Autodesk® Storm and Sanitary Analysis

Intelligent, Efficient Hydrology and Hydraulic Modelling and Analysis Using Autodesk® Storm and Sanitary Analysis

Autodesk® have provided a unique solution catering to urban and water engineers, in order to efficiently and intelligently model and analyse urban drainage systems, stormwater and sanitary sewer systems. This solution forms part of the Building Information Modelling (BIM) process for infrastructure development.
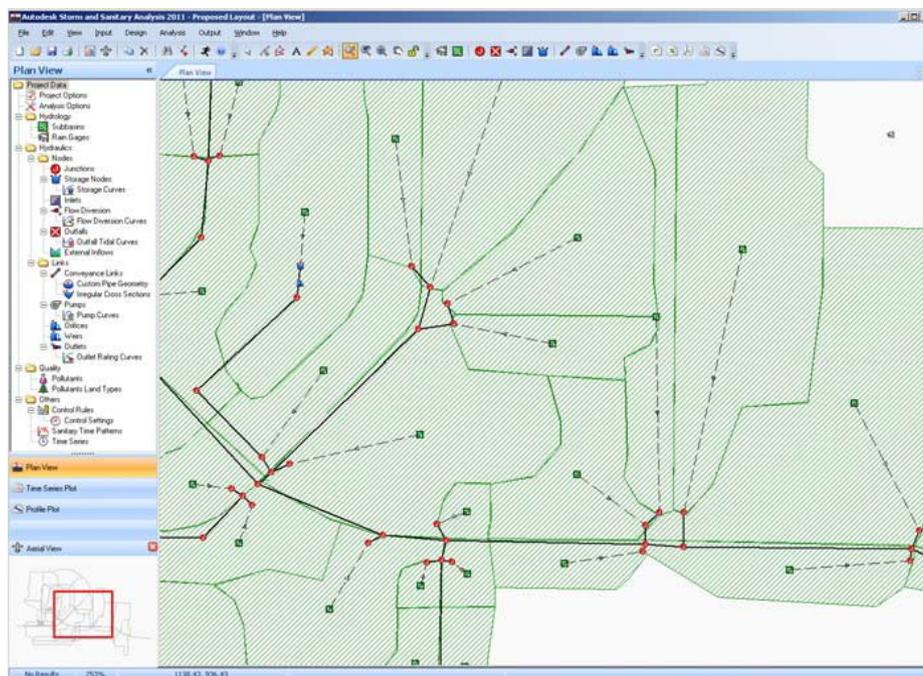

Figure 1: The Storm and Sanitary Analysis User Interface is easy to navigate, with related commands grouped together for quick access.

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Engineering Challenges

In today's urban, environmental and water engineering environment, there is a continuing shift towards efficiency, faster turnaround times on projects, constant need for cost reductions, and a greater need for multiple software platforms to communicate and maintain Building Information Modelling processes. This is especially evident in the water engineering field. These design challenges include:

- Pre- and post-development urban drainage.
- Water runoff calculations.
- Open channel and gutter design.
- Stormwater reticulation networks.
- Sanitary networks.
- Inflow and outflow design.
- Culverts and stormwater management.
- Detention pond design.

Overcoming Challenges with Autodesk® Storm and Sanitary Analysis (SSA)

SSA is an advanced, powerful and comprehensive modelling engine specifically developed for the design and analysis of the above systems. SSA is included in the installation of both Autodesk® AutoCAD® Civil 3D® and Autodesk® AutoCAD® Map 3D® and integrates directly with and extends the modelling capabilities of both Civil 3D and Map 3D. SSA helps overcome the above challenges by:

- Improving data transfer between Civil 3D and SSA to create multiple design scenarios.
- Keeping models up to date with the latest design alternative.
- Performing hydraulic analysis earlier in the design process for multiple projects.
- Performing analysis on non-CAD models.

SSA is built on the powerful EPA SWMM[1] engine and can be used to model complex hydrology, hydraulics and water quality scenarios. Along with the SWMM analysis engine, SSA includes but is not limited to the following analysis engines:

- Rational
- Modified Rational
- HEC-1
- SCS TR-20
- SCS TR-55

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[1] US Environmental Protection Agency Storm Water Management Model. For more information, visit their website at
https://www.epa.gov/water-research/storm-water-management-model-swmm

Design Capabilities

SSA fully integrates with Civil 3D for improved drainage design and analysis. Once a network has been modelled in Civil 3D, SSA is used to design the network to handle specific rainfall conditions. The following components can be designed and analysed:

- Highway drainage systems (including kerb and gutters).
- Stormwater sewer networks.
- Subdivision drainage systems (including subbasins/catchments).
- Sizing and designing detention facilities and outlet structures.
- Bridges and culverts (including roadway overtopping).
- Water quality studies.
- Sanitary sewers, lift stations, CSO's, SSO's and force mains.
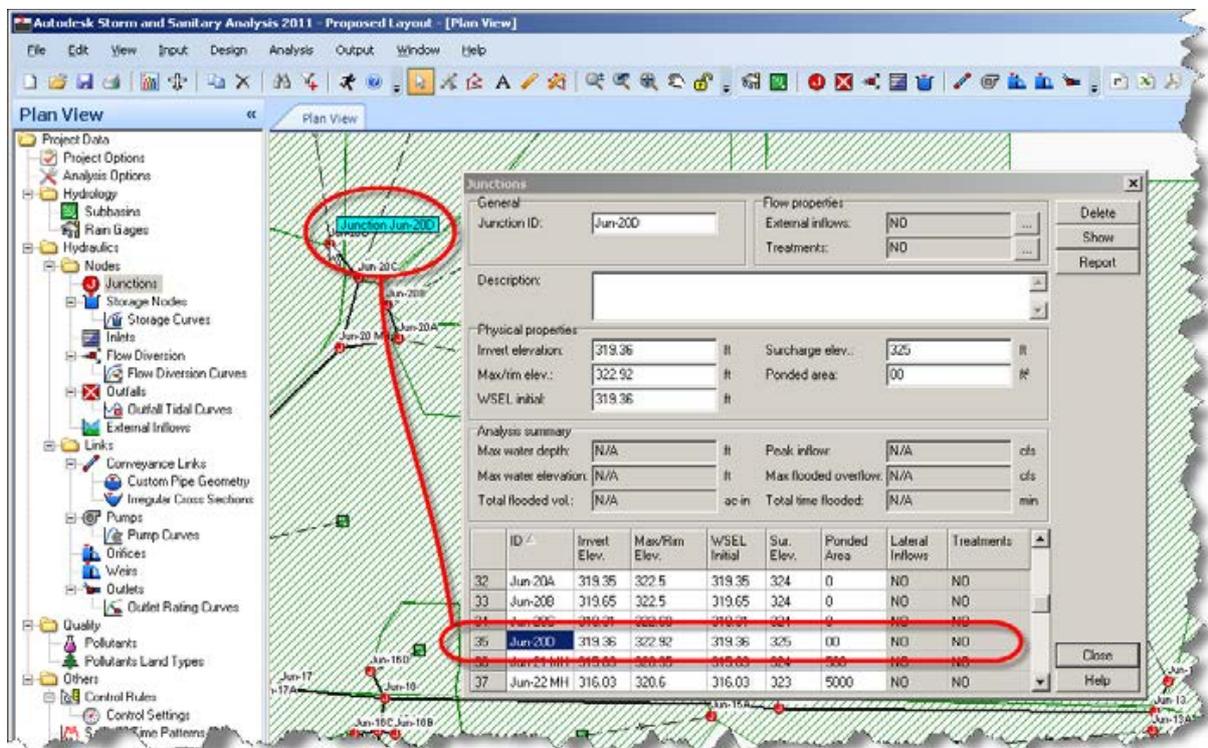
Figure 2: Design parameters are set using tabular inputs, in a user-friendly, logical manner.

Figure 3: SSA provides visual notifications about where systems fail, according to the analysis performed.

Integration with AutoCAD® Products

SSA is capable of outputting design data to both Civil 3D and Map 3D, but has powerful built-in profile tools available to the engineer as an alternative. This is found to be useful when the design engineer does not have the source drawings available and needs to communicate their design results with collaborating parties. The generated output includes the following information:

- Maximum HGL and EGL.
- Critical Depth.
- Maximum discharge, flow depth and velocities.
- Pipe Dimensions.
- Rim and sump elevations.

Advanced Modelling and Additional Data

Additional to the analysis factors mentioned above, SSA is capable of including environmental factors that will influence a stormwater or sanitary network. These factors greatly affect the accuracy of the design, and ultimately, the intended capacity of the network. These factors are referred to as Climatology factors, and include:

- Temperature.
- Evaporation.
- Wind Speed
- Snow Melt.
- Areal Depletion.

Figure 4: Full climatology controls available in SSA.

When designing stormwater networks, and urban drainage systems, engineers and designers often overlook the importance of water pollution, and the impact that pollution will have on their systems. Designers are able to include full pollutant data in their designs, greatly enhancing the accuracy of their networks. Pollutant factors include:

- Land types.
- Street sweeping.
- Pollutant build-up.
- Pollutant wash off.

- Pollutant land type assignment.
- Pollutant treatment.

Output and Reporting

Engineers can use the built-in reporting functionalities, as well as building custom report templates, in order to convey their designs and analysis results to collaborators. Because SSA is built on the EPA SWMM engine, results can be exported from SSA to a SWMM file for use by other collaborators. SSA is also capable of sharing data with Autodesk® Hydraflow Storm Sewers, for further refining of designs.

Typical output formats include but are not limited to:

- SWMM ASCII files.
- Hydraflow Storm Sewers files.
- Microsoft® Excel® spreadsheets.
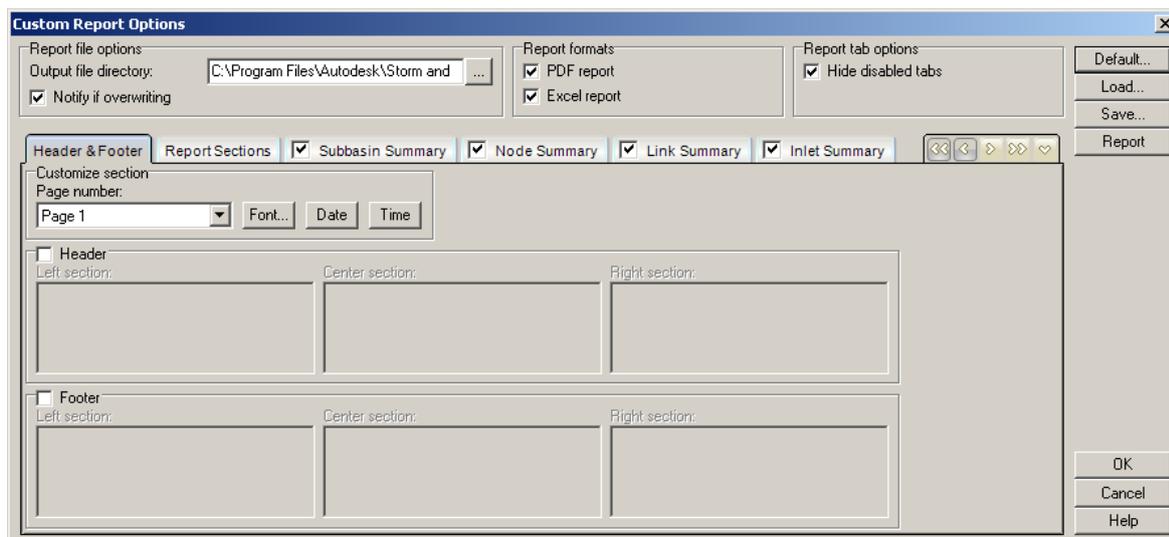- LandXML files.
- GIS Shapefiles.

Figure 5: creating custom reports and report templates.

Conclusion

SSA is an extensive design and analysis package for urban and water engineers. The industry specific tools will enable engineers to produce accurate designs, and comprehensive analyses, while conforming to BIM requirements.

For more information about Storm and Sanitary Analysis, please refer to the Autodesk website below:
http://www.autodesk.com/products/autocad-civil-3d/features/visualization-and-analysis/storm-sanitary-analysis

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