MINIMUM DRAINAGE DESIGN STANDARDS

1. Onsite Requirements.

   a. All portions of a development shall be protected from flood hazard, inundation, sheet overflow and ponding of storm waters. All finished floors shall be above the water surface of a one-hundred-year frequency storm runoff as shown on the Federal Flood Insurance Program Flood Insurance Rate Map.

   b. All surface waters occurring within a development, as well as all surface waters flowing into and/or through the development, shall be collected and conveyed through the development without damage to any improvement, building site or dwelling which may be constructed within the development.

   c. Storm drainage facilities within a development shall be designed and constructed in compliance with the requirements of this section and any other City codes and standards to adequately convey, with freeboard, the storm water runoff from the maximum potential development of the drainage basin watershed.

   d. The developer shall dedicate to the City, or other public agency, an easement for construction, maintenance and operation of all storm drainage and access facilities required to convey drainage water originating in a public street, easement or open space to a public storm drainage facility.

2. Offsite Development Requirements.

   a. All surface waters flowing from a development in any form or manner shall be conveyed, without watershed diversion or damage to any improvement, building or dwelling, to a natural watercourse having a definable bed and banks, or to an existing public storm drainage facility having adequate capacity to its point of discharge into a natural watercourse. The City may require that flows from a development be regulated to not exceed the capacity of watercourses downstream to contain the amount of flow from the fully developed drainage basin watershed area.

   b. Storm drainage facilities outside a development shall be designed and constructed in compliance with the requirements of this Section and with City standard plans and specifications and design standards of the City, to adequately convey, with freeboard, the storm water runoff from the maximum potential development of the drainage basin watershed.

   c. Where surface waters must be conveyed beyond the boundaries of a development to discharge into a natural watercourse or into an existing adequate public storm drainage facility, the developer shall comply with either subsection (d), or (e) of this Section, prior approving a final or parcel map or issuance of a site development or building permit.

d. The developer shall submit the following:

i. A copy of a recorded conveyance from the adjacent property owner(s), in a form and content acceptable to the City, granting a storm drainage easement to the developer to construct, maintain and operate all necessary storm drainage and access facilities, and

ii. A copy of a recorded offer of dedication from the adjacent property owner(s), in a form and content acceptable to the City, offering to dedicate to the City or other public agency sufficient land rights for construction, maintenance and operation of all necessary storm drainage and access facilities. The documents shall be obtained from all property owner(s) between the boundaries of the development and the point at which the surface waters will be discharged into a natural watercourse having definable bed and banks or an existing adequate public storm drainage facility.

e. The developer shall present written evidence which proves to the satisfaction of the City that it is not feasible to obtain an easement from the adjacent property owners. The City, in its sole discretion, may then authorize the institution of condemnation proceedings to acquire the easement at the developer's expense.

3. Runoff quantity determination. Runoff quantities shall be determined by methods consistent with current engineering practices for the frequency of the average recurrence interval according to Section 5.

4. Drainage facilities - Definition. As used in this division, the terms "storm drainage facility" and "drainage facility" shall include, but not be limited to, channels, ditches, conduits, pipes, culverts, detention basins and all appurtenances.

5. Drainage facilities - Minimum capacities. Storm drainage facilities directly affecting a development shall have the following minimum capacities:

a. Major drainage facilities serving a watershed area four (4) square miles or greater shall have adequate capacity to contain, with sufficient freeboard, a 50-year frequency of average recurrence interval runoff and contain without freeboard a 100-year average recurrence interval runoff.

b. Secondary drainage facilities serving a watershed area one (1) square mile or greater but less than four (4) square miles shall have adequate capacity to contain, with freeboard, a 25-year frequency of average recurrence interval runoff.

c. Minor drainage facilities serving a watershed area less than one (1) square mile shall have adequate capacity to contain, with freeboard, a 10-year frequency of average recurrence interval runoff.

6. Closed conduits - Minimum size. Closed conduits, including street-crossing culverts,

shall be of a size adequate to carry the design flow, but shall not be smaller than fifteen (15) inches inside diameter.

7. Closed conduits - Minimum slope. Minimum flow line gradients for closed conduits shall not be less than five one-thousandths (0.005) of a foot per foot of length.

8. Closed conduits - Outlet velocity. Where the outlet velocity is high enough to create erosion at the outfall channel, suitable protective works shall be constructed to dissipate the flow. At a minimum, the outlet end of a closed conduit shall be protected by a cutoff wall and the placement of loose riprap. The protective works shall be those specified by a licensed engineer and shall be based on engineering calculations of allowable flow velocities.

9. Closed conduits - Material. All pipe or culverts intended for use within a public easement or street right-of-way shall be reinforced concrete unless specifically approved by the City Engineer. If approved, corrugated steel and aluminum pipe shall be bituminous coated. Additional protective coating or paving of metal pipes may be required for severe service conditions. The class or gauge of pipe or culvert proposed at each location shall be shown on the improvement plans. Private pipes or culverts may be of any approved type and strength to meet field conditions designed by the developer's engineer and approved by the City Engineer.

10. Storm drainage catch basins and manholes. Catch basins and manholes shall be according to the City Standard Plans, Contra Costa County Standard Plans, or other design approved by the City Engineer. Pipes shall not enter through a corner of the catch basin. Catch basins shall be placed not more than 1,000 feet apart or where gutter capacity may be exceeded. Gutter capacity is considered exceeded if water encroaches into the travel lane of the street. The maximum distance between manholes shall be 500 feet, or as required by the City Engineer. Catch basins shall be located at intersections to remove the curb flow before it reaches the pedestrian crossings. Catch basins at sag vertical curves shall have capacity for 50-year average recurrence interval runoff.

Unless specifically permitted by the City Engineer, structures shall be installed at all junctions.

11. Closed conduits - Alignment. All storm drainage conduits shall be straight between structures except that one vertical or one horizontal deflection of not more than five (5) degrees will be permitted in pipe sizes of thirty (30) inches or more, provided that one structure shall be installed at the downstream or upstream end of a curve of approved radius. Structures shall be installed at deflections of more than five (5) degrees in the horizontal or vertical alignment of the conduit.

12. Closed conduits - Streets and Watercourses. Water within street areas shall be placed in closed conduits when the design depth of flow extends into the travel lane of the street. Storm water in natural or improved earth channels shall be placed in closed conduits or concrete lined channels when required by the City Engineer.

13. Drainage Facilities - Freeboard. The hydraulic grade line in any storm drainage facility shall be at least eighteen (18) inches below the top of any catch basin grate or manhole cover.

14. Easements - General Requirements. Easements shall provide sufficient land rights for construction, maintenance and operation of drainage and access facilities. All easements shall be provided with access, usable by vehicular maintenance equipment, to a public street.

15. Closed conduits - Minimum Widths of Easements. Minimum widths of easements shall be equal to the outside diameter or width of the conduit plus three (3) feet on each side, with a minimum of ten (10) feet. Additional width may be required for drainage structures. If an easement is offered for dedication to provide for the future construction of a drainage system, the easement width may include an additional width for construction purposes.

16. Structures and Encroachments Within Easements. No permanent structures of any kind other than drainage structures may be constructed within any storm drainage easement. Encroachments may be permitted if an Encroachment Permit Agreement is approved by the City Engineer and recorded at the expense of the applicant. Public utilities may be installed within easements upon approval by the City.

17. Private Drainage Systems. Earth and concrete lined ditches, yard drains, pipes carrying water originating on private property and other similar drainage systems are considered private systems and easements for these systems shall not be offered or granted to the City. The property owner shall be responsible for the maintenance of private systems.

18. Subdrains. Subdrain facilities shall be provided where specified by the soil engineer controlling the work and other areas where deemed necessary by the City. Facilities will be required to convey the subdrainage to an approved point of discharge. The property owner shall be responsible for the maintenance of subdrain facilities.

19. Structure Setback Lines - General Requirements. In general, structure setbacks for unimproved channels shall comply with Contra Costa County Ordinance 89-28, Section 914-14 as amended unless specifically approved by the City Engineer. The City Engineer shall determine setbacks from improved channels based on the type of improvement and the maintenance access requirements.

20. Structures and Encroachments Within Structure Setback Areas. No permanent structures of any kind other than drainage structures may be constructed within, under or over any structure setback area described in this chapter. Fencing and landscaping, including trees and shrubs, are excluded from this restriction. The structure setback line shall be verified prior to the issuance of a building permit.

21. Protection of Natural Watercourses. The City, at its sole discretion, may determine that a natural watercourse, or a substantial portion of a natural watercourse, is a scenic attraction or possesses significant riparian habitat, and may require that the watercourse, or portion of the watercourse, be protected in its natural state. The watercourse or portion required to be protected shall be referred to as a "scenic easement".

22. Watercourse Capacity and Stability Analysis. Before a protected watercourse may be utilized for discharge of drainage flowing through or from a development, the watercourse's

capacity and stability shall be substantiated through hydraulic calculations performed by a licensed engineer. Design flow volumes in excess of the watercourse's reasonable capacity shall be conveyed around the protected watercourse or shall be detained in adequate detention basins. Flow velocities which cause erosion shall be mitigated using environmentally-sensitive techniques approved by the City.

23. Vegetation Removal. Vegetation removal within a protected watercourse shall be restricted to the removal of downed trees, trees that are precariously undercut and trees that have the potential of creating a major obstruction within the floodway. Removal work shall be done in an environmentally-sensitive manner, so as to minimize damage to remaining trees, undergrowth and other riparian vegetation. Trees requiring removal of dead or diseased limbs shall be trimmed under the supervision of a tree specialist. A Tree Removal Permit shall be required for removal of trees protected by the Tree Preservation Ordinance.