

Appendix

Best Management Practices Manuals and Resources

The erosion prevention and sediment control, and the stormwater management model ordinances, require the use of handbooks and/or manuals that describe the proper methods for designing and maintaining the Best Management Practices required by the ordinances. Since compiling these handbooks is expensive and time consuming, the following references are offered as examples of handbooks that could be referenced by a model ordinance, and made available for developers and builders in the community.

City of Portland, Bureau of Environmental Services, 503-823-7740

Stormwater Management Manual

<http://www.enviro.ci.portland.or.us/swm1.htm>

Portland's manual can be found online at the above address. The manual covers everything from design requirements for pollution reduction facilities to a thorough description of Best Management Practices. While not all of this manual is applicable to smaller jurisdictions, some of the sections could be referenced and easily incorporated into the model codes in Chapter 4.

Unified Sewerage Agency (USA) 503-846-8621

Erosion Control Technical Guidance Handbook and Design and Construction Standards

The Design and Construction Standards includes design requirements for stormwater and surface water as well as technical guidance on BMP design. The first copy is free by calling USA. The Erosion Control Handbook covers building practices and is free.

Oregon Department of Transportation (ODOT) 503-986-3720

Erosion and Sediment Control Manual

The ODOT Erosion and Sediment Control Manual is included in the draft 4d rules (see Chapter 2) and describes how state roads are to be maintained to protect and enhance water quality. While this manual focuses on road maintenance activities there is information about common BMPs and erosion control planning and design. Copies are available for \$20.00 by calling the above number.

Oregon Department of Transportation (ODOT)

Routine Road Maintenance -

Water Quality and Habitat Guide Best Management Practices

<http://www.odot.state.or.us/eshtm/images/4dman.pdf>

Includes a wide variety of road maintenance activities and BMPs that can be employed to reduce the impacts to water quality and habitat.

Incorporation of Risk Assessment in Erosion Control Ordinances

In adopting an Erosion and Sediment Control (ESC) ordinance, a local government must strike a balance between addressing the relative risk of each land disturbing activity and ease of enforcement. The risk of damaging sediments traveling from a disturbed site to a water body depends on the following factors:

- Amount of soil disturbed
- Occurrence of rain
- Erosivity of the soil
- Slope
- Proximity to water body or storm drain

Common Approach

Most erosion control ordinances address all of these factors in some way. Usually they start with a threshold for area of disturbance. Some also include a threshold in terms of cubic yards of soil. The ordinance applies when the threshold is exceeded. The potential threat of rain may be addressed by setting a time window for when erosion control measures are required. In western Oregon that window is usually from October to May. Other jurisdictions require some level of erosion control year round and extra measures, such as stabilization of all exposed soil, during high-risk months. A site's slope and proximity to a water body or storm drains are typically addressed within specifications for erosion control plans for all activities needing such plans. Sites on slopes need more preventative measures than flat sites, and the location of water is a prime concern for designing the ESC plan. Soil erosivity is not often addressed in ordinances, however, it may be a factor for adopting an ordinance in jurisdictions having significant areas of erodible soils.

This approach requires only an estimate of exposed soil to determine whether an ESC ordinance applies. All other variation in risk is handled on a site-by-site basis through review of the ESC plan, or not at all.

Alternative Approach

It is possible for a jurisdiction to enter into more risk assessment up front so that enforcement activity can be focused on high-risk sites. This approach requires inventory and mapping of the risk factors throughout the jurisdiction or a more detailed evaluation of risks for each activity at the time of proposal. Strategies for using risk factors to target enforcement activity are recommended below:

- Amount of soil disturbed – It is not possible to map this factor, but it can be used in conjunction with landscape factors to assess overall risk of an activity. Whether used alone or in conjunction with other factors, a jurisdiction should consider establishing two thresholds based on size, one to distinguish low risk from medium risk, and one to distinguish between medium and high risk. See table below. Jurisdictions should encourage builders to phase their projects. If the risk assessment and required ESC measures are based on the amount of soil disturbed at any one time, rather than the entire project, a builder will have an incentive to keep the disturbed area to a minimum.

- Occurrence of rain – Although rain is less likely during summer months, rain does occur in western Oregon even in the “dry season”, sometimes with great intensity. Since the water level in streams and rivers is low at this time, they may be less able to recover from a discharge of sediment. Suspension of all ESC requirements for any period of time is not recommended, although more protective ESC measures should be required for medium and high-risk sites during the rainy season.
- Erosivity of the soil – The occurrence of sand, a very low-risk soil, and various highly erodible soils is specific to certain regions. The relative benefits of mapping these areas to assist in risk assessment will be unique to each jurisdiction. If highly erodible soils are widespread, a jurisdiction may want to require the same ECS measures everywhere.
- Slope – Slope is a critical factor for ESC since water traveling downhill gains erosive force as it speeds up. Raindrops falling on a flat surface can only dislodge a few grains of soil, but can not move it. Water flowing over exposed soil can eat away hundreds of small “rills” or even wide “gullies”, if it gets moving fast enough. If the slope continues beyond the construction site, the dislodged soil can be carried hundreds of feet to a drainage or to surface water. Moderate and high-risk areas based on slope are relatively easy to map. Some jurisdictions may already have or are considering hillside protection ordinances. These provisions often have a threshold of about 20% slope and address the most extreme erosion and sedimentation risk.
- Proximity to water body or storm drain – Even in the flattest valleys, the area within a couple hundred feet of a stream tends to slope toward the stream. Soil disturbing activities near surface waters are therefore high risk. Jurisdictions are expected to have riparian protection ordinances. The ESC benefit of their existing or proposed riparian ordinance should be considered when setting thresholds for this risk factor. A wide riparian buffer, such as 100 feet, for all streams in an area where the streamside vegetation is intact, may eliminate the need for a high risk threshold based on proximity to a surface water, since no construction or limited public facilities could occur in these areas anyway. Smaller buffers, those that only protect fish bearing streams, or those along streams which do not have healthy vegetation are probably not sufficient to protect against sedimentation from construction related erosion. A jurisdiction must also consider intermittent drainages that run near or through a site.

The presence of a storm drain system provides a direct link from a construction site to a surface water. Jurisdictions should regulate all land disturbing activity, above some minimal threshold in areas served by a storm drain system. The minimal threshold should be chosen to avoid regulation of a typical garden plot.

The following table offers a strategy to address the three main risk variables that are common to all jurisdictions. The overall risk of an activity is determined by the combined risk of the three factors.

High Risk: Any activity assessed to fall in the high risk category for any one factor or the moderate risk category for any two risk factors.

Moderate Risk: Any activity assessed to be below all high risk thresholds and at moderate risk for one risk factors.

Low Risk: Any activity assessed to be at low risk for all risk factors **or** any activity resulting in soil disturbance below the minimum area threshold would not be regulated.

Matrix of Relative Risk for Three Risk Factors

	Diminimus	Low	Moderate	High
Area of disturbance in square feet	<500	500 - 5000	5000 - 10,000	>10,000
Proximity to water or storm drain system	NA	> 200 feet	100 – 200 feet	<100 feet
Slope	NA	<3%	3% to 8%	>8%

Note: Thresholds given here are for illustration only. Jurisdictions will need to determine thresholds based on landscape conditions and water quality concerns specific to their area. A storm drain system includes ditches and roads by which storm water can travel.

Recommended ESC Measures for Moderate and High Risk Sites

Moderate risk sites:

- Storm drain protection
- Gravel entryway if vehicles will be driven on site
- Soil stockpile coverage with mulch, grass or plastic
- Permanent stabilization of site at completion of project

High risk sites:

- Erosion and sediment control plan including the following:
 - Present and proposed site contours
 - Location of surface water and storm drain inlets
 - Areas designated for vehicle access
 - Location of soil stockpiles
 - Areas of existing vegetation to be preserved
- Storm drain protection
- Gravel entryway
- Soil stockpile coverage with mulch, grass or plastic
- Slope stabilization, silt fence, straw waddles, etc.
- Straw mulch or equivalent on disturbed areas not actively being worked
- Permanent stabilization of site at completion of project

The assessment strategy and recommended ESC measure listed here are not adequate to serve alone as an ESC ordinance. Other model codes, however, could be adapted to address risk more critically with the inclusion of these concepts.

Incorporation of Water Quality Treatment Facilities in the Erosion and Sediment Control Ordinance

The following section can be included in the erosion and sediment control ordinance found in section 4.4.9 of the Guidebook. The purpose of the following language is to protect specific water resources from erosion or sediment generated by a single large development. This section requires a manual or a referenced manual that describes water quality treatment facility standards.

VII. Special Water Quality Treatment Facilities

[List water resources to be protected] are vitally important to [jurisdiction's recreational-based economy] and to the quality of life of [jurisdiction] residents. Special water quality detention and treatment facilities may be required for major developments draining to [list water resources to be protected], designed in accordance with the [list manual referenced for water quality treatment facilities or the adopted erosion control plan if appropriate].

- A. Applicability. The [planning official] shall require water quality treatment or detention facilities for developments which qualify under any of the following:
 - 1. The development involves [10] acres or more.
 - 2. The development occupies [one acre] or more of steep slope or constrained slope area as defined by [Chapter X.X of this development code].
 - 3. The development will cause degradation of water quality in the receiving stream without detention or treatment.
 - 4. The development involves paved parking areas (exclusive of single family and two-family residences), fuel storage or dispensing areas, vehicle wash areas, or vehicle maintenance or dismantling areas.
- B. Responsibility and Treatment Options. Water quality facilities for major developments shall be required for purposes of minimizing water quality impacts on [list protected water resources], prior to deposition into natural drainageways.
 - 1. Water quality facilities shall be designed and constructed by the developer, to ensure that stormwater runoff is treated on site, prior to discharge.
 - 2. Treatment may include infiltration devices, grassy swales, treatment ponds or other methods approved by the [jurisdiction], consistent with the [list manual referenced for water quality treatment facilities or the adopted erosion control plan if appropriate].
- C. Placement of Water Quality Facilities. Placement of water quality facilities shall be limited as follows:
 - 1. The water quality facilities shall not be constructed within an existing or created wetlands unless a mitigation plan is approved by the [jurisdiction] and the Oregon Division of State Lands.
 - 2. The water quality facility shall not be placed on land with slopes of [15% or greater], within [50] feet of the top of the bank of a stream, or within a defined floodway area.
 - 3. The water quality facility may be constructed within the 100 year floodplain, provided that the area is (a) outside the area covered by the 25-year flood event,

- and (b) the water quality facility effectively and exclusively uses native plant species.
4. Where the approval authority determines that a more efficient and effective regional site exists within the sub-basin, the water quality facility may be constructed off-site.
- D. Water Quality Facility Standards. The design and functions of required water quality control facilities shall be determined based on the recommendations of the [list manual referenced for water quality treatment facilities or the adopted erosion control plan if appropriate].
1. The preliminary subdivision plat, site plan, or permit application shall include plans and a certification prepared by a professional engineer registered in Oregon that the proposed stormwater quality control facilities have been designed in accordance with the [list manual referenced for water quality treatment facilities or the adopted erosion control plan if appropriate].
 2. The plan shall specifically consider source control of pollution (oil and water separators), runoff treatment, streambank erosion control, wetland impacts, impacts on water quality sensitive areas, and off-site analysis and mitigation.
 3. A long-term (20-year) operation and maintenance plan shall be required. This plan shall document how and by whom the water quality facility will be maintained.
 4. If the water quality facility is dedicated to the [jurisdiction], maintenance of the facility shall be the responsibility of the developer for at least two years after the facility has been constructed and approved by the [jurisdiction]. If the facility is not dedicated to the [jurisdiction], then it shall be the continuing responsibility of the developer.
 5. In all cases, runoff from impervious areas used for repair, cleaning, refueling, storing or servicing of vehicles and machinery shall be treated on site to remove oil, grease and other chemicals.

Additional Model Codes

The following two model codes are referenced in Chapter 4. The first code is an example of how to include a performance-based code that encourages careful site design to eliminate effective impervious surfaces. The second code is a FEMA Model Flood Hazard Ordinance to meet National Flood Insurance Program requirements. This code is provided to help communities update old flood hazard codes.

Zero Effective Impervious Surfaces – Sample Code Provisions

Sections:

X.50.010 Goal and Purpose.

X.50.020 Definitions.

X.50.030 Applicability.

X.50.040 Development Review Process.

X.50.050 Deviation from [jurisdiction] code.

X.50.060 Authorized Deviations from Engineering Design and Development Guidelines and Public Works Standards

X.50.070 Evaluation and Monitoring.

X.50.010 Goal and Purpose.

This Chapter is enacted with the goal of retaining the critical functions of the landscape including evapotranspiration and infiltration after site development such that near “zero effective impervious surface” is achieved. As part of meeting such a goal, this chapter is intended to fulfill the following purposes:

- (1) Provide those developing the land the opportunity to demonstrate environmental benefits related to site development with significantly reduced offsite drainage from development;
- (2) Improve the conditions of habitat and ground and surface waters within a watershed with innovative urban residential design and development techniques;
- (3) Foster broad community acceptance of the use of significantly less impervious surface and greater natural habitat conservation on housing and other development sites; and
- (4) Provide the opportunity to identify and evaluate potential substantive changes to land use development regulations which support and improve natural functions of watersheds.

X.50.020 Definitions.

As used in this demonstration program, the words hereinafter defined shall have the meaning set forth in this section, unless the context clearly requires otherwise.

- (1) “Forested area” means a treed area which functions, or which over time will be restored to function, as a mature native forest characterized by an undisturbed native plant understory.
- (2) “Drainage collection system” means a system for conveying, treating and detaining stormwater runoff including but not limited to pipes, culverts, ditches, swales, ponds, and outfalls.

- (3) “Innovative site design” means development techniques for residential housing using creative approaches to site design, habitat and tree and native plant retention, significant reduction of impervious surfaces, changes in traditional site features such as roads and drainage structures in favor of natural habitat features which result in zero or near-zero drainage discharge from the site after development.
- (4) “Zero effective impervious surface” means impervious surface reduction to a small fraction of that resulting from traditional site development techniques such that usual manmade drainage collection systems are not necessary.
- (5) “Zero effective impervious surface project” means those projects characterized by an absence of a traditional manmade drainage collection system. It is a project for which total impervious surface has been reduced to a small fraction of that resulting from traditional development. Necessary impervious surface will be placed in discontinuous increments such that runoff travel distance to a forested and native vegetation buffer is minimized and does not exceed 50 feet. Landscaped areas will be minimized and buffered on the downslope side by forest. Forested area comprises at least 60% of the project. Forested areas substitute for the traditional drainage system and are to be maintained in perpetuity. It is preferred that the site be characterized by a predominance of Soils Conservation Service Class C or D soils.

X.50.030 Applicability

The provisions of this chapter apply to the following land use districts (list districts that apply).

X.50.040 Development Review Process.

- (1) Selected housing and other development projects shall submit project applications and all required documentation, per [jurisdiction] code, to the department of planning and development services. The [jurisdiction] shall coordinate review. Project applications shall comply with applicable provisions of the [jurisdiction] code and may deviate from certain code provisions pursuant to subsection (6) herein.
- (2) Development in the following districts are permitted to submit applications under the provisions of this ordinance: [list appropriate districts]
- (3) If a proponent fails to demonstrate progress on a selected project six (6) months following receipt of a letter from the development review team outlining project requirements, the project selection committee may de-designate the project for inclusion in this program. In the event of de-designation, the proponent may submit the project subject to existing land use development regulations of the county.
- (4) Pursuant to the purpose, procedures and guidelines of the demonstration program and considering the recommendations of the project selection committee and development review team, deviations from requirements of the [development code] and engineering design and development standards (EDDS) may be approved by the [Director of Planning] and or by the Hearings Officer. Projects granted deviations from the EDDS shall demonstrate adequate provision for fire safety and access.

- (5) An official site plan shall be prepared in compliance with [list appropriate section] for all projects selected under this section, shall be recorded, and shall be binding on the owners, heirs and successors of the property. Changes to the official site plan shall require a plat alteration or other appropriate process to be approved by the [jurisdiction]. The [Planning Director] shall approve minor revisions and shall make recommendations on major revisions to official site plans to the hearings officer. The [jurisdiction] may require Codes, Covenants and Restrictions (CC & Rs) to be developed as a condition of plat approval. Development of land, site design, landscaping, natural drainage features, habitat protection, stormwater design, project design, placement and size, and other site features related to this program shall be consistent with the approved site plan. A specific land clearing and tree retention plan shall be submitted as part of the approved site plan package.

X.50.050 Authorized Deviations from Engineering Design and Development Guidelines and Public Works Standards.

In order to accomplish the purpose and goal of this chapter, the director may approve, or for those projects requiring review and approval by either the hearings officer or by the [city council/county commission], recommend approval of deviations from engineering design and the provisions of the [jurisdiction's] development code and public works standards in accordance with the requirements set forth in this chapter. Deviations shall be based on the following criteria.

- A. The deviations contribute to and are consistent with the zero effective impervious surface goals of this chapter.
- B. The proposed development project offers reasonable assurance that near zero effective impervious surface will be achieved and maintained.
- C. The deviations do not threaten public health or safety.
- D. The change is consistent with generally accepted engineering and design criteria, except as necessary to achieve the purpose of this chapter.
- E. The change promotes one or more of the following:
 1. innovative site or project design furthering the purposes of the program,
 2. increased on site stormwater retention using a variety of vegetation and landscape conditions,
 3. retention or redevelopment of original natural habitat conditions over a significant portion of the site,
 4. improved on-site water quality beyond that required by current applicable regulations,
 5. retention or re-creation of pre-development and/or natural hydrologic conditions to the maximum extent possible, and
 6. The reduction of effective impervious surfaces to near zero.
- F. The deviations do not increase density by more than [twenty (20)] percent than what would otherwise be allowed under [jurisdiction] regulations then in effect.
- G. The deviations meet the minimum required density in the district [does not reduce the maximum density allowed without the use of this ordinance by more than ten percent]

The applicant will be required to list and document the justification for each deviation requested. In order for such a project to be approved, it must be demonstrated that the

project meets all other requirements of the [jurisdiction] Development Code except for such specific deviations, and that such project has a reasonable assurance of long term success. Binding covenants, conditions and restrictions shall be submitted in conjunction with each project and shall require retention of forest and other environmentally sensitive areas (streams, wetlands, steep slopes, etc), no net increases in impervious surface, and such other critical features as the [jurisdiction] may require.

X.50.060 Official Approval

All projects proposed under the terms of this chapter shall require approval of either a plat or the official site plan pursuant to the provisions of this code. The site plan or plan shall be in recordable form which shall be binding upon the owners of the real property, their heirs and assigns. The plat or official site plan shall include a specific land clearing and tree retention plan which shall be referenced upon the face of the plat or binding site plan. All development of the land, site design, landscaping, natural drainage features, habitat protection, stormwater design, and the design, placement and size of housing or other buildings and any additional site features shall be consistent with the approved plat or site plan. Any changes will require a formal application and amendment of either the plat or the official adopted site plan pursuant to the provisions of this code.

18.50.070 Evaluation and Monitoring.

Each application for approval of a project pursuant to the terms of this chapter shall be accompanied by a proposed monitoring and evaluation process designed to measure the performance of specific elements addressed in the deviations sought for the project. After the approval of a project, the city shall, with such cooperation as may be required of the property owner, document project progress, and in particular, those innovations and code deviations granted as part of such project approval. Written progress evaluations shall be prepared by [Director] and provided to the Planning Commission and City Council. An annual report on all such approved projects shall be prepared for the City Council and Planning Commission, including a summary description and evaluation of each selected project and any recommendations regarding substantive changes to the [jurisdiction] Development Code which are supported by such evaluation.

FEMA Model Flood Hazard Ordinance for Oregon to meet National Flood Insurance Program requirements

Adoption of this ordinance will comply with the standards for participation in the National Flood Insurance Program. The model includes standards and provisions that encourage sound flood plain management and if implemented allows property owners to obtain flood insurance at a more affordable rate.

FEMA recommends that non-residential construction have the lowest floor elevated one foot above the base flood elevation; or that the area below one foot above the base flood elevation be flood proofed.

The minimum requirement for participation in the NFIP non-residential construction requires that the lowest floor be elevated to or above the base flood elevation or that the area below the base flood elevation be flood proofed.

Even though the minimum standards only require elevation to the base flood elevation, it is recommended that communities adopt the higher standard because elevating one foot above the base flood elevation will allow your industries and businesses to receive a substantial reduction in the cost of their flood insurance. Also, as increased development happens, flood elevations can increase, and the one-foot-above standard allows for an additional margin of safety.

Because of the substantial number of manufactured homes that have experienced foundation failure, this model recommends that dry stacked blocks not be used to support manufactured homes in areas of high velocity and/or high water depths.

The model ordinance also includes sections for development in Shallow Flooding Areas (AO Zones), Section 5.5 and Coastal High Hazard Areas (V1-V30, VE and/or V), Section 5.6. If your community does not have either of these zones designated on your Flood Insurance Rate Map, it is not necessary to adopt these sections of the model ordinance.

If you have any questions concerning adoption of this model or participation in the NFIP please contact the Federal Emergency Management Agency Regional Office at (206) 487-4679.

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**OREGON MODEL
FLOOD DAMAGE PREVENTION ORDINANCE**

**SECTION 1.0
STATUTORY AUTHORIZATION, FINDINGS OF FACT, PURPOSE, AND
OBJECTIVES**

1.1 STATUTORY AUTHORIZATION

The Legislature of the State of Oregon has delegated the responsibility to local governmental units to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the [jurisdiction] does ordain as follows:

1.2 FINDINGS OF FACT

- (1) The flood hazard areas of [jurisdiction] are subject to periodic inundation which results in loss of life and property, health, and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.
- (2) These flood losses are caused by the cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities, and when inadequately anchored, damage uses in other areas. Uses that are inadequately floodproofed, elevated, or otherwise protected from flood damage also contribute to the flood loss.

1.3 STATEMENT OF PURPOSE

It is the purpose of this ordinance to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

- (1) To protect human life and health;
- (2) To minimize expenditure of public money and costly flood control projects;
- (3) To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- (4) To minimize prolonged business interruptions;
- (5) To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets, and bridges located in areas of special flood hazard;
- (6) To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;

- (7) To ensure that potential buyers are notified that property is in an area of special flood hazard; and,
- (8) To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

1.4 METHODS OF REDUCING FLOOD LOSSES

In order to accomplish its purposes, this ordinance includes methods and provisions for:

- (1) Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
- (2) Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- (3) Controlling the alteration of natural flood plains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;
- (4) Controlling filling, grading, dredging, and other development which may increase flood damage; and
- (5) Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or may increase flood hazards in other areas.

SECTION 2.0 DEFINITIONS

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

“APPEAL” means a request for a review of the interpretation of any provision of this ordinance or a request for a variance.

“AREA OF SHALLOW FLOODING” means a designated AO, or AH Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and, velocity flow may be evident. AO is characterized as sheet flow and AH indicates ponding.

“AREA OF SPECIAL FLOOD HAZARD” means the land in the flood plain within a community subject to a one percent or greater chance of flooding in any given year. Designation on maps always includes the letters A or V.

“BASE FLOOD” means the flood having a one percent chance of being equaled or exceeded in any given year. Also referred to as the “100-year flood.” Designation on maps always includes the letters A or V.

“BASEMENT” means any area of the building having its floor subgrade (below ground level) on all sides.

“BREAKAWAY WALL” means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces, without causing damage to the elevated portion of the building or supporting foundation system.

“COASTAL HIGH HAZARD AREA” means an area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. The area is designated on the FIRM as Zone V1-V30, VE or V.

“CRITICAL FACILITY” means a facility for which even a slight chance of flooding might be too great. Critical facilities include, but are not limited to schools, nursing homes, hospitals, police, fire and emergency response installations, installations which produce, use or store hazardous materials or hazardous waste.

“DEVELOPMENT” means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations located within the area of special flood hazard.

“ELEVATED BUILDING” means for insurance purposes, a non-basement building which has its lowest elevated floor raised above ground level by foundation walls, shear walls, post, piers, pilings, or columns.

“EXISTING MANUFACTURED HOME PARK OR SUBDIVISION” means a manufactured home park subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the adopted floodplain management regulations.

“EXPANSION TO AN EXISTING MANUFACTURED HOME PARK OR _____” means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

“FLOOD” OR “FLOODING” means a general and temporary condition of partial or complete inundation of normally dry land areas from:

- (1) The overflow of inland or tidal waters and/or
- (2) The unusual and rapid accumulation of runoff of surface waters from any source.

“FLOOD INSURANCE RATE MAP (FIRM)” means the official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

“FLOOD INSURANCE STUDY” means the official report provided by the Federal Insurance Administration that includes flood profiles, the Flood Boundary-Floodway Map, and the water surface elevation of the base flood.

“FLOODWAY” means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

“LOWEST FLOOR” means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage, in an area other than a basement area, is not considered a building’s lowest floor, provided that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of this ordinance found at Section 5.2-1(2).

“MANUFACTURED HOME” means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term “manufactured home” does not include a “recreational vehicle.”

“MANUFACTURED HOME PARK OR SUBDIVISION” means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

“NEW CONSTRUCTION” means structures for which the “start of construction” commenced on or after the effective date of this ordinance.

“NEW MANUFACTURED HOME PARK OR SUBDIVISION” means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the effective date of adopted floodplain management regulations.

“RECREATIONAL VEHICLE” means a vehicle which is:

- (a) Built on a single chassis;
- (b) 400 square feet or less when measured at the largest horizontal projection;
- (c) Designed to be self-propelled or permanently towable by a light duty truck; and
- (d) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

“START OF CONSTRUCTION” includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation of the property or accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

“STRUCTURE” means a walled and roofed building including a gas or liquid storage tank that is principally above ground.

“SUBSTANTIAL DAMAGE” means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

“SUBSTANTIAL IMPROVEMENT” means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either:

- (1) Before the improvement or repair is started; or
- (2) If the structure has been damaged and is being restored, before the damage occurred. For the purposes of this definition “substantial improvement” is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

The term does not, however, include either:

- (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or
- (2) Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

“VARIANCE” means a grant of relief from the requirements of this ordinance which permits construction in a manner that would otherwise be prohibited by this ordinance.

“WATER DEPENDENT” means a structure for commerce or industry which cannot exist in any other location and is dependent on the water by reason of the intrinsic nature of its operations.

SECTION 3.0 GENERAL PROVISIONS

3.1 LANDS TO WHICH THIS ORDINANCE APPLIES

This ordinance shall apply to all areas of special flood hazards within the jurisdiction of _____ .

3.2 BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD

The areas of special flood hazard identified by the Federal Insurance Administration in a scientific and engineering report entitled “The Flood Insurance Study for the _____,” dated _____, 19__, and as amended, with accompanying Flood Insurance Maps, as amended, are hereby adopted by reference and declared to be a part of this ordinance. The Flood Insurance Study is on file at _____ .

3.3 PENALTIES FOR NONCOMPLIANCE

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this ordinance and other applicable regulations. Violations of the provisions of this ordinance by failure to comply with any of its requirements (including violations of conditions and safeguards established in connection with conditions), shall constitute a misdemeanor. Any person who violates this ordinance or fails to comply with any of its requirements shall upon conviction thereof be fined not more than _____ or imprisoned for not more than ____ days, or both, for each violation, and in addition shall pay all costs and expenses involved in the case. Nothing herein contained shall prevent the _____ from taking such other lawful action as is necessary to prevent or remedy any violation.

3.4 ABROGATION AND GREATER RESTRICTIONS

This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

3.5 INTERPRETATION

In the interpretation and application of this ordinance, all provisions shall be:

- (1) Considered as minimum requirements;
- (2) Liberally construed in favor of the governing body; and,
- (3) Deemed neither to limit or repeal any other powers granted under State statutes.

3.6 WARNING AND DISCLAIMER OF LIABILITY

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of _____, any officer or employee thereof, or the Federal Insurance Administration, for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

SECTION 4.0 ADMINISTRATION

4.1 ESTABLISHMENT OF DEVELOPMENT PERMIT

4.1-1 Development Permit Required

A development permit shall be obtained before construction or development begins within any area of special flood hazard established in Section 3.2. The permit shall be for all structures including manufactured homes, as set forth in the "DEFINITIONS," and for all development including fill and other activities, also as set forth in the "DEFINITIONS."

4.1-2 Application for Development Permit

Application for a development permit shall be made on forms furnished by the _____ and may include but not be limited to plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question; existing or proposed structures, fill, storage of materials, drainage facilities, and the location of the foregoing. Specifically, the following information is required:

- (1) Elevation in relation to mean sea level, of the lowest floor (including basement) of all structures;
- (2) Elevation in relation to mean sea level to which any structure has been floodproofed;
- (3) Certification by a registered professional engineer or architect that the floodproofing methods for any nonresidential structure meet the floodproofing criteria in Section 5.2-2; and

- (4) Description of the extent to which a watercourse will be altered or relocated as a result of proposed development.

4.2 DESIGNATION OF THE (local administrator)

The (local administrator) is hereby appointed to administer and implement this ordinance by granting or denying development permit applications in accordance with its provisions.

4.3 DUTIES AND RESPONSIBILITIES OF THE (local administrator)

Duties of the (local administrator) shall include, but not be limited to:

4.3-1 Permit Review

- (1) Review all development permits to determine that the permit requirements of this ordinance have been satisfied.
- (2) Review all development permits to determine that all necessary permits have been obtained from those Federal, State, or local governmental agencies from which prior approval is required.
- (3) Review all development permits to determine if the proposed development is located in the floodway. If located in the floodway, assure that the encroachment provisions of Section 5.3(1) are met.

4.3-2 Use of Other Base Flood Data

When base flood elevation data has not been provided in accordance with Section 3.2, BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD, the (local administrator) shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a Federal, State or other source, in order to administer Sections 5.2, SPECIFIC STANDARDS, and 5.3 FLOODWAYS.

4.3-3 Information to be Obtained and Maintained

- (1) Where base flood elevation data is provided through the Flood Insurance Study or required as in Section 4.3-2, obtain and record the actual elevation (in relation to mean sea level) of the lowest floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement.
- (2) For all new or substantially improved floodproofed structures:
 - (i) Verify and record the actual elevation (in relation to mean seal level), and
 - (ii) Maintain the floodproofing certifications required in Section 4.1-2(3).
- (3) Maintain for public inspection all records pertaining to the provisions of this ordinance.

4.3-4 Alteration of Watercourses

- (1) Notify adjacent communities and the Department of Land Conservation and Development prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Insurance Administration.
- (2) Require that maintenance is provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished.

4.3-5 Interpretation of FIRM Boundaries

Make interpretations where needed, as to exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions). The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in Section 4.4.

NOTE - If you do not include Section 4.4 (Variance Procedure), end the above sentence after the word “interpretation,” and add the following sentence: “such appeals shall be granted consistent with the standards of Section 60.6 of the Rules and Regulations of the National Flood Insurance Program (44 CFR 59-76).”

4.4 VARIANCE PROCEDURE

4.4-1 Appeal Board

- (1) The _____ as established by _____ shall hear and decide appeals and requests for variances from the requirements of this ordinance.
- (2) The _____ shall hear and decide appeals when it is alleged there is an error in any requirement, decision, or determination made by the _____ in the enforcement or administration of this ordinance.
- (3) Those aggrieved by the decision of the _____, or any taxpayer, may appeal such decision to the _____, as provided in _____.
- (4) In passing upon such applications, the _____ shall consider all technical evaluations, all relevant factors, standards specified in other sections of this ordinance, and:
 - (i) The danger that materials may be swept onto other lands to the injury of others;
 - (ii) The danger to life and property due to flooding or erosion damage;
 - (iii) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;
 - (iv) The importance of the services provided by the proposed facility to the community;
 - (v) The necessity to the facility of a waterfront location, where applicable;

- (vi) The availability of alternative locations for the proposed use which are not subject to flooding or erosion damage;
 - (vii) The compatibility of the proposed use with existing and anticipated development;
 - (viii) The relationship of the proposed use to the comprehensive plan and flood plain management program for that area;
 - (ix) The safety of access to the property in times of flood for ordinary and emergency vehicles;
 - (x) The expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site; and,
 - (xi) The costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water systems, and streets and bridges.
- (5) Upon consideration of the factors of Section 4.4-1(4) and the purposes of this ordinance, the _____ may attach such conditions to the granting of variances as it deems necessary to further the purposes of this ordinance.
- (6) The _____ shall maintain the records of all appeal actions and report any variances to the Federal Insurance Administration upon request.

4.4-2 Conditions for Variances

- (1) Generally, the only condition under which a variance from the elevation standard may be issued is for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing items (I-xi) in Section 4.4-1(4) have been fully considered. As the lot size increases the technical justification required for issuing the variance increases.
- (2) Variances may be issued for the reconstruction, rehabilitation, or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, without regard to the procedures set forth in this section.
- (3) Variances shall not be issued within a designated floodway if any increase in flood levels during the base flood discharge would result.
- (4) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
- (5) Variances shall only be issued upon:
 - (i) A showing of good and sufficient cause;
 - (ii) A determination that failure to grant the variance would result in exceptional hardship to the applicant;
 - (iii) A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary

public expense, create nuisances, cause fraud on or victimization of the public as identified in Section 4.1-4(4), or conflict with existing local laws or ordinances.

- (6) Variances as interpreted in the National Flood Insurance Program are based on the general zoning law principle that they pertain to a physical piece or property; they are not personal in nature and do not pertain to the structure, its inhabitants, economic or financial circumstances. They primarily address small lots in densely populated residential neighborhoods. As such, variances from the flood elevations should be quite rare.
- (7) Variances may be issued for nonresidential buildings in very limited circumstances to allow a lesser degree of floodproofing than watertight or dry-floodproofing, where it can be determined that such action will have low damage potential, complies with all other variance criteria except 4.4-2(1), and otherwise complies with Sections 5.1-1 and 5.1-2 of the GENERAL STANDARDS.
- (8) Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with a lowest floor elevation below the base flood elevation and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

SECTION 5.0 PROVISIONS FOR FLOOD HAZARD REDUCTION

5.1 GENERAL STANDARDS

In all areas of special flood hazards, the following standards are required:

5.1-1 Anchoring

- (1) All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure.
- (2) All manufactured homes must likewise be anchored to prevent flotation, collapse, or lateral movement, and shall be installed using methods and practices that minimize flood damage. Anchoring methods may include, but are not limited to, use of over-the-top or frame ties to ground anchors (Reference FEMA's "Manufactured Home Installation in Flood Hazard Areas" guidebook for additional techniques).

5.1-2 Construction Materials and Methods

- (1) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.
- (2) All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.

- (3) Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

5.1-3 Utilities

- (1) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;
- (2) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters; and,
- (3) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

5.1-4 Subdivision Proposals

- (1) All subdivision proposals shall be consistent with the need to minimize flood damage;
- (2) All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage;
- (3) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and,
- (4) Where base flood elevation data has not been provided or is not available from another authoritative source, it shall be generated for subdivision proposals and other proposed developments which contain at least 50 lots or 5 acres (whichever is less).

5.1-5 Review of Building Permits

Where elevation data is not available either through the Flood Insurance Study or from another authoritative source (Section 4.3-2), Applications for building permits shall be reviewed to assure that proposed construction will be reasonably safe from flooding. The test of reasonableness is a local judgment and includes use of historical data, high water marks, photographs of past flooding, etc., where available. Failure to elevate at least two feet above grade in these zones may result in higher insurance rates.

5.2 SPECIFIC STANDARDS

In all areas of special flood hazards where base flood elevation data has been provided as set forth in Section 3.2, BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD or Section 4.3-2, Use of Other Base Flood Data, the following provisions are required:

5.2-1 Residential Construction

- (1) New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated one foot above the base flood elevation.
- (2) Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must be either certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria:
 - (i) A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
 - (ii) The bottom of all openings shall be no higher than one foot above grade.
 - (iii) Openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

5.2-2 Nonresidential Construction

New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor, including basement, elevated at or above the base flood elevation; or, together with attendant utility and sanitary facilities, shall:

- (1) Be floodproofed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water;
- (2) Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;
- (3) Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on their development and/or review of the structural design, specifications and plans. Such certifications shall be provided to the official as set forth in Section 4.3-3(2);
- (4) Nonresidential structures that are elevated, not floodproofed, must meet the same standards for space below the lowest floor as described in 5.2-1(2);
- (5) Applicants floodproofing nonresidential buildings shall be notified that flood insurance premiums will be based on rates that are one foot below the

floodproofed level (e.g. a building floodproofed to the base flood level will be rated as one foot below.

5.2-3 Manufactured Homes

- (1) All manufactured homes to be placed or substantially improved within Zones A1-A30, AH, and AE on the community's FIRM on sites:
 - (i) Outside of a manufactured home park or subdivision,
 - (ii) In a new manufactured home park or subdivision,
 - (iii) In an expansion to an existing manufactured home park or subdivision,
or
 - (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood;

shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated one foot above the base flood elevation and be securely anchored to an adequately designed foundation system to resist flotation, collapse and lateral movement.

- (2) Manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A1-30, AH, and AE on the community's FIRM that are not subject to the above manufactured home provisions be elevated so that either:
 - (i) The lowest floor of the manufactured home is elevated one foot above the base flood elevation, or
 - (ii) The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately designed foundation system to resist flotation, collapse, and lateral movement.

5.2-4 Recreational Vehicles

Recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either:

- (i) Be on the site for fewer than 180 consecutive days,
- (ii) Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or
- (iii) Meet the requirements of 5.2-3 above and the elevation and anchoring requirements for manufactured homes.

5.3 FLOODWAYS

Located within areas of special flood hazard established in Section 3.2 are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

- (1) Prohibit encroachments, including fill, new construction, substantial improvements, and other development unless certification by a registered professional civil engineer is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.
- (2) If Section 5.3(1) is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of Section 5.0, PROVISIONS FOR FLOOD HAZARD REDUCTION.

5.4 ENCROACHMENTS

The cumulative effect of any proposed development, where combined with all other existing and anticipated development, shall not increase the water surface elevation of the base flood more than one foot at any point.

5.5 STANDARDS FOR SHALLOW FLOODING AREAS (AO ZONES)

Shallow flooding areas appear on FIRMs as AO zones with depth designations. The base flood depths in these zones range from 1 to 3 feet above ground where a clearly defined channel does not exist, or where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is usually characterized as sheet flow. In these areas, the following provisions apply:

- (1) New construction and substantial improvements of residential structures and manufactured homes within AO zones shall have the lowest floor (including basement) elevated above the highest grade adjacent to the building, one foot or more above the depth number specified on the FIRM (at least two feet if no depth number is specified).
- (2) New construction and substantial improvements of nonresidential structures within AO zones shall either:
 - (i) Have the lowest floor (including basement) elevated above the highest adjacent grade of the building site, one foot or more above the depth number specified on the FIRM (at least two feet if no depth number is specified); or
 - (ii) Together with attendant utility and sanitary facilities, be completely flood proofed to or above that level so that any space below that level is watertight with walls substantially impermeable to the passage of water

and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. If this method is used, compliance shall be certified by a registered professional engineer or architect as in section 5.2-2(3).

- (3) Require adequate drainage paths around structures on slopes to guide floodwaters around and away from proposed structures.
- (4) Recreational vehicles placed on sites within AO Zones on the community's FIRM either:
 - (i) Be on the site for fewer than 180 consecutive days,
 - (ii) Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or
 - (iii) Meet the requirements of 5.5 above and the elevation and anchoring requirements for manufactured homes.

5.6 COASTAL HIGH HAZARD AREAS

Located within areas of special flood hazard established in Section 3.2 are Coastal High Hazard Areas, designated as Zones V1-V30, VE and/or V. These areas have special flood hazards associated with high velocity waters from surges and, therefore, in addition to meeting all provisions in this ordinance, the following provisions shall also apply:

- (1) All new construction and substantial improvements in Zones V1-V30 and VE (V if base flood elevation data is available) shall be elevated on pilings and columns so that:
 - (i) The bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated one foot or more above the base flood level; and
 - (ii) The pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Wind and water loading values shall each have a one percent chance of being equaled or exceeded in and given year (100-year mean recurrence interval);
- (2) A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of (i) and (ii) of this Section.
- (3) Obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures in Zones V1-30 and VE, and

whether or not such structures contain a basement. The local administrator shall maintain a record of all such information.

- (4) All new construction shall be located landward of the reach of mean high tide.
- (5) Provide that all new construction and substantial improvements have the space below the lowest floor either free of obstruction or constructed with nonsupporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purpose of this section, a breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions:
 - (i) Breakaway wall collapse shall result from water load less than that which would occur during the base flood; and
 - (ii) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and nonstructural). Maximum wind and water loading values to be used in this determination shall each have a one percent chance of being equaled or exceeded in any given year (100-year mean recurrence interval).
- (6) If breakaway walls are utilized, such enclosed space shall be useable solely for parking of vehicles, building access, or storage. Such space shall not be used for human habitation.
- (7) Prohibit the use of fill for structural support of buildings.
- (8) Prohibit man-made alteration of sand dunes which would increase potential flood damage.
- (9) All manufactured homes to be placed or substantially improved within Zones V1-V30, V, and VE on the community's FIRM on sites:
 - (i) Outside of a manufactured home park or subdivision,
 - (ii) In a new manufactured home park or subdivision,
 - (iii) In an expansion to an existing manufactured home park or subdivision, or
 - (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood;
 - (v) meet the standards of paragraphs 5.6(1) through (8) of this section and that manufactured homes placed or substantially improved on other sites in an existing manufactured home park

or subdivision within Zones V1-30, V, and VE on the FIRM meet the requirements of Section 5.2-3.

(10) Recreational vehicles placed on sites within Zones V1-30, V, and VE on the community's FIRM either:

- (i) Be on the site for fewer than 180 consecutive days,
- (ii) Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or
- (iii) Meet the requirements of Section 4.1-1(Permitting requirements) and paragraphs 5.6(1) through (8) of this section.

Simplified Approach Design Criteria for Stormwater Management

The following text is from Chapter 4 of the City of Portland's Stormwater Management Manual from City of Portland.. The "simplified" or "combined" approach to designing stormwater management facilities was incorporated into the stormwater management model code included in the Water Quality Model Code (Section 4.4.7). The design criteria in the Portland manual were selected to meet environmental conditions in the northern Willamette Valley. It is probable that these design criteria will be found adequate for much of Western Oregon. **However, if a jurisdiction is interested in adopting these design criteria, a finding must first be made that the soil permeability and precipitation patterns for the area are such that these criteria will provide adequate treatment.**

Design criteria for pollution reduction and flow control facilities in this chapter of City of Portland's stormwater Management Manual are included on this CD in a separate file titled **Portland Design Standards.pdf**. This file must be opened in Adobe Acrobat. Adobe Acrobat version 4.0 is available on this CD. The software can also be obtained free of charge from the Adobe web site at: <http://www.adobe.com/>.

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From: City of Portland Stormwater Management Manual.
See <http://www.enviro.ci.portland.or.us/swm2.htm> for full document.

Chapter 4.0 SIMPLIFIED APPROACH FOR POLLUTION REDUCTION AND FLOW CONTROL FACILITIES

Summary of Chapter 4.0

This chapter provides a relatively simple approach for selecting and designing facilities that provide both pollution reduction and flow control. It identifies which types of development can use the simplified approach. Specific design criteria are provided for each facility.

4.1 INTRODUCTION

The simplified approach is a relatively simple process for selecting and designing pollution reduction and flow control facilities. This approach addresses small projects where a combination facility is more practical than separate pollution reduction and flow control facilities.

BES staff went through a technical process to determine facility designs and sizes that would be effective on such sites. The process included a review of technical literature, review of BES monitoring data, calculations, and theoretical analysis.

Facilities designed in accordance with the simplified approach are presumed to comply with the City's pollution reduction requirements and flow control policies.

A facility that is used as a mitigation measure (see Chapter 1.0, Section 1.4) may not also be used as a simplified approach.

4.2 APPLICABILITY

The simplified approach may be used if the proposed development meets the following criteria:

- Falls under Management Level 2 or 3
- Creates less than 15,000 square feet of non-mitigated impervious area
- Is a parking lot that exceeds 15,000 square feet, but has simplified measures designed to receive stormwater from no more than 15,000 square feet of impervious area

If the development does not meet the above criteria, the applicant is required to use either the presumptive or performance approach for pollution reduction (Chapter 5.0) and the performance approach for flow control (Chapter 6.0).

Because the simplified approach uses combination facilities, applicants who wish to design separate pollution reduction and flow control facilities shall use the approaches specified in Chapters 5.0 and 6.0.

Applicants who do not qualify for the simplified approach, but wish to use a simplified measure that is not included in Chapter 5.0 or 6.0, shall do so using the performance approach in those chapters. The applicant will be required to demonstrate that the facilities will control for the appropriate storm events and will treat to a 70 percent removal standard for total suspended solids (TSS).

4.2.1 Combined Sewer Areas

Because combined sewers overflow to the Willamette River in wet weather, it is important to minimize the quantity of stormwater flow entering the system. For that reason, development projects discharging to the combined sewer system (see Exhibit 1-1 in Chapter 1.0) are required to use **either** the mitigation measures identified in Chapter 1.0 (Section 1.4) **or** the simplified approaches identified in this chapter to the maximum extent practicable. Complete on-site disposal of stormwater will be required where feasible.

4.2.2 Total Maximum Daily Loads (TMDLs)

The simplified approach may be used if stormwater from the applicable project will discharge into a stream that has established total maximum daily loads (TMDLs). However, the applicant shall also demonstrate through the performance approach (*see Chapter 5.0*) that the development proposal is consistent with specific TMDL requirements. (*See Chapter 5.0, Section 5.4, for a discussion of TMDLs and water quality limited streams.*)

4.2.3 Discharging to Existing Systems

A development may discharge to an existing **publicly** owned and maintained pollution reduction facility (PRF) if all of the following criteria are met:

- The conveyance system and facility to which the development is connecting has capacity (*see definition of capacity in Chapter 1, Section 1.3*).
- To the maximum extent practicable, the development has used mitigation measures (*as described in Chapter 1.0, Section 1.4*) or simplified approaches (as described in this chapter) within the area of the project that will be private property.

A development may discharge to an existing off-site **privately** owned and maintained PRF if the following criteria are met:

- To the maximum extent practicable, the development has used mitigation measures (*as described in Chapter 1.0, Section 1.4*) or simplified approaches (as described in this chapter) within the area of the project that will be private property.
- The PRF has capacity (*see definition of capacity in Chapter 1.0, Section 1.3*).
- The development owner or applicant receives written approval from the owner of the PRF.
- There is no history of maintenance violations at the PRF to which the development will be discharging.
- The owner of the PRF retains all responsibility for operation and maintenance of the PRF (agreements between the parties for shared responsibility notwithstanding).
- The design criteria used for the facility are equivalent or better than those in the *Stormwater Management Manual* (in effect at the time of the request).

If the development meets these criteria and discharges to an existing PRF, no additional treatment or flow control is required.

4.3 STORMWATER DISPOSAL

The stormwater management requirements in this manual may not always sufficiently manage stormwater **volume** (as opposed to flow control). Additional disposal measures may be required through building and plumbing codes, and must be approved by the Office of Planning and Design Review (OPDR). Contact the Development Services Center at 503-823-7760 for more information.

Drywells and/or sumps will be treated as a piped storm sewer system. The Oregon Department of Environmental Quality (DEQ) has identified drywells and/or sumps as "Class V Injection Wells" under the federal Underground Injection Control (UIC) Program. Since the UIC Program states that these types of wells have a direct impact on groundwater, stormwater pollution controls (as identified in Chapter 9.0) will apply. More information about the UIC program can be found at DEQ's web site:

<http://waterquality.deq.state.or.us/wq/groundwa/uichome.htm>

4.4 FACILITY SELECTION AND DESIGN

Form SIM: Simplified Approach for Stormwater Management Facilities shows how to select and size facilities. Applicants using the simplified approach shall submit Form SIM as part of their submittal package (*see Chapter 3.0*).

(Form SIM is located in a separate file on this CD, either in PDF or Excel format. See "simform.xls" or "simform.pdf")

Descriptions and design criteria for the various facilities are provided following Form SIM, showing the applicability and limitations of each facility. The design criteria were specifically developed for use with this simplified approach. The required facility surface areas in column 3 of Form SIM shall be used to size the facility, and the specified facility sizes cannot be altered. Minimum/maximum dimensions are provided in the design criteria drawings, and shall be made relative to the surface area requirement.

Facilities designed under the simplified approach shall also fulfill the requirements identified in Chapter 7.0 (Landscape, Aesthetics, Fencing, and Access) and Chapter 8.0 (Operations and Maintenance Requirements).

(For design standards graphics please see the separate file titled wq_appendix_portland design.pdf.)

