Major Project

CITY OF ASPEN ENGINEERING DEPARTMENT

GRADING AND DRAINAGE REQUIREMENTS FOR MAJOR DESIGN

You need to apply for a Major Grading and Drainage permit if:

- If you increase impervious area more than 1,000 s.f. (this includes adding hard surface patios, increasing the footprint of the house, etc.).
- If you disturb more than 1,000 s.f. of land (this includes grading, even if a structure or hard surface is not added, as well as "scrape and replace").
- If you add or repair more than 1,000 s.f. snowmelt.
- If the project will increase impervious area by more than 25% of the existing site imperviousness (this includes adding hard surface patios, increasing the footprint of the house, etc.) or 50% or more of existing structure.

Reports are required, unless determined by the Development Engineer to be unnecessary. The Plan and Report must be signed and stamped by a Colorado Professional Engineer. One copy of the Report and one copy of the Plans set is required for Sufficiency Review. Two copies of each will be required for Building Permit Application.

DRAINAGE REPORT SHALL INCLUDE:

General

- □ Signature, date, and stamp of a Colorado Professional Engineer.
- □ Description of the existing site, including common location, topography, land use, ground cover, soil type, drainage pattern, and receiving system.
- □ Description of the proposed project, including changes to land use, topography, ground cover, soil type, drainage pattern and receiving system.
- □ Discussion of any previous drainage studies (i.e., project master plans) for the site that influence or are influenced by the drainage design and the mitigation plan for any negative impacts.
- □ Discussion of the effects of adjacent drainage issues.
- □ Reference to major drainage way planning studies such as flood hazard delineation reports, master plans, and flood insurance rate maps.
- □ Discussion of the drainage impact of site constraints such as streets, utilities, existing structures, and development or site plan.
- □ Identification of all irrigation facilities and waterways within the watershed that will influence or be influenced by the site drainage.
- □ Discussion of easements and tracts for drainage purposes, including the conditions and limitations for use.
- □ Report must include printed copies of the input and output files for all computer models used for the analysis and design.
- □ Reference plan drawings as needed.

Drainage Basins and Sub-basins

- □ Describe existing and proposed sub-basins, including ground cover, acreage, soil type, and location and method of discharge.
- ▭ Delineate and reference sub-basins on a map with contours. Each drainage basin should be labeled with its area (in acres), runoff coefficient (C), and Q (cfs).
- □ Discuss offsite drainage patterns and impact on site under existing basin conditions and fully-developed basin conditions.
- □ Discuss historic undeveloped and post-developed drainage flow rates at specified point locations (should match labeled locations on plan).

Low Impact Site Design

- □ Describe what efforts have been made to reduce runoff and increase infiltration (e.g. reduce impervious area, disconnect impervious area, route runoff via landscape rather than hard infrastructure).

Hydrologic Criteria

- □ Identify design storm recurrence intervals.
- □ Identify design rainfall.
- □ Identify runoff calculation method.
- □ Identify detention discharge and storage calculation method.
- □ Discussion and justification of other criteria or calculation methods used that are not presented in or referenced by the criteria.
- □ Identify the area, storm frequency, rainfall intensity, time of concentration, runoff coefficients, and adjustments for each sub-basin.
- □ Calculate the historic runoff. Refer to Section 5.2 of the URMP.
- □ Calculate the post development runoff flows for each sub-basin and compare these flows to historic undeveloped flows or fee in lieu. Post development flows must not exceed historic flows. Determine post development flow prior to inclusion of detention. Flow should be calculated for each location that runoff leaves the site. Each drainage basin should be labeled with its area (in acres), runoff coefficient (C), and Q (cfs).
- □ Provide calculations of the WQCV, minor event (5-yr for drywell, 5- or 10-year for storm system and detention) and major storm runoff (100yr) at specific design points.
- □ Hydrographs at critical design points.

Hydraulic Criteria

- □ Identify the hydraulic design point for closed systems tied to the City's existing collection system.
- □ Identify flow capacity of drainage facilities.
- □ Calculate culvert sizes with capacities and area of contribution.
- □ Calculate storm sewer capacity including capacity of next two downstream drainage structures (max velocity 20 ft/sec, HGL 12 inches below ground , EGL below ground, minimum velocity of 5 ft/sec at half full conduit flow).
- □ Calculate gutter capacity (max velocity 10 ft/sec, allowable spread = 4 feet minor storm, 12-inch depth at flow line for major storm, n=.016 for street, n=.025 for grass)
- □ Calculate storm inlet capacity (clogging factor = 50%).
- □ Provide open channel design and calculations.

- □ Check and/or channel drop design.
- □ Calculate the downstream/outfall system capacity to the major drainage way system.

Proposed Facilities

- □ Describe proposed better site design practices (BMPs) used to treat the water quality capture volume, detention methods and outlet design with protection techniques.
- □ Provide sizing calculations and approximate locations, with drainage basins, of BMPs used to treat the water quality capture volume.
- □ Provide volumes and release rates for detention storage facilities and information on outlet works.
- □ Discussion of easements and tracts for drainage purposes, including the conditions and limitations for use.
- □ Discussion of the off-site drainage facilities needed for the conveyance of minor and major flows to the major drainage way.
- □ Provide a separate section of the report that includes a narrative of the **Operation and Maintenance** requirements of the proposed on site drainage improvements. Include a description of access for maintenance operations, maintenance schedule, and contact information for party responsible for maintenance.

GRADING AND DRAINAGE PLANS SHALL INCLUDE:

- □ Signature, date, and stamp of Colorado Professional Engineer on each plan sheet.
- □ Vicinity map with north arrow and scale.
- □ Drawings must be 24" x 36" in size.
- □ Scale of 1"=10’ to 1"=40’ or plan must be provided in sufficient detail and clarity to identify drainage flows entering and leaving the development and general drainage patterns.
- □ Benchmark and tie to the City of Aspen Survey.
- □ Name of the subdivision or project, property map and parcel number.
- □ Date of preparation, scale, and symbol designating true north.
- □ Legend to define map symbols.
- □ Property lines and easements with purposes noted.
- □ Existing and proposed contours at 1-foot maximum intervals. In terrain where the slope exceeds 15%, the maximum interval is 10 feet. The contours shall extend a minimum of 100 feet beyond the property lines. **Additional topography can be obtained from the City of Aspen GIS Department.**
- □ Overall drainage area boundary and drainage sub-area boundaries for all basins on and off site.
- □ Location, elevation, and FIRM rate code for all existing floodplains within 100’ of property.
- □ All major drainage ways for which the 100-year floodplain and floodway have been defined shall have the 100-year floodplain and floodway delineated on the plans. This also applies to detention basins.
- □ Indicate the top of slope of the Roaring Fork River and its tributaries (Hunter Creek, Castle Creek, and Maroon Creek) and delineate the 15’ no-touch setback.
- □ Existing building footprints, streets, utility locations and elevations, ROW width, flow line width, curb type, sidewalk, approximate slopes, drainage facilities and structures, irrigation ditches, roadside ditches, drainage ways, gutter flow directions,

and culverts. All pertinent information such as material, size, shape, slope, and location shall also be included.

- □ Proposed building footprints, streets, utility locations and elevations, ROW width, flow line width, curb type, sidewalk, approximate slopes, drainage facilities and structures, irrigation ditches, roadside ditches, drainage ways, gutter flow directions, and culverts. All pertinent information such as material, size, shape, slope, and location shall also be included.
- □ Proposed type of street flow (i.e., vertical or combination curb and gutter), roadside ditch, gutter, slope and flow directions, and cross pans.
- □ Proposed storm sewers and open drainage ways, including inlets, manholes, culverts, and other appurtenances, (i.e. riprap protection, allowable manhole spacing = 400 ft).
- □ **Proposed landscaping (berms, planters, shrub beds, trees, etc.). Overlay the actual landscape plan onto the proposed grading and drainage plan.**
- □ Profile views for all subsurface drainage facilities showing their size, slope, lengths, design storm hydraulic grade lines (major and minor), energy grade lines, cover, details of structures and/or City Standard details, and relationship with existing utilities. (18 vertical clearance for storm from water lines, 5 foot horizontal from any utility, 7 feet below ground surface, 2 % slope minimum, 18 inch min for main, 15 inch min for lateral).
- □ Profile views for all driveways and walkways @ 5'-0" o.c. or a minimum of three elevation points: openings (i.e. garage slab, thresholds of doors), property line and edge of street.
- □ Cross-sectional views of all open channels, including irrigation ditches, trickle channels, spillway structures, etc., as necessary. These views shall include applicable easement/property line/ROW boundaries and water surface elevations such as the 100-year storm depth, 2-year storm depth, major storm (100-year) freeboard, and irrigation operating level.
- □ Finished floor and grade at foundation elevations of all buildings. In residential developments also provide lot corner elevations and any grade break elevations critical to the grading concept. Show positive drainage away from structures as required by Building Code (IRC – R401.3 and IBC – 1805.3.4).
- □ Spot elevations critical to describe drainage features and their functions (e.g. inlets, cross pans, spillways, inlets/outlets of manholes, culverts, and storm sewers).
- □ Proposed outfall point for runoff from the developed area and facilities to convey flows to the final outfall point without damage to downstream properties.
- □ Routing and accumulation of flows at various critical points for the initial and major storm runoffs listed on the drawing.
- □ Routing of offsite drainage flow through the development.
- □ Flow path leaving the development through the downstream properties ending at a major drainage way.
- □ Summary Runoff Table.
- □ Natural hazards: The designation of all areas that constitute natural hazard areas including but not limited to snow slide, avalanche, mudslide, and rockslide. Show areas with slopes from 30% to 40% and areas with slopes greater than 40%. Areas with slopes from 30% to 40% and areas with slopes greater than 40% will require a slope stability study performed by the Colorado Geological Survey (800-945-0451).
- □ Civil details of dry wells, outlet structures, foundation drain sumps, custom design, etc.

- □ Erosion prevention and sediment control measures for all phases of construction, including areas of revegetation.
- □ Profile views for all subsurface drainage facilities showing their size, slope, lengths, design storm hydraulic grade lines (major and minor), cover, details of structures and/or City Standard details, and relationship with existing utilities. (18 vertical clearance for storm from water lines, 5 foot horizontal from any utility, 7 feet below ground surface, 2 % slope minimum, 18 inch min for main, 15 inch min for lateral).