Appendix G
Stormwater Management

Erosion and Sediment Control.

A. All open drainage lines and swales shall be protected against erosion by suitable stabilizing materials or construction.
B. Exposing the smallest practical area of land at any one time during development shall be required. Erosion prevention measures shall be completed within five (5) days after the soil is exposed except in areas in the immediate vicinity of active construction where such construction would preclude the preventive measures from becoming effective.
C. Provision for temporary vegetation and/or mulching to protect critical areas shall be made. Such steps shall include but not be limited to seeding or sodding or the spreading of straw on denuded areas of soil.
D. Temporary sedimentation basins and/or check dams shall be erected before the subdivision is under construction. These facilities shall be maintained until such time as all construction is completed and permanent erosion prevention measures are effective, at which time the subdivider shall dispose of the erosion materials collected and remove any remaining temporary facilities.

Drainage Design.

A. Particular attention should be given to storm drainage facilities. These facilities shall be designed to take the runoff from streets, lawns, paved areas and roof areas. Full engineering attention shall be given to the interception and conveyance of stormwater by one or more of the following means a street drainage system, a system of lot line drainage swales, and or existing drainage channels through the subdivision.
B. Storm drains and channels shall be designed and provided to adequately convey the anticipated runoff from the development as well as all future development upstream or uphill from the development in question.
C. The drainage system and/or culverts shall be designed in accordance with established engineering principles, approved by the Village Engineer.
D. Refer to Appendix E for additional material, design and installation standards.
E. The developer and his engineer shall be responsible for furnishing, as part of their plans to be presented before the Planning Board, full, sufficient details of all hydraulic structures. This includes, but is not limited to, cross sections of drainage channels, details of wall construction, erosion control structures, special manholes and all such other items as may be necessary to establish fully the methods and materials to be followed in construction.
F. Drainage pipe culverts shall be installed to carry the present requirements of the subdivisions as well as that, which reasonably may be anticipated from future construction, both from within the subdivision and from adjoining properties which normally drain across the area of the proposed development.
G. The discharge of established natural watercourses and stormwater in open ditches shall be permitted only after specific approval by the Planning Board. If, in its opinion, public health or safety is jeopardized, or there is danger of erosion, approval shall be denied. In such case, pipe of the proper kind and size shall be installed or the required paved sluiceways constructed. It shall be the responsibility of the developer to set aside areas for the collection and passage of both natural and storm waters.
H. In the design of storm drainage piping systems, an N of thirteen thousandths (0.013) shall be used for smooth pipe and an N of twenty-four thousandths (0.024) shall be used for corrugated metal pipe, unless the corrugated metal pipe is of the smooth-flo type. In this case an N of thirteen thousandths (0.013) may be used.
I. Open channels serving as main drainageways normally will not be accepted by the Village where, by engineering design, it has been established that the future flow (under conditions of full development) could be conveyed in a pipe system having an N value of thirteen thousandths (0.013) up to and including a size of forty-eight (48) inches diameter or equivalent. Developers and their engineers bear the responsibility of providing technical design data in this regard which shall be submitted to the Village and their Engineer, whose approval or disapproval of this data shall be final and binding.
J. Surface drainage in gutters shall be limited to the equivalent of that flowing from one and five-tenths (1.5)

impervious acres; however, where the tributary impervious area exceeds the runoff from one and zero-tenths (1.0) impervious acres a double inlet catch basin shall be used.

K. Storm drains conveying drainage along side lot lines shall extend to the rear lot line or to the main channel to which the drain is discharging.

L. All open drainage lines (watercourses and ditches) shall be protected by easements guaranteeing to the Village the right-of-access and power to improve the channels, as well as prohibiting structural or terrain encroachments within the easement except on approval by the Village Engineer or other delegated Village officer. Such easements shall have a minimum width of twenty (20) feet.

M. Drainage runoff design criteria.

(1) While the Village reserves the right to establish particular parameters in each individual instance, the general philosophy is to permit runoff from any particular development of an amount no more than would normally occur under a natural, undeveloped condition, for the particular design storm. That is, the Village generally agrees that the property owners along the downstream channel should be prepared to accept a rate of discharge from the upstream areas equivalent to the discharge from the upstream area under a natural or agricultural condition. [For undeveloped design runoff, a minimum runoff coefficient of four tenths (0.4) shall be used.]

(2) The Village also reserves the right to establish other more restrictive parameters. For example if the downstream area has been subjected to floods in the past, even while the upstream areas were not developed, and if the Planning Board deems it desirable and appropriate to remedy this situation, they may at their discretion require an appropriate size and type impoundment area as well as storm sewers and culverts, which can assist in rectifying the downstream flooding situation. This downstream flooding situation might be a case where backyards flood rather frequently, or where downstream piping systems are overtaxed, possibly causing backup into cellars and yards, etc. (Additional costs for this problem rectification may be borne in part by the Village, along with the developer. If so, the Village's costs shall be distributed on a benefit basis as determined by the Board of Trustees.)

N. Parameters of rules regarding stormwater discharge are simply stated below:

(1) No developed area shall discharge more stormwater into adjacent culverts and channels than occurs under a natural undeveloped condition.

(2) The flow capacity of channels and culverts immediately downstream from a development does not necessarily govern the adequacy of the total drainage system downstream.

O. Engineering procedures for stormwater retention structures.

(1) The Planning Board may determine it to be desirable to require stormwater retention basins in certain areas. There are various reasons for this, not the least of which is that continual upstream development over-taxes downstream natural watercourses as well as man-made drainage facilities. Secondly, these increased rates of stormwater runoff cause environmental problems downstream such as highly erosive velocities, flooding and over-topping of the banks. Consequently it has been determined advisable to insist upon retention basins where appropriate and to have these retention basins designed in a manner compatible with the particular problem.

(2) In order to arrive at an engineering estimate of storm flows and proposed retention pond size, the engineer must proceed according to the following steps:

(a) Determine the design storm recurrence [twenty-five (25) years to fifty (50) years] in accordance with these Regulations.

(b) Using topographic maps and the appropriate charts and graphs, determine the maximum expected natural runoff (minimum C = 0.2) for the design storm. Factors affecting this number include slope of land, surface cover, area of drainage basin and the presence or lack of well-defined natural channels. This number now places a ceiling on the allowable discharge from any development in the area under question for the given design storm.

(c) Design the collection system using the standard rational method (minimum C = 0.4).

(d) With an area designated for the location of the pond, determine the maximum depth of the pond.

(e) Design an outlet structure which discharges water as a continuous function of head and which will discharge the maximum allowable flow at maximum pond depth.

(f) Draw inflow hydrographs for a number of design storms of different durations and make a straight line approximation to an outflow hydrograph starting with $Q_o = 0$ at $t = 0$ and assuming that good pond design is based on the outflow reaching its peak just as the inflow equals the outflow.

(g) Calculate the accumulated volume for each of the above cases. The one giving the greatest volume is the critical storm for this retention pond.

(h) If desired, make a more detailed analysis using the now determined critical storm and standard flood routing techniques. Otherwise, use the above-estimated volume and size of the area of the pond.

(i) If an outlet which discharges water as a continuous function of head is used, lesser storms should discharge approximately proportional lesser flows.

(3) Plan details shall show the pond location, size, inlet and outlet structures and safety features, such as fencing, etc.

(4) The developer's engineer shall submit, with the final plans, drainage calculations justifying the size of pipes, channels, impoundment basins and related structures.

(5) Developers and their engineers shall so design the vertical control of their subdivision that surcharge of storm drainage systems will not cause a backup or flooding of cellars. This will normally require that cellar drains not be connected to the storm drainage system unless the cellar floor is higher than pavement grade in order that the street drain system can run fully surcharged or the cellar drainage discharges through a sump pump and check valve.