Certificate in Stormwater Management and Drainage Design

Stormwater Modeling and Analysis

Stormwater modeling and analysis is a critical component of stormwater management and drainage design. In this explanation, we will cover key terms and vocabulary related to stormwater modeling and analysis that are essential for understanding the concepts and practices in the field.

1. Stormwater: Stormwater is the runoff generated from rainfall events that flow over the ground surface and through the drainage system. Stormwater can pick up pollutants and contaminants as it flows, which can negatively impact water quality in receiving waters.
2. Modeling: Modeling is the process of creating a representation or simulation of a real-world system or process. In stormwater modeling, we create a mathematical representation of the drainage system and the surrounding watershed to simulate the movement of stormwater through the system.
3. Analysis: Analysis is the process of examining and interpreting the results of a model to gain insights and make informed decisions. In stormwater analysis, we use the results of the model to evaluate the performance of the drainage system, identify areas of concern, and develop solutions to improve stormwater management.
4. Drainage system: A drainage system is the network of pipes, channels, and structures that collect and convey stormwater runoff. Drainage systems can include both natural and man-made components, such as rivers, streams, swales, and storm sewers.
5. Watershed: A watershed is the land area that drains to a particular point, such as a river, lake, or ocean. Understanding the watershed is critical for stormwater modeling and analysis, as the characteristics of the watershed can significantly impact the movement and quality of stormwater.
6. Hydrologic cycle: The hydrologic cycle is the continuous process by which water circulates between the Earth's surface, atmosphere, and oceans. The hydrologic cycle includes processes such as evaporation, condensation, precipitation, infiltration, and runoff.
7. Runoff: Runoff is the flow of water over the ground surface or through the drainage system. Runoff can be classified as either stormwater runoff or baseflow. Stormwater runoff is the flow generated during and immediately after a rainfall event, while baseflow is the flow that occurs between rainfall events.
8. Infiltration: Infiltration is the process by which water seeps into the ground. Infiltration can help to reduce runoff and recharge groundwater resources.
9. Water quality: Water quality refers to the chemical, physical, and biological characteristics of water. Poor water quality can have negative impacts on aquatic life, human health, and the environment.
10. Best management practices (BMPs): BMPs are strategies or techniques used to manage stormwater and improve water quality. BMPs can include practices such as green infrastructure, sediment control, and source control.
11. Green infrastructure: Green infrastructure is a network of natural and semi-natural features, such as parks, gardens, and green roofs, that provide benefits such as stormwater management, air quality improvement, and habitat creation.
12. Sediment control: Sediment control is the practice of preventing or reducing the movement of sediment

in runoff. Sediment control can help to protect water quality by reducing the amount of sediment that enters receiving waters.
13. Source control: Source control is the practice of preventing or reducing the amount of pollutants that enter stormwater runoff. Source control can include practices such as street sweeping, litter collection, and spill prevention.
14. SWMM: SWMM (Storm Water Management Model) is a dynamic hydrologic and hydraulic simulation model used for simulating the movement of stormwater through drainage systems. SWMM can be used to evaluate the performance of drainage systems, identify areas of concern, and develop solutions to improve stormwater management.
15. HEC-RAS: HEC-RAS (Hydrologic Engineering Center's River Analysis System) is a modeling software used for simulating water flow in rivers and channels. HEC-RAS can be used for floodplain mapping, bridge scour analysis, and sediment transport analysis.
16. Rational method: The rational method is a simplified method for estimating peak runoff rates from small urban watersheds. The method is based on the formula Q = CiA, where Q is the peak runoff rate, C is the runoff coefficient, i is the rainfall intensity, and A is the watershed area.
17. Curve number: Curve number is a parameter used in the USDA (United States Department of Agriculture) method for estimating runoff from small watersheds. Curve number is a measure of the runoff potential of a watershed, based on factors such as land use, soil type, and antecedent moisture conditions.
18. Time of concentration: Time of concentration is the time required for water to flow from the most distant point in a watershed to the outlet. Time of concentration is an important parameter in stormwater modeling, as it affects the duration and volume of runoff.
19. Overland flow: Overland flow is the flow of water over the ground surface, typically occurring in areas with steep slopes or impervious surfaces. Overland flow can contribute to erosion and sedimentation, as well as flooding in downstream areas.
20. Channel flow: Channel flow is the flow of water in a defined channel, such as a river or storm sewer. Channel flow can be affected by factors such as channel geometry, roughness, and flow velocity.

In conclusion, stormwater modeling and analysis is a complex field that requires a solid understanding of key terms and vocabulary. By understanding concepts such as drainage systems, watersheds, and hydrologic cycles, as well as modeling techniques such as SWMM and HEC-RAS, professionals in the field can effectively evaluate the performance of drainage systems and develop solutions to improve stormwater management and water quality. Through the use of BMPs, green infrastructure, and source control, we can work towards a more sustainable and resilient urban environment.