the land use shall be stored a minimum of two hundred (200) feet from any wetland, lake or stream

.

(2) General-purpose floor drains shall not be connected to septic systems.

(3) *Secondary containment facilities shall be provided for all hazardous materials of sufficient size to hold the entire volume of the materials. Containment areas shall be designed and constructed so that hazardous materials cannot escape from the immediate storage area by gravity flow through drains, soil or to surface waters.*

(4) Wells shall be properly maintained and sealed and abandoned wells shall be plugged and capped according to state requirements.

8. Place additional Specific Design Standards on Special Uses which have the potential to greatly affect water quality.

Recommendations: Add the following language to Chapter 15 (Special Uses), Section 15.6, Special Use Specific Design Standards:

#1 Add a new paragraph 7 to Section 15.6, M, Golf courses or country clubs:

7. Tees, greens and fairways shall be arranged in a manner to limit chemical runoff into wetlands or surface waters. An undisturbed natural vegetative buffer strip of

thirty five (35) feet shall be provided immediately adjacent to wetlands or water bodies.

#2 Add new subparagraphs a-c to Section 15.6, S, paragraph 13, Mining of natural resources:

a. Soil and gravel stockpiles shall not be located within two hundred (200) feet of wetlands or water bodies.

b. Extraction operations shall not occur within one hundred (100) feet of a wetland or water body.

c. An undisturbed natural vegetative buffer strip of thirty five (35) feet shall be provided immediately adjacent to wetlands or water bodies during excavation activities.

#3 Insert a new paragraph 16 (renumber existing paragraph 16 to 17) to Section 15.6, EE, Salvage yards, Junk yards:

16. Storage shall not be permitted within one hundred (100) feet of a wetland or surface water body.

#4 Insert a new paragraph 5 to 15.6, MM, vehicle wash establishment, either self-serve or automatic:

5. All wash bays shall be at least one hundred (100) feet from any wetland or surface water body.

D – III Muskegon Charter Township Zoning Ordinance Recommendations

NOVEMBER 15, 2001

Muskegon Charter Township
Recommended Zoning Ordinance Amendments
Related to Muskegon River Watershed

The following amendments address issues related to the Muskegon River watershed and are intended as amendments to the existing Muskegon Charter Township Zoning Ordinance. The article and section numbers are referenced to that ordinance.

OPEN SPACE DEVELOPMENT

Amend Section 58-72, with the addition of a new subsection (d) Open Space Development Regulations, to read in full as follows:

(d) *Open Space Development Regulations*

(1) Description and Purpose

a. The purpose of a Open Space Development (OSD) is to permit greater flexibility in development. The intent of the regulations is to foster the preservation of significant natural features and open spaces that would otherwise be developed but will be preserved as a result of the OSD.

b. The OSD provisions are not intended as a device for ignoring the requirements of this Ordinance nor are they intended simply as a means to increase density. Rather these provisions are intended to result in land development substantially consistent with the underlying zoning, but provide a degree of flexibility in design to allow for customization of design to meet the unique natural conditions of a particular site and innovation in design to create a higher quality development than could otherwise be possible with the underlying zoning.

(2) Qualifying Conditions - Not withstanding the General Requirements of Section 58-72 (b), the following shall be required of any Open Space Development proposal:

a. The tract of land for which a OSD application is received must be either in one (1) ownership or the subject of an application filed jointly by the owners of all affected properties.

b. The property within an OSD must have a minimum area of twenty (20) contiguous

acres. The Planning Commission may consider a lesser development size if the OSD site exhibits unusually valuable natural features or other unique conditions or location which warrant consideration as an OSD. The Planning Commission shall document these conditions in their minutes.

c. An OSD may only be applied for in lands located within a Rural Residential or R-1 District.

d. The applicant must demonstrate that the property proposed for the OSD contains unique site conditions, significant natural features, large open spaces, or active agricultural land, which would be otherwise be developed but will be preserved as a result of the OSD.

e. A minimum of fifty percent (50%) of the OSD must be in open space.

(3) Review Procedures

a. An Open Space Development shall be processed as a planned unit development in accordance with the requirements of Section 58-72, except as otherwise required by subsection 58-72 (d).

b. The OSD application shall be required to receive approval of a preliminary and secondary plan review in accordance with the requirements of Section 58-72 (c)(2) and (3).

c. In addition to the applicable requirements of Section 58-72 (c)(2) an Open Space Development application and preliminary plan shall include all the following information, unless the Building Official determines that some of the required information is not reasonably necessary:

1. Current proof of ownership of the land to be utilized or evidence of a contractual ability to acquire such land, such as an option or purchase agreement, or a signed agreement from the property owner(s) indicating permission to file such application.
2. Ten (10) copies of the Parallel Plan used to determine base density, meeting the requirements of Sec. 58-72, (c)(2).
3. Written documentation that the proposal meets the standards of 58-57 and , Sec. 58-72 (d)(6).
4. If a phased development is proposed, identification of the areas included in each phase. The density, lot area and setbacks of proposed housing units within each phase and for the total OSD.
5. Arrangement and area calculations for open space, including upland and wetland open space areas.

(4) Permitted Uses: Only the following uses, either singly or in combination, may be permitted within the OSD.

a. Single-family detached dwellings.
b. Accessory buildings and uses customarily associated with single family detached dwellings.
c. Agriculture.
d. Open space and recreational facilities for use by the residents of the OSD.
e. Public open space or open space and natural areas dedicated to a public or private non-profit organization or agency that shall ensure that the open space remains in place in perpetuity.

(5) Site Development Requirements

a. The minimum lot and yard requirements for residential uses shall be determined by the following chart. Minimum floor area and height regulations for dwelling units shall conform to the underlying Residential District requirements.

Services Provided	**Lot Requirements**			**Yard Requirements (Ft.)**		
	Area (Sq. Ft.)	**Width (Ft.)**	**% Coverage**	**Front**	**Each Side**	**Rear**
Individual septic system/well	RR - 20,000	80	20%	25	10	20
	R-1 - 10,000					
Either community or public sanitary sewer	8,000	70	30%	25	10	20

b. Land not proposed for development, but used for the calculation of overall density shall be considered open space and subject to the requirements of 58-72, (5).

c. Development Density

1. Parallel Plan: The maximum base density and number of dwelling units permitted in the OSD shall be determined through the submission of a parallel plan showing the number of dwelling units that may be developed under the existing zoning classification. The Planning Commission may require additional detail or information as it may determine necessary to evaluate the feasibility of the parallel plan. The parallel plan shall meet the following minimum requirements:

(a) The parallel plan shall contain enough detail to permit the Township to evaluate the feasibility of development for each lot.
(b) All lots or buildings shown on the parallel plans shall be located on buildable lots, which, for the purposes of this Section shall mean lots that are of sufficient size and shape to meet existing zoning requirements and accommodate a main building, septic and well systems (where no public sanitary sewer or water system is to be used), and required streets and driveways.
(c) Areas of wetlands, water bodies, and other unbuildable areas shall not be

included within buildable areas, but may be included in the lot area calculations.

(d) In evaluating the feasibility of the parallel plan, the Planning Commission shall consider whether or not the plan would have been approved under the processes normally used to review site plans or subdivision plans, including such factors as access, lot orientation, street layout, and other considerations the Commission deems appropriate.

2. Bonus Density

(a) In order to preserve the maximum amount of open space, the Planning Commission, may permit an Open Space Development an increase in the number of dwelling units above the base density established in the parallel plan, up to a maximum of sixty percent (60%) of the base density. The Open Space Development may be eligible for consideration of a cumulative density bonus in accordance with the following:

Facility/Open Space Provided		**Density Bonus**
Open Space Percentage (open space proposed to be included for the purposes of bonus density shall meet the Open Space Requirements of this Section, including minimum dimensions)	55%	Up to 10%
	60%	Up to 20%
	65%	Up to 30%
Providing walking trails/pathways through the entire OSD		Up to 10%
Providing active recreation areas (ball field, tennis court, tot lot, swimming pool, etc.) at a ratio of at least one facility per 25 dwelling units.		Up to 20%
Providing innovative design features, such as traditional neighborhood development, traffic calming measures, and other similar features.		Up to 30%

(b) The Planning Commission may elect to award all or a portion of the available bonus density. In determining the amount of density bonus to be awarded, the Planning Commission shall find that the design of the Open Space Development substantially meets the Description and Purpose of Section 58-72 (d) 1, and the Design Principles of Section 58.72 f (5). The Commission shall state its reasons for the amount of bonus awarded.

d. Open Space Requirements: Any open space provided in the OSD shall meet the following considerations and requirements:

1. Open space areas shall be large enough and of proper dimensions so as to constitute a useable area, with adequate access, through easements or other similar arrangements, such that all properties within the entire OSD may utilize the available open space.

2. The OSD shall have a minimum of fifty percent (50%) open space. Open space within an OSP shall have a minimum dimension of at least one hundred and fifty (150) feet in both length and width in order to be considered and counted as open space.

3. Evidence shall be given that satisfactory arrangements will be made for the maintenance of such designated land to relieve the Township of the future maintenance thereof.

4. Open space may be provided where significant natural features may be preserved and/or be used for passive or active recreation. Open space is encouraged to be located between neighborhood clusters of housing units.

5. All land set aside as open space shall be deed restricted, protected by conservation easement, or other similar permanent restriction, to ensure that the open space remains in a natural and undisturbed condition in perpetuity. Land set aside for agriculture may, at the discretion of the property owner(s) be converted to open space, but shall not be used as land for the construction of additional dwellings, nor used for any other development.

6. All open space shall be in the joint ownership of the property owners within the OSD. A property owner's association shall be formed which shall take responsibility for the maintenance of the open space.

e. Development Setback

1. Any building area, which for the purposes of this Section shall mean any lot on which a main use is located, shall be located at least two hundred (200) feet from any public street right-of-way not constructed as part of the OSD.

2. No native or natural vegetation shall be removed from the (200) foot setback, nor any grading or changes in topography occur, except that necessary for entrance roads, required utilities, or drainage improvements.

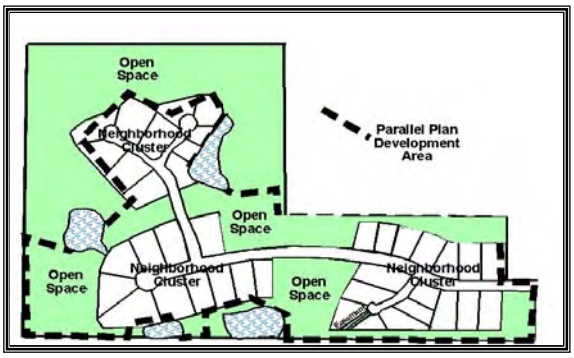
3. The Planning Commission may modify this requirement provided the applicant demonstrates that the clearing of existing vegetation would contribute significantly to the purpose and objectives of the OSD.

4. The Planning Commission may reduce this setback to not less than one hundred (100) feet if existing landscaping or topography provides a natural screen that substantially blocks the view to the proposed development. In such case the Commission may also require additional landscaping if necessary to further screen the development area. Such landscaping may consist of either existing vegetation, land forms, or landscaped areas using native or natural materials, or a combination thereof.

5. OSD sites abutting more than one (1) public street shall be permitted to reduce the setback on the shortest side of the abutting streets to one hundred (100) feet

without a natural screen. No native or natural vegetation shall be removed from the one hundred (100) foot setback, nor any grading or changes in topography occur, except that as may be necessary for entrance roads or utilities.

6. The Planning Commission may require a landscape plan for the development setback area showing additional landscaping to enhance the screening of the Open Space Development from the adjacent street. This landscaping may consist of either existing vegetation, land forms, or landscaped areas using native or natural materials, or a combination thereof.



f. Design Principles: The overall intent of the Open Space Development regulations is to foster more creative development design, using open space to the advantage of the development, maintaining the rural character of the township, ensuring access to open spaces, preserving natural features, and other design objectives intended to foster an improved living environment. To this end the following general guidelines will be considered by the Planning Commission in evaluating proposed Open Space Developments.

1. Open space should be provided where significant natural features may be preserved, active agricultural land maintained, or be used for passive or active recreation.

2. Open space should generally be used to group areas of residential neighborhoods as clusters of housing units. This is intended to avoid the suburban development type normally found in urbanized areas. Generally, neighborhood clusters should have not more than 10-15 units per cluster for smaller developments and 15-20 units for larger developments.

3. The Open Space Development should be designed with due regard for views from roadways as well as lots within the OSD.

4. Open space within the development should generally be accessible from as many places within the development as possible, rather than limited to individual easements between development lots. To this end, providing open space segments along the internal roadways will be considered a high priority by the Township. Such areas should be large enough to appear as open space, rather than a vacant lot for future development, and kept in their natural state. Such areas may, however, incorporate trails or other internal pedestrian circulation paths.

5. The overall design of the Open Space Development should emphasize the rural character of the Township, provide views to open spaces from as many areas of the development as possible, and avoid long, straight street segments and rows of

homes.

(6) Review Standards: The following review standards will be used by the Planning Commission and Township Board, in addition to the general standards of Sec. 58-57, in their consideration of a OSD. Before such developments may be approved the Planning Commission and Township Board shall find:

a. That the OSD meets the Description and Intent, and Qualifying Conditions of 58-72, (d), (1) and (2).

b. That the OSD does not substantially alter the character of the general neighborhood in which the development is proposed.

c. That the location of the buildings of the OSD do not unduly impact other single family uses in the vicinity of the proposed development.

d. That the OSD preserves, in perpetuity, unique site conditions, such as significant natural features; large, well placed and accessible open space areas; or active agricultural land.

e. That the OSD can accommodate adequate and safe disposal of sewage and can provide an adequate, assured source of water for domestic use.

f. The Planning Commission may require evidence from the applicant that groundwater sources will be protected and other environmental concerns met. Approval of the Muskegon County Health Department or other agencies may not be the sole determining factor in this regard. To this end, the Commission may specify additional evidence it deems necessary, including additional soil borings, soil reports, hydrological tests, and other such evidence which will be submitted by the applicant and reviewed by the Township prior to approval of the OSD.

NATIVE PROTECTIVE STRIP

Add a new Section 58-29, Native Protective Strip, to read in full as follows:

Sec. 58-29 Native Protective Strip.

(a) A minimum strip, at least twenty-five (25) feet in depth bordering each bank of any watercourse, as measured from the top of the bank, line shall be maintained in its natural vegetative state, except for the permitted clearing of dead or noxious plants or as otherwise permitted in this section.

(b) Within this strip, a space of no greater than ten (10) feet in width may be selectively trimmed and pruned to allow for the placement of walkways, and/or for a view of the waterway, with the approval of the Building Official. Any walkway constructed inside the strip shall be on the land side and may be oriented perpendicular or parallel to the water line. Because the intent of the native protective strip is water quality protection, porous materials such as wood chips or gravel shall be used.

(c) The Building Official may allow limited clearing of the vegetative strip, only when required for construction of a permitted building or structure outside the vegetative strip, provided that the land cleared is returned to a vegetative state which is approximately the same quality or greater and extent as that which existed prior to the clearing.

(d) Individual trees within the Native Protective Strip may be removed which are in danger of falling, causing damage to dwellings or other structures, or causing blockage of the watercourse.

(e) The Native Protective Strip shall not be used for any motorized vehicular traffic, parking, or for storage of any kind, including junk, waste, or garbage, or for any other use not otherwise authorized by this Ordinance

PARKING REQUIREMENTS

Amend Sec. 58-342, with the addition of new paragraphs (c) and (d) to read in full as follows:

(c) Parking Area Deferment

(1) Where the property owner can demonstrate that the required amount of parking is excessive, the Planning Commission may approve a smaller parking area, provided that area of sufficient size to meet the parking space requirements of this article is retained as open space.

(2) The site plan shall note the area where parking is being deferred, including dimensions and dotted parking lot layout.

(3) The property owner shall agree, in writing, to construct the additional parking at the direction of the Planning Commission based on observed use within six (6) months of being informed of such request in writing by the Building official.

(4) Stormwater calculations shall be provided to verify adequate stormwater storage capacity if an expansion is necessary.

(d) Maximum Parking Requirement

(1) To minimize excessive areas of pavement which detract from the aesthetics of an area and contribute to high rates of stormwater runoff, no parking lot shall have parking spaces totaling more than an amount equal to ten percent (10%) greater than the minimum parking space requirements, as determined by the Off-Street Parking Requirements of Sec. 58-341 (10) or Sec. 58-342 (a), except as may be approved by the Planning Commission.

(2) The Planning Commission, upon application may grant additional spaces beyond those permitted in (1), above. In granting such additional spaces the Planning Commission shall determine that the parking area otherwise permitted will be

inadequate to accommodate the minimum parking needs of the particular use and that the additional parking will be required to avoid overcrowding of the parking area. The actual number of permitted spaces shall be based on documented evidence of use and demand provided by the applicant.

SITE PLAN REVIEW REQUIREMENTS

Amend Sec. 58-486, Standards for approval, paragraph (3) to read in full as follows:

(3) Stormwater and Erosion Protection

(a) Appropriate measures shall be taken to ensure that removal of surface waters will not adversely affect neighboring properties, the public stormwater drainage system, or nearby bodies of water.
(b) Provisions shall be made to accommodate stormwater, prevent erosion and the formation of dust.
(c) The use of detention/retention ponds may be required.
(d) Surface water on all paved areas shall be collected at locations so that it will not obstruct the flow of vehicular or pedestrian traffic or create standing water that may interfere with this traffic.
(e) Areas of natural drainage such as swales, wetlands, ponds, or swamps shall be protected and preserved insofar as practical in their natural state to provide areas for natural habitat, preserve drainage patterns and maintain the natural characteristics of the land.
(f) Catch basins or other protective measures may be required to contain oil filters or traps to prevent contaminants from being discharged to the natural drainage system. Other provisions may be required to contain runoff or spillage from areas where hazardous materials are stored, or proposed to be stored.
(g) Compliance with the requirements of Sec. 58-487 shall also be demonstrated.

Appendix E

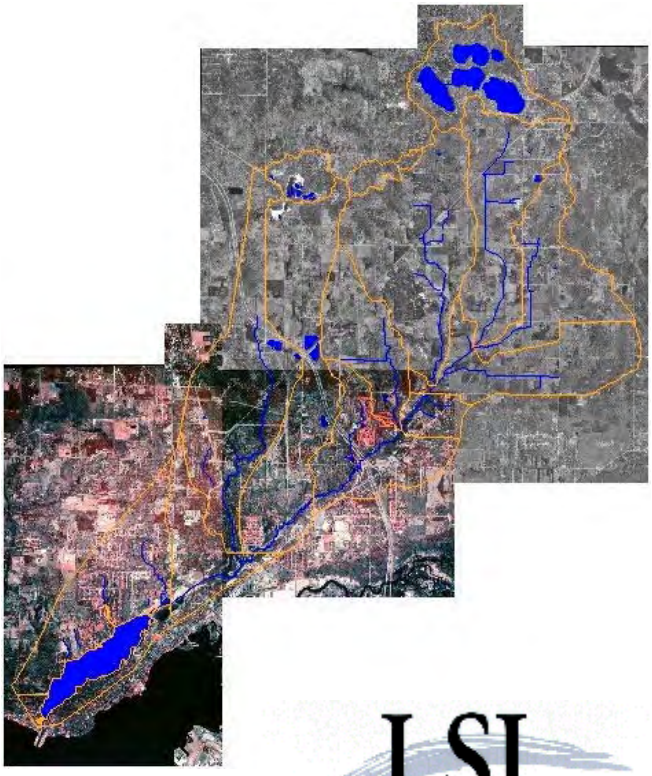
Site Plan Review Guide

Produced by:
Langworthy, Strader, LeBlanc, and Associates Inc.

Appendix E

Site Plan Review Guide For Water Quality Protection

BEAR CREEK WATERSHED PROJECT



Muskegon Conservation District

LSL
LANGWORTHY STRADER LEBLANC & ASSOCIATES, INC.

TABLE OF CONTENTS

PART 1 INTRODUCTION

PURPOSE 1-1

SITE PLAN REVIEW REQUIREMENTS 1-1

What is a Site Plan? 1-1
When is Site Plan Review Required? 1-1
Ordinance Requirements 1-2

SITE PLAN REVIEW DECISIONS 1-4

Conditional Approvals 1-4
Documentation 1-5
Post-Decision Documentation 1-6
Site Plan Amendments 1-6
Appeals of Site Plan Review Decisions 1-7

SITE PLAN REVIEW AND VARIANCES 1-8

SITE PLAN REVIEW - LIMITS OF AUTHORITY 1-8

CONCLUSION 1-9

PART 2 SITE PLAN REVIEW FOR WATER QUALITY ISSUES

BACKGROUND 2-1

THE MASTER PLAN 2-2

SURFACE WATER PROTECTION 2-3

Impervious Surfaces 2-3
Regulatory Measures 2-4
Site Plan Review Considerations 2-5

Stormwater Management 2-6
Regulatory Measures 2-7
Site Plan Review Considerations 2-8

Open Space Preservation Development
Regulatory Measures 2-9
Site Plan Review Considerations 2-10

Water Body Setbacks 2-10
Regulatory Measures 2-11
Site Plan Review Considerations 2-13

GROUNDWATER PROTECTION 2-13

Threats to Groundwater Quality 2-13
Regulatory Measures 2-16
Site Plan Review Considerations 2-18

PART 3 WHY ARE QUALITY SITE PLANS IMPORTANT?

REQUIRED SITE PLAN ELEMENTS 3-2

Identification 3-2
Narrative/Notes 3-4
Site Plan 3-4
Site Plan Details 3-5

“READING” SITE PLANS 3-6

Site Visits 3-6
Practice Makes Perfect 3-8

PART 4 SITE PLAN REVIEW - ANNOTATED ORDINANCE

SAMPLE SITE PLAN REVIEW CHAPTER 4-1

ANNOTATED ORDINANCE . . . . . 4-2 - 4-19

APPENDIX
SAMPLE ESCROW POLICY
SAMPLE ZONING APPLICATION FORM
SAMPLE ZONING APPLICATION CHECKLIST

PART 1 INTRODUCTION

PURPOSE

The purpose of the Site Plan Review Guide is to provide a set of general rules and procedures regarding the site plan review process, and to tailor that process to the needs of preserving water quality within the Bear Creek Watershed. The Guide is intended for the use of planning commissions, legislative bodies, and administrative officials to better acquaint themselves with the issues related to development and site plans that might affect water quality in the area.

The Guide consists of 4 parts:

- ❑ Part 1 Introduction and Site Plan Review Requirements
- ❑ Part 2 Water Quality Issues Related to Site Plan Reviews
- ❑ Part 3 Site Plan Elements
- ❑ Part 4 Site Plan Review Annotated Ordinance

SITE PLAN REVIEW REQUIREMENTS

What Is a Site Plan?

The Zoning Acts define a site plan as "the documents and drawings required by the zoning ordinance to insure that a proposed land use or activity is in compliance with local ordinances and state and federal statutes." The Acts allow the community to define the extent of the documents and drawings needed to make this determination.

TOWNSHIP ZONING ACT
Act 184 of 1943
CITY AND VILLAGE ZONING ACT
Act 207 of 1921
COUNTY ZONING ACT
Act 282 of 1945

This material will not deal with the other plan reviews needed for the construction of a structure, such as plumbing plans, etc. “Site plan” will pertain to the plans necessary to define the relationship of proposed structures to the land (e.g., natural features and wildlife habitat) and surface and ground water.

When is a Site Plan Review Required?

The Zoning Acts state that the community may "require the submission and approval of a site plan before authorization of a land use or activity regulated by the zoning ordinance." Before a site plan can be required, however, the ordinance must state which land uses or

REQUIRED
SITE PLAN REVIEW

A site plan review is *required* as part of any review of a special land use. or planned unit development.

activities will need approval.

The ordinance must specifically indicate the conditions under which a site plan will be reviewed. Any "body, board, or official" may be granted the authority to review site plans. The zoning ordinance need only specify what person or body will do so. It is also possible to divide these responsibilities between different bodies or individuals. A site plan will normally be reviewed in one of two ways: administratively, or by a Planning Commission or legislative body (e.g., Township Board).

An administrative review is that completed by a governmental staff member, such as the Building Official, Community Planner, Zoning Administrator, or other similar official. Generally, such uses or activities as single family dwellings on individual lots, home occupations, accessory buildings, etc. will receive an administrative site plan review, conducted prior to the issuance of a building permit.

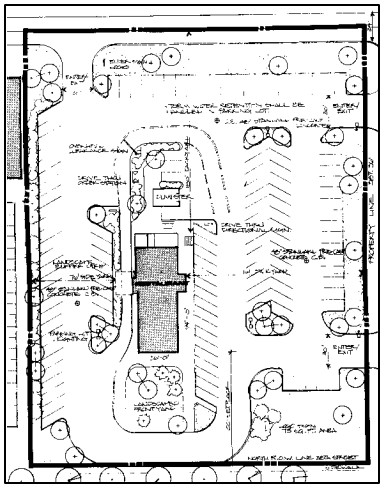
Other reviews may be accomplished through a public review procedure before a Planning Commission or legislative body.

Site Plans and Rezonings

One time that site plans should <u>not</u> be considered is when the community is reviewing a rezoning request. A site plan, in this instance, can be distracting. During a rezoning process, the Planning Commission and/or legislative body should not be swayed by what may be proposed by the petitioner. Instead, they must keep in mind that ALL of the uses permitted in the proposed district may be placed on the site; not just the one shown on the site plan. The only exception to this is when the site plan is part of rezoning process used to approve a planned unit development. In that situation, the plan becomes part of the rezoning approval.

Ordinance Requirements

If site plan review is to be undertaken by the community the Zoning Acts require the zoning ordinance to contain “the procedures and requirements for the submission and approval of site plans,” which are outlined below. The site plan process can also ensure that other permits and approvals are properly acquired, for example, county driveway approvals or state wetland and flood plain permits.



Sample site plan

Applications

Generally, a zoning ordinance should describe the application content and process to include:

- Site Plan contents (covered later in this Guide) and number of copies.
- Application submission deadline (usually between 14 and 30 days prior to the meeting at which the application will be first reviewed).
- Required fees.
- Application forms (see Appendix for examples).

A number of actions are needed before the site plan is actually reviewed before the Planning Commission. The first step is to ensure that the application is complete. The Zoning Ordinance should specify who will receive and accept the application. Before the application is accepted the form should be complete, the fee should be paid, and the site plan checked for the required information.

Of these, the last is the most important. The person designated by the ordinance to accept an application must be qualified to review the site plan to see that the necessary information is included. A check list approach is probably the best method to see that this is accomplished.

Fees

Fees for site plan review can be divided into two categories; application fees and review (escrow) fees. The application fee should be determined by evaluating the processing cost for a typical site plan. This may be determined by estimating costs for mailed notices (if notices are required), staff time needed for reviews, meeting expenses, and other regular processing costs.

A separate “escrow” fee may be used to pay for professional assistance from engineers, planners, attorneys, etc., to aid in the review of the site plan. With this procedure the applicant is required to submit a minimum estimated fee with the application submission which is then used to pay for the costs of the review. If additional fee is needed, the applicant must submit the required amount. If all of the fee is not used it is returned to the applicant. The Appendix contains an example escrow policy.

Process

Site plan review, when conducted without any

The key to any public review process is consistency. The procedures used for one site plan review should be apply to all.

other zoning approvals (such as a special land use), is the only zoning approval for which Zoning Acts do not require a public review or public hearing. As an administrative process, rather than one that permits a wide degree of discretion, it is generally considered that a public review is not necessary. Some communities, however, have elected to require some degree of public notice that may or may not include a formal public hearing process.

If the community desires a public notice, the zoning ordinance must include the requirements for that notice and whether or not a public hearing will be conducted. Notices may, for example, mirror the special land use or rezoning requirements, noticing property owners and occupants within 300 feet of the site involved in the review. Generally, a newspaper publication, required for special land uses and rezonings, is not necessary for site plan reviews. Compliance with the Open Meetings Act is also necessary.

The key to any public review process is consistency. The procedures used for one site plan review should apply to all. The community should not arbitrarily decide that reviews may be needed for one project but not for others.

Standards

Site Plan review regulations need to include what information must be on a site plan and standards for the Planning Commission to evaluate the proposed site plan against. As examples: the ordinance may require that natural features such as wetlands and wood lots be reflected on the site plan. A standard of review related to this information may be that the proposed development, to the extent possible, must limit the destruction of trees and wetland areas. The Planning Commission should also consider Master Plan objectives and any relevant studies available to them (e.g., water quality or habitat studies) while evaluating the site plan.

SITE PLAN REVIEW DECISIONS

Conditional Approvals

The Zoning Acts note the possible actions related to site plans as approval, denial, or approval with conditions.

- *Approval* certifies that the plan meets all the requirements of the community. When all requirements have been met, the approving authority *must* grant the approval.

- *Denial* states that the plan fails to meet one or more of those requirements. The specific requirement or standard that was not met must be clearly stated as part of

the denial.

A *conditional approval*, however, states neither. Rather, a conditional approval of a site plan means that the plan as it was presented failed to meet all of the standards and requirements of the zoning ordinance or other applicable laws, and that the conditions imposed are those necessary to ensure that those standards and requirements are met. Accordingly, any conditions imposed must be “tested” against this consideration. In other words, if the condition was not imposed, would one or more of the standards or requirements not be met?

Presumably, the approving authority for the site plan could simply table the approval until the plan was revised to meet the standards and requirements, and additional conditions would be unnecessary.

Documentation

Documentation of decisions is the last formal step in the site plan review process. Documentation takes place in the form of a motion.

Motions

The motion to approve, deny or approve with conditions should state the conclusion, and the rationale for the conclusion, indicating how the facts support the decision reached. A motion must have: a maker and supporter; a description of the nature of the request; the action taken (approval, approval with conditions, denial, tabling), any conditions attached to affirmative decisions; and, the reasons for the action taken (applicability of standards).

In some communities, discussion on the issue, if thoroughly documented in the minutes, may be adequate to provide enough information related to compliance with the standards of the ordinance. Otherwise, a summary of the discussion is appropriate. Referencing staff reports, when available, is also appropriate.

Some hints for making motions:

- Motions may have to withstand legal scrutiny; phrase it carefully.
- Be sure everyone is clear on the motion.
- Reference relevant sections of the ordinance and staff reports.
- Conditions may be imposed on any site plan review decision.

The motion should include who is responsible to ensure conditions are implemented, such as "a revised site plan shall be submitted to the Secretary of the Planning Commission or

Zoning Administrator to certify that all conditions have been met."

Post-Decision Documentation

The applicant and Secretary of the approving body should each sign at least 2 copies of the approved site plan. The applicant should keep one copy and the community at least one other. This provides a record of understanding of what site plan was approved and when. The Secretary should include the date of the approval.

Other procedures:

- A copy of the minutes should be sent to the applicant following review by the approving bodies.

- A letter should be sent to the applicant specifically noting the action taken by the approving body, including any conditions placed on the approval, if appropriate. This letter may include further instructions regarding the proposal. For example, if the approval granted was for a Preliminary Site Plan, the letter may state that Final Site Plan approval is necessary prior to issuance of a building permit. If other approvals are necessary, such as a variance, this should be noted as well.

Site Plan Amendments

From time to time it may be necessary for the applicant to change the site plan that was originally submitted, prior to construction. The Zoning Acts provide for amendments with the following provision:

> "If a zoning ordinance requires site plan approval, the site plan, as approved, shall become part of the record of approval, and subsequent actions relating to the activity authorized shall be consistent with the approved site plan, unless a change conforming to the zoning ordinance receives the mutual agreement of the landowner and the individual or body which initially approved the site plan."

Many ordinances use a "major" and "minor" amendment process, as follows.

1. The holder of a valid Final Site Plan notifies the Zoning Administrator of a proposed amendment to the approved site plan.

2. Minor changes are approved by the Zoning Administrator who may certify in writing to the Planning Commission that the proposed revision does not alter the basic design or specified conditions of the plan placed by the Planning Commission. This

confirms that the amendment is "consistent" with the approved plan, as required by the Zoning Act.

Minor changes may include:

- Reduction of the size of any building and/or sign.
- Movement of buildings and/or signs by no more than ten (10) feet.
- Replacement of landscaping plants by similar materials.
- Changes of building materials to a higher quality.
- Changes in floor plans which do not alter the character of the use.
- Internal rearrangement of a parking lot which does not affect the number of parking spaces or alter access locations or design.
- Any changes required or requested by the community for safety.

3. Should the Zoning Administrator determine that the amendment is not a minor one, the site plan must be resubmitted and a new site plan review conducted in the same manner as the first application.

Appeals of Site Plan Review Decisions

The Zoning Acts require that only the Zoning Board of Appeals be authorized to hear and decide appeals from any administrative decision, including a site plan review, either by an administrative official or body (Planning Commission). Appeals must be filed within the time set in the ordinance. The ZBA can reverse or affirm, wholly or partly, or may modify the prior decision made by the administrative body or official from whom the appeal is taken.

However, the appeal is not an opportunity for the applicant to present additional evidence to convince the Board of Appeals to reach a decision different than that of the individual or body being appealed. The deliberation of the ZBA will be based on the record presented to the reviewing authority to determine whether or not the decision made was appropriate and related to the standards applicable to that decision. In other words, did the reviewer make the decision using the proper standards and procedures?

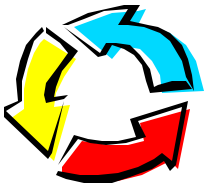
If the ZBA finds that the individual or body used the proper procedures and considerations in making their decision, the appeal should be denied. If, on the other hand, the ZBA finds an error in the manner in which the decision was reached, they may grant the appeal.

However, granting the appeal does not automatically reverse the action of the original decision maker. Rather, it simply means that the ZBA may now become the decision maker for the site plan review. As such, the decision of the ZBA is limited to an exercise of the same powers as those of the administrative party. Review standards must still be

considered and a decision rendered.

An appeal of a decision by the ZBA goes to Circuit Court. The legislative body does not have the authority to override ZBA decisions.

SITE PLAN REVIEW AND VARIANCES



A common dilemma faced by communities is dealing with a site plan that requires a variance. This is often referred to as a “chicken and egg” issue in zoning. Which should come first, the approval of the site plan, made subject to the approval of the variance; or should the variance issue be decided before the site plan is reviewed?

While there is no one answer for this situation, a policy of dealing with variances prior to site plan review has the least potential for causing problems. If, for example, a site plan was approved pending action on a significant setback variance, and the variance was subsequently denied, the plan would likely have to be returned to the approving authority for further action. If, though, the variance was heard first, and denied, the plan could be altered to meet the setback requirement of the ordinance and processed.

On the other hand, there may be some circumstances where a required variance would not create a significant change to the plan. For example, a variance for a larger wall sign than allowed by the ordinance would not necessarily affect the location of the structures, parking, and other site elements. Accordingly, the plan could be approved subject to hearing that variance request.

SITE PLAN REVIEW - LIMITS OF AUTHORITY

As noted earlier, the authority to review site plans comes directly from the State Zoning Acts. Used properly, this authority can be a powerful tool to ensure that land use and environmental effects of land development are adequately considered. However, site plan review authority is not unlimited; the Zoning Acts define some practical limits on the ability to review and alter submitted plans. These limits are imposed by review standards that are required to be placed within the ordinance and considered by the approving authority for all site plans.

The Act requires that the zoning ordinance (and/or other applicable ordinances and laws) contain the various requirements and standards by which the site plan will be evaluated. The purpose of this is to permit an applicant or potential applicant to know the means by which the plan will be evaluated and approved.

> *Decisions rejecting, approving, or conditionally approving a site plan shall be based upon requirements and standards contained in the zoning ordinance, other township planning documents, other applicable ordinances, and state and federal statutes.* (Township Zoning Act MCL 125.286e)

The requirement for standards is also intended to prevent decision makers from imposing requirements and conditions that are completely unrelated to the ordinance requirements or the site plan and the land development issues affected by the plan. For example, site plan approval could not be conditioned on a requirement for an applicant to make off-site improvements, such as installation of traffic signals at nearby intersections.

Further, another requirement of the Zoning Acts state that if the standards and requirements of the zoning ordinance and other applicable ordinances are met, site plan approval must be granted.

> *A site plan shall be approved if it contains the information required by the zoning ordinance and is in compliance with the zoning ordinance and the conditions imposed pursuant to the ordinance, other township planning documents, other applicable ordinances, and state and federal statutes.* (Township Zoning Act - MCL 125.286e)

CONCLUSION

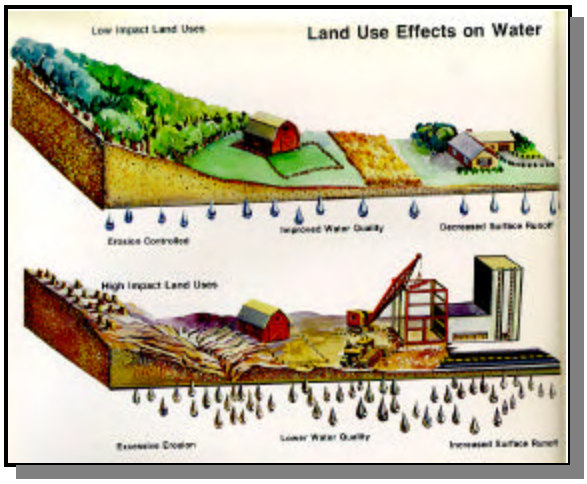
Site plan review can be a powerful tool for the community to protect its character, environmental resources, and quality of life. However, this process is only as effective as having well-written regulations, knowing and using proper procedures, and insisting on quality development.

PART 2
SITE PLAN REVIEW FOR WATER QUALITY ISSUES

BACKGROUND

Increased development and a growing population can bring with it demand for public water and sewer, improved roads and the need for stormwater management. Higher density residential development and commercial and industrial uses can have marked effects on water quality. There is an integral relationship between water quality, and the intensity of land use. The Bear Creek/Bear Lake watershed is already experiencing significant growth, for example, in just five years (1990-1995) the population increased 5.6%.

Residential uses . . . . . people live by water bodies for aesthetics and recreation
Agricultural uses . . . . . water bodies are often part of a farm
Industrial use . . . . . water is often used for processing and wastewater discharge



Water resources are part of a fragile system which is at risk. Generally, protection and/or improvement of water quality takes place in two arenas; surface water quality - lakes, streams, rivers and ponds - and groundwater quality. The preservation of water quality is important for plant and animal life, tourism, recreation, and drinking water supplies.

Site plan review, and the ability to take into account surface water and groundwater protection measures, are critical parts of the community's efforts to protect these vital elements of the Bear Creek Watershed. The following discussion briefly describes various water quality related issues and regulations, and further describes those considerations (i.e., standards in the regulations) that should be made during the site plan review process.

A more detailed discussion of regulatory measures may be found in a separate publication related to the Bear Creek Watershed Management Plan.

THE MASTER PLAN

In the long run, it is more affordable to protect our water resources than it is to try to restore them. Effective planning can be a step in the right direction!

Protecting water quality can mean that communities consider how much land they have planned and zoned for various uses. Accordingly, a broader approach to protecting water quality and the sensitive natural resources in the Bear Creek watershed might be taken through a comprehensive review of the master plans and zoning maps of each community. The objective is to ensure that the planned and zoned uses in the community are at the appropriate level. Some basic questions might be:

- Can the expected community or regional population support the planned commercial areas?
- Did the planned areas for growth consider environmental limitations, such as the capacity of the soils to accommodate individual septic systems? Was the presence and efficient use of existing or planned infrastructure considered, particularly public water and sewer services?
- Are there plan objectives and ordinance standards in place to protect natural resources and wildlife habitat including measure to protect wood lots, wetlands, natural drainage areas, surface water, steep slopes and other elements of rural character?
- Can existing infrastructure support planned residential, commercial, and industrial areas?
- Will the expected development and related population growth and infrastructure harm the quality of life enjoyed by the current residents?
- How will the expected development and population growth effect the community?

If these questions raise concerns about the need for the amount of land planned and zoned for intensive development, a comprehensive review of the community's Master Plan and zoning map is necessary.

Protection of surface and groundwater resources requires efforts on several fronts, including the need for regional planning, land planning for individual sites, and technological advances that may offer alternative solutions. Regional planning must be based on the entire watershed; it will do little good for one community to implement

solutions to its problems only to find that neighboring communities do not. Water resources have no respect for community boundaries.

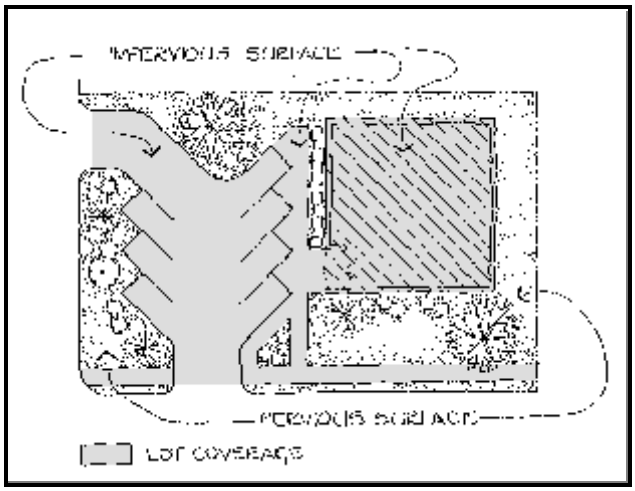
SURFACE WATER PROTECTION

One direct effect of land use planning is its effect on runoff and water quality. Typically development equates to impervious surface which equates to changes in the functioning of a watershed. Surface water features - lakes, streams, rivers, and ponds - are directly affected by land development. Development activities, including soil erosion, creation of impervious surfaces (such as parking lots and roofs), as well as recreational activities affect surface water quality.

An important element to surface water protection is the need to moderate the effects that recreational and development activities have on surface waters. Overuse of lakes and other inland and lakeshore areas will, over time, degrade water quality through over fertilization, small gasoline and oil spills, stirring of lake bottom sediments, among other effects. These activities also have an effect on shoreline erosion.

Impervious Surfaces

Non-point source pollution poses one of the greatest threats to surface water. Rather than occurring from one major source, like a sewage treatment plant or industrial use, non-point source pollution results from rainfall or snowmelt moving over and through the ground. As this runoff water moves, it picks up and carries away natural and human-made pollutants and deposits them into water bodies, wetlands, and groundwater. Large amounts of stormwater flowing over sun-warmed pavement also warms lakes and streams, causing thermal pollution.



In the rural areas of Michigan, including the Bear Creek Watershed, sources of non-point contamination include a combination of agricultural runoff, lawn chemicals, salt, oil and grease from pavement, and soil erosion. Of these, the control of impervious surfaces (such as roofs and roads), from which stormwater runoff flows is an area where local governments may have a significant influence.

Impervious surfaces may cover anywhere from five to ten percent or more of a residential site, and substantially higher portions of non-residential development. Smaller sites, in particular, may have significantly higher coverages, particularly those commercial and industrial uses with large parking areas. Higher percentages of impervious surfaces will considerably change not only quantity, but quality of runoff from roads, buildings and parking lots.

Traditionally, channelization, dams, and storm sewers have been used to control the effects of runoff from development and increased impervious surfaces. While these measures may reduce flooding potential by diverting water, they tend to accelerate the water quality degradation. Measures like vegetative buffers, on-site stormwater control and limiting impervious surfaces are less expensive in the long run, and they protect surface water quality.

Regulatory Measures

Impervious Surface Limits: Ordinances with little or no emphasis on managing stormwater or water quality will generally only enforce lot coverage limits on those areas covered by main and accessory buildings. However, the most effective definition for purposes of water quality protection will include limits on all impervious surfaces (like parking lots):

> *Any material that substantially reduces or prevents the infiltration of water into previously undeveloped land. For purposes of this Ordinance, an impervious surface shall include streets, roofs, sidewalks, patios, parking lots, and other similar surfaces.*

Regulatory measures first require this new definition of impervious surfaces be placed within the Definitions chapter of the Zoning Ordinance. In developing appropriate regulations, each zoning district should contain a limit on the amount of impervious surfaces on a site and the distance impervious surfaces can be from wetlands or water bodies. The percentage impervious coverage limits established for each district must take into account the nature of the uses permitted, including such factors as required parking areas, building sizes, landscaping requirements, etc. Generally, the percentages used will be higher than what is often found in Zoning Ordinances that only measure lot coverage through limits in building area.

Parking Requirements: One possible change to the zoning requirements is gaining acceptance in areas where impervious surface runoff is of particular concern. Most parking requirements address "minimum" numbers of spaces, but permit any size parking area to be constructed. Some communities are now utilizing a concept of "maximum" parking requirements to ensure that parking lots are not overbuilt. Generally, the maximum requirements can not be exceeded without specific justification by the developer.

There are several implications to this method of enforcing parking requirements, including the possibility of requiring some parking areas to be removed when changes of use occur that would require a lower maximum parking requirement than the previous use.

Another related regulation is the use of "deferred" parking. This regulation permits individual uses to build fewer parking spaces than required by the calculation of the Zoning Ordinance. Applicants that can demonstrate the need for fewer parking spaces may request that parking area be set aside, but not paved until needed.

In approving a deferred parking arrangement, the site plan must clearly show the deferred area, and include specific provisions that preserve that area from future development of any use but parking. Should either the applicant or the community determine that the additional spaces are needed, they must be constructed in the deferred parking area. In the meantime, however, that area is either kept in a natural state, or at least not covered by impervious materials.

Model Development Principles Related to Parking Requirements

- The required parking ratio governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking space construction. Existing parking ratios should be reviewed for conformance taking into account local and national experience to see if lower ratios are warranted and feasible.
- Reduce the overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in spillover parking areas.
- Provide meaningful incentives to encourage structured and shared parking to make it more economically viable.
- Wherever possible, provide stormwater treatment for parking lot runoff using bioretention areas, filter strips, and/or other practices that can be integrated into required landscaping areas and traffic islands.
- Setbacks to surface waters.

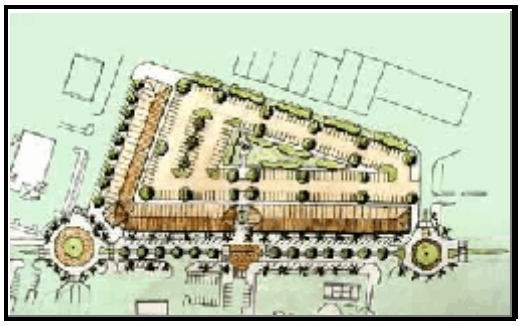
Better Site Design: A Handbook for Changing Development Rules in Your Community, Center for Watershed Protection

Site Plan Review Considerations

Site plans should clearly indicate those areas covered by impervious surfaces, both to allow a determination of whether the regulation has been met, and to see where the drainage from those surfaces is to be directed.

Special attention should be directed to larger, contiguous impervious surface areas.

- The site plan should include information on the percentage of impervious surfaces. The community may also require the plan to highlight impervious areas, either by using cross-hatching or otherwise calling attention to the areas.



- During the review, emphasis may be placed on potential areas where impervious surfaces might be reduced, or broken into smaller areas. Use of landscape islands in large parking lots, for example, may accomplish both objectives.

- If the deferred parking arrangement is used, the planned parking area must clearly be indicated. (Note that stormwater calculations and requirements may change if the deferred parking is constructed.)

Using Experts

Most planning commissions and other lay-reviewers will not have the background necessary to properly determine whether engineering standards and requirements have been met. It is both necessary and appropriate to rely on outside consultants or staff advisors to ensure that drainage and other engineering considerations have been adequately addressed.

Stormwater Management

Ideally, a civil engineer would want stormwater to be managed in a fashion that would not substantially alter the natural hydrologic regime, especially as it relates to the quantity of runoff (from rainfall) versus infiltration within a watershed. To a planning commission, this means that the land should be disturbed as little as possible. Curb and gutter are not a desirable or necessary solution to manage storm water runoff because it channels stormwater which can cause more environmental damage.

As more development takes place, either on large projects or on small home sites, the disturbed land loses its ability to hold soil in place. Natural vegetative cover is replaced by roof tops, roadways, parking lots, and other impervious surfaces. The increase in impervious area will greatly increase the rate and volume of runoff and decrease water infiltration into the ground. If water cannot filter into the ground it is more likely to carry pollutants to surface waters.

As a result of these newly developed impervious areas, rainfall can easily overcome the ability of soil to remain in place. As rainfall hits the disturbed soil it has two choices; if on flat ground some may percolate into the groundwater; the remainder will either pond on the site, or find the most direct route available to run off the site, taking soil and pollutants along with it in the form of stormwater.

To address this potential problem, many communities have adopted standards that require post-development rates of runoff not exceed pre-development runoff rates. This is generally accomplished by detaining or retaining stormwater to control the rate at which runoff is allowed to leave the development site. If stormwater facilities are properly designed, significant water quality benefits can be realized, which in turn, protects aquatic wildlife habitat. Various stormwater management alternatives can be employed to accomplish these objectives.

Regulatory Measures

> *Detention* involves temporarily detaining stormwater and releasing it to a planned location at a controlled rate. With *retention*, stormwater is held indefinitely with no discharge. Stormwater is allowed to infiltrate into the ground rather than flow from the site.

As noted above, regulations related to stormwater management are normally found in separate ordinances or adopted construction standards. There are, however, some other land development related regulations that may be effective in managing stormwater, as well as preventing excessive sedimentation or erosion.

> *Note: Some of the measures used in surface water protection, as described in the next section, are also effective in helping manage stormwater runoff.*

The community may adopt a requirement for a Stormwater Management Plan, either as part of the zoning review, or as a separate ordinance requirement. Site-level stormwater management plans are generally composed of maps and a narrative. The maps and associated construction drawings show existing site features and proposed alterations highlighting the location and type of proposed stormwater management system.

The narrative consists of a written statement explaining the natural and proposed drainage system, a detailed description of projected runoff quantity and quality and an explanation of why certain management practices were chosen for pollution control. Highlighted should be a detailed description of the relationship of the proposed development to drainage and runoff within the entire watershed (within reference to a watershed management plan should one exist). Provisions for site safety and maintenance of approved management measures should also be included.

The Plan must be prepared and sealed by a professional engineer. The ordinance language should also require a performance bond, cash escrow, certified check, or other acceptable form of performance security in an amount sufficient to ensure the execution of the Stormwater Management Plan. In addition, a maintenance agreement which details ownership and financial responsibility for the operation and maintenance of stormwater management facilities should be required.

More detailed information on this subject is available through other Bear Creek Watershed planning efforts. In general, when standards are set for stormwater flow limits, communities should make sure their engineers are familiar with hydrologic modeling studies conducted specifically for the watershed and "phase II" stormwater requirements which have set stricter national criteria for stormwater management.

Site Plan Review Considerations

As noted earlier, reviewing authorities should rely on professional assistance to ensure that stormwater management is properly designed and integrated into the site plan. There are, however, some basic principles that can be followed during the site plan review process. To protect water quality and hydrology in the Bear Creek Watershed, it is essential to properly manage stormwater on newly developed sites.

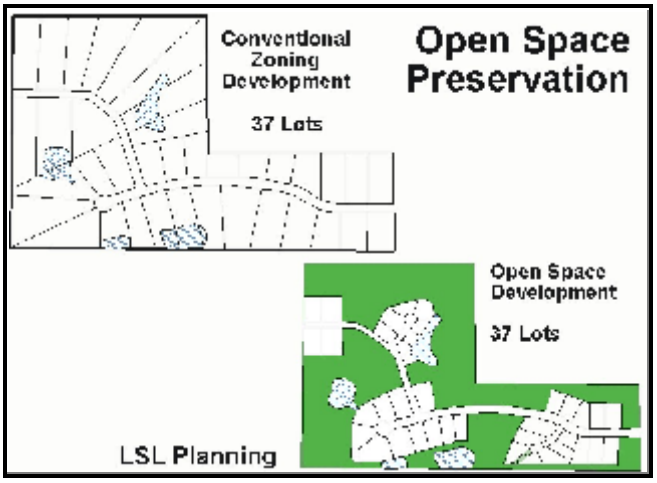
- The development should be planned to fit the particular topography, soils, waterways and natural vegetation of the site. The goal is to minimize the amount of exposed soil and to prevent major disruptions of existing drainage patterns (unless corrections to the natural drainage would eliminate existing or potential problems).

- Expose the smallest practical area of land for the shortest possible time, by scheduling and staging project activities. The site plan review process may be used to require the applicant to designate phases, including their timing, to lessen the overall effects that may occur at one time.

- The location of stormwater facilities must be sensitive not only to the natural drainage flow, but also to the proposed uses on the site and adjacent existing or future uses. To the extent possible, drainage facilities (detention/retention ponds or vegetative filters and buffers) should be placed in common areas, rather than made part of an individual lot.

- Detention/retention facilities and vegetative buffers facilities should also be attractively designed to look as natural as possible, through the addition of landscaping or use of a contoured design, for example.

Open Space Preservation Development



Water quality protection is a further incentive for the clustering of residential units, also known as Open Space Preservation Development. Under this development technique the allowable density is based on a "parallel plan" showing reasonable and permissible development under existing zoning. While Open Space Development may increase the net density for a smaller area of a larger parcel, the overall density would still fall into the requirements of the existing zoning.

It would also allow for the preservation of significant natural features, provide open space for recreation and wildlife habitat, allow the continuation of farming of interior land areas and decrease the overall amount of impervious surfaces. To preserve the roadside character, some or all of the required open space could be placed abutting the roadway. The open space can be placed in a conservation easement to permanently preserve the space. The preservation adds to the aesthetic beauty of the development in addition to improving water quality and providing wildlife habitat.

Regulatory Measures

In 2001, the Michigan legislature passed legislation mandating that local governments provide zoning regulations related to "open space preservation." The provisions of the law do not apply to communities that had open space provisions in their ordinances prior to October 1, 2001. However, the regulations must have been used by at least one residential project that permanently preserved at least 50 percent of the land within the development for townships, or 20 percent for cities and villages. Communities can also promote higher percentages of open space areas through incentive-based zoning.

The provisions apply to a "qualified" township, city or village. To be "qualified" the community must have a zoning ordinance, a population of 1,800 or more, and have residentially zoned land with a minimum lot size of one-half acre (2 units per acre or 21,780 square feet) without public sewer, or 14,520 square feet (3 units per acre) with public sewer.

The open space provisions are to be provided as an “option” to the land owner. Regulations added to the ordinance must provide a minimum of 50 percent open space in townships and 20 percent in cities and villages and that the open space be permanently protected from development by some legal means that assures its preservation.

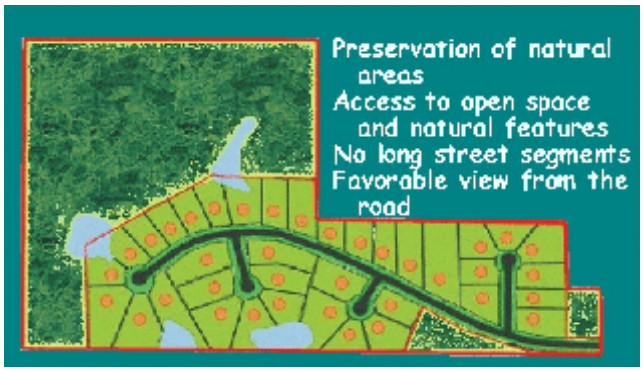
Open space preservation development requires a careful analysis of the natural features of the site.

Two other provisions require that the development not be dependent on an extension of either public water or public sewer systems (unless those systems would otherwise be required even without the open space option), and that the affected land had not already been developed under an open space provision. The open space preservation provisions do not override any applicable ordinances or laws related to groundwater protection or approval of sanitary sewer disposal systems where public systems are unavailable.

The act broadly defines open space (“undeveloped state”) with a golf course as the only specific exclusion from consideration as open space. While the act does not require that the open space be usable for recreation or other uses, local ordinances can require that at least a certain portion of the open space be useable (e.g., not underwater).

Site Plan Review Considerations

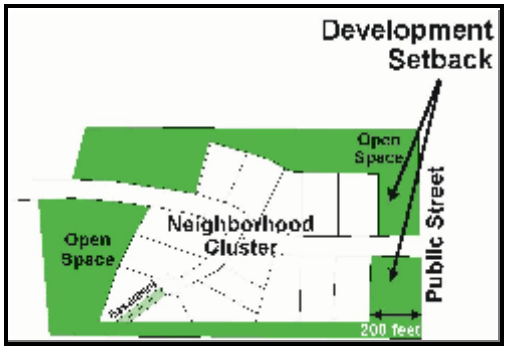
To properly utilize Open Space Preservation Development regulations, it is necessary to require applicants to submit detailed information regarding the presence of natural features, topographic conditions, soils, natural drainage ways, and other site characteristics that might affect the layout of the development. Significant views may also be highlighted that might contribute to a high quality development.



Open space should be provided where significant natural features, wildlife habitat and

active agricultural land can be preserved. Open spaces can be used for passive or active recreation and as stormwater buffers. By connecting open space areas from several developments, wildlife corridors result, which provides routes of travel to help promote their survival.

Another development technique, useful where natural areas are scattered throughout the site, is to cluster lots in small groups (perhaps from four to ten lots in smaller developments, to as many as 15-20 in larger developments), with open space between clusters. Emphasis should be on the creation of smaller, more cohesive neighborhoods, as opposed to long linear stretches of homes. Creating these small clusters helps promote a sense of community. Larger expanses of open space should be used to separate the neighborhoods.



A “development setback” should be included that provides a substantial open space area between existing access roadways and the building sites within the project. The development setback area should remain in as natural a state as possible, with only the street and necessary utilities requiring land disturbance. These areas become part of the conservation easement and are restricted from the future development.

Consideration of traffic patterns for both vehicles and pedestrians is also important. Nature and walking trails provide an attractive element to an Open Space Development, but must be planned and constructed carefully in order to be functional and remain in character with the area. Trail materials must be durable to avoid future maintenance issues. For example, materials such as wood chips, while natural, require frequent replenishment.

Water Body Setbacks

In proximity to water features, construction and other activities can decrease water quality through soil erosion, nutrient or chemical runoff, and removal of filtering vegetation. Buffer zones around surface water features where vegetation removal or soil disturbance is minimized can help maintain water quality.

Regulatory Measures

<u>Overlay Zoning</u>

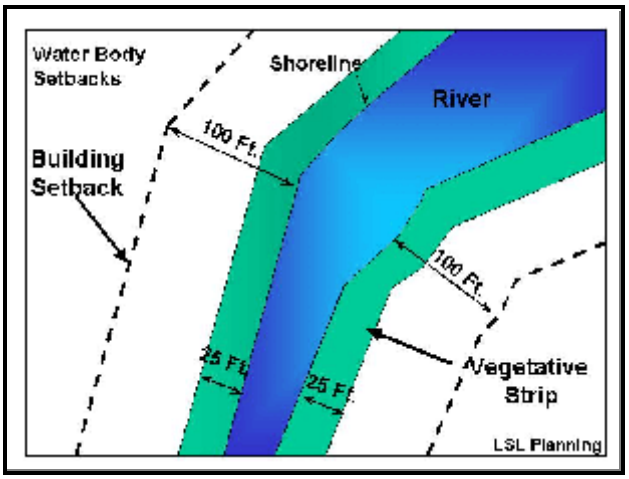
Overlay zoning is the application of an additional set of regulations to an established zoning district. Areas commonly targeted by overlay zones include: floodplains, watersheds, lake shore lands, river and tributary corridors, threatened and endangered species habitat, groundwater recharge areas, high risk erosion areas, historic districts or economic revitalization areas. Overlay zoning can be used to help ensure uniform regulations are in place across several zoning districts or political jurisdictions.

The benefits of using an overlay zone include:

- The preservation of natural features and wildlife habitat (e.g., a greenbelt along a river);
- Response to land use issues that affect multiple zoning districts;
- The enhancement of public awareness of a valuable resource; and
- The preservation of character continuity between districts.

Vegetative Buffers

A greenbelt or vegetative buffer is an area of natural or established native vegetation. By reducing runoff, greenbelts help reduce pollution transport to lakes and streams both protecting aquatic habitat and preserving waterfront habitat. An overlay zone could be used to preserve natural vegetative buffers along a stream that meanders through several zoning districts or political jurisdictions.



- Setbacks from inland lakes and streams can be established through the zoning ordinance. Regulations may specify a minimum shoreline setback (often up to 100 feet or more) for structures and septic systems.

- Setback requirements may include the preservation of at least a 25 -foot wide native, uncleared vegetation buffer strip immediately adjacent to the shoreline.

- Requirements in the vegetative buffer zone may include limited use of fertilizer and pesticide applications.

- Boat storage and dock facilities may also be regulated.
- Some communities enforce larger setbacks for agricultural operations and livestock management (e.g., a minimum of 35 feet).

Greenbelts or vegetated buffers are an effective way to address soil erosion and the effects of runoff on surface water quality. The attraction of surface water for residential or other land uses often leads to the desire for additional views to the water by clearing vegetation along streambanks and lake shorelines. This contributes to reduced water quality and often leads to the eventual loss of aesthetic value and the degradation of the environment (e.g., it can degrade a cold-water trout stream).

Site Plan Review Considerations

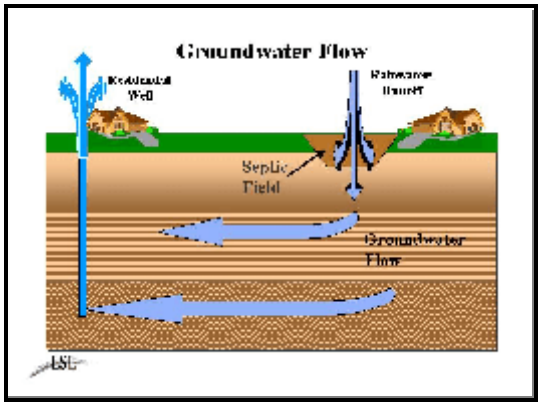
Maintaining Vegetative Strips

One of the more difficult aspects of vegetative strip is ongoing enforcement. As new property owners purchase homes the maintenance requirements may not always be clearly communicated. As a result, it is important for the community to undertake an on-going education effort to both alert property owners of the importance of the vegetative strip as well as the

There may be many instances in which a site plan related to water body setbacks or vegetative buffers are not seen by a planning commission. Often, the regulations apply to individual single family lots, which are typically not part of the site plan review process. However, for those cases where non-residential, or larger residential developments are subject to site plan review, the submitted plans should clearly show the locations of all water body setbacks and vegetative strips. In addition, information from the applicant should be obtained regarding the methods by which the future homeowners or property owners will be informed about the presence of these features, and the restrictions that will apply to them (e.g., limiting lawn chemical use).

GROUNDWATER PROTECTION

Threats To Groundwater Quality



Any substance that is placed or injected in the ground has the potential to affect groundwater quality. Businesses such as dry cleaners, photographers and hair salons serve as examples of potentially hazardous land uses due

to the types of chemicals they routinely use. If these businesses operate on individual well and septic service, the chance of groundwater contamination, through an accidental spill or mishandling, is especially high.

Other businesses normally considered environmentally sound, such as golf courses, can actually threaten groundwater. These businesses often use relatively large amounts of lawn fertilizers, pesticides and other chemicals and can cause temporary "drawdowns"[1] of the water table with irrigation systems, affecting nearby uses.

The cumulative impact of individual homes using lawn chemicals can also threaten groundwater quality. Directly applying chemicals to the ground for any land use presents an uninterrupted opportunity for groundwater contamination. Such groundwater contamination could cost a community millions of dollars to remedy if groundwater is a primary water source. A recent report by the Geophysics Study Committee of the Commission on Physical Sciences, Mathematics, and Resources (National Research Council) stated:

> "Groundwater contamination may be localized or spread over a large area, depending on the nature and source of the pollutant and on the nature of the groundwater system. A problem of growing concern is the cumulative impact of contamination of a regional aquifer from nonpoint sources (i.e., those that lack a well defined single point of origin), such as those created by intensive use of fertilizers, herbicides, and pesticides. In addition, small point sources, such as numerous domestic septic tanks or small accidental spills from both agricultural and industrial sources, threaten the quality of regional aquifers."

The *State of Michigan Comprehensive Groundwater Protection Program,* published by the Michigan Department of Environmental Quality reports that:

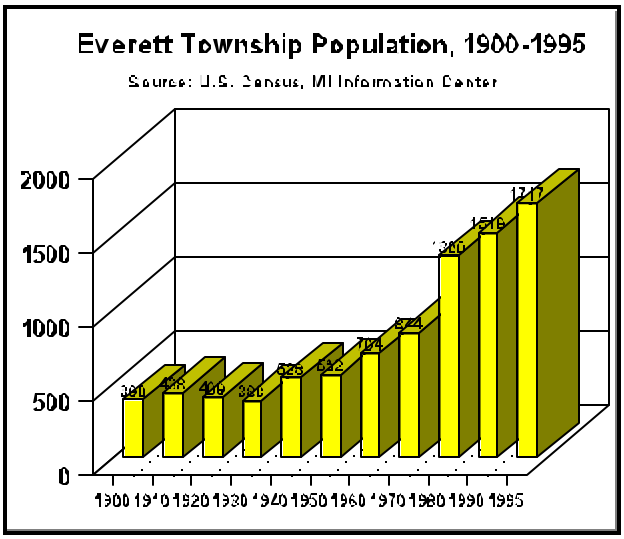
> "(A)bout half of all Michigan residents depend on groundwater as their primary source of fresh drinking water - either through public water supply systems or private drinking water wells. For many communities, groundwater is the only possible source of fresh water for drinking. Cleanup of groundwater contamination sites is expensive and slow, and often creates hardships for the persons affected."

Septic Systems

Because septic systems are underground, they are often ignored, even by people who use

[1] The groundwater table can temporarily be lowered, or a drawdown can occur, if too much water is pumped too rapidly out of the ground.

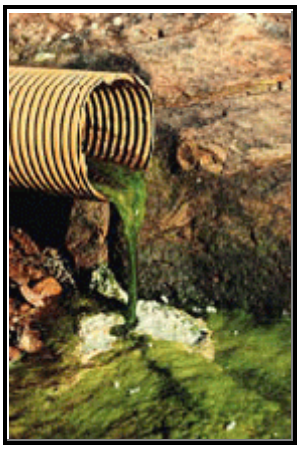
them. But with septic systems, “out of sight” should not mean “out of mind.” Failing septic systems can introduce several contaminants into groundwater including nitrates, salts, and harmful microorganisms. Even if properly maintained and sited, the average life span of a septic system is only approximately 20 years.



Groundwater protection will become increasingly important as population densities in areas not served by public utilities continue to increase.
An improperly sited, designed, installed or operated septic system can pollute drinking and surface water. In such situations, sewage may contaminate wells in the area or move to the land surface, or both.

The problem now generally unrecognized, will continue to become more evident. As seen in the sample population chart of but one township in Newaygo County, the population in rural communities, largely was stable until the 1970s when dramatic rises began. This trend is a common one; and nearly all of the new resident families use a septic system, dramatically raising the possibility of failures.

In the watershed contaminated groundwater has a potentially devastating effect. As a result, maintaining appropriate densities of development, proper disposal of sanitary sewer wastes and proper management of lawn chemicals are critical factors in ensuring the adequacy and quality of domestic water sources.



Point Sources

Other sources of potential groundwater contamination are somewhat easier to identify. They include industrial operations which may use hazardous chemicals, landfills, gasoline filling stations, and other direct sources of contaminates. For the most part, these sources are heavily regulated by the state or federal government. These include regulations affecting landfill, hazardous wastes, underground storage tanks (removal and construction), and brownfield regulations. (Brownfields are previously

contaminated sites that, under certain conditions, may be utilized for particular land uses.)

Other, larger sites, may also be considered point sources. Where there are larger, contiguous areas having a combination of poor soils unsuitable for septic systems, a high water table, an increasing amount of rural development, and/or a large number of intensive livestock operations, these areas can threaten the quality of the groundwater supplies.

Examples of places which may increase concerns relative to groundwater reservoirs include:

- Existing sites identified to administer The Michigan Environmental Response Act by the Michigan Department of Environmental Quality identified LUST (Leaking Underground Storage Tanks) sites;
- Existing licensed landfills (active or inactive);
- Industrially used or zoned sites;
- Existing residential development that equals or exceeds a gross density (total acres divided by number of dwelling units) of one unit for every one and one-half (1.5) acres; or
- Existing agricultural development totaling more than five hundred (500) acres.

Regulatory Measures

Efforts to protect groundwater resources need to occur at all levels of government. Special consideration to the types and densities of permitted land uses should apply in areas that offer little natural protection to groundwater. This should also apply where the protection level is unknown. Land use regulations, land acquisition, and education programs can play a key role in protecting groundwater. Examples of land use control activities include the following:

- Land use plans which take into account groundwater vulnerability; and groundwater recharge areas (such as coarse sands and gravels).
- Zoning ordinance and site plan review standards related to preventing hazardous wastes from entering the environment (e.g., aboveground secondary containment and interior floor drain control);
- Purchase of land and/or conservation easements to provide a wellhead protection buffer around municipal well fields;
- Development standards requiring vegetative buffers and filters along rivers and tributaries.
- Public education through public meetings, school-based classroom programs, library displays, cable television, videos, information flyers, and newsletters provided by local

units of government and agencies. For example, conservation districts, Michigan State University Extension, non-profit entities, and watershed organizations.

From a land planning perspective, simply requiring larger lots does little or nothing to enhance groundwater quality. One of the few readily available solutions to polluted wells or failed septic systems is to obtain public water and sewer. With the larger lots sizes and frontages prevalent in many of the communities within the watershed, the costs to provide water and sewer services to homes are likely to be exorbitant. On the other hand, where lot frontages are lower, so too will be the cost to provide public utilities.

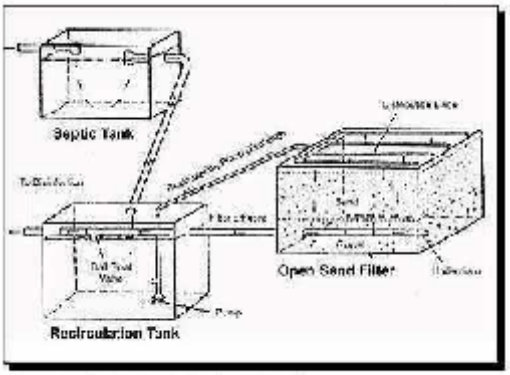


Figure 3: Typical Recirculating Sand Filter System

Septic system regulation is the responsibility of the various health departments in relation to permitting, placement, and enforcement. The county health departments are also responsible for the inspection of septic systems prior to the sale of a parcel of land. If the system fails the counties' tests, the system must be upgraded or maintenance must be completed before a permit will be issued to the new property owner.

Finally, there are technological advances on the horizon that may offer opportunities to improve groundwater. These include:

- man-made wetlands;
- terraced, overland flow systems;
- package plants;
- sand-filter systems; and
- greenhouse, peat, and bio-filter systems.

The following are some specific measures that may be taken by communities within the watershed to help in the protection of groundwater resources.

Septic System Maintenance Requirements

It is generally recommended that septic tanks be pumped out or the sludge and scum layers be measured at least every three years so that solids don't wash out into the soil treatment system. Solids can clog the soil and limit its ability to properly treat the septic-tank effluent. A local government may choose to impose septic system maintenance

requirements on individual developments.

However, implementing this recommendation is sometimes difficult without adequate cooperation between the community and county health departments. One solution may be to adopt a local ordinance that establishes “septic system maintenance districts,” where higher concentrations of septic systems are present. Within these districts, property owners could be required to submit evidence of inspection or maintenance of septic systems at periodic intervals. This may be particularly effective for any approved Open Space Developments (covered elsewhere) or other developments which have homeowner associations.

Secondary Containment
(for industrial and agricultural uses)

A common groundwater protection method for identified potential sources of groundwater contamination (such as above ground fuel storage tanks and facilities) is a requirement for secondary containment. A variety of containment methods are possible, but the most common is the construction of “traps” for runoff and spillage areas where possible contaminants are contained within walls or other structures and any runoff captured and contained within the structure. Other, more elaborate systems are required, such as that pictured, for larger, intensive activities with extensive use of chemicals, fuels, or other potential contaminants.

In certain agricultural applications, like the management of farm chemicals, manure and silage, there are tax benefits for owners and operators who engage in best management practices (BMPs) to protect water quality.

Site Plan Review Considerations

Local units of government through the site plan review process should be made aware of the locations for possible contamination and the measures planned by the operator to reduce the risks associated with those materials. This can be done as part of the site plan review process for potential point sources of contamination, such as industrial uses involving chemicals or hazardous materials. Each site plan should contain a stormwater management plan that details the impact of proposed land use on water quantity and quality, both on-site and within the watershed. This may be implemented by adding a requirement for site plans for submission of information regarding potential hazardous

materials, and measures to be taken to protect drainage ways, water bodies, or other areas from accidental spills.

Another provision which can be made part of the site plan review process, as well as for discretionary zoning approvals, such as planned unit developments and special land uses, is a requirement for monitoring wells for specific land uses with potential to affect groundwater resources. Monitoring wells have long been required for certain uses, such as landfills. Increasingly, communities are requiring them for other uses, such as golf courses, sand and gravel mining operations, higher density residential developments in identified groundwater vulnerability areas, and others.

Monitoring Well

Provided on the following page are specific site plan review standards for groundwater protection published by The Michigan Department of Environmental Quality. These standards could be incorporated into a communities zoning ordinance, with additional standards as determined necessary depending on the type of development a community is experiencing, problems experienced in the past, etc.

Site plan review standards allow land use commissioners to review plans for compliance with general planning guidelines to protect groundwater, while the detailed engineering is best left to trained professionals.

On-Site Community Treatment Systems

The expense involved in resolving groundwater issues for a single site makes some solutions financially difficult. One area-wide solution intended for limited use is a package treatment system which serves smaller areas. Although a single, small development project may not be able to afford the installation and operation of a compact treatment system, several combined projects may join forces to implement an effective waste treatment system.

A number of management and financial issues would obviously need to be resolved before such a system was implemented. Administering the system will likely be the responsibility of individual property owners formed into an association or authority. Questions of who will pay for the initial acquisition and installation of the system as well as maintenance responsibilities will need to be addressed. Issues of liabilities and other legal problems must also be examined. Generally, engineering expertise will be needed to conduct routine repairs and inspections, and replace system components when needed.

To encourage these systems, zoning ordinances may offer density increases for developments utilizing community systems, where public systems are not, and will not be available. The bonus should be reasonable, but may be significantly higher than those bonuses often offered for open space or recreational amenities. These developments will, for the most part, take place within an open space (cluster) development.

Quality Recommended Site Plan Review Standards for Water Resource Protection (adapted from Michigan Department of Environmental Quality)

Site Plan Information: (add to usual list of submittal requirements)...

_____ Existing topographic elevations at two (2) foot contour intervals. Indicate direction of drainage surface and groundwater flow.

_____ The location and elevations of existing water courses and water bodies, including county drains and man-made surface drainage ways, flood plains, and wetlands.

_____ Proposed stormwater management plan including design of sewers, outlet, and retention or detention ponds. Sufficient data regarding site runoff estimates and off-site drainage patterns shall be provided to permit review of feasibility and permanence of drainage detention and/or retention as well as the impact on local surface and groundwater.

_____ Information on soils capability for various uses.

_____ The location and status of any floor drains in structures on the site. The point of discharge for all drains and pipes shall be specified on the site plan.

_____ Location for any existing or proposed outdoor storage facilities (above ground and below ground storage).

_____ Location for on-site wastewater treatment and disposal systems.

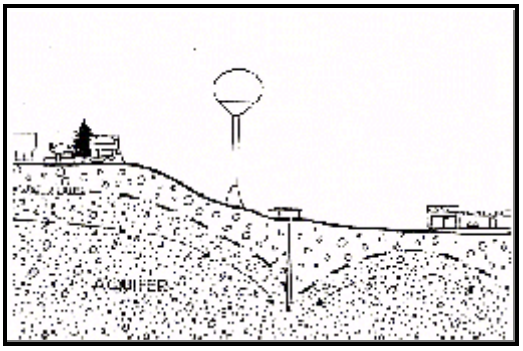
_____ Location of existing and proposed private drinking water wells, monitoring wells, irrigation wells, or wells used for industrial processes.

_____ Size, location, and description of any proposed interior or exterior areas of structures for storing, using, loading or unloading of hazardous substances, hazardous wastes, and/or polluting materials.

_____ Delineation of areas on the site which are known or suspected to be contaminated, together with a report on the status of cleanup or closure.

_____ Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal.

Wellhead Protection



The purpose of wellhead protection programs is to protect public water supplies taken from groundwater from potential sources of contamination. Protection is provided by identifying the area supplying groundwater to the community's wells, identifying potential sources of contamination within that area, and developing methods to cooperatively manage the area and minimize the potential threat to groundwater.

Wellhead protection programs must address seven elements:

- Establishment of roles and duties for communities and property owners within the wellhead protection area.
- A description of the wellhead protection area including maps of topography and soils types.
- Identification of potential sources of contamination within the wellhead protection area.
- Procedures to manage the protection area and minimize threats to the water supplies.
- Plans for water supply emergencies.
- Procedures for the development of new well sites.
- Public participation methods.

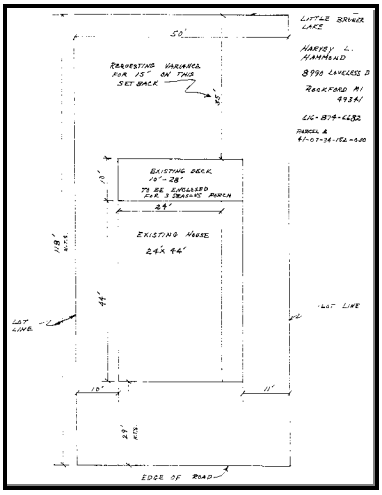
A wellhead protection area is defined as the surface and subsurface area surrounding a water well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field. In Michigan, the area for any potential threat is based upon a ground water time-of-travel (TOT) of 10 years.

Zoning and land use measures to protect wellhead areas are generally similar to those that protect open spaces, including purchase of lands and conservation easements. Certain land uses are also generally excluded from the protected area (like gas stations). Grants are available from the Michigan Department of Environmental Quality to assist communities in developing wellhead protection programs and ordinances.

PART 3
SITE PLAN ELEMENTS

WHY ARE QUALITY SITE PLANS IMPORTANT?

The growth patterns experienced by Michigan Communities are the result of numerous individual site planning decisions made over long periods of time. Site plans must clearly illustrate the potential impacts on the natural environment in order for local governmental officials to make sound development-related decisions that will affect the character of their communities.



This quality of site plan is unacceptable in today's development environment.

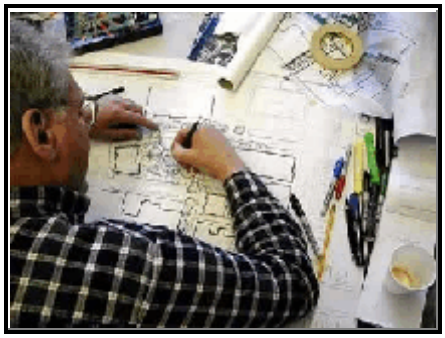
In the past, it was typical for applicants to request that a Planning Commission accept a "back of the envelope," or hand-drawn, unscaled sketches for site plan approval. Often, this led to poorly designed sites, with associated traffic problems, adverse effects on adjacent properties, unplanned development, and natural resource degradation.

In today's development environment the degree to which that development may affect the community has made the stakes too high to accept this degree of informality regarding zoning related decisions, and especially site plan review.

There are some basic requirements that, if followed, can help save time and money for both the community as well as the applicant.

- *Require that a qualified professional complete the site plan.*

  To ensure the highest quality of site plan a design professional should be required to prepare the site plan. This is necessary due to the complexity and accuracy required for a properly drawn, dimensioned site plan. Many problems that may be encountered during or after the project development process can often be averted by using a design professional. Very few exceptions to this requirement should be permitted.



- *Use a site plan checklist.*

Site plan review provisions of the Zoning Ordinance should include a comprehensive list of what is to be required on a plan. Providing a site plan checklist to the applicant as part of the application package can guide the professional developing the plan. The checklist should then be evaluated prior to the community's acceptance of the plan for the review submission. The ordinance may include language that permits the person responsible for accepting the plan to waive unnecessary items, but otherwise incomplete plans must be returned and the application rejected. Sample checklists are provided in the appendices and should be tailored to individual communities.

REQUIRED SITE PLAN ELEMENTS

A site plan should consist of basic elements that provide decision makers with critical information necessary to review a site plan. These may generally be divided into the following:

- ❑ Identification
- ❑ Narrative/Notes
- ❑ Site Plan
- ❑ Site Plan Details

Identification

This element is necessary to ensure proper identification and tracking of the site plan through the community, from submission of the application through the final building inspection. Among the identification elements are:

- title
- scale
- north arrow
- legend
- name of professional preparer
- date of production and revisions
- location map

Title: The title is pertinent component of the site plan because it quickly identifies the proposed development for decision makers. The title should be unique, easily identified and clear to a plan reviewer. A title of "Residential Development," for example, would not be acceptable; "The Pine Tree Apartments," would be.

Scale: To make a site plan useful for review, design professionals use a consistent relationship between size on the map and actual size of the development. This relationship is called map scale. For instance, a site plan may use one inch to represent what is actually fifty (50) feet on earth. Site plan makers express scale as a mathematical ratio, or fraction. The unit on the map is expressed as the number one (numerator). A scale of 1" = 50' would be read as “one inch to fifty feet.”

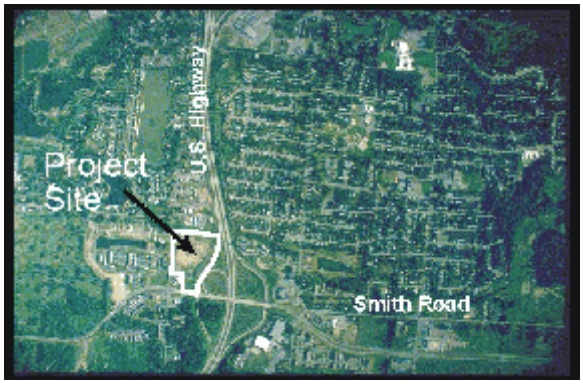
North Arrow. The purpose of the north arrow is for orientation. It gives the site plan reviewer a way to determine the direction of the map as it relates due north. Most site plans are typically geared so that due north faces the top of the page.

Legend: A legend is used to identify symbols and (points, lines, colors) that represent the man-made and natural features on the plan. The content and level of detail of the legend will vary greatly between site plans. At a minimum, any symbols used to represent site plan elements should be identified.
For example, is often used to represent wetlands.

Name of professional preparer: As noted above, the identification of the preparer indicates the fact that a certain level of care and accuracy went into the plan’s preparation. A professional seal may also be required.

Date of production and revisions: While this seems self-explanatory, and somewhat simple, it represents one of the more important elements of identifying plans. Dates become particularly sensitive when multiple versions of a plan are submitted to the community. The lack of revision dates can create confusion as to which plan may be valid.

Location map: This is a small scale (showing a larger area) map, which may or may not be scaled, indicating the location of the property covered by the site plan. The map should show enough detail, such as surrounding streets, large physical features, such as a lake, or other details, to permit the community to accurately locate the site. An aerial photo would also be helpful.



Narrative/Notes

The narrative portions of the site plan can provide a wide variety of information related to the site. Examples may include:

General Notes: The General Notes offers a location where specific information related to the plan may be placed. Examples may include such statements as:

1. All utilities shall be constructed underground.
2. All permits required by state and local agencies will be obtained and submitted prior to commencement of construction.
3. Design of stormwater facilities will comply with requirements of the Township and Muskegon County.

Some notes may be provided that are specific to individual locations within the site. For example:

4. Lots 2, 12, and 17 will access only internal roadways. No direct driveway access will be permitted onto the existing County Road.

Notes may also be provided that outline site characteristics and basic development requirements, often those required by the Zoning Ordinance. For example: (see box).

Other information could be provided related to the type of development proposed. Commercial projects, for example, may include the number of parking spaces, showing the method used to calculate the number required.

Site Data

Total Area:	22.22 acres
Open Space:	17.15 acres
Existing Zoning:	RR
Proposed Zoning:	Open Space PUD
Proposed Use:	Single family detached
# Home sites:	12

Site Plan

The data provided by design professionals for site plans can vary depending on the proposed development(s) purpose. Part 4, the Sample Site Plan Review Chapter, provides a list of required site plan elements, and some narrative regarding those items. Generally, the site plan requirements (with examples) fall under the following basic areas:

Site Data (existing and proposed)

- Lot lines
- Topography
- Easements
- Setback lines

Natural features

- Soils and soil capabilities
- Wood lots, wetlands and steep slopes
- Presence of threatened or endangered species (which can be easily checked against a state database)

Vehicle and Pedestrian Facilities

- Parking lots
- Sidewalks and bike paths
- Driveways and access points to adjacent roadways
- Loading/unloading facilities

Utilities

- Location/sizes of public water and sanitary sewer lines
- Drainage facilities
- Fire hydrant locations
- Storm sewer/catch basins
- Stormwater filter/infiltration beds

Building and Structures

- Main and accessory buildings
- Signs
- Light poles
- Trash receptacles
- Landscaping

Other state, federal or county approvals:

- Critical dunes or high risk erosion areas, etc.
- State wetlands permits
- County drive permit
- Information regarding the status of county or state permits if they are in process.

Site Plan Details

Communities vary widely in the level of detail required for site plans. In many instances the level of detail required is related to the commitment of the community to maintaining its

character. This may call for the submission of other information more specifically related to the community's character and design objectives.

- ❑ In developed communities site plans are often for the development of sensitive sites, such as those in infill areas, in sensitive locations, those with unique site conditions, or where redevelopment of existing sites is proposed. In these areas there may be a greater emphasis on building design and architecture, to ensure that the development is consistent with surrounding properties, and on how the site relates to adjacent development, and less emphasis on environmental aspects.
- ❑ In more rural communities, or those with larger expanses of vacant lands, the emphasis may be on preserving of natural features to preserve a rural or suburban character.

Some examples of additional information for these communities might include:

Urban/Developed Communities

- Environmental analysis for suspected contamination sites.
- Building elevations, including materials and colors to be used.
- Access management plan.
- Landscape plans.

Rural/Suburban Communities

- Natural features analysis.
- Wetland determination plan.
- Open space plan.
- Landscape plans.

"READING" SITE PLANS

The process of reviewing site plans requires imagination. Some people find it difficult to translate the view of a one-dimensional drawing to a three-dimensional site. Reading plans becomes easier with practice. There are some techniques that can help.

Picturing this site as developed, requires imagination, and a site visit.

Site Visits

Visiting the location where the site plan is to be constructed is critical in rendering an informed decision. To do so, it is necessary for the community to ensure that its decision makers receive the application materials, including the site plan, far enough in advance of the meeting to enable them to take the time to visit each site. For those communities with

extensive development, and long agendas, it may be useful to divide up the site visits between members, and have reports made regarding each site. While convenient, this can not make up for actually observing the site first hand.

Prior to visiting the site, some precautions should be taken. First, make sure that *written permission* for entering the site has been granted by the property owner. Entering a private site, regardless of membership on a planning commission or other body, without permission could result in trespass charges. Obviously, permission would not be required if the site is otherwise available to the public (such as an existing shopping center). There are a number of ways to obtain this permission, but perhaps the simplest is to make it part of the application form. This can be done by adding a statement such as:

> *Optional: I hereby grant permission for members of the _____ Township (Planning Commission) (Board of Zoning Appeals) (Township Board) (or Zoning Administrator) to enter the above described property for the purposes of gathering information related to this application. Note to applicant: This permission is optional and failure to grant permission will not affect any decision on your application.*

It is important to remember that permission need not be granted; that is why the signature is optional. Should permission not be granted there may be other options for collecting information. Written permission may be sought from neighboring property owners. In addition, the applicant may be asked to supply additional visual materials, such as surveys, photographs, or other information. However, this should not be requested as a punishment for not being permitted on the site; rather, the information requested should be limited to that necessary to substitute or an on-site visit.

Ex Parte Communications

Once the identification has been made, the property owner/resident will likely attempt to engage the decision maker in conversation related to the proposed plan. It is important that property owners, neighbors or applicants not be contacted or spoken to regarding the application outside of the meeting called for that purpose. This is known as an *"ex parte"* contact (or from only one point of view) and has been found to be potentially prejudicial. Similarly, communication with other decision makers is also prohibited.

The intent of information gathering is to insure that everyone has the same information on which to base a decision. If an ex parte contact cannot be avoided, it should be reported to the rest of the decision makers, along with the general content of the conversation.

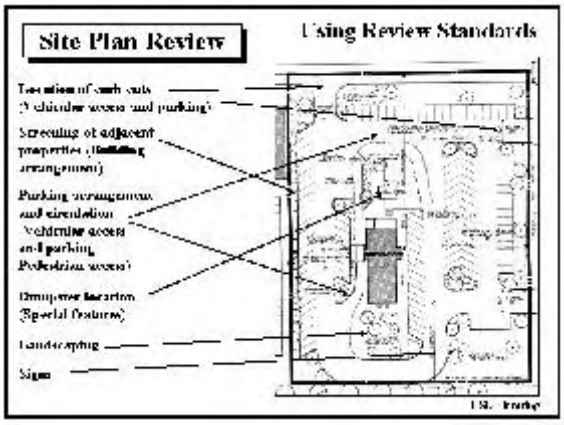
Site visits should also be conducted individually, rather than as a group of 2 or more. Group visits, if conducted, must be preceded by notice under the Open Meetings Act**.**

Given the potential problems associated with meeting the strict requirements of this Act, as well as other regulations, such as the Americans With Disabilities Act (ADA), site visits by individual members is the recommended procedure.

Once on the site....

If visiting an occupied site (one with a home, business, etc., after verifying written permission) the property owner/resident should be notified of the visit, simply to avoid any misunderstanding. The site visitor should have some form of identification that indicates membership on the appropriate board (or from the community if a staff member).

However, communication with the property owner/resident must be avoided (see insert on Ex Parte Communications). If additional questions or issues come up prior to the meeting, contacting the zoning administrator is permissible. The administrator will then ensure that all decision makers receive the same information.



Relating review standards to the site plan and site visit can simplify an otherwise daunting task.

The myriad of details that are observable during a site visit can be overwhelming. There is, however, a method by which the visit can be organized by using the *site plan review standards* (and other applicable standards, such as those for special land uses) to guide the visit. The review standards will address such issues as site development issues, traffic and site circulation, and environmental conditions. Using the standards to guide the visit will pinpoint those features that are most relevant to the plan under consideration. Examining traffic conditions, natural features, surrounding land uses, and general neighborhood characteristics will provide a sense of how the development will affect the site as well as its surroundings. Visits at different times and days would also be useful.

Describing the site visit to the other decision makers at the meeting will add to their own visit findings and provide another point of view. Photographs, slides or video tape may be a good option, particularly for larger, inaccessible sites.

Practice Makes Perfect

For those who have not had the benefit of experience in reviewing plans, it may be useful

to undertake some practice runs by obtaining a plan of a site that has been developed, studying the plan at home (or at the community offices), then taking the plan along on the site visit. Experienced plan reviewers know, for example, that distances as seen on a plan are deceiving, something like the rear-view mirrors and their statement “Objects are larger than they may appear.”

In the case of a site plan, objects shown on the plan will generally appear larger and “closer” than they might seem in a one-dimensional view. Setback areas that seem large, may, in fact, appear quite small after construction; or buildings that seem modest in size, may not be so modest when on the ground.

Over time, reading site plans will become easier, but site visits and following the other procedures noted here should be a constant rule.

PART 4
SITE PLAN REVIEW - ANNOTATED ORDINANCE

SAMPLE SITE PLAN REVIEW CHAPTER

The following is a sample Site Plan Review Chapter that places an emphasis on water quality issues. The purpose of the sample is to provide guidance as to the possible general contents of a site plan review chapter; it is not intended to be adopted without being adapted to the individual communities within the Bear Creek watershed. Differences between communities, such as staff or consultant availability, Planning Commission experience levels, and other considerations must be taken into account.

The sample ordinance addresses the major elements necessary for an effective site plan review process, including:

- ❑ Identification of site plans to be reviewed.
- ❑ Application requirements
- ❑ Site plan processing procedures
- ❑ Site plan review standards.
- ❑ Status of approved plans, including plan amendments, approval expirations and extensions, and appeals.

No public review process is included in the example. Many site plans are submitted as part of some other zoning approval, such as a special land use, that will otherwise require public review.

The format of the text includes comments on most elements, highlighting the importance of some of the provisions, as well as noting potential alternatives to the language.

ORDINANCE PROVISION	COMMENTS
ARTICLE 14 SITE PLAN REVIEW	
Section 14.01 PURPOSE	
The purpose of this Article is to provide for consultation and cooperation between the applicant and the Planning Commission in order that the applicant may accomplish planned objectives in the utilization of land within the regulations of this Zoning Ordinance. It is also intended to ensure that the development may be completed with minimum adverse effect on the use of adjacent streets and highways and on existing and future uses and environment in the immediate area and vicinity.	As with many parts of the Zoning Ordinance, describing an overall intent of the language is necessary to permit an understanding of what the community expects from the site plan review process.
Section 14.02 SITE PLANS REVIEWED	
A. The Zoning Administrator shall not issue a Zoning Compliance Permit for any principal use until a Final Site Plan has been reviewed and approved by the Planning Commission under the following circumstances:	The community may elect which site plans it wishes to review, versus those which can approved administratively.
1. Permitted Uses in Residential Districts, except farms detached single family dwellings (unless part of a site condominium project), essential services, state licensed residential family care facilities, family day care homes, home occupations, and accessory buildings and uses.	The exceptions are useful to ensure that the Planning Commission's time is not taken up by routine reviews that are better done by the Zoning Administrator.

ORDINANCE PROVISION	COMMENTS
2. Permitted Uses in the C-1, I-1 and I-2 Districts.	A wide variety of review options is available. For example, the ordinance could specify that all permitted uses within Multiple Family and Nonresidential Districts require site plan review.
3. Uses Permitted as Special Land Uses in any District.	Site plan review is required by law for all Special Land Uses and planned unit developments.
4. Site condominiums in any District.	This is a useful provision to ensure that site condominiums are evaluated in the same general manner as the subdivision review process.
5. As otherwise might be required by this Ordinance.	The ordinance may state other times when a site plan will be required.
B. All plans not reviewed by the Planning Commission shall be approved by the Zoning Administrator after ensuring that the site plan is in conformance with the Zoning Ordinance.	Note the exceptions above. This ensures that <u>all</u> plans undergo a review to ensure, at a minimum that the requirements of the Zoning Ordinance are met.
Section 14.03 APPLICATION PROCEDURES	
A. An application for Site Plan Review shall be submitted at least thirty (30) days prior to the next Planning Commission meeting through the Zoning Administrator who will review the application and plans for completeness then transmit it to the Planning Commission.	It is essential that the Zoning Administrator check site plans before accepting them as part of the application. All required information should be on the plan (unless waived by the Zoning Administrator) before it is accepted. The submission period may be shorter, particularly if there is no public review process where notices are not required.
B. An application for either a Preliminary or Final Site Plan Review shall consist of the following:	All required materials must be present and submitted before the plan is accepted for review.

ORDINANCE PROVISION	COMMENTS
1. Ten (10) copies of the Preliminary or Final Site Plan completed in accordance with the requirements of Section 1404 A or B as applicable.	Make sure that there are enough copies available for each member, one for the public, and enough to cover any staff reviews that are necessary.
2. A completed application form as provided by the Township.	The Appendix contains a sample zoning application form.
3. Payment of a fee in accordance with a fee schedule as determined by the Township Board from time to time.	See Part 1 for a discussion on fees.
4. A legal description including permanent parcel number of the entire property which is the subject of the Site Plan Review.	This is necessary in order to clearly establish the location of the site.
5. Other materials as required in this Article.	
Section 14.04 REVIEW PROCEDURES	
A. Preliminary Site Plan Review	Site plan review procedures may include an optional "preliminary" process to allow the community an opportunity to comment on the plan prior to final detailing and engineering.
1. If desired by the applicant a Preliminary Site Plan may be submitted for review by the Planning Commission prior to final site plan submittal. The purpose of such procedure is to allow discussion between the applicant and the Planning Commission to better inform the applicant of the acceptability of the proposed plans prior to incurring extensive engineering and other costs which might be necessary for final site plan approval.	

ORDINANCE PROVISION		COMMENTS
2.	Preliminary Site Plans shall include the following unless deemed unnecessary by the Zoning Administrator.	This permits some degree of latitude for the Zoning Administrator to accept plans that fail to meet all of the requirements, but do provide those that are necessary for that particular development.
a.	Small scale sketch of properties streets and use of land within one half (½) mile of the area.	Commonly known as a “location map.” This gives the reviewers a better context of the site within the community.
b.	Ten (10) copies of a site plan at a scale of not more than one (1) inch equals one hundred (100) feet (1"=100') completed by a qualified person showing any existing or proposed arrangement of:	Scale is important to ensure that sufficient detail is available for a thorough review.
(1)	Existing adjacent streets and proposed streets	
(2)	Lot lines.	
(3)	Parking lots and access points, including those within one hundred (100) feet of the site.	Careful consideration of the location of access points both on the site and with respect to adjacent properties is critical.
(4)	Proposed buffer strips or screening.	This is the preliminary plan, so details on plant materials are not necessary.
(5)	Significant natural features; and other natural characteristics including but not limited to open space stands of trees, soils with severe limitations, brooks, ponds, floodplains, hills, and similar natural assets and specifically including the following:	More detail is required for natural features, even at the preliminary stage, to ensure that the reviewers have sufficient information on which to base their comments.

ORDINANCE PROVISION	COMMENTS
(a) Groupings of trees with a contiguous area of ten thousand (10,000) square feet or greater in size;	The size of the area included may be changed to meet the community's needs. In general, this is used to identify a significant stand of trees, rather than focusing on small groupings.
(b) Any individual trees greater than twenty four (24) inches in diameter that are included in any area of the site which will be disturbed by the proposed development;	This is another optional provision that permits trees that may have a visual impact to be identified and perhaps preserved.
(c) General topographical features including contour intervals no greater than ten (10) feet. Areas of steep slopes greater than twelve percent (12%) shall be highlighted;	In this context, steep slopes are considered natural features that need to be addressed. This may be particularly important in areas with highly erodible soils.
(d) Wetlands, one hundred (100) year floodplains and water bodies. A wetland determination shall be required for any wetlands falling within the jurisdiction of the Michigan Department of Environmental Quality.	The wetland determination, if required, should be submitted at the preliminary stage to ensure that they are taken into account for density calculations, site development planning, etc. The determination may also be required when local wetland ordinances are in effect.
(6) Location of any signs not attached to the building.	
(7) Existing and proposed buildings.	Existing buildings, including those to be removed, should be shown.
(8) All buildings and driveways within one hundred (100) feet of all property lines.	This is necessary to determine the potential effects the plan may have on neighboring properties, and to ensure that traffic conflicts, including those across the street, are avoided.
c. A narrative describing:	Not all plan issues can be shown visually. A separate text narrative will help fill in some details.

ORDINANCE PROVISION	COMMENTS
(1) The overall objectives of the proposed development.	This can be a very general statement of the purpose of the development. Issues important to the applicant can be expressed in this portion of the narrative.
(2) Number of acres allocated to each proposed use and gross area in building, structures, parking, public and/or private streets and drives, and open space.	This permits more accurate density and lot coverage calculations.
(3) Dwelling unit densities by type if applicable.	Only for residential projects - to allow a determination of the overall possible impacts related to traffic and community services.
(4) Proposed method of providing sewer and water service as well as other public and private utilities.	At this stage the details may not be worked out, but the intent can be stated.
(5) Proposed method of stormwater management.	This will be used in combination with other required materials submitted at the final plan stage.
3. The Planning Commission shall review the Preliminary Site Plan and make such recommendations to the applicant that will cause the Plan to be in conformance with the review standards required by this Article.	Normally, preliminary site plans are not “approved” but simply commented on to provide direction for the completion of the final site plan. The review standards are covered to ensure that the plan meets the basic requirements, or can be changed to do so.
B. Final Site Plan Review	Normally, the preliminary stage is optional. The applicant may be permitted to submit directly for a final site plan review. This would be most appropriate for small site, single use developments.
If desired by the applicant a Final Site Plan may be submitted for review without first receiving approval of a preliminary site plan. Final site plans shall include the following information unless deemed unnecessary by the Zoning Administrator:	

ORDINANCE PROVISION		COMMENTS
1.	Legal description of the property including permanent parcel number.	See comments on similar items for the preliminary plan.
2.	Small scale sketch of properties streets and use of land within one half (½) mile of the area.	Location map.
3.	A narrative describing the items indicated in Section 1404 A 2 c.	More detail may be available at this stage, as compared to the preliminary plan.
4.	Ten (10) copies of a site plan at a scale not to exceed one (1) inch equals one hundred (100) feet (1" = 100') completed by a qualified person. The following items shall be shown on the plan:	
a.	Date of preparation/revision.	This is particularly important in keeping multiple plan versions separated.
b.	Name and address of the preparer.	
c.	Existing man-made features.	
d.	Dimensions of setbacks locations heights and size of buildings and structures.	The additional detail here adds dimensions to ensure zoning compliance and to determine potential community impacts.
e.	Street rights-of-ways indicating proposed access routes internal circulations and relationship to existing rights-of-ways.	Careful attention to access management is necessary during the review process.
f.	Proposed grading.	This assists in determining the extent to which site conditions will be changed. Large scale grading is discouraged.

ORDINANCE PROVISION	COMMENTS
g. Location and type of drainage, sanitary sewers, storm water management and other utilities.	Sizes, type, and location are all important considerations for utility placement. The ability to provide future maintenance is also important.
h. Location and type of fences, landscaping, buffer strips and screening.	More detail on landscaping is provided. If desired, a separate landscape plan may be required.
i. Significant natural features; as provided in Section 1404 A 2 b (5) except that topography of the site shall be indicated at a minimum of five (5) foot intervals including its relationship to adjoining land.	See earlier comments, as well as the review standards addressing this issue.
j. Location and type of signs and on-site lighting.	In some situations, the Planning Commission may wish to require a lighting plan, particularly for large lots or sites in sensitive locations. “Night sky” concerns are becoming increasingly prevalent.
k. Proposed parking areas and drives. Parking areas shall be designated by lines showing individual spaces and shall conform with the provisions of Article XVI (Off-Street Parking and Loading).	Note relationship of spaces to building entrances, as well as pedestrian accommodations within larger parking lots.
l. Any public or private easements.	Land within easements is generally unable to be used in calculating density of residential projects.
m. Dimensions and number of proposed lots.	The arrangement of lots is also important.
n. All buildings and driveways within one hundred (100) feet of all property lines.	As noted earlier, this is to ensure a proper relationship between the site under development and its neighbors, as well as the abutting roadways.

ORDINANCE PROVISION	COMMENTS
C. In addition to the above requirements five (5) copies of a stormwater management plan shall be submitted showing the location and size of all stormwater management facilities including but not limited to conveyance systems and treatment/storage systems (i.e. vegetative infiltration buffers and basins) and the calculations used to determine such facilities. Stormwater management plans must be prepared and sealed by a professional engineer. Prior to approving a stormwater management plan the Township may require any or all of the following:	If desired, this may be limited to sites over a certain size. However, as the cumulative effects of stormwater become more evident, even small sites may be required to submit the stormwater plan.
1. A fee for an outside engineering review of stormwater management plans submitted by the applicant.	The plan will have to be reviewed by a professional engineer. The “outside” review applies only if the community does not have an in-house engineer. The fee may also be covered by the escrow policy, if one is in place.
2. A performance bond, cash escrow, certified check, or other acceptable form of performance security in an amount sufficient to ensure the execution of the stormwater management plan.	This provision would be necessary if the Zoning Ordinance does not have an administrative provision regarding performance guarantees.
3. A maintenance agreement which details ownership and financial responsibility for the operation and maintenance of stormwater management facilities.	Unlike landscaping, which is relatively inexpensive to maintain, major failures in stormwater facilities can be costly.
4. In order to be approved all stormwater management plans must meet the following performance standards:	
a. Runoff leaving the site must be controlled to a non-erosive velocity both during and after construction.	See the next standard.

ORDINANCE PROVISION	COMMENTS
b. After development runoff from the site shall approximate the rate of flow volume and timing of runoff that would have occurred following the same rainfall under pre-development conditions or a maximum release rate of 0.20 cubic feet per second (cfs). Stormwater management conveyance and treatment/storage facilities shall be designed to reduce flood hazards and water pollution related to runoff from the proposed development project.	This is a common principle of most stormwater regulations: runoff from the site must be about equal to the rate of runoff that would have occurred under pre- development conditions.
c. The design of any stormwater management system shall be based upon a 25-year frequency 24-hour duration storm event. Retention basins without a positive outlet must be designed to hold runoff from a 100-year storm event. Vegetative filtration, infiltration, retention and detention requirements shall meet the minimum standards of the Michigan Department of Environmental Quality Stormwater Manual.	This is a reasonable engineering standard, and often used for development planning.
d. The banks of retention and detention basins shall not exceed 6:1 (horizontal to vertical) unless a fence is constructed. Basin design shall blend with the natural landscape.	This is to avoid slopes from which it would be difficult to climb. Fences are not normally required unless some clear hazard exists or, as noted here, steeper slopes are needed.

ORDINANCE PROVISION	COMMENTS
5. The Planning Commission prior to granting approval of a Final Site Plan may request from the applicant any additional graphics or written materials prepared by a qualified person or persons to assist in determining the appropriateness of the site plan. Such material may include but need not be limited to aerial photography photographs; traffic impacts; impact on significant natural features and drainage; and other pertinent information.	This is a catch-all requirement that permits special consideration of difficult or sensitive sites. It may also be invoked when a site visit was not possible to provide information in place of that visit.
6. The Planning Commission shall approve deny or approve with conditions the Final Site Plan based on the purposes objectives and requirements of this Ordinance and specifically the standards of Section 1405.	What ever action is taken must be supported by information related to the review standards (following section). If all review standards and ordinance requirements are met, the site plan must be approved.

ORDINANCE PROVISION	COMMENTS
Section 14.05 **SITE PLAN REVIEW STANDARDS**	
The Planning Commission shall review the Preliminary and Final Site Plan and approve, approve with conditions, or deny the application based on the purposes, objectives, and requirements of this Ordinance and specifically the following considerations when applicable:	Site plan review standards are required in the ordinance so the applicant knows what has to be done to receive approval. Included are standards that relate most directly to natural resource and water quality elements.
A. Site Development Standards	For ease of reference, the standards have been divided into functional areas. This is only a sample; the format may differ in other Ordinances.
1. The uses proposed will not harm the public health safety or welfare. All elements of the site plan shall be designed to take into account the site's topography, the size and type of lot, the character of adjoining property, and the type and size of buildings. The site shall be developed so as not to impede the normal and orderly development or improvement of surrounding property for uses permitted in this Ordinance.	This standard permits the community to consider the general layout, with particular attention to how buildings are arranged, relationship to the natural features, and how structures and activity areas may affect adjacent properties. This may also be used to for more specific purposes, such as assisting in the implementation of shared driveways and parking lot connections between uses.
2. All buildings or groups of buildings shall be arranged so as to permit necessary emergency vehicle access as required by the Fire Department and Sheriff's Department.	Plans should be reviewed by safety officials to ensure that access to the building is adequate; both from outside the site as well as internally.
3. All loading and unloading areas and outside storage areas including refuse storage stations shall be screened from the view of the street and/or adjacent properties.	This provision would not necessarily be needed if the Zoning Ordinance contained a provision that restricted the location of loading and storage areas, i.e., not facing public streets or residential areas.

ORDINANCE PROVISION	COMMENTS
4. Off-street parking and loading areas shall be provided where required with particular attention to noise, glare, and odor effects of each use in the plan on adjoining properties and properties in the proposed development.	The ordinance may also contain separate provisions related to locations of parking and loading areas. For example, loading areas may be required to be located away from public streets and/or residential districts and uses.
5. Exterior lighting shall be arranged so that it is deflected away from adjacent properties and so that it does not impede the vision of traffic along adjacent streets. Flashing or intermittent lights shall not be permitted. All lighting on poles shall have fixtures directing light downward.	Lighting standards in some ordinances can be very detailed. This is a general provision that covers those communities that do not have this language.
B. Traffic and Circulation Standards	
1. Safe, convenient, un-congested and well-defined vehicular and pedestrian circulation within and to the site shall be provided. Drives streets and other elements shall be designed to promote safe and efficient traffic operations within the site and at its access points.	Site plan review is one of the most effective means to prevent traffic and safety hazards. Careful attention to driveway spacing and location, circulation patterns throughout the site, and the use of front and rear service drives are all effective tools to address safety issues.
2. The arrangement of public or common ways for vehicular and pedestrian circulation and their connection to existing or planned streets in the area shall be planned to operate in the safest and most efficient means possible.	Separate provisions for pedestrians is also useful, particularly for those sites with some potential to draw pedestrians. But safety of pedestrians walking from the vehicles to the building(s) is also relevant.

ORDINANCE PROVISION	COMMENTS
C. Environmental Standards	
1. The landscape shall be preserved in its natural state insofar as practical by removing only those areas of vegetation or making those alterations to the topography which are reasonably necessary to develop the site in accordance with the requirements of this Ordinance. The Planning Commission may require that landscaping buffers and/or greenbelts be preserved and/or provided to ensure that proposed uses will be adequately buffered from one another and from surrounding public and private property. Buffer areas shall contain native species whenever practical.	The first choice of any development should be the preservation of existing mature vegetation and, to the extent possible, natural site contours. The use may dictate the ability to conform to this, but the Planning Commission should make it a high priority. This provision also permits the Commission to add landscaping for sensitive sites, nonresidential uses located near residential areas, etc.
2. An appropriate soil erosion control plan shall be provided to prevent pollutants and sediments from leaving the site and entering surface water. Best management practices like staging exposed areas, seeding with native species groundcovers shall be employed.	
3. For sites of one (1) acre or more stormwater management facilities shall be designed constructed and maintained to prevent flooding and protect water resources. Stormwater management facilities may be incorporated into the open space portions of a development site.	This may have to be coordinated with any open space preservation ordinance provisions to ensure that detention areas are counted into the required open space percentage.

ORDINANCE PROVISION	COMMENTS
4. Areas of natural drainage such as swales wetlands or ponds shall be protected and preserved insofar as practical in their natural state to provide areas for natural habitat preserve drainage patterns and maintain the natural characteristics of the land.	Review of the grading plan is the first step in determining the effectiveness of site alterations in maintaining natural drainage courses.
5. Appropriate measures shall be taken to ensure that removal of surface waters will not adversely affect neighboring properties or nearby bodies of water. Provisions shall be made to accommodate stormwater to prevent erosion and the formation of dust. Efforts should be made to reduce/minimize the amount of impervious surfaces. Such techniques available include: infiltration basins trenches or dry wells grassed (vegetated) waterways or swales rain gardens in yards or parking lots and pervious pavers for overflow parking. The use of detention/ retention ponds may be required. Surface water on all paved areas shall be collected at intervals so that it will not obstruct the flow of vehicular or pedestrian traffic or create standing water.	Several separate provisions are lumped into this standard to cover the somewhat obvious aspects of stormwater and site development. This review can help determine If impervious surface limits are met (if used).
6. Catch basins or other protective measures may be required to contain oil filters or traps to prevent contaminants from being discharged to the natural drainage system. Other provisions may be required to contain runoff or spillage from areas where hazardous materials are stored or proposed to be stored.	This standard helps implement specific protection measures, such as wellhead protection and the trapping of potential spills from storage areas.

ORDINANCE PROVISION	COMMENTS
D. The general purposes and spirit of this Ordinance and the Master Plan of the Township shall be maintained.	While this sound vague, it actually has significant meaning. The Plan may address water quality and other environmental issues which may be affected by development of an individual site. While there may not be specific language in the Ordinance, some consideration of other factors covered by the Master Plan can be used to guide development decisions.

ORDINANCE PROVISION	COMMENTS
Section 14.06 APPROVED SITE PLANS	
A. Upon approval of the Final Site Plan by the Planning Commission the Chair of the Planning Commission shall sign three (3) copies thereof. One (1) signed copy shall be made a part of the Township's files; one (1) shall be forwarded to the Building Inspector for issuance of a building permit; and one (1) copy shall be returned to the applicant.	Signing site plans helps determine the plan that was approved, or provides a date for reference to the minutes of the meeting where the approval and attached conditions are recorded.
B. Each development shall be under construction within one (1) year after the date of approval of the Final Site Plan by the Planning Commission except as noted below.	This is commonly referred to as “drop dead” date. Time limits are enforced to take into account conditions on surrounding properties which may have changed since the time of the original approval.
1. The Planning Commission may grant one (1) six (6) month extension provided the applicant applies for such extension prior to the date of the expiration of the Final Site Plan.	This can be used to take into account season-related delays. It is important to stick to the requirement that the request for extension be submitted prior to the plan’s expiration date.
2. The extension shall be approved if the applicant presents reasonable evidence to the effect that said development has encountered unforeseen difficulties beyond the control of the applicant but is then ready to proceed.	There are any number of circumstances that might generate a delay. Consideration of those situations is reasonable. Note the requirement that the condition be beyond the control of the applicant, and that the condition appears to be remedied.
3. Should neither of the aforementioned provisions be fulfilled or a six (6) month extension has expired without construction underway the Final Site Plan approval shall be null and void.	Ultimately, the aim is avoid having old, approved site plans retaining their validity.

ORDINANCE PROVISION	COMMENTS
C. Amendments to an approved Final Site Plan may occur only under the following circumstances:	
1. The holder of a valid Final Site Plan shall notify the Zoning Administrator of any proposed amendment to such approved site plan.	Amendments may only be done to an approved site plan if both the holder of the plan and the community agree. Neither can act independently.
2. Minor changes may be approved by the Zoning Administrator upon certification in writing to the Planning Commission that the proposed revision does not alter the basic design nor any specified conditions of the plan as agreed upon by the Planning Commission. In considering such a determination the Zoning Administrator shall consider the following to be a minor change:	This often used provision requires the Zoning Administrator to report approved minor changes to the original approving body. An optional provision might also allow the Zoning Administrator to send some plan changes that may meet the definition of minor to the Planning Commission, but in the opinion of the Administrator, should be reviewed by the Commission.
a. Reduction of the size of any building and/or sign.	These changes usually do little to affect the overall site. The minor changes, however, must be carefully considered, since in some instances even minor shifts in building locations or other changes can have an effect on adjacent properties.
b. Movement of buildings and/or signs by no more than ten (10) feet.	
c. Plantings approved in the site plan landscape plan may be replaced by similar types of landscaping on a one-to-one or greater basis.	
d. Changes of building materials to a higher quality as determined by the Zoning Administrator.	
e. Changes in floor plans which do not alter the character of the use.	Floor plan changes may have the potential to change other plan features, such as parking requirements.

ORDINANCE PROVISION	COMMENTS
f. Internal rearrangement of a parking lot which does not affect the number of parking spaces or alter access locations or design.	This may be necessary on the site to take into account other minor changes, or respond to stormwater management or other site related concerns.
g. Changes required or requested by the Township for safety reasons shall be considered a minor change.	This streamlines the process for changes that would otherwise have to be approved anyway.
3. Should the Zoning Administrator determine that the requested modification to the approved site plan is not minor resubmission to the Planning Commission for an amendment shall be required and conducted in the same manner as an original application.	A “major” amendment becomes a new site plan review procedure, including new plans, fees, etc., as if it was a new review.
D. If any person shall be aggrieved by the action of the Planning Commission appeal in writing to the Zoning Board of Appeals may be taken within five (5) days after the date of such action. The Zoning Board of Appeals shall fix a time and place for a public hearing to be published in a newspaper prior to the hearing. All interested parties shall be afforded the opportunity to be heard thereat. After such hearing the Zoning Board of Appeals shall affirm or reverse the action of the Planning Commission stating its findings and the reasons for its action and a written copy of such finding s reasons and action shall be given to the appellant.	The Zoning Acts require ZBA action for “administrative” decision. A site plan review is considered an administrative decision. Appeals sent to legislative bodies are not appropriate actions. The actions of the ZBA are limited to determining if the Planning Commission acted properly in its application of the review standards. It is not intended to be a second site plan review. If it is determined that the actions were done properly the decision must be upheld. If not, a new decision may be undertaken by the ZBA under the same provisions as the Planning Commission.

ORDINANCE PROVISION	COMMENTS
E. The Zoning Administrator may make periodic investigations of developments for which site plans have been approved. Failure to comply with the requirements and conditions of the approved site plan shall be considered a violation of this Ordinance.	Approvals and conditions applied to those approvals are permanent. If, at any time, they are not met, enforcement procedures may be initiated.

APPENDICES

- Sample Escrow Policy
- Sample Zoning Application Form
- Sample Zoning Application Checklist
- Sample Site Plan Review Checklist

A RESOLUTION REGARDING ZONING APPLICATION FEES AND ESTABLISHING AN ESCROW FUND REQUIREMENT FOR CERTAIN ZONING APPLICATIONS AND DEVELOPMENTS

WHEREAS, the **Township Board ("Township Board") has established certain fixed application fees for zoning reviews and approvals pursuant to the ** Township Zoning Ordinance ("Zoning Ordinance") and state law; and

WHERE AS, there are certain developments, zoning applications, and projects which require ** Township ("Township") to incur additional and at times extraordinary out-of-pocket costs and expenses above and beyond what is associated with typical or average zoning reviews for minor projects; and

WHEREAS, the Township Board believes that it is reasonable and appropriate to place the cost of processing zoning applications and decisions for medium and large scale developments (or applications involving unusual costs to the Township) on the applicants involved rather than on the taxpayers of the Township; and

WHEREAS, the Township intends that the zoning review and escrow fees be reasonably related and proportionate to the costs incurred by the Township for the particular application or zoning process involved, and that such fees and reimbursements be used to defray the costs of administering and enforcing the Zoning Ordinance and the Township Zoning Act, as amended (MCL 125.271 et seq.); and

WHEREAS, the Township Board intends to establish this Escrow Policy to accomplish the above goals.

NOW, THEREFORE, BE IT RESOLVED AS FOLLOWS:

1. The fixed basic zoning application fees (as met by the Township Board by resolution from time-to-time) shall hereafter cover costs associated with the following:

    A. Applicant's appearance at regular Planning Commission, Zoning Board of Appeals, and/or Township Board Meetings.
    B. Mailing and legal notice requirements for public hearings.
    C. Involvement by Township board members and employees (excluding outside contractors or professionals such as township engineering, planning, legal counsel, and other services).

In addition to the fixed zoning fees, all other expenses and costs incurred by the Township which are directly associated with reviewing and processing a zoning application for uses specified in Section 3 hereof shall be paid (or reimbursed to the Township) from the funds in an Escrow Account established by the applicant as

provided herein. The Township may draw funds from an applicant's Escrow Account to reimburse the Township for out-of-pocket expenses incurred by the Township relating to the application. Such reimbursable expenses include, but are not limited to, expenses related to the following:

A. Mailing, legal notices and commission member compensation for special Planning Commission meetings and Planning Commission subcommittee meetings.
B. Mailing, legal notices, and Township Board member compensation for special Township Board meetings and Township Board subcommittee meetings.
C. Mailing, legal notices, and Zoning Board of Appeals member compensation for special Zoning Board of Appeals meetings.
D. Services of the Township Attorney directly related to the application.
E. Services of the Township Engineer directly related to the application.
F. Services of the Township Zoning Administrator or Planner directly related to the application.
G. Services of other professionals working for the Township which are directly related to the application.
H. Any additional public hearings, required mailings and legal notice requirements necessitated by the application.
I. Educational Program Costs- Stormwater and Septic management.

2. Applications involving the following shall be subject to this Escrow Fund requirements:

   A. Site Plan reviews
   B. Planned Developments (PD)
   C. Special Use permits
   D. Any rezoning
   E. Plat approvals
   F. Site condominiums
   G. Private road approvals/permits
   H. Variance or interpretation proceedings before the Zoning Board of Appeals where Township officials determine that the scope of the project or application will probably require the assistance of the Township professionals or involve the additional costs refereed to in Section 2 hereof.
   I. Land division approvals if the Township Board or Zoning Board of Appeals is involved.

3. The escrow fees for each application for uses specified in Section 3 hereof are established at $500.00 increments commencing with an initial $1,000.00 deposit by the applicant with the Township Clerk. The initial $1,000.00 escrow fee shall be provided by the applicant to the Township Clerk at the time of application. No application shall be processed prior to the required escrow fee having been deposited with the Township Clerk. Any excess funds

remaining in the Escrow Account after the application shall has been fully processed, reviewed and the final Township decision has been rendered regarding the project will be refunded to the applicant with no interest to be paid on those funds. At no time prior to the Township's final decision on the application the balance in the Escrow Account fall below $500.00. If the funds in the Escrow Account drop below $500.00, an additional deposit of $500.00 by the applicant into the Escrow Account shall occur before the application review process will be continued. Additional amounts above $1,000.00 may be required to be placed in the Escrow Account by the applicant at the discretion of the Township. (Notwithstanding the preceding, the escrow fee deposit for private roads involving only one or two parcels shall be established at an initial Five Hundred Dollar ($500.00) deposit with the funds in the Escrow Account being replenished back up to Five Hundred Dollars ($500.00) when the funds in the account for such private roads serving one or two parcels drop below One Hundred Dollars ($100.00).

4. No building permit or final Township approval or permit shall be granted for an application until all outstanding out-of-pocket costs and expenses incurred by the Township as specified above have been reimbursed to the Township from the Escrow Account.

5. The Township Clerk shall maintain records regarding the Escrow Account and shall authorize the disbursement of escrow funds in writing. Such escrow funds (from one or more applicants) shall be kept in a separate Township bank account.

6. If an applicant objects to the amount of escrow funds it must deposit with the Township or how the escrow funds have been applied, it can appeal the Township's determination regarding these matters to the Township Board. All such appeals shall be in writing and shall be made not later than thirty (30) days after final Township action regarding the application.

SAMPLE TOWNSHIP APPLICATION FORM

Application for: (check any that apply)

___ Rezoning
___ Special Land Use
___ Site Plan Review
___ Variance (Board of Appeals)
___ Subdivision
___ Land Division
___ Planned Unit Development
___ Other _____

Applicant Information

Name _____
Phone _____
Address _____

Owner Information (If different from applicant)

Name _____
Phone _____
Address _____

Property Information

Address/Location _____
Parcel # _____
Zoning (Current) _____ Property Size_____

Description of Proposed Use/Request (use other side or attach pages as needed)

_____

_____

_____

I hereby attest that the information on this application form is, to the best of my knowledge, true and accurate.

_____ _____
Signature of applicant Date

Optional: I hereby grant permission for members of the SmallvilleTownship (Planning Commission) (Board of Zoning Appeals) (Township Board) (or Zoning Administrator) to enter the above described property for the purposes of gathering information related to this application. *Note to applicant: This permission is optional and failure to grant permission will not affect any decision on your application.*

_____ _____
Signature of applicant Date

Office Use Only

Date received_____ Fee Paid _____
Materials received: Site Plans _____ Legal Description _____
Application accepted by: _____

SAMPLE APPLICATION CHECKLIST

Your application requires approval by the:

___ Planning Commission ___ City Council ___ Zoning Board of Appeals

As a:

___ Rezoning
___ Special Land Use
___ Site Plan Review
___ Variance from Section _____ of the Zoning Ordinance
___ Subdivision
___ Land Division
___ Planned Unit Development
___ Other _____

The following materials, at a minimum, are required to be submitted as part of this review. *The application will not be considered complete, and will not be accepted, until all of the items have been submitted.*

_____ ___ Copies of a site plan meeting the requirements of the Zoning/Subdivision/Land Division Ordinance
_____ Legal Description of the property
_____ Review Fee of $_____
_____ Competed application form

For earliest consideration by the (Planning Commission) (City Council) (Board of Appeals) this application, and all of the required materials, must be submitted to the City Clerk no later than 5:00 p.m. on _____
(Submission Date)

The next available submission date, after the above date, is _____
(Submission Date)

If a completed application and all required materials are received by the Submission Date, the following meeting(s) will be held to review the application. Attendance by a representative of the applicant is required. All meetings, unless otherwise notified, will be held at City Hall (INSERT ADDRESS)

_____p.m. (Planning Commission) (City Council) (Board of Zoning Appeals)
_____p.m. (Planning Commission) (City Council)

I hereby acknowledge receipt of this information and a completed copy of this form has been provided to me.

_____ _____
Signature of applicant Date

SMALLVILLE TOWNSHIP APPLICATION INFORMATION

Your application requires approval by the:

__ Planning Commission __ Township Board __ Zoning Board of Appeals

As a:

__ Rezoning
__ Special Land Use
__ Site Plan Review
__ Variance from Section _____ of the Zoning Ordinance
__ Subdivision
__ Land Division
__ Planned Unit Development
__ Other _____

The following materials, at a minimum, are required to be submitted as part of this review. *The application will not be considered complete, and will not be accepted, until all of the items have been submitted.*

_____ ___ Copies of a site plan meeting the requirements of the Zoning/Subdivision Ordinance.
_____ Legal Description of the property noted on the application.
_____ Review Fee of $_____
_____ Competed application form

For earliest consideration by the (Planning Commission) (Township Board) (Board of Appeals) this application, and all of the required materials, must be submitted to the Township Clerk no later than 5:00 p.m. on _____
(Submission Date)

The next available submission date, after the above date, is _____
(Submission Date)

If a completed application and all required materials are received by the Submission Date, the following meeting(s) will be held to review the application. Attendance by a representative of the applicant is required. All meetings, unless otherwise notified, will be held at the Township Hall, (address) at 7:30 p.m.

_____ (Planning Commission) (Township Board) (Board of Zoning Appeals)
_____ (Planning Commission) (Township Board)

I hereby acknowledge receipt of this information and a completed copy of this form has been provided to me.

_____ _____
Signature of applicant Date

Appendix F

A Hydrologic Study of the Bear Creek and Bear Lake Watershed

Produced by:
Hydrologic Studies Unit
Geologic and Land Management Division
Michigan Department of Environmental Quality (MDEQ)

A Hydrologic Study of the Bear Creek Watershed

Michigan's Nonpoint Source Program

Dave Fongers
Hydrologic Studies Unit
Geological and Land Management Division
Michigan Department of Environmental Quality

Table of Contents

Summary 1
Project Goals 10
Watershed Description and Model Parameters 10
Model Results 24
Appendices A-1
  Appendix A: Bear Creek Hydrologic Model Parameters A-1
  Appendix B: Bear Creek Monitoring A-7

For comments or questions relating to this document, contact Dave Fongers at:

517-373-0210
fongersd@michigan.gov
MDEQ, GLMD, P.O. Box 30458, Lansing, MI 48909

Michigan's Nonpoint Source Program

Summary

A hydrologic model of the Bear Creek watershed was developed by the Hydrologic Studies Unit (HSU) of the Michigan Department of Environmental Quality (MDEQ) using the Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS). The hydrologic model was developed to help determine the effect of land use changes in the watershed on Bear Creek's flow regime and to provide design flows for streambank stabilization Best Management Practices (BMPs). The Bear Creek Watershed Committee may combine this information with other determinants, such as open space preservation, to decide what locations are the most appropriate for wetland restoration, stormwater detention, in-stream BMPs, or upland BMPs. The communities within the watershed could also use the information to help develop stormwater ordinances.

The hydrologic model has four scenarios corresponding to 1800, 1978, 1997, and build-out land use. The build-out scenario is based on zoning. General land use changes illustrated in Figure 1 show that urban uses are projected to continue to increase, with a net loss of natural areas. Because of these land use trends, the model predicts increases in runoff volumes and peak flows from 1800 to 1978/1997 and from 1978/1997 to build-out for all four design storms analyzed, as shown in Figures 2 through 9. More detailed land use information is provided in the Watershed Description and Model Parameters section of this report. Additional flow details are in the Model Results section of this report.

The projected runoff volume and peak flow increases from the 10, 4, and 2 percent chance (10-year, 25-year, and 50-year), 24-hour storms would aggravate flooding problems unless mitigated through the use of effective stormwater management techniques. The projected increases from the 50 percent chance (2-year), 24-hour storm will increase channel-forming flows. The channel-forming flow in a stable stream usually has a one to two year recurrence interval. These relatively modest storm flows, because of their higher frequency, have more effect on channel form than extreme flood flows. Hydrologic changes that increase this flow can cause the stream to become unstable. Stream instability is indicated by excessive erosion at many locations throughout a stream reach. Stormwater management techniques used to mitigate flooding can also help mitigate projected channel-forming flow increases. However, channel-forming flow criteria should be specifically considered in the stormwater management plan so that the selected BMPs will be most effective. For example, detention ponds designed to control runoff from the 4 percent chance, 24-hour storm often do little to control the runoff from the 50 percent chance, 24-hour storm unless the outlet is specifically designed to do so.

The average yield from the 50 percent chance, 24-hour storm for the Bear Creek watershed is 0.01 and 0.02 cubic feet per second per acre (cfs/acre) for current and build-out conditions, respectively. These values have implications for fish habitat and stream stability management. The average yield from the 4 percent chance, 24-hour storm for the Bear Creek watershed is 0.07 and 0.11 cfs/acre for current and build-out conditions, respectively. These values have implications for flood control management.

Additional details are shown in Figures 10 through 12 and in the Model Results section of this report.

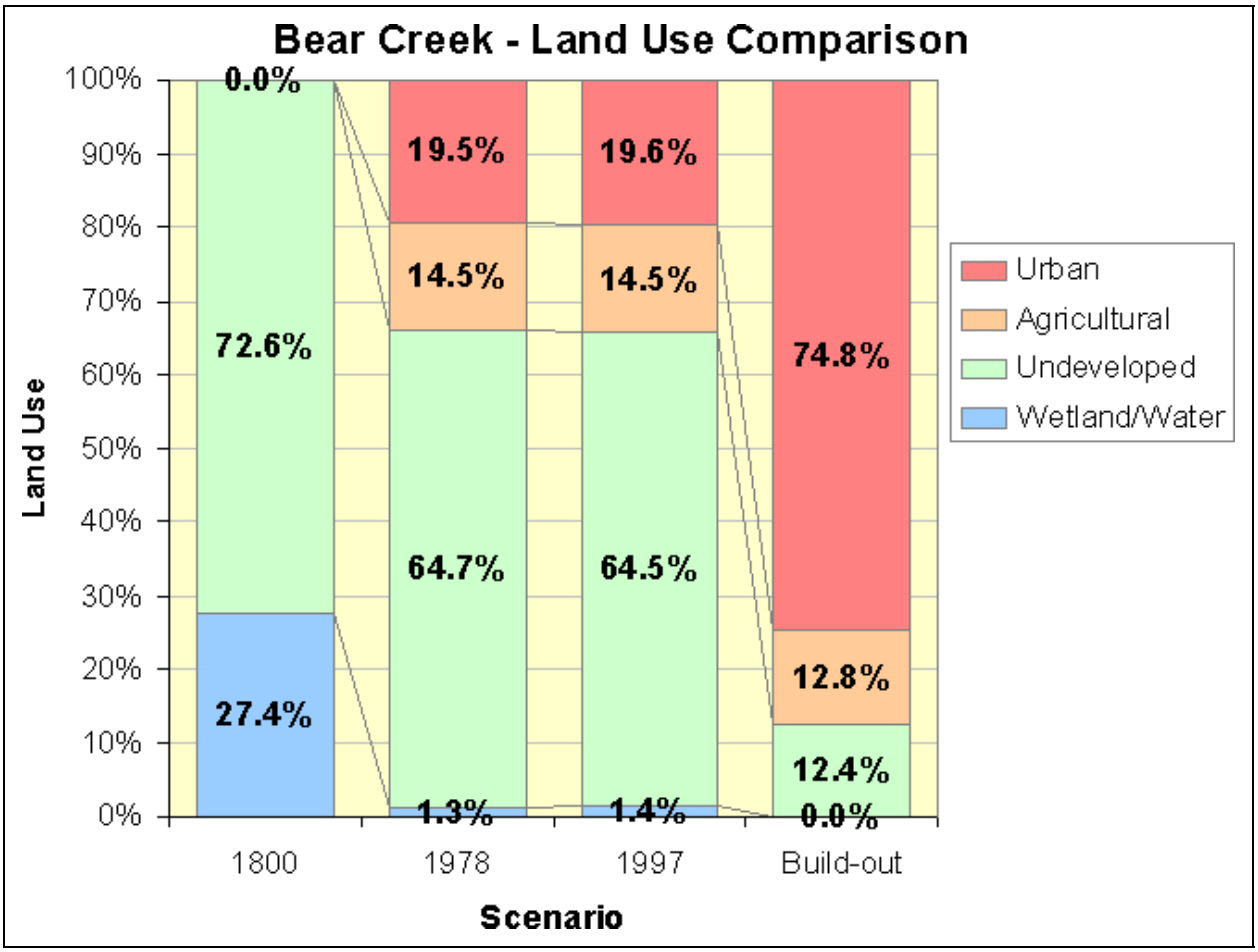


Figure 1: Land Use Comparison

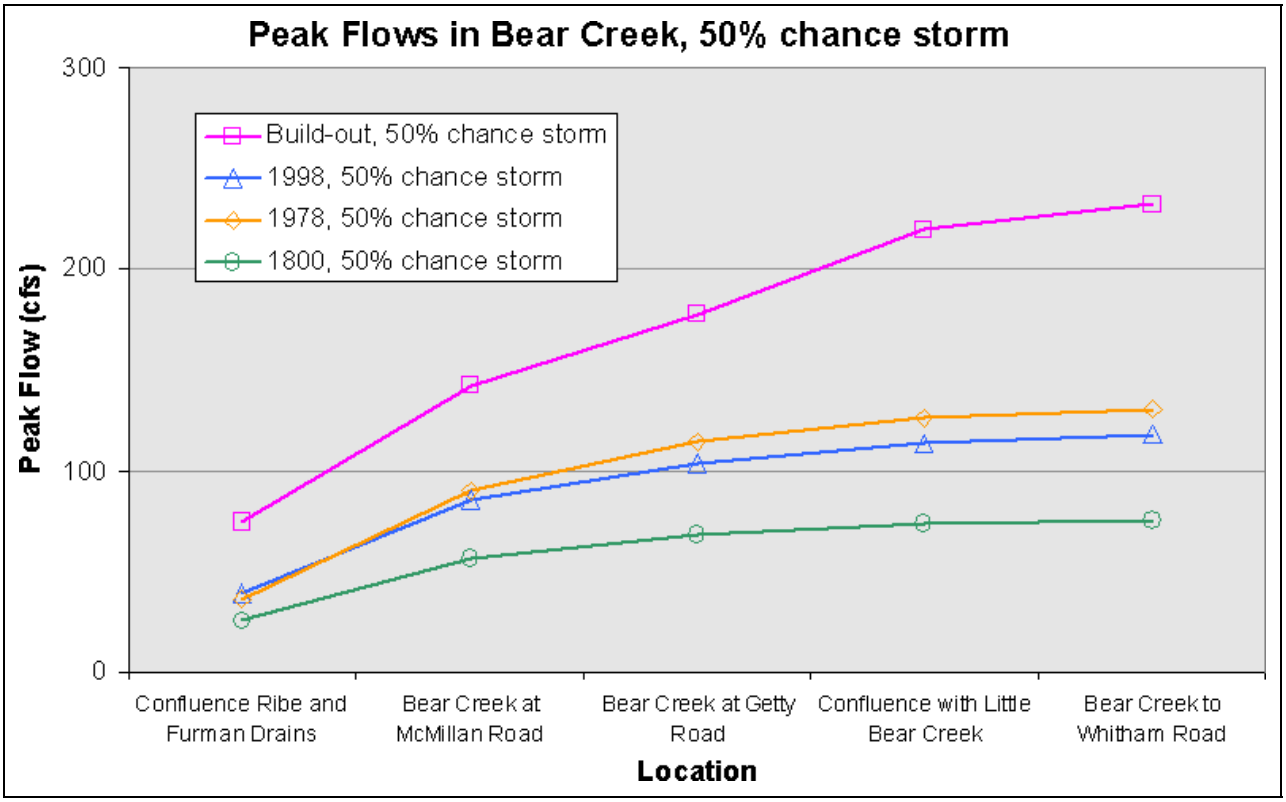


Figure 2: Predicted peak flows for selected locations, 50 percent chance storm

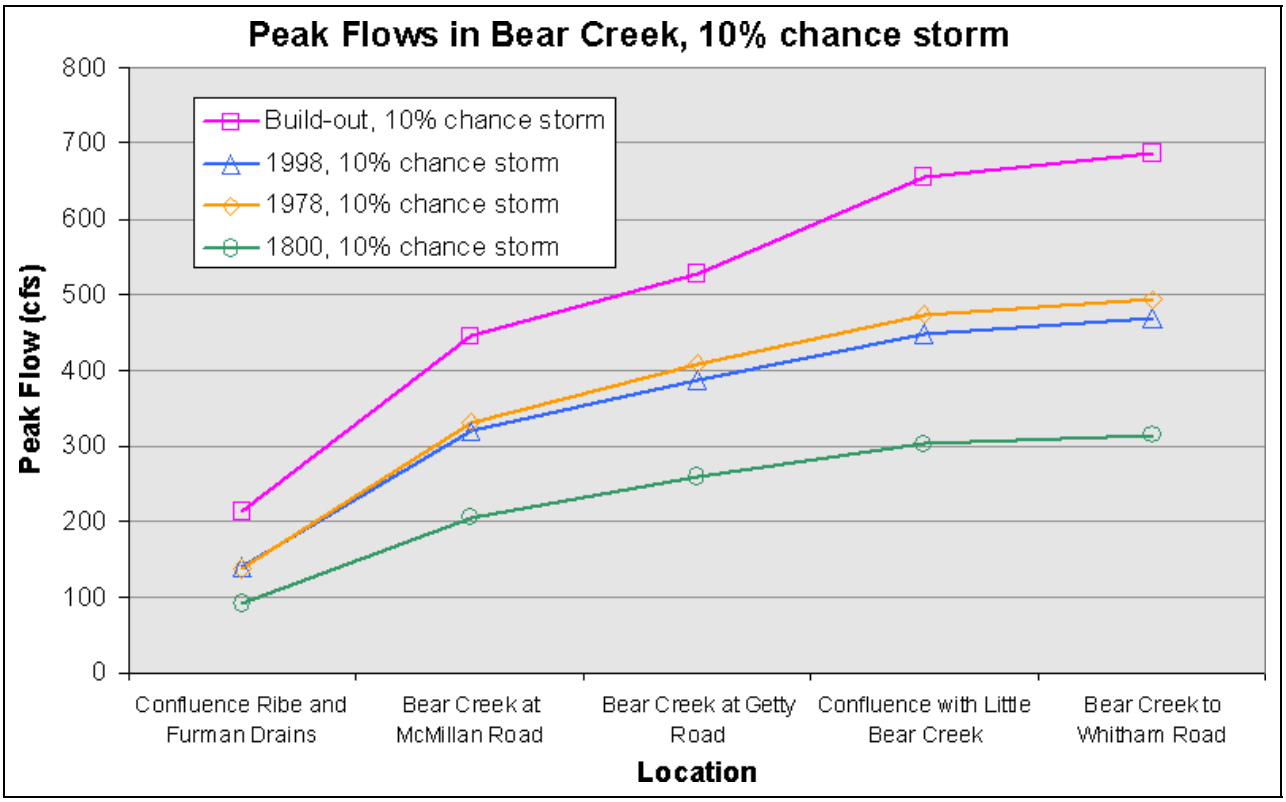


Figure 3: Predicted peak flows for selected locations, 10 percent chance storm

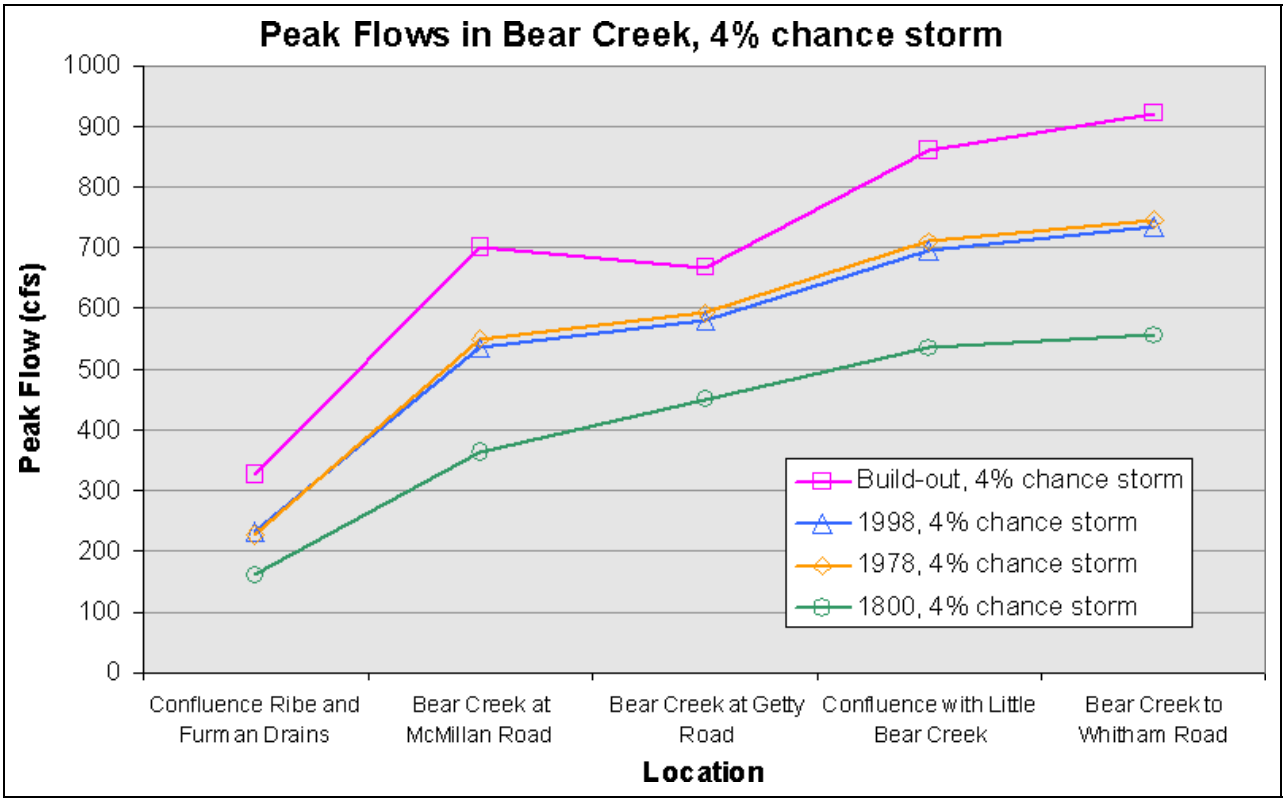


Figure 4: Predicted peak flows for selected locations, 4 percent chance storm

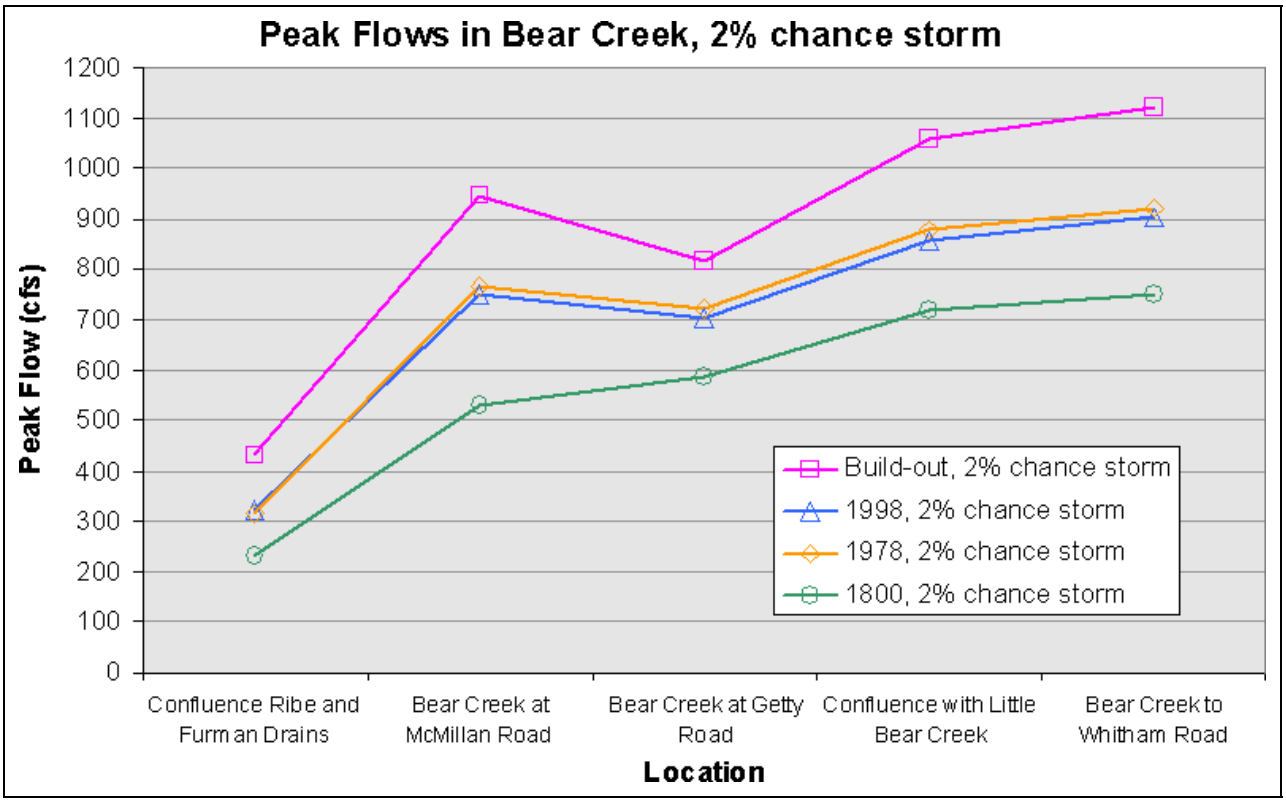


Figure 5: Predicted peak flows for selected locations, 2 percent chance storm

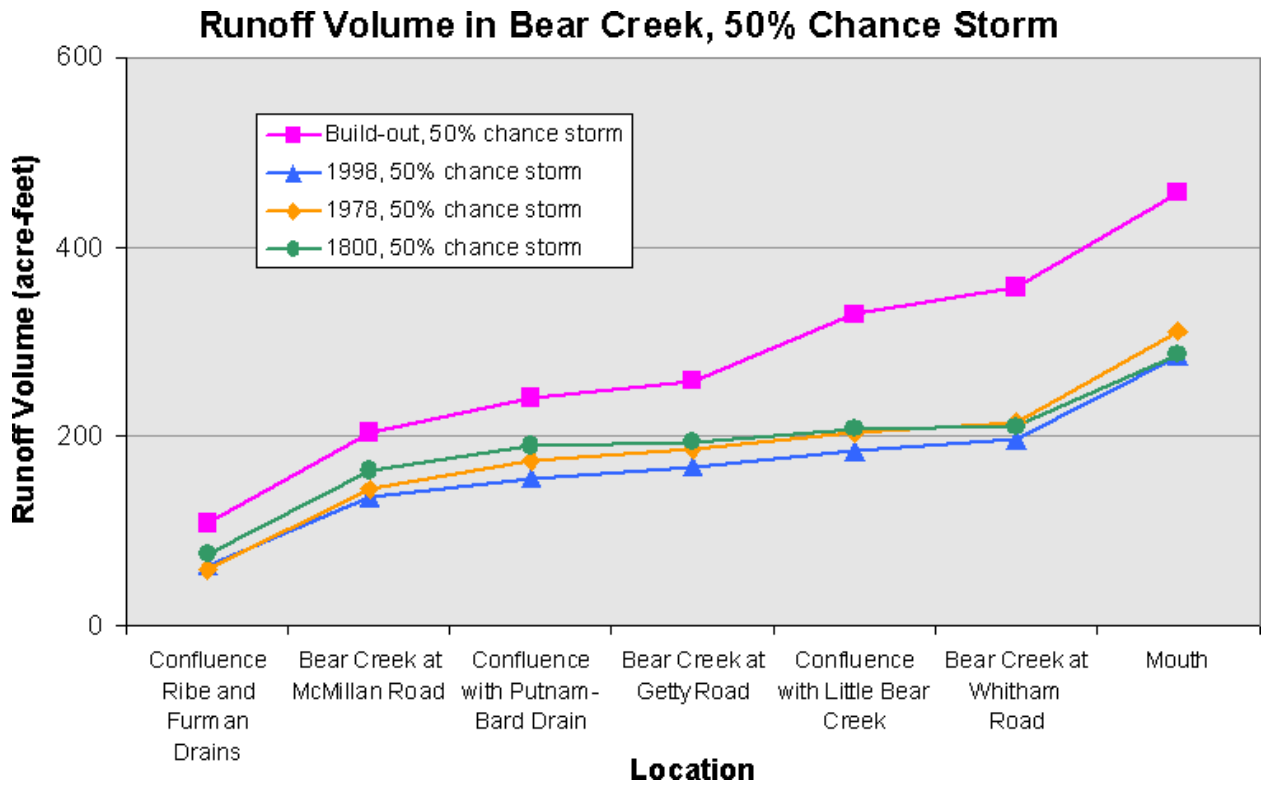


Figure 6: Predicted runoff volumes, 50 percent chance storm

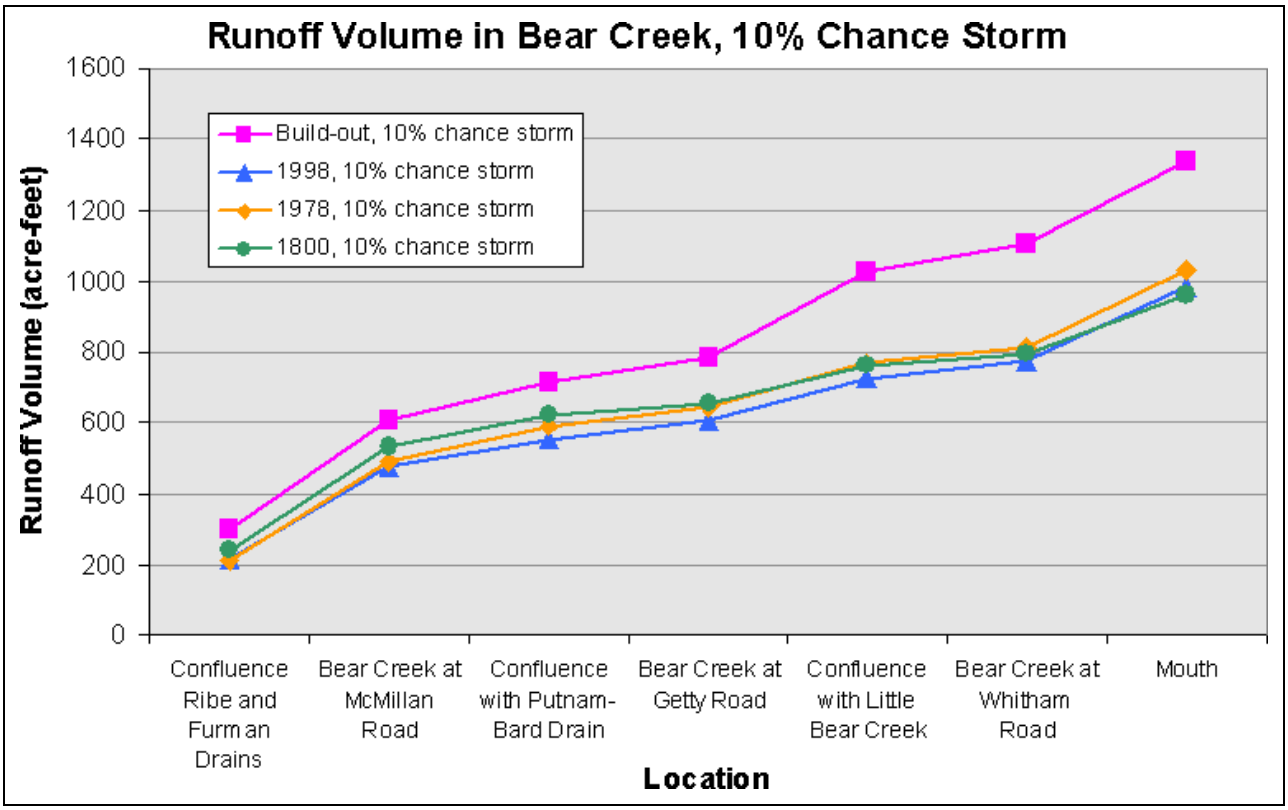


Figure 7: Predicted runoff volumes, 10 percent chance storm

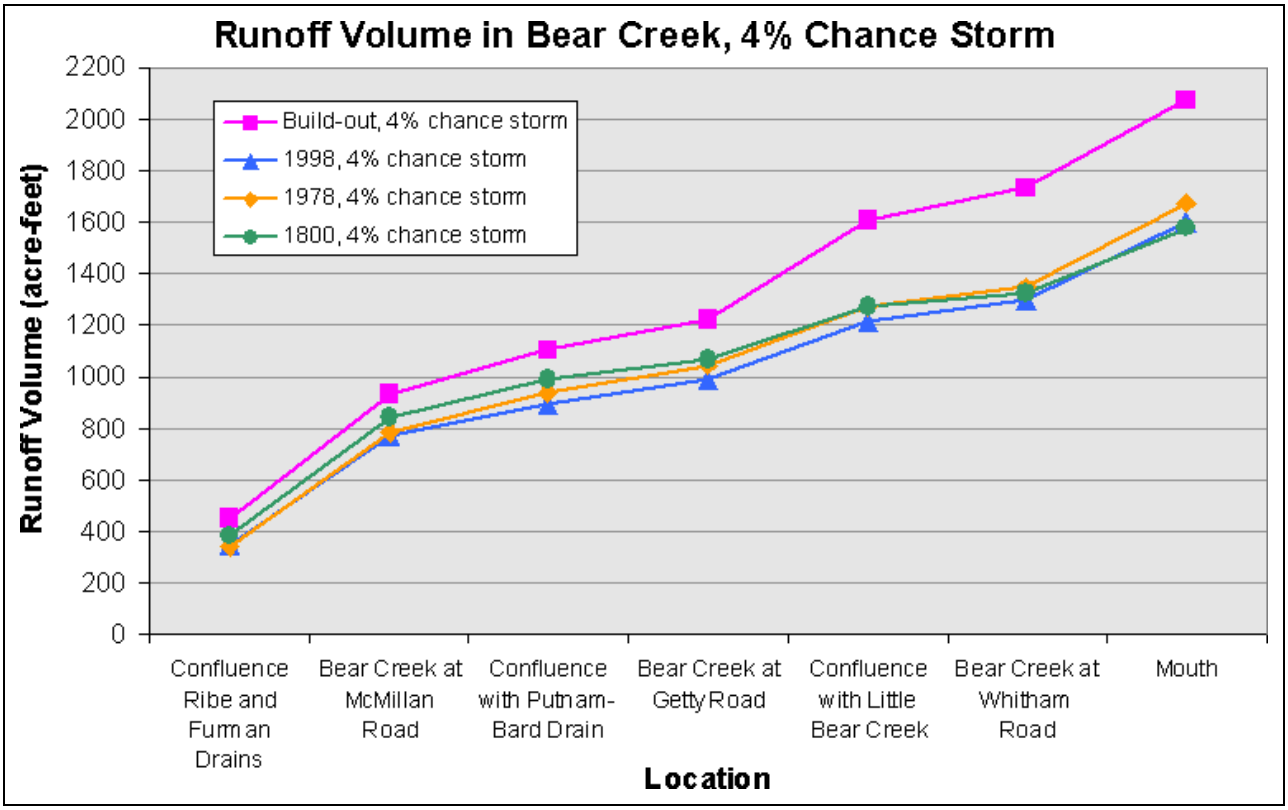


Figure 8: Predicted runoff volumes, 4 percent chance storm

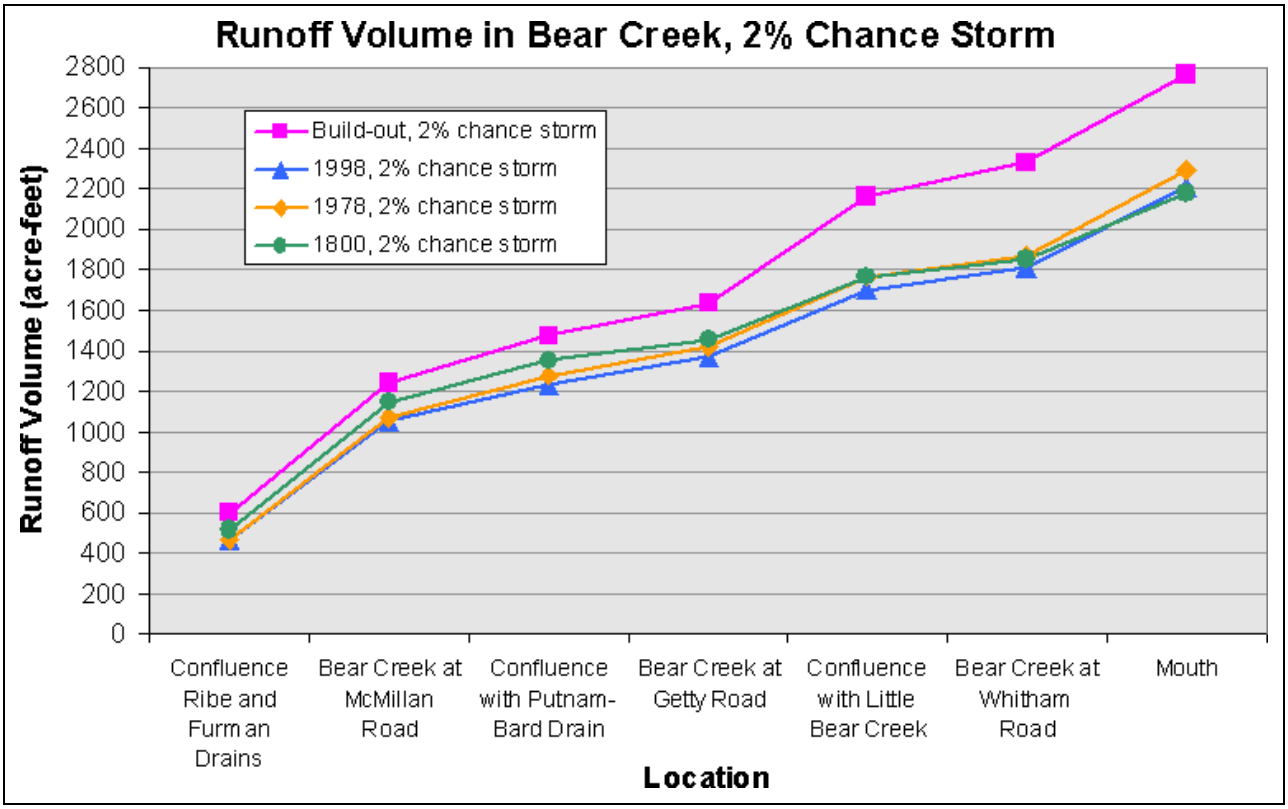


Figure 9: Predicted runoff volumes, 2 percent chance storm

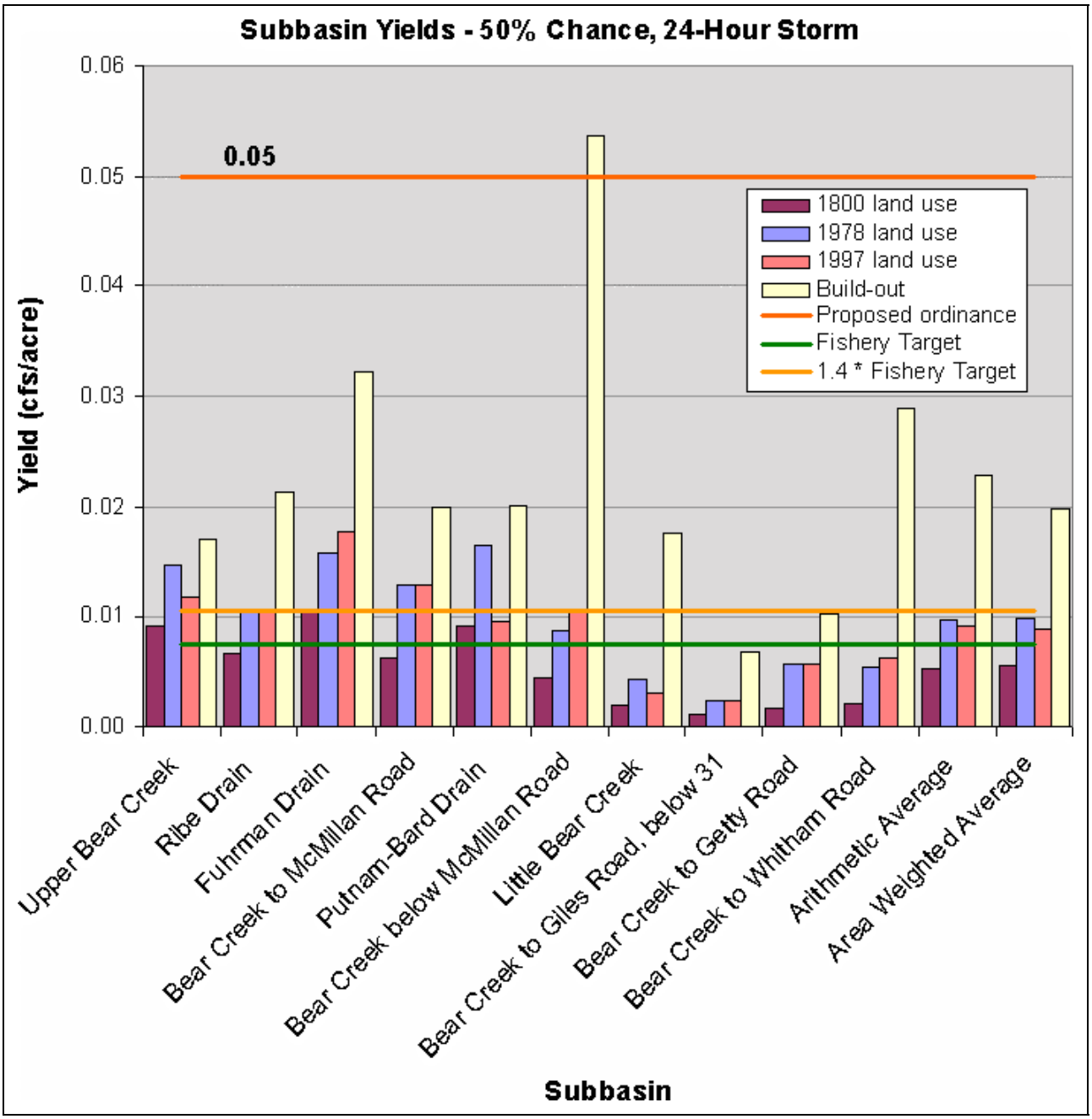


Figure 10: Subbasin Yields, 50 percent chance, 24-hour storm

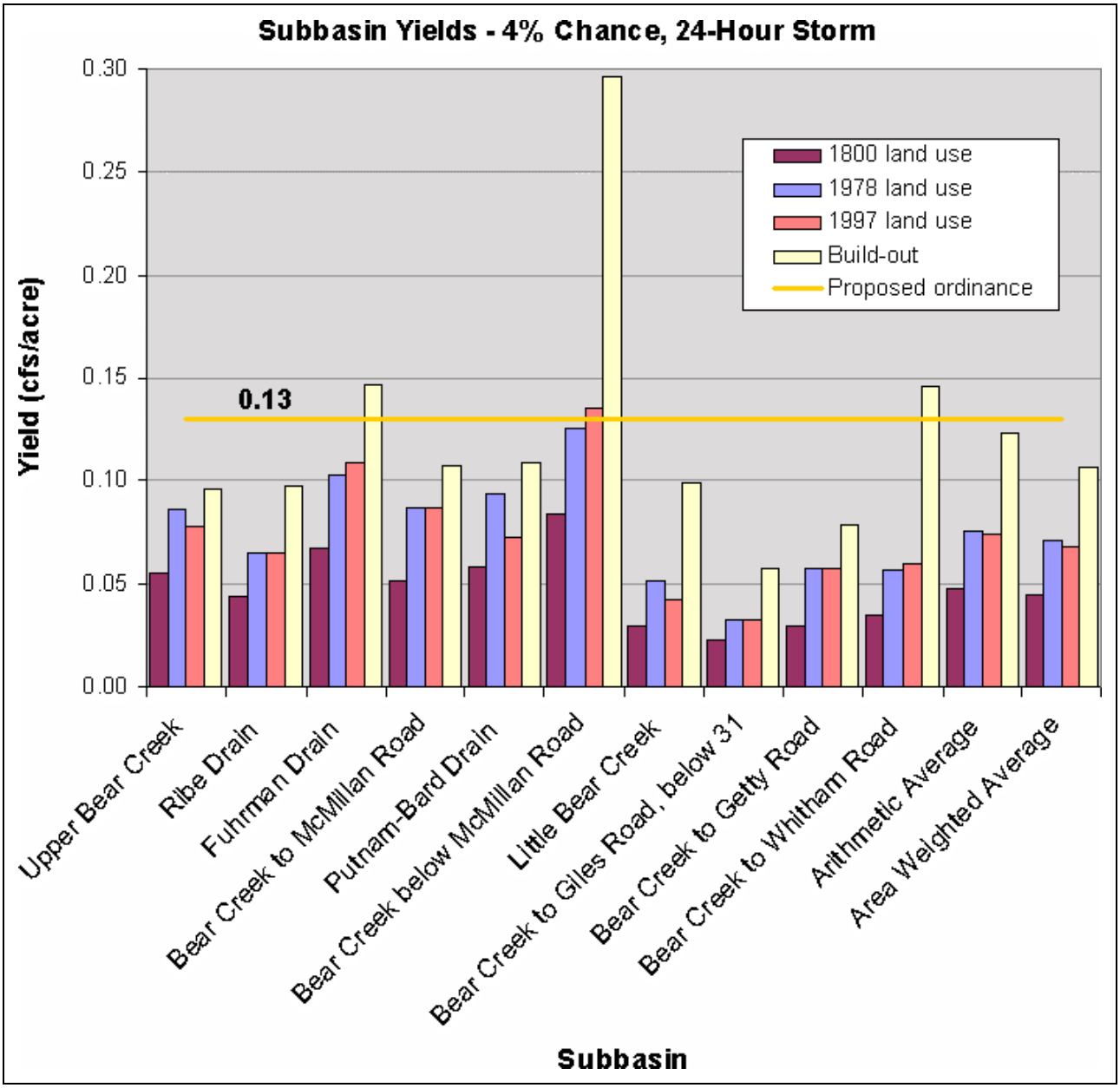


Figure 11: Subbasin Yields, 4 percent chance, 24-hour storm

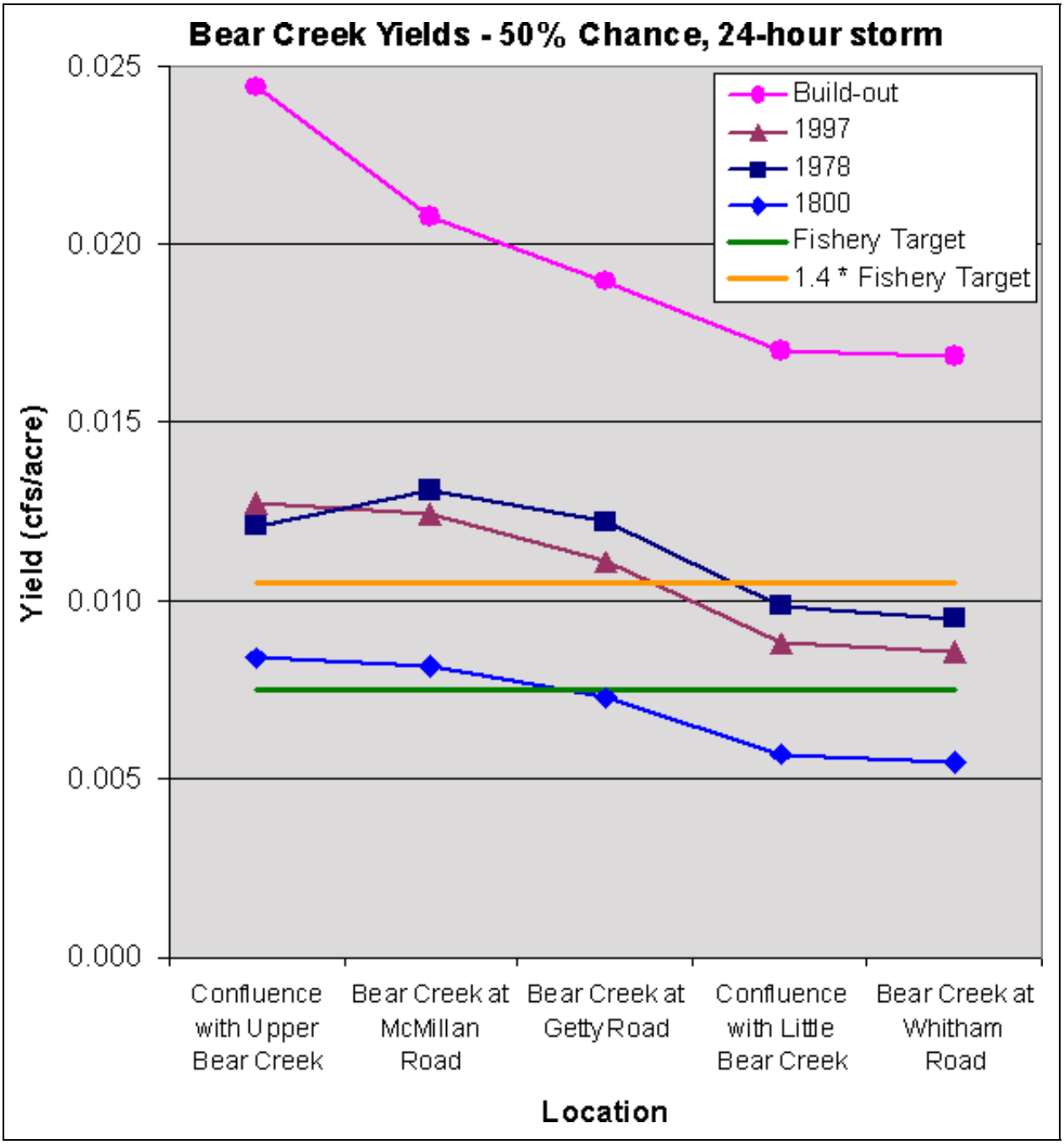


Figure 12: Bear Creek Yields, 50 percent chance, 24-hour storm

Project Goals

The Bear Creek hydrologic study was initiated in support of a Muskegon River watershed project, which is funded in part by a United States Environmental Protection Agency (USEPA) Part 319 grant administered by the MDEQ. The goals of this study are:

- to better understand the watershed's hydrologic characteristics and the impact of hydrologic changes, especially land use changes, in the Bear Creek watershed
- to facilitate the selection and design of suitable BMPs
- to provide information that can be used by local units of government to develop or improve stormwater ordinances

Watershed Description and Model Parameters

The 29.8 square mile Bear Creek watershed, Figure 13, is located in Muskegon County. Bear Creek outlets to the Muskegon River. The study divides the watershed into sixteen subbasins, as shown in Figure 14. Subbasins 1, 2, 3, and 11a are not included in our hydrologic model. Subbasins 1, 2, and 3 do not have an apparent overland outlet for surface runoff. We have assumed that these subbasins do not contribute surface runoff to Bear Creek or its tributaries. According to the United States Geological Survey (USGS) quadrangle, Subbasin 11a does not have a stream or surface drain. Overland runoff would have to cross a railroad track and a freeway. We do not expect runoff above the freeway from Subbasin 11a to significantly contribute to the peak flow.

Our analysis of the watershed uses the curve number technique to calculate surface runoff volumes and peak flows. This technique, developed by the Natural Resources Conservation Service (NRCS) in 1954, represents the runoff characteristics from the combination of land use and soil data as a runoff curve number. The curve numbers for each subbasin, listed in Appendix A, were calculated from digital soil and land use data using Geographic Information Systems (GIS) technology.

Runoff curve numbers were calculated from the land use and soil data shown in Figures 15 through 19. Land use maps based on the MDEQ GIS data for 1800 and 1978, are shown in Figures 15 and 16, respectively. The 1800 land use information is provided at the request of the Bear Creek project manager. The MDEQ Nonpoint Source program does not expect or recommend that the flow regime calculated from 1800 land use be used as criteria for BMP design or as a goal for watershed managers. The 1997 land use data were provided by the University of Michigan, but have been modified slightly. The extent of the sand mining land use spanning Subbasins 1 and 11 was enlarged to match the extent visible in the 1992 aerial photos shown in Figure 20. Sand mining is assumed to be a noncontributing area within the subbasins. The aerial photos in Figure 20 were also used to estimate the housing densities. Densities of one house per one-third acre for Subbasin 15 and one house per one-half acre for all other subbasins were used in the

runoff curve number calculations. The build-out analysis, Figure 18, assumes land use is developed to the maximum allowed under zoning regulations. Zoning information was compiled and provided by HNTB Michigan, Inc. Zoning classifications and land use classes used for the hydrological analysis are shown in Table 1. The conservation/open space classification was assumed to be 50 percent agricultural and 50 percent forest and is shown as the cross-hatched area in Figure 18. Land use information by subbasin is also detailed in Table 2.

The aerial photography depicted in Figure 20 has been provided to the Bear Creek project manager in a larger size. The photos were taken in 1992 and 1998. The 1992 photos are the gray-scale aerial photos and cover the upper two-thirds of the watershed. The 1998 photos are the false-color infrared aerial photos and cover the lower third of the watershed. In false-color infrared photos, bright red areas indicate vigorous plant growth. The brightest areas are usually yards and golf courses. Deciduous trees are various shades of dark gray because the photos are generally taken in April for leaf off conditions. Coniferous trees are dark red and often very compact because most are in plantations. Open fields with grasses, forbs, or shrubs are often pink or grayish mixed with pink because there is generally not a lot of vigorous growth when the photos are taken. Because plant coverage is generally minimal in agricultural fields, they are typically gray-green and often mottled looking (light and dark areas). Water is often black or even bluish depending on the sediment content in the water. The reflectivity of impervious areas varies, and often appear either white or dark.

Table 1: Interpretation of Zoning Classifications for Curve Number Calculations

Zoning Classification	**Hydrologic Analysis Classification**
AG – Agriculture	Agricultural
COM – Commercial	Commercial
OF – Office	Commercial
IND – Industrial	Industrial
CON – Conservation/Open Space	Forest/Agriculture
PUB – Public/Quasi-public	Outdoor Recreation
R1 – High Density Residential, minimum lot size 0-43,560 sq. ft.	Residential
R2 – Medium Density Residential, minimum lot size 1-5 acres	Residential
R3 – Low Density Residential, minimum lot size >5 acres	Residential
MF – Multiple Family	Residential
MHP – Manufactured Home park	Residential
MXD – Mixed Uses	Residential

The NRCS soils data for the watershed is shown in Figure 19. Where the soil is given a dual classification, B/D for example, the soil type was selected based on land use. In these cases, the soil type is specified as D for natural land uses or the alternate classification (A, B, or C) for developed land uses. The runoff curve numbers calculated from the soil and land use data are listed in Appendix A. The percent impervious field is left at 0.0, because it is already incorporated in the curve numbers. The initial loss field is left blank so that HMS uses the default equation based on the curve number.

The time of concentration for each subbasin, which is the time it takes for water to travel from the hydraulically most distant point in the watershed to the design point, was calculated from the USGS quadrangles. The storage coefficients, which represent storage in the subbasin, were iteratively adjusted to provide a peak flow reduction equal to the ponding adjustment factors described further in Appendix A. Times of concentration and storage coefficients are not listed for Subbasins 14, 15, or 16. Subbasin 16 is Bear Lake. Subbasins 14 and 15 are drainage directly to Bear Lake, split by township boundaries, and are included at the request of the project manager to provide an estimate of the relative runoff contribution from each township. Calculation of peak flow from these subbasins has no significance, because the flows are dispersed and highly attenuated by Bear Lake. Only the runoff volumes from these subbasins are of interest, which is not affected by the time of concentration or storage coefficient values.

The reach routing method is the lag method. Lag is the travel time of water within each section of the river. The method translates the flood hydrograph through the reach without attenuation. It is not appropriate for reaches that have ponds, lakes, wetlands, or flow restrictions that provide storage and attenuation of floodwater. Lag for each reach is calculated from the USGS quadrangles. These values are listed in Appendix A.

The selected precipitation events were the 50, 10, 4, and 2 percent chance (2-, 10-, 25-, and 50-year), 24-hour storms. Design rainfall values for these events are tabulated in *Rainfall Frequency Atlas of the Midwest*, Bulletin 71, Midwestern Climate Center, 1992, pp. 126-129, and summarized for this site in Appendix A. These values have been multiplied by 0.964 to account for the size of the watershed.

These parameters were then incorporated into a HEC-HMS model to compute runoff volume and flow. Precipitation and flow monitoring data, Appendix B, were collected with the intent of using it to calibrate the hydrologic model, but the data are not adequate for that purpose.

Although the flow monitoring effort did not result in suitable calibration data, the predicted peak flows were compared to the USGS gage data as described in the “Model Results” section. The preliminary model appeared to substantially overpredict the peak flows from the four and two percent chance storms. Further analysis indicated that significant storage was likely in the wetland above US-31/Putnam Road, as shown in Figure 21. Based on estimates of culvert flows and wetland areas, storage was added to the model in the reach above Getty as specified in Appendix A.

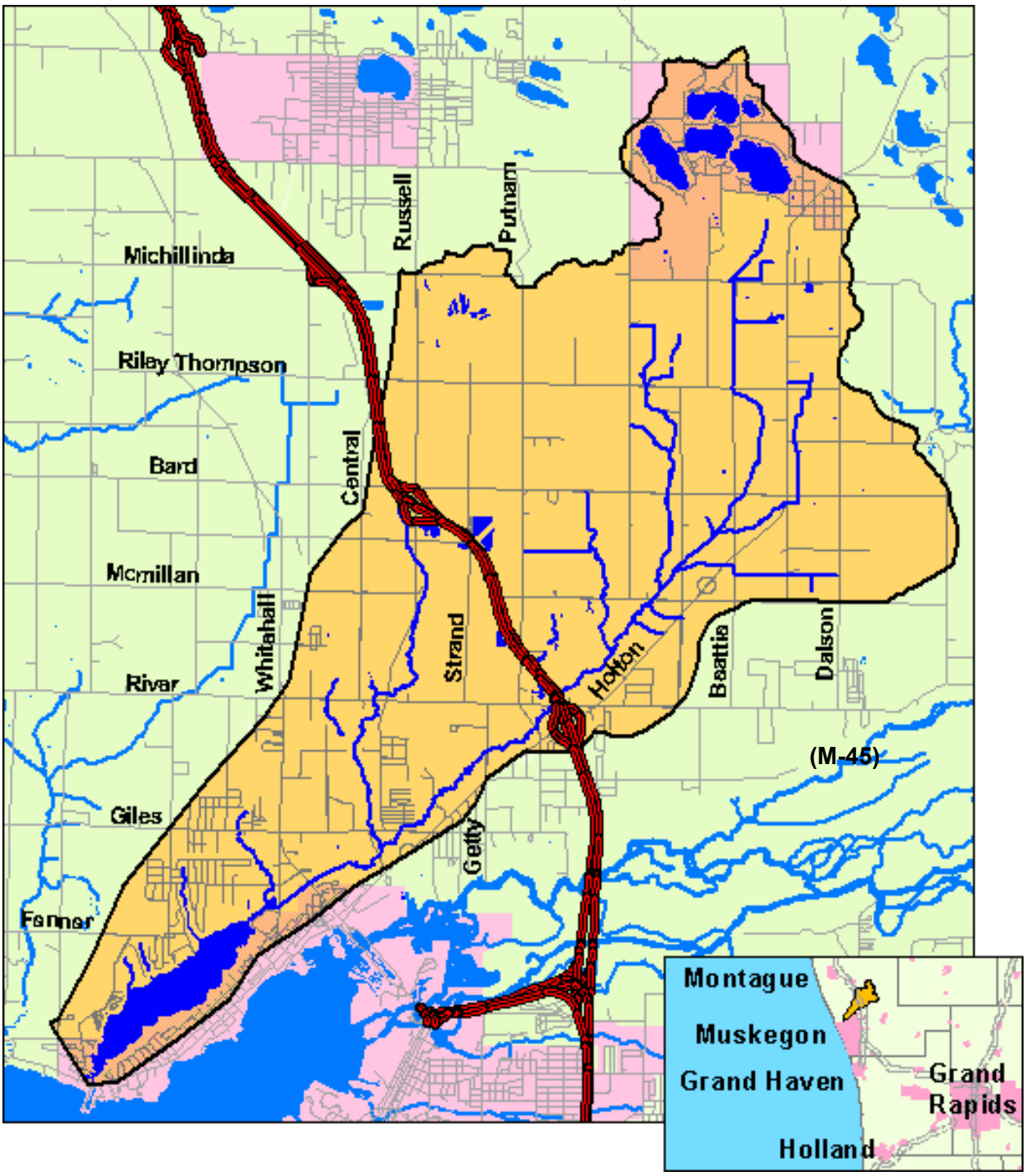


Figure 13: Delineated Bear Creek Watershed

Subbasin	Area (sq. mi.)	Description
1	0.49	Non-contributing area, west
2	0.28	Non-contributing area, central
3	1.77	Non-contributing area, east
4	3.76	Upper Bear Creek
5	2.69	Ribe Drain
6	2.07	Fuhrman Drain
7	2.21	Bear Creek to McMillan Road
8	1.57	Putnam-Bard Drain
9	0.47	Bear Creek below McMillan
10	3.69	Little Bear Creek
11 a	1.80	Bear Creek to Giles Road, above 31
11 b	1.97	Bear Creek to Giles Road, below 31
12	1.87	Bear Creek to Getty Road
13	1.39	Bear Creek to Whitham Road
14	2.58	Bear Creek, Laketon Twp.
15	0.55	Bear Creek, North Muskegon Twp.
16	0.62	Bear Lake

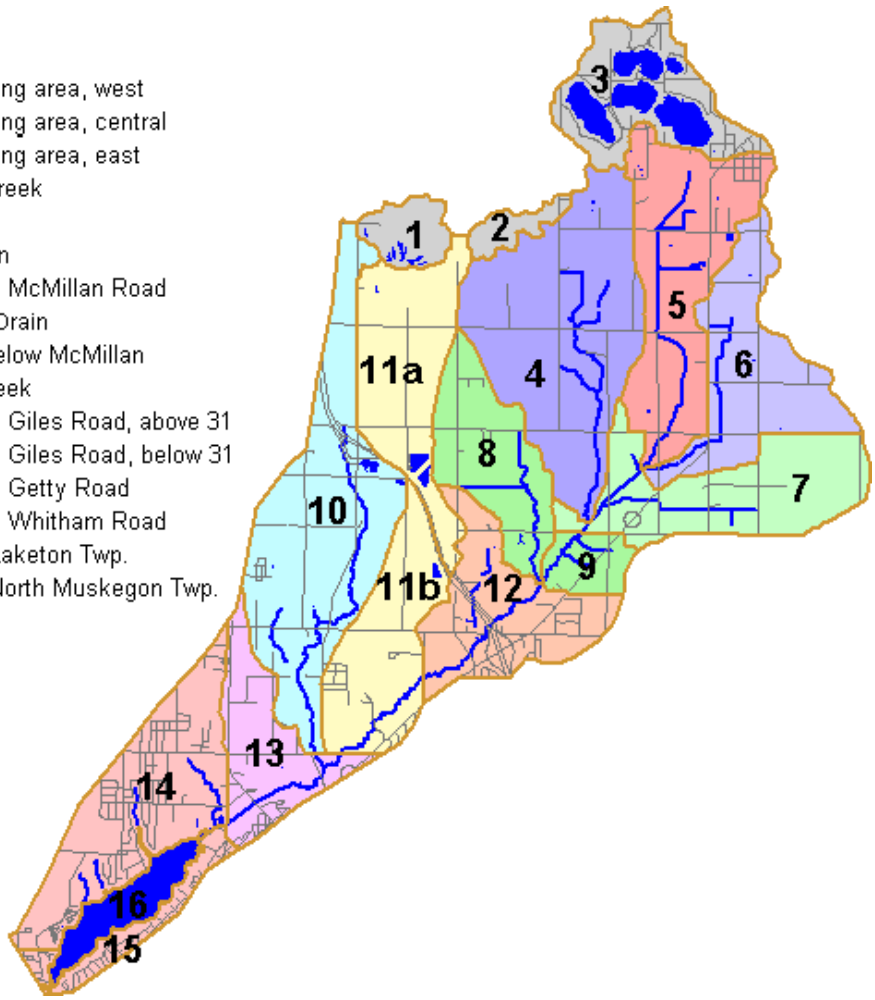


Figure 14: Subbasin Identification

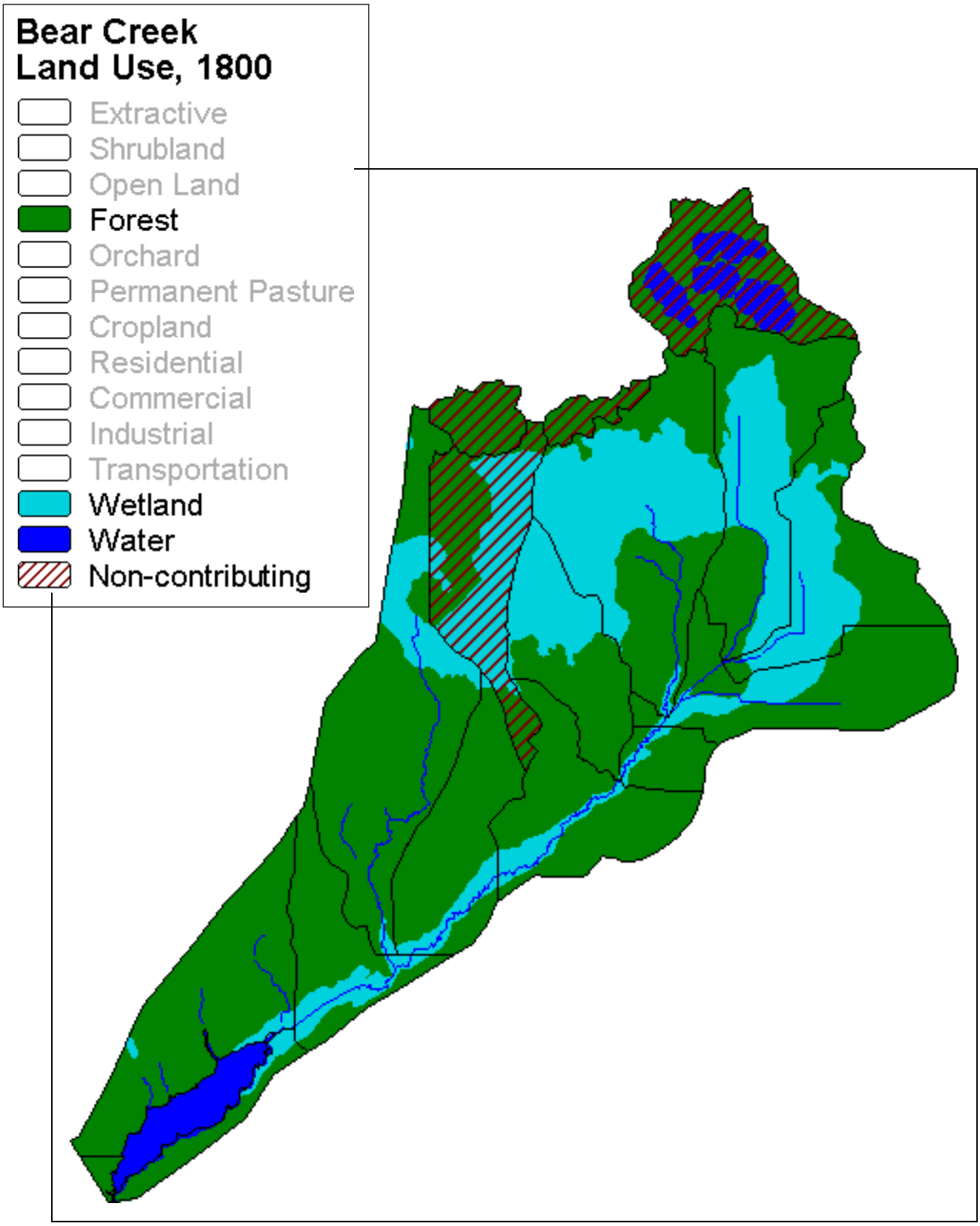


Figure 15: 1800 Land Use Data

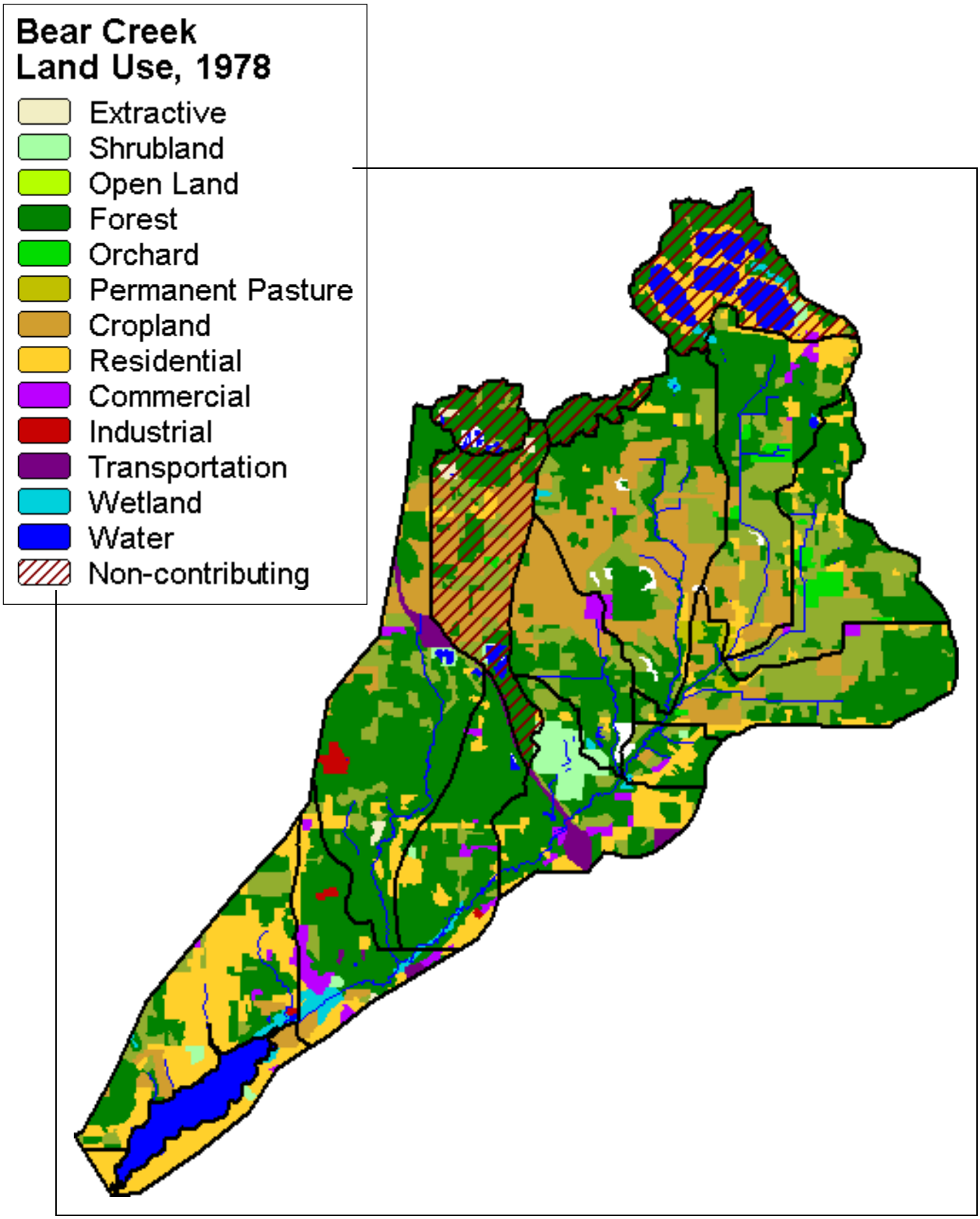


Figure 16: 1978 Land Use Data

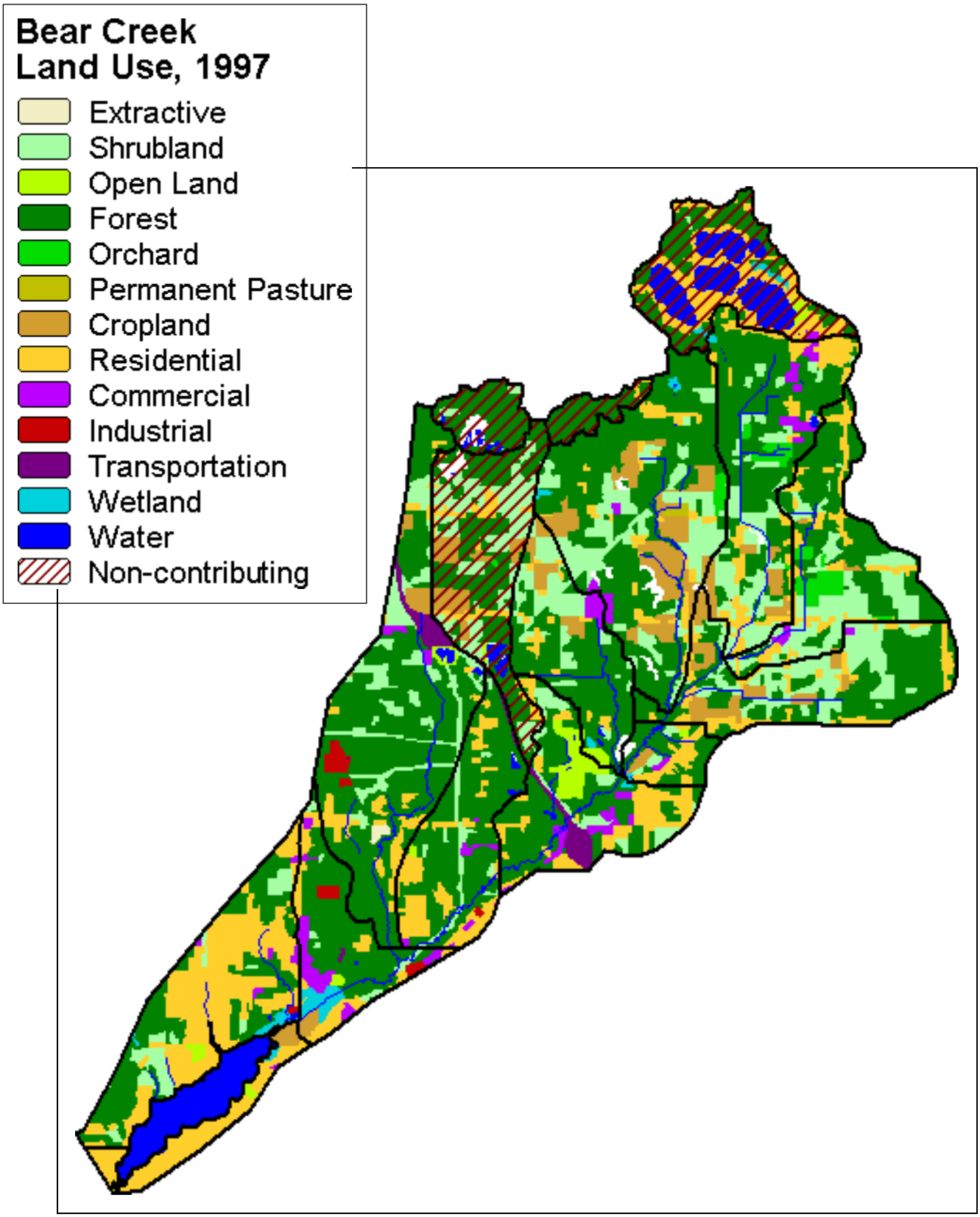


Figure 17: 1997 Land Use Data

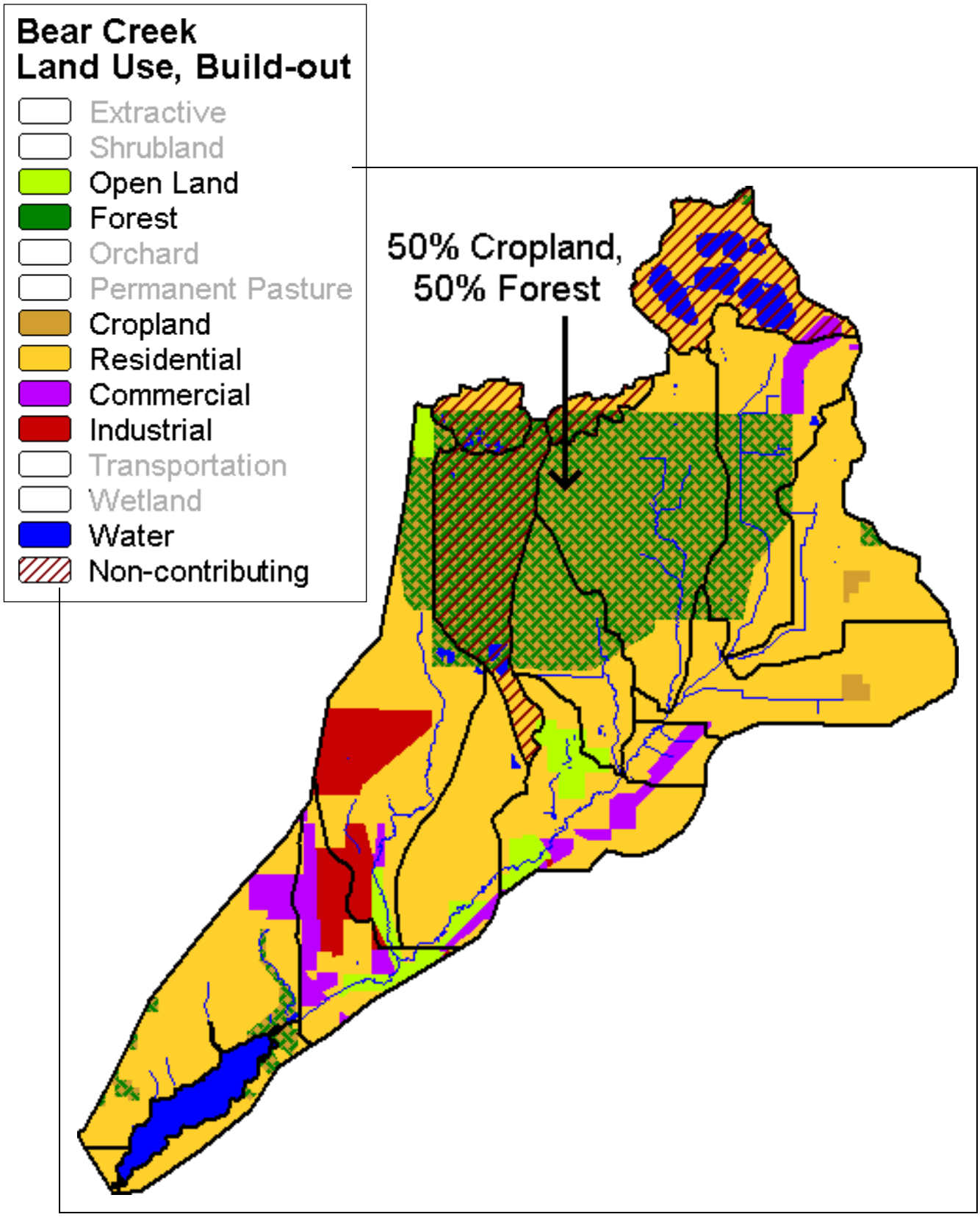


Figure 18: Zoned, or Build-Out, Land Use Data

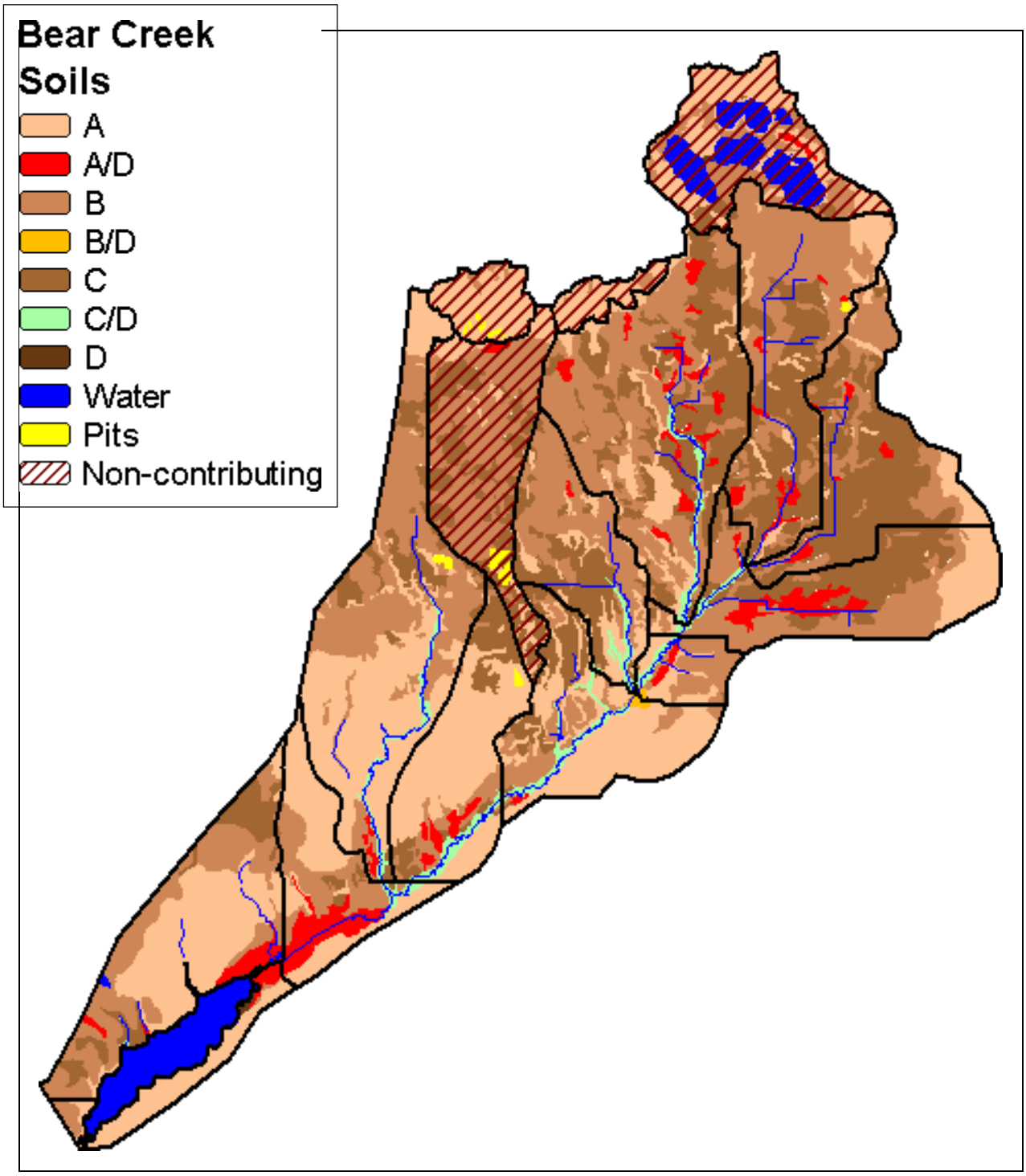


Figure 19: NRCS Soils Data

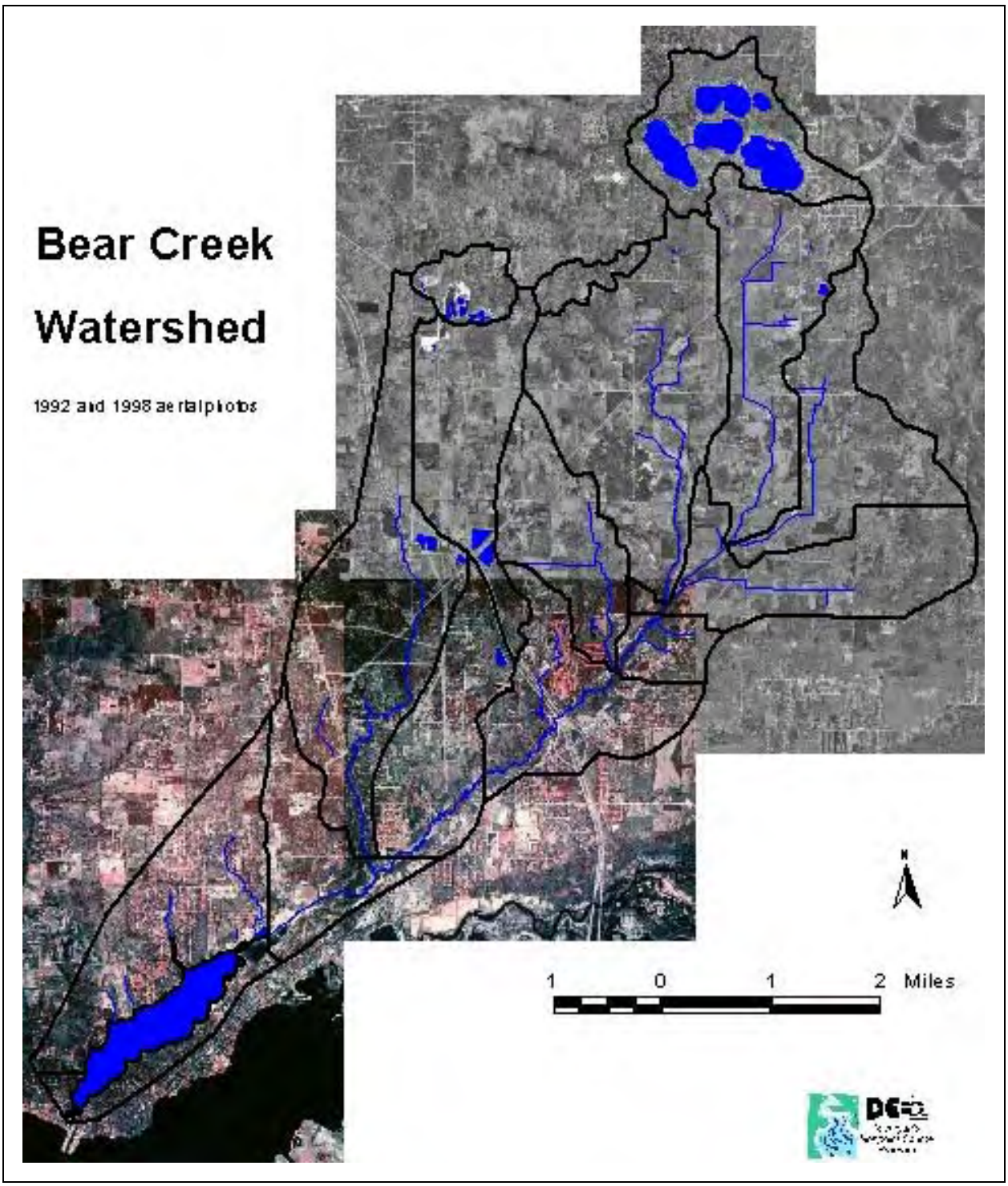


Figure 20: 1992 and 1998 Aerial Photography

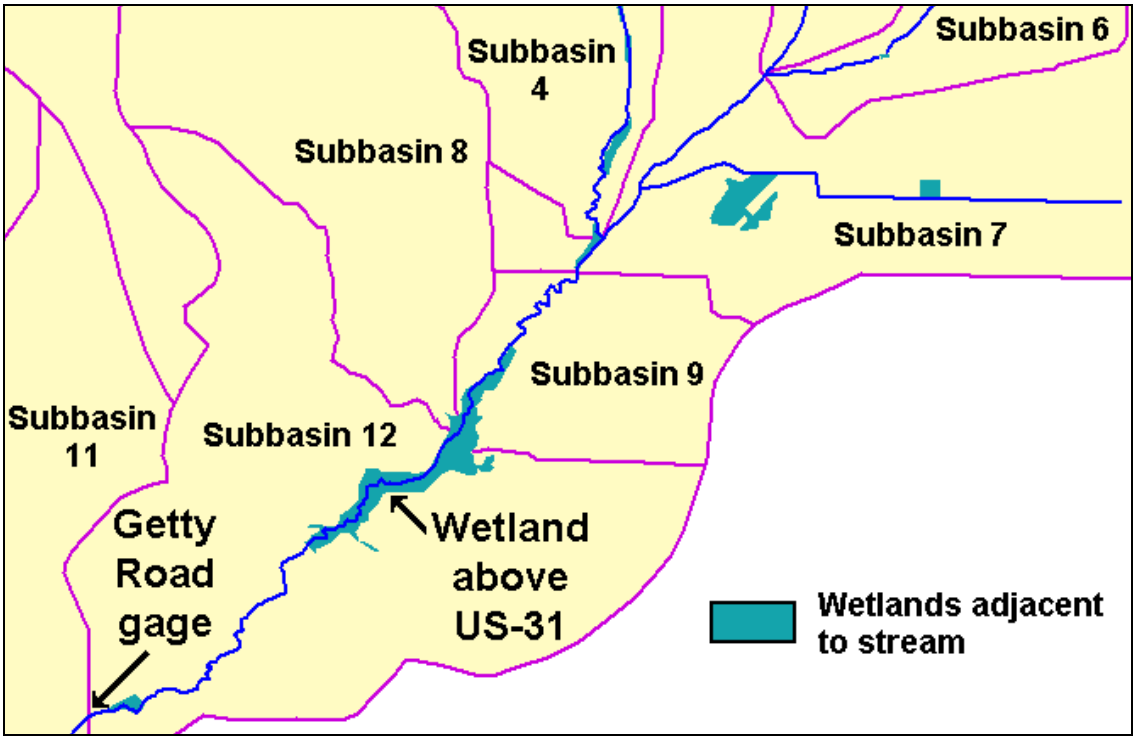


Figure 21: Wetlands adjacent to the creek as shown on USGS quadrangles

Table 2: Land Use by Subbasins (Land uses less than 0.5 percent are not listed because all percentages are rounded to the nearest percent)

Description	Scenario	Residential	Commercial	Industrial	Road	Pit	Cemeteries, Outdoor Rec.	Cropland	Orchard	Pasture	Herbaceous Openland	Forest	Water	Wetland	Sand Dune
Upper Bear Creek	1800											46%		54%	
	1978	2%	1%					34%		1%	19%	41%		1%	1%
	1997	2%	1%					35%		1%	20%	42%		1%	
	Build-out	20%						40%				40%			
Ribe Drain	1800											57%		43%	
	1978	11%	2%					14%	3%	1%	26%	42%			
	1997	11%	2%					14%	3%	1%	26%	42%			
	Build-out	52%	7%					20%				20%			
Fuhrman Drain	1800											52%		48%	
	1978	8%						3%	8%		38%	42%			
	1997	8%						3%	8%		39%	42%			
	Build-out	94%						4%				2%			
Bear Creek to	1800											84%		16%	
	1978	7%	1%					14%		3%	28%	46%			

Description	Scenario	Residential	Commercial	Industrial	Road	Pit	Cemeteries, Outdoor Rec.	Cropland	Orchard	Pasture	Herbaceous Openland	Forest	Water	Wetland	Sand Dune
McMillan Road	1997	7%	1%					14%		3%	28%	46%			
	Build-out	95%						4%				1%			
Putnam-Bard Drain	1800											54%		46%	
	1978	1%	3%				2%	37%			12%	41%			2%
	1997	1%	3%				2%	37%			12%	41%			2%
	Build-out	35%					3%	31%				31%			
Bear Creek below McMillan Road	1800											89%		11%	
	1978	23%	2%				1%	3%			12%	54%		1%	3%
	1997	23%	2%				1%	3%			12%	54%		1%	3%
	Build-out	77%	23%												
Little Bear Creek	1800											86%		14%	
	1978	5%		2%	3%	1%	1%	8%			11%	68%			1%
	1997	5%		2%	3%	1%	1%	8%			11%	68%	1%		
	Build-out	54%	1%	24%			5%	8%				8%			
Bear Creek to Giles Road, below 31	1800											88%		12%	
	1978	13%	3%		1%		1%				5%	75%	1%	2%	
	1997	13%	3%		1%		1%				5%	75%	1%	2%	
	Build-out	92%	3%				5%								
Bear Creek to Getty Road	1800											88%		12%	
	1978	17%	4%		8%		16%				9%	46%			
	1997	17%	4%		8%		16%				9%	46%			
	Build-out	68%	11%				21%								
Bear Creek to Witham Road	1800											79%		21%	
	1978	15%	10%	1%	2%		1%	4%			4%	53%		8%	
	1997	15%	10%	1%	2%		1%	4%			4%	53%		8%	
	Build-out	38%	28%	21%			13%								
Bear Creek, Laketon Twp.	1800											97%		3%	
	1978	49%	1%				1%	5%			11%	31%		2%	
	1997	49%	1%				1%	5%			11%	31%		2%	
	Build-out	84%	7%					4%				4%			
Bear Creek, North	1800											85%	2%	13%	
	1978	85%	1%				2%	10%						2%	
	1997	85%	1%				2%	10%						2%	

Description	Scenario	Residential	Commercial	Industrial	Road	Pit	Cemeteries, Outdoor Rec.	Cropland	Orchard	Pasture	Herbaceous Openland	Forest	Water	Wetland	Sand Dune
Muskegon Twp.	Build-out	84%						8%				8%			
Overall Watershed	1800											73%		27%	
	1978	14%	2%		1%		2%	13%	1%		17%	47%		1%	1%
	1997	14%	2%		1%		2%	13%	1%		17%	48%		1%	
	Build-out	62%	5%	5%			4%	13%				12%			

Model Results

The model results for the 50, 10, 4, and 2 percent chance, 24-hour storms and the 1800, 1978, 1997, and build-out land use scenarios are illustrated in Figures 2 through 9 and detailed in Tables 4 through 7. Table 4 lists the predicted peak flows from each subbasin. These values represent the peak flow contribution from the subbasins, not the flow in the creek. Table 5 lists the predicted peak flows at locations in the creek. Flows for the Bear Creek confluence with Putnam-Bard Drain location are not reported because the actual wetland storage extends through that location, but the modeled storage does not. Actual flows for the Witham Road location may be lower than reported because that flow could be attenuated by the wetlands in that area, which is not included in the model. The amount of attenuation may also vary with the level of Bear Lake, which fluctuates with the level of Lake Michigan. Table 6 lists the predicted runoff volumes from each subbasin. Table 7 lists the predicted runoff volumes at locations in the creek.

The flow monitoring effort did not result in suitable calibration data, but the predicted peak flows can be compared to the USGS gage data shown in Table 3. As shown in Figure 22, the preliminary model appeared to substantially overpredict the peak flows from the four and two percent chance storms. Further analysis indicated that significant storage was likely in the wetland above US-31/Putnam Road, as shown in Figure 21. The eight-foot diameter culverts under US-31 and Putnam Road are estimated to have 2 ½ to 3 three feet of sediment, so that at 570 to 750 cfs, the culverts are flowing full. The area of the wetland shown on the USGS quadrangle is estimated to be 36.5 acres. The total area of wetlands adjacent to the stream above Getty Road is estimated to be 68.6 acres. Based on this information, storage was added to the final model in the reach above Getty as specified in Appendix A.

The projected increases in stormwater runoff volume and peak flows from 1978/1997 to build-out conditions are of primary interest to Bear Creek watershed's stormwater managers. Model predictions based on this land use change show significant increases in runoff volumes and peak flows for all four design storms. Peak flows and runoff volumes from the 50 percent chance 24-hour storm are predicted to increase more, on a percentage basis, than flows from the 10, 4, or 2 percent chance, 24-hour storms. The projected increases in runoff volumes and peak flows from the 50 percent chance storm would increase the channel-forming flow, which will increase streambank erosion. Channel-forming flow is the flow that is most effective at shaping the channel. In a stable stream, the channel-forming flow has a one- to two-year recurrence interval and is the bankfull flow. The projected increases in runoff volumes and peak flows from the 10, 4, and 2 percent chance storms will aggravate flooding. These projected increases can be moderated through the use of effective stormwater management techniques.

The Bear Creek watershed is in Muskegon County. A model stormwater ordinance adopted, or being considered for adoption, by neighboring counties calls for a maximum release rate of 0.05 cfs/acre for runoff from the 50 percent chance, 24-hour storm for Zone A areas, the most environmentally sensitive of the three zones. Currently, the

average yield from this storm for the Bear Creek Watershed is 0.01 cfs/acre, with no subbasins higher than 0.05 cfs/acre, as shown in Figure 10. The yield from one of the ten subbasins may exceed 0.05 cfs/acre with continued development. The ordinance also calls for a maximum release rate of 0.13 cfs/acre for runoff from the 4 percent chance, 24-hour storm for Zones A and B. Currently, the average yield from this storm is 0.07 cfs/acre, with one subbasin higher than 0.13 cfs/acre, as shown in Figure 11. The yield from three of the ten subbasins may exceed 0.13 cfs/acre with continued development. Additional details are listed in Table 8.

In our Pigeon River watershed study, we compared the flows from the 50 percent chance, 24-hour storm to flows based on a target yield of 0.0075 cfs/acre. This target yield was selected as criteria for a good trout fishery based on Mike Wiley and Paul Seelbach's November 1998 report titled "*An ecological assessment of opportunities for fisheries rehabilitation in the Pigeon River, Ottawa County*." Although clearly not the sole factor determining fish habitat quality, the good quality trout habitat corresponds to the locations with yields less than the target yield. Impaired habitat corresponds to locations with yields less than about 1.4 times the target yield. Locations with higher yields generally did not have trout. These same thresholds were applied to the Bear Creek results. For the 1800 scenario, three Bear Creek locations would be classified as good and two would be impaired. For the 1997 scenario, no Bear Creek locations would be classified as good, two would be impaired, and three would be poor. For the build-out scenario, all Bear Creek locations would be classified as poor. Complete results are shown in Figures 10 and 12 and listed in Tables 8 and 9.

Table 3: USGS Gage 04122100 Analysis, Bear Creek near Muskegon

Frequency Flow	Flow (cfs)
99 percent (~1-year)	70
80 percent (1.25-year)	130
50 percent (2-year)	210
20 percent (5-year)	320
10 percent (10-year)	410
5 percent (20-year)	500
2 percent (50-year)	650
1 percent (100-year)	750
0.5 percent (200-year)	900
0.2 percent (500-year)	1100

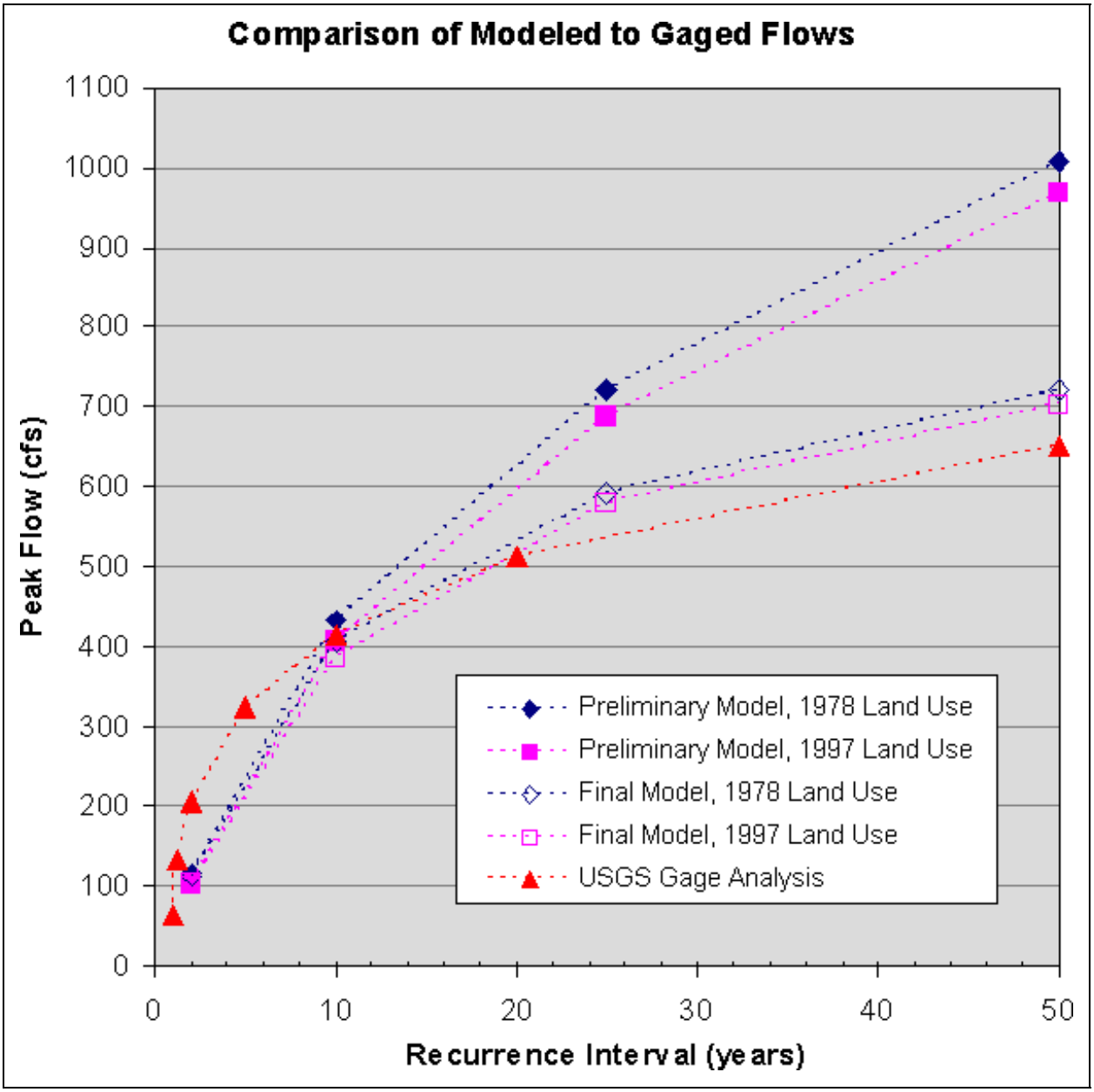


Figure 22: Comparison of Modeled Peak Flows to USGS Gage 04122100

Table 4: Peak flows per subbasin

Subbasin	Land Use Scenario	Peak Flow (cfs)			
		50% chance, 24-hour storm	10% chance, 24-hour storm	4% chance, 24-hour storm	2% chance, 24-hour storm
Upper Bear Creek	1800	22	75	132	192
	1978	35	126	208	289
	1997	29	110	187	264
	Build-out	41	142	231	316
Ribe Drain	1800	12	42	74	109
	1978	18	67	112	157
	1997	18	67	112	157
	Build-out	37	108	167	222
Fuhrman Drain	1800	14	50	89	129
	1978	21	81	137	190
	1997	23	87	144	199
	Build-out	43	126	194	257
Bear Creek to McMillan Road	1800	9	39	72	107
	1978	18	73	123	173
	1997	18	73	123	173
	Build-out	28	95	152	207
Putnam-Bard Drain	1800	9	33	58	86
	1978	17	58	95	131
	1997	10	41	73	104
	Build-out	20	68	110	149
Bear Creek below McMillan Road	1800	1	11	25	41
	1978	3	19	38	58
	1997	3	21	41	62
	Build-out	16	56	89	121
Little Bear Creek	1800	5	33	70	112
	1978	10	62	120	180
	1997	7	50	100	155
	Build-out	41	143	233	319
Bear Creek to Giles Road, below 31	1800	1	12	26	43
	1978	3	19	37	58
	1997	3	19	37	58
	Build-out	8	37	66	95
Bear Creek to Getty Road	1800	2	16	35	57
	1978	7	37	68	102
	1997	7	37	68	102
	Build-out	12	54	93	133
Bear Creek to Witham Road	1800	2	14	31	50
	1978	5	26	50	76
	1997	6	28	53	80
	Build-out	26	82	129	173

Table 5: Peak flows in Bear Creek

Location	Drainage Area (square miles)	Land Use Scenario	Peak Flow (cfs)			
			50% chance 24-hour storm	10% chance 24-hour storm	4% chance 24-hour storm	2% chance 24-hour storm
Confluence of Ribe and Fuhrman Drains	4.8	1800	26	91	159	232
		1978	37	137	226	315
		1997	39	141	232	322
		Build out	74	213	327	432
Bear Creek at McMillan Road	10.7	1800	56	204	363	528
		1978	90	331	550	766
		1997	85	320	536	750
		Build out	142	444	701	945
Confluence of Bear Creek with Putnam-Bard Drain	12.8	1800	66	244	432	629
		1978	108	397	658	915
		1997	97	371	624	875
		Build out	167	524	828	1115
Bear Creek at Getty Road	14.6	1800	68	259	450	589
		1978	115	408	591	720
		1997	104	386	580	702
		Build out	177	526	667	817
Confluence of Bear Creek with Little Bear Creek	20.1	1800	73	302	535	718
		1978	126	474	711	877
		1997	113	447	695	855
		Build out	219	655	862	1059
Bear Creek at Witham Road	21.5	1800	75	314	556	752
		1978	131	494	748	921
		1997	118	468	733	901
		Build out	232	686	922	1121

Table 6: Runoff volumes per subbasin

Subbasin	Land Use Scenario	Runoff Volume (acre-feet)			
		50% chance, 24-hour storm	10% chance, 24-hour storm	4% chance, 24-hour storm	2% chance, 24-hour storm
Upper Bear Creek	1800	66	203	270	369
	1978	59	188	297	400
	1997	48	167	297	400
	Build-out	59	188	320	429
Ribe Drain	1800	38	126	192	263
	1978	34	119	192	263
	1997	34	119	204	279
	Build-out	59	166	252	332
Fuhrman Drain	1800	38	115	149	203
	1978	27	92	156	211
	1997	29	98	178	238
	Build-out	49	135	203	265
Bear Creek to McMillan Road	1800	22	86	144	199
	1978	26	92	151	208
	1997	26	92	151	208
	Build-out	38	117	182	244
Putnam-Bard Drain	1800	26	82	102	141
	1978	27	83	129	173
	1997	16	62	130	174
	Build-out	27	83	130	174
Bear Creek below McMillan Road	1800	2	12	22	32
	1978	3	14	25	35
	1997	3	15	26	37
	Build-out	10	28	42	56
Little Bear Creek	1800	11	78	149	221
	1978	14	86	149	221
	1997	11	79	159	234
	Build-out	57	183	289	389
Bear Creek to Giles Road, below 31	1800	3	31	63	95
	1978	6	39	73	108
	1997	6	39	73	108
	Build-out	13	57	99	140
Bear Creek to Getty Road	1800	5	37	71	106
	1978	12	56	98	140
	1997	12	56	98	140
	Build-out	17	69	115	161
Bear Creek to Witham Road	1800	4	30	56	83
	1978	10	44	76	108
	1997	11	47	81	113
	Build-out	28	81	124	165
Bear Creek, Laketon Twp.	1800	6	51	98	146
	1978	24	95	142	201

	1997	18	82	159	221
	Build-out	30	107	176	241
Bear Creek, North Muskegon Twp.	1800	1	8	17	26
	1978	2	13	24	35
	1997	2	13	24	35
	Build-out	2	13	24	35
Bear Lake	All	69	111	139	163

Table 7: Runoff volumes in Bear Creek

Location	Drainage Area (square miles)	Land Use Scenario	Runoff Volume (acre-feet)			
			50% chance 24-hour storm	10% chance 24-hour storm	4% chance 24-hour storm	2% chance 24-hour storm
Confluence of Ribe and Fuhrman Drains	4.8	1800	76	241	383	517
		1978	61	211	341	466
		1997	64	217	348	474
		Build out	108	300	454	597
Bear Creek at McMillan Road	10.7	1800	164	530	846	1144
		1978	145	491	789	1073
		1997	137	476	769	1050
		Build out	205	605	933	1241
Confluence of Bear Creek with Putnam-Bard Drain	12.8	1800	191	623	996	1349
		1978	175	588	943	1282
		1997	157	553	898	1229
		Build out	241	715	1105	1471
Bear Creek at Getty Road	14.6	1800	195	658	1065	1454
		1978	186	644	1041	1421
		1997	169	609	995	1368
		Build out	258	784	1221	1632
Confluence of Bear Creek with Little Bear Creek	20.1	1800	209	766	1275	1768
		1978	206	769	1273	1763
		1997	185	726	1217	1697
		Build out	328	1024	1609	2161
Bear Creek at Witham Road	21.5	1800	212	793	1329	1850
		1978	215	813	1349	1871
		1997	197	774	1298	1810
		Build out	356	1105	1733	2326
Mouth	25.2	1800	287	961	1580	2184
		1978	310	1031	1671	2290
		1997	286	980	1603	2210
		Build out	457	1336	2071	2765

Table 8: Subbasin yields

Subbasin	Yield (cfs/acre) from 50% chance 24-hour storm				Yield (cfs/acre) from 4% chance 24-hour storm			
	1800 Land use	1978 Land use	1997 Land use	Build-out	1800 Land use	1978 Land use	1997 Land use	Build-out
Upper Bear Creek	0.009	0.015	0.012	0.017	0.055	0.086	0.078	0.096
Ribe Drain	0.007	0.010	0.010	0.021	0.043	0.065	0.065	0.097
Fuhrman Drain	0.011	0.016	0.018	0.032	0.067	0.103	0.109	0.146
Bear Creek to McMillan Road	0.006	0.013	0.013	0.020	0.051	0.087	0.087	0.107
Putnam-Bard Drain	0.009	0.016	0.010	0.020	0.058	0.095	0.072	0.109
Bear Creek below McMillan Road	0.004	0.009	0.010	0.054	0.084	0.126	0.135	0.296
Little Bear Creek	0.002	0.004	0.003	0.018	0.030	0.051	0.043	0.100
Bear Creek to Giles Road, below 31	0.001	0.002	0.002	0.007	0.023	0.033	0.033	0.057
Bear Creek to Getty Road	0.002	0.006	0.006	0.010	0.029	0.057	0.057	0.078
Bear Creek to Witham Road	0.002	0.005	0.006	0.029	0.035	0.056	0.060	0.146
Arithmetic Average	0.005	0.010	0.009	0.023	0.048	0.076	0.074	0.123
Area weighted Average	0.006	0.010	0.009	0.020	0.045	0.072	0.068	0.106

Table 9: Bear Creek yields

Location	Yield (cfs/acre) from 50% chance 24-hour storm			
	1800 Land use	1978 Land use	1997 Land use	Build-out
J1, Confluence of Ribe and Fuhrman Drains	0.0084	0.0121	0.0127	0.0244
J2, Bear Creek at McMillan Road	0.0082	0.0131	0.0124	0.0208
J4, Bear Creek at Getty Road	0.0073	0.0122	0.0111	0.0190
J5, Confluence of Bear Creek with Little Bear Creek	0.0057	0.0098	0.0088	0.0170
J6, Bear Creek at Witham Road	0.0055	0.0095	0.0086	0.0169
Average	0.0070	0.0113	0.0107	0.0196

Appendices

Appendix A: Bear Creek Hydrologic Model Parameters

This appendix is provided so that the model may be recreated by an engineering consultant, or others, if desired. Table A1 provides the 24-hour Type II SCS design rainfall values specific to the region of the state where Bear Creek is located. Figure A1 summarizes the hydrologic elements in the HEC-HMS model. Tables A2 and A3 provide the parameters that were specified for each of these hydrologic elements. The initial loss field in HEC-HMS is left blank so that the default equation based on the curve number is used. The curve number for Subbasin 16, Bear Lake, should be 100, but is entered as 99 because that is the maximum allowed by HEC-HMS. The arbitrary value selected for Subbasins 14, 15, and 16 was one hour. These parameters only affect peak flows, not runoff volumes, calculated from these subbasins. Runoff volumes are the only results of interest for these subbasins.

Table A4 provides the reach parameters for the routing method. Table A5 provides the storage-discharge relationship for the reservoir added to reach 3. Because this reservoir accounts for storage that extends into Reach 2, the computed peak flows Junction 3 are expected to be too high and were not listed in this report. The control specified in HEC-HMS was for a four day duration using a five-minute time interval.

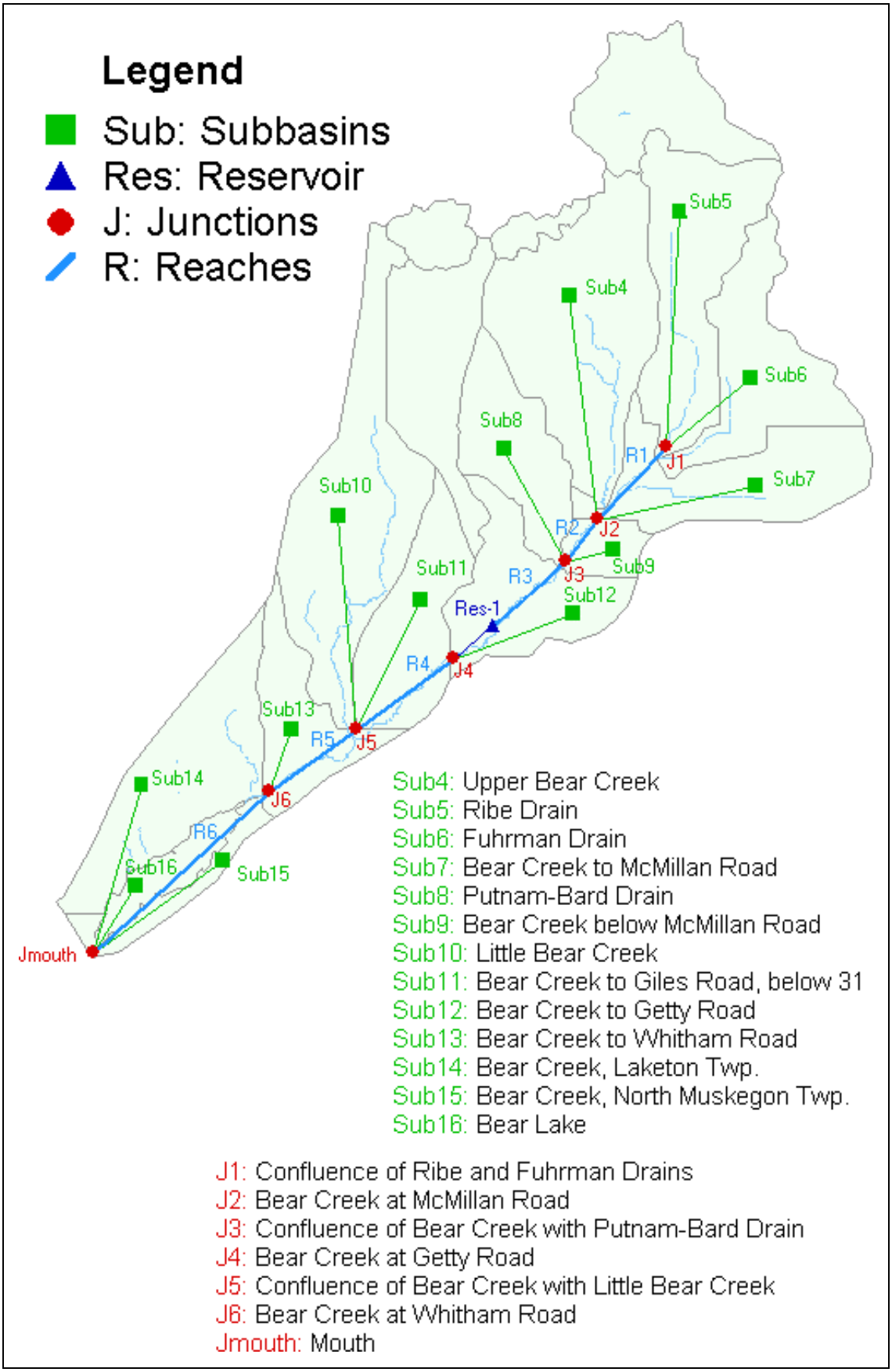


Figure A1: Hydrologic Elements defined for HEC-HMS model

Table A1: Design Rainfall Values for Muskegon County (Region 5)

SCS Type II Precipitation Event	Precipitation*
50% chance (2-year), 24-hour storm	2.20
10% chance (10-year), 24-hour storm	3.47
4% chance (25-year), 24-hour storm	4.32
2% chance (50-year), 24-hour storm	5.05

*standard values were multiplied by 0.964 to account for the watershed size

Table A2: Subbasin Parameters – Area, Curve Number, Initial Loss

Subbasin		Drainage Area (sq. mi.)				Runoff Curve Number				Initial Loss
		1800	1978	1997	Build-out	1800	1978	1997	Build-out	
4	Upper Bear Creek	3.76	3.76	3.76	3.76	71	69	67	69	Default
5	Ribe Drain	2.69	2.68	2.68	2.68	69	67	67	73	Default
6	Fuhrman Drain	2.07	2.07	2.07	2.07	71	67	68	74	Default
7	Bear Creek to McMillan Road	2.21	2.21	2.21	2.21	65	66	66	70	Default
8	Putnam-Bard Drain	1.57	1.57	1.57	1.57	70	70	65	70	Default
9	Bear Creek below McMillan Road	0.47	0.47	0.47	0.47	59	61	62	72	Default
10	Little Bear Creek	3.67	3.66	3.66	3.66	57	58	57	69	Default
11b	Bear Creek to Giles Road, below 31	1.80	1.79	1.79	1.79	55	57	57	62	Default
12	Bear Creek to Getty Road	1.87	1.87	1.87	1.87	56	61	61	64	Default
13	Bear Creek to Witham Road	1.38	1.38	1.38	1.38	57	62	63	72	Default
14	Bear Creek, Laketon Twp.	2.57	2.57	2.57	2.57	56	64	62	66	Default
15	Bear Creek, North Muskegon Twp.	0.55	0.55	0.55	0.55	53	58	58	58	Default
16	Bear Lake	0.62	0.62	0.62	0.62	100	100	100	100	Default
	Total	25.23	25.20	25.20	25.20					

Table A3: Subbasin Parameters – Times of Concentration and Storage Coefficients

Subbasin	Scenario	Time of Concentration (hours)	Storage Coefficient			
			50% chance, 24-hour storm	10% chance, 24-hour storm	4% chance, 24-hour storm	2% chance, 24-hour storm
Upper Bear Creek	1800	7.63	28	23	19.5	17.5
	1978		10	9.2	9	8.8
	1997		10.1	9.3	9	8.8
	Build-out		7.63	7.63	7.63	7.63
Ribe Drain	1800	9.61	32.5	27.3	23.5	21
	1978		12.6	11.6	11.4	11.1
	1997		12.7	11.7	11.4	11.1
	Build-out		9.61	9.61	9.61	9.61
Fuhrman Drain	1800	6.04	22	17.5	15	13.5
	1978		6.04	6.04	6.04	6.04
	1997		6.04	6.04	6.04	6.04
	Build-out		6.04	6.04	6.04	6.04
Bear Creek to McMillan Road	1800	7.03	20.5	16.4	14.2	13.2
	1978		7.03	7.03	7.03	7.03
	1997		7.03	7.03	7.03	7.03
	Build-out		7.03	7.03	7.03	7.03
Putnam-Bard Drain	1800	6.89	24.7	20	17	15.2
	1978		9.7	8.9	8.6	8.4
	1997		10	9	8.6	8.4
	Build-out		6.89	6.89	6.89	6.89
Bear Creek below McMillan Road	1800	2.16	10.2	4.9	4.15	3.85
	1978		4	3	2.85	2.75
	1997		3.8	2.95	2.85	2.75
	Build-out		2.16	2.16	2.16	2.16
Little Bear Creek	1800	7.28	20.5	18	15.1	13.7
	1978		7.28	7.28	7.28	7.28
	1997		10.1	9.1	8.7	8.4
	Build-out		7.28	7.28	7.28	7.28
Bear Creek to Giles Road, below 31	1800	9.04	22	21	18.2	16.5
	1978		15.5	14.5	13.2	12.5
	1997		15.5	14.5	13.2	12.5
	Build-out		9.04	9.04	9.04	9.04

Bear Creek to Getty Road	1800	6.97	18.7	16.7	14	12.6
	1978		10.2	8.8	8.5	8.2
	1997		10.2	8.8	8.5	8.2
	Build-out		6.97	6.97	6.97	6.97
Bear Creek to Witham Road	1800	5.37	19.5	15	12	10.7
	1978		14.7	11	9.7	9
	1997		14.4	10.8	9.6	9
	Build-out		5.37	5.37	5.37	5.37
Bear Creek, Laketon Twp.		See text				
Bear Creek, North Muskegon Twp.		See text				
Bear Lake		See text				

Table A4: Channel Reach Parameters

Reach	Length (meters)	Average Slope	Lag (minutes)
1	1440	0.17	54
2	1440	0.24	47
3	3140	0.17	123
4	2960	0.14	125
5	2090	0.10	103
6	4060	(Lake)	See text

Table A5: Reach Storage-Discharge Relationship

Storage (acre-feet)	Discharge (cfs)	Comments
0	0	
20	300	Minimal storage and flow restriction until stream is out of bank
60	500	
206	640	Values based on culvert capacity and wetland area with an average storage depth of three feet
320	750	Values linearly extrapolated for build-out scenario

Appendix B: Bear Creek Monitoring

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JOHN ENGLER
GOVERNOR

RUSSELL J. HARDING
DIRECTOR

November 25, 2002

To: Kathy Evans
Muskegon County Conservation District

From: Dave Fongers
Geological and Land Management Division, MDEQ

Subject: Bear Creek Monitoring

As requested, the Hydrologic Studies Unit (HSU) of the Geological and Land Management Division (GLMD) has completed its hydrologic monitoring of Bear Creek. This monitoring was requested in support of a Section 319 grant.

Precipitation, temperature, and river stage data were collected from August 21 to November 14, 2002. The monitoring locations are shown in Figure 1. The river stage data were adjusted so that a water surface elevation of zero would correspond to our estimate of the hydraulic control of zero flow. Figure 2 is a graph of the temperature data. Figure 3 is a graph of all of the precipitation and river stage monitoring data.

The monitoring study was intended to provide calibration data for a hydrologic model. Figure 4 highlights the monitoring data from the largest storm event that initially appears to be most useful for this purpose. However, although the rain gages in the north end of the watershed recorded 3.29 and 3.33 inches of rainfall, the Muskegon Airport only recorded 1.40 inches of rainfall, as shown in Figures 5 and 6. The precipitation may not have been sufficiently uniform over the watershed to use this storm to calibrate the hydrologic model.

Our ability to convert the stage data to flows is also limited. We were able to obtain only one unique flow measurement at each site. The Quality Assurance Project Plan (QAPP) for this study calls for a minimum of two flow measurements at each location. Without at least two measurements, calculating flows from the stage data involves an unacceptable level of uncertainty. We have to assume that we will be unable to obtain the second measurement within the deadlines of this project and will therefore be unable to provide data suitable calibration data from this monitoring study.

If you have any questions or comments regarding our analysis, please contact me at 517-373-0210.

cc: Ric Sorrell, GLMD
Tim Hall, WD – Grand Rapids
Ralph Reznick, WD

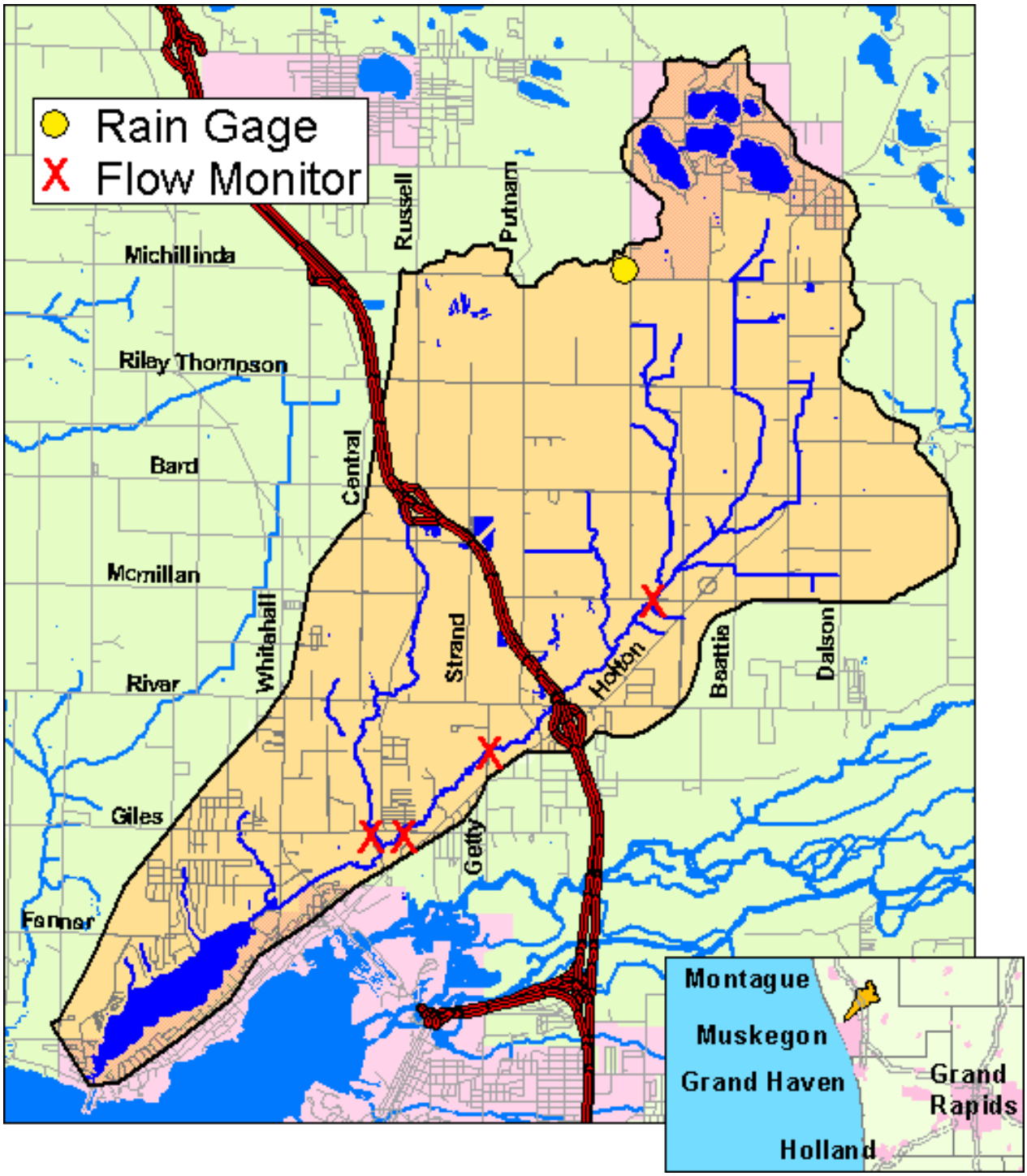


Figure 1: Gage Locations

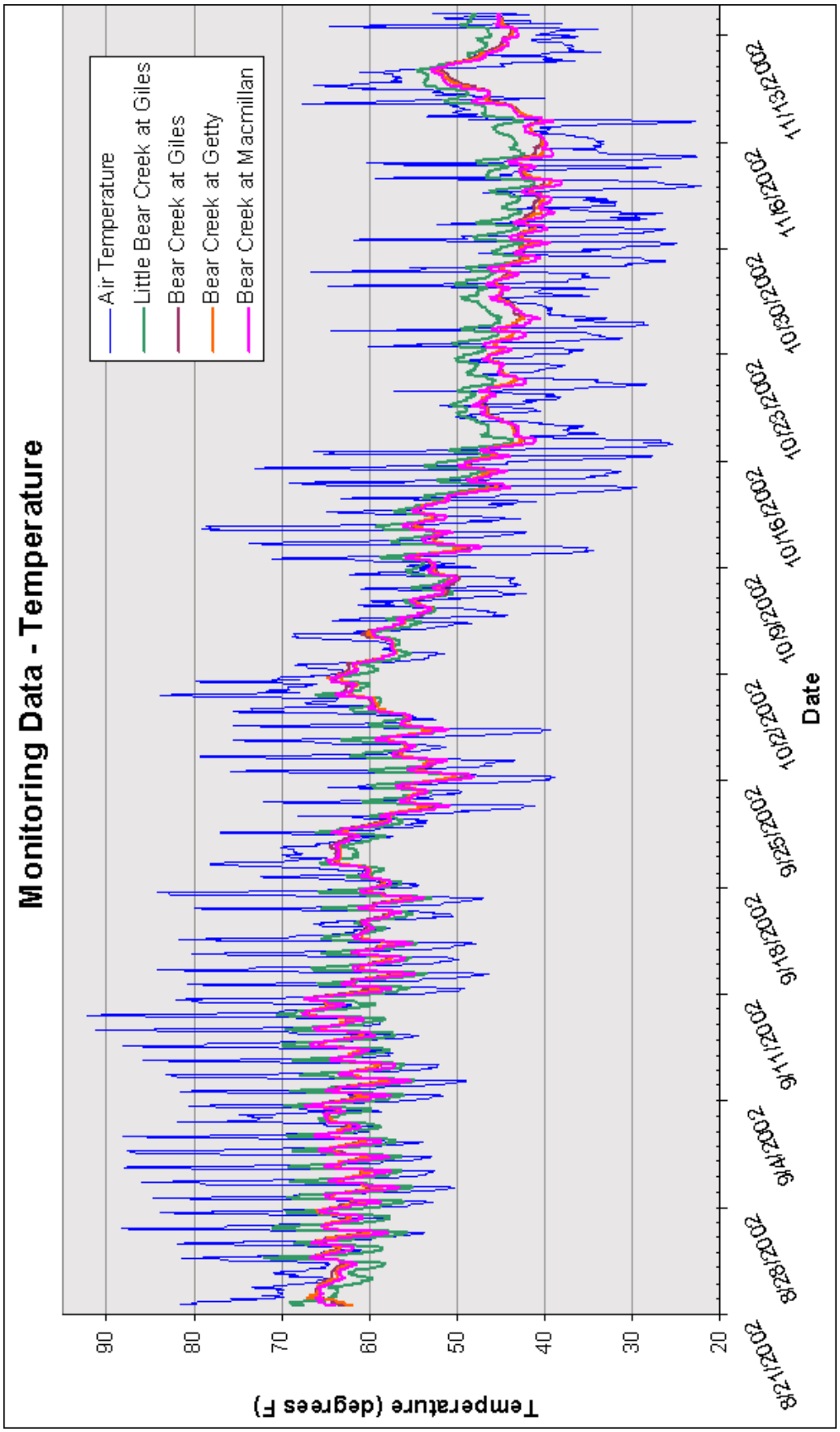


Figure 2: Temperature Data

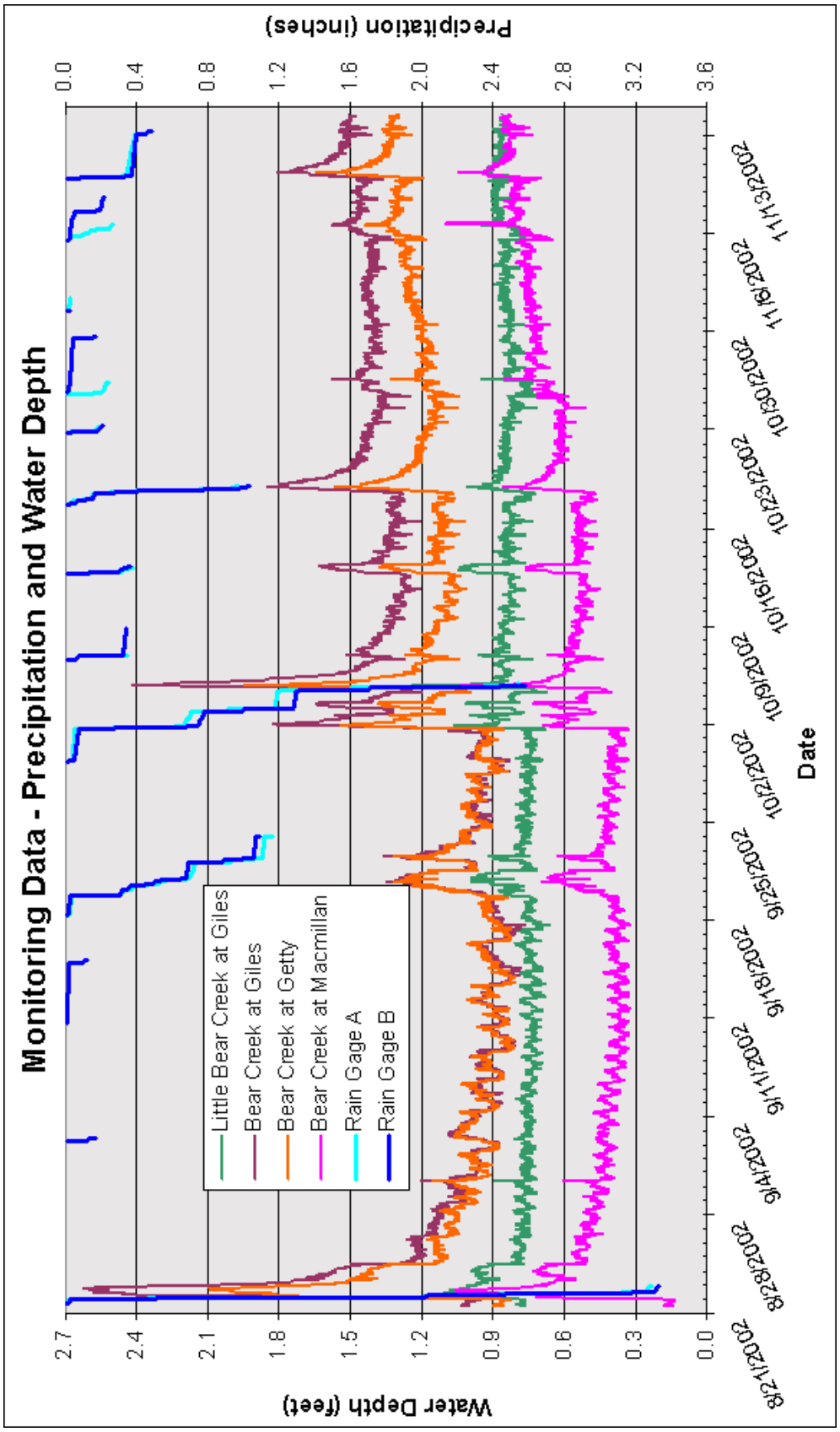


Figure 3: Precipitation and River Stage Data

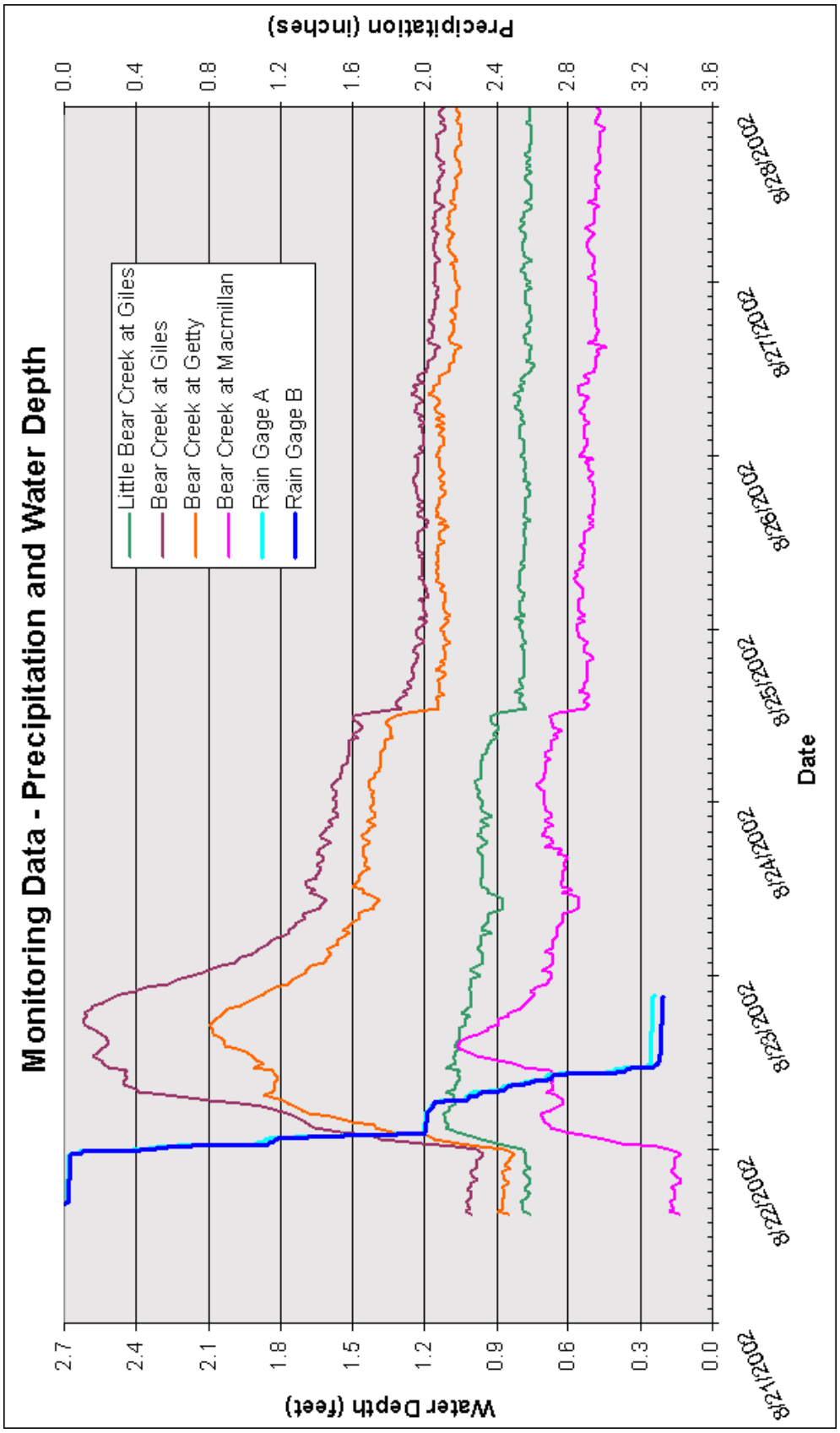


Figure 4: Monitoring Data from the Largest Storm Event

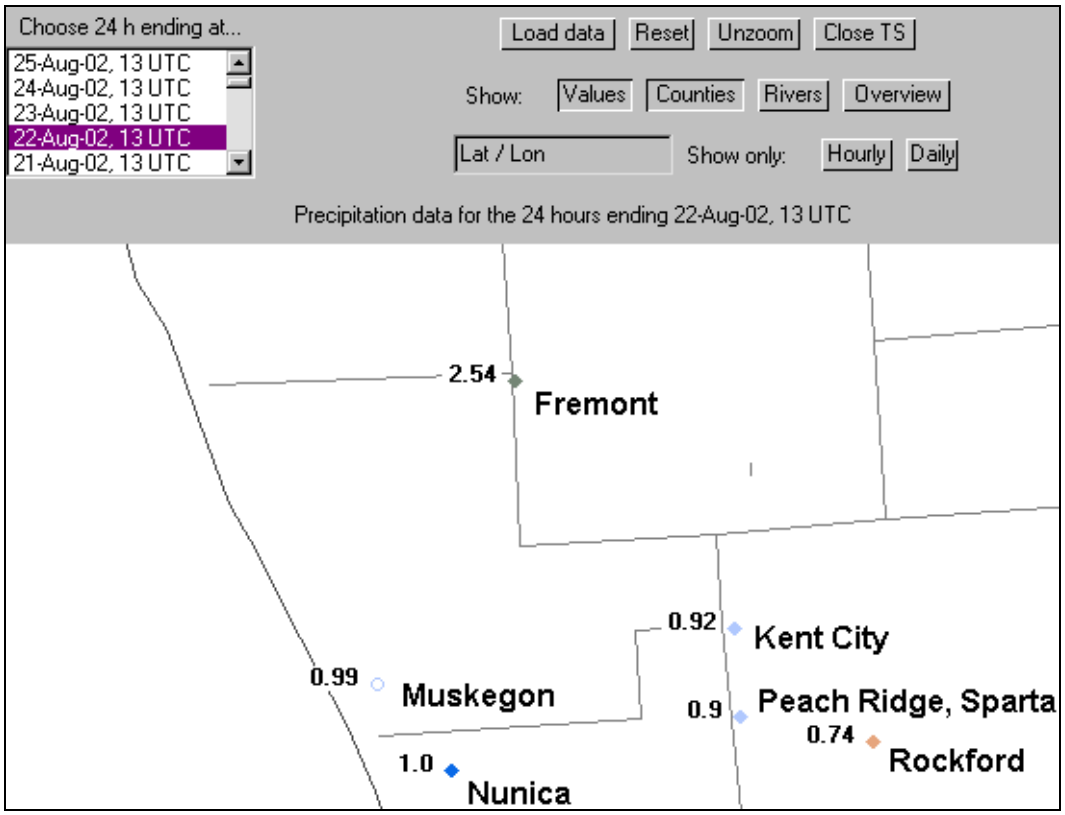


Figure 5: August 22, 2002 Rainfall Totals

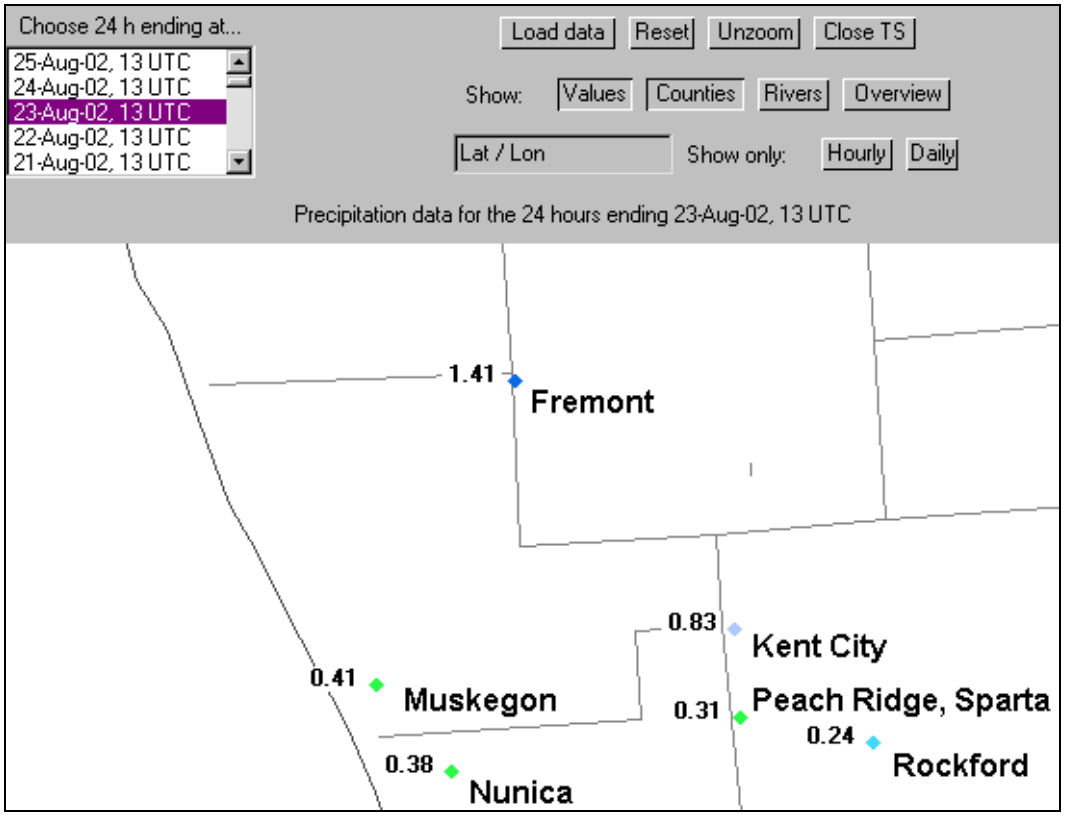


Figure 6: August 23, 2002 Rainfall Totals