

Engineering Education Department HERC Report 2014-2015

HERC funding was used to develop environmental engineering curriculum materials for **ENGR 2270 – Computer Engineering Drafting**. ENGR 2270 is required by all students in Biological Engineering, Environmental Engineering and Civil Engineering. Currently, a majority of the assignments are geared towards civil engineering students. It is important that the biological and environmental students have the opportunity to complete assignments to meet their needs and that are of interests to them. To address this issue, we will develop assignments for use in the course related to **contaminant mapping and stormwater basins**. A sample of the types of problems developed is included in the following section. We developed three curriculum modules for use in ENGR 2270. The funds were used to support graduate students in the development of the course assignments.

The U.S. Department of Education provided funding as part of the USU STARS! GEAR UP project. The project is part of a \$32.8 million grant to help 3000 Utah middle scholars. The program targets underrepresented student and science teachers. College of Engineering faculty Kurt Becker and Ryan Dupont will lead the engineering effort in the areas of watershed science and water quality leading to classroom lessons that can meet the Next Generation Science Standards (NGSS) with engineering as a fundamental part. The project relates environmental processes related to recycling of nutrients and biodegradation.

The Summer Program is designed to provide participants with direct, hands-on experiences with the research method related to topic areas of relevance to many minority populations, i.e., the environment, water quality, and urban water sustainability. These topic areas encompass several Grand Challenges that have been identified by National Academy of Engineering including: Restoring and Improving Urban Infrastructure, Providing Access to Clean Water, and Managing the Nitrogen Cycle. Students and teachers learn about the water and nutrient cycles and urban impacts to water quality, will evaluate research questions relevant to the watershed in which they live, learn and apply measurement techniques used to monitor watershed health and water quality status, and learn to present their findings in a coherent and comprehensive manner. Participants will contribute their findings to the bigger picture of water sustainability along the Wasatch Front. Teachers learn methods related to water quality monitoring and data presentation relevant to watershed and urban storm system measurement that can be used to address the next generation of science standards. Students gain an understanding of water quality and urban development impacts, and are trained in field sampling and water quality monitoring techniques that are intended to introduce them in a hands-on and compelling way to natural sciences, natural resources, environmental quality and human impacts on the natural environment. Funding for the Summer Program is provided by GEAR UP. The partnership between HERC and GEAR UP will strengthen both programs by leveraging funds from GEAR UP to supply a halftime graduate student as Match from HERC. The Match will enable USU researchers to study the impact of the project on teachers and students as they engage in the environmental engineering summer program.

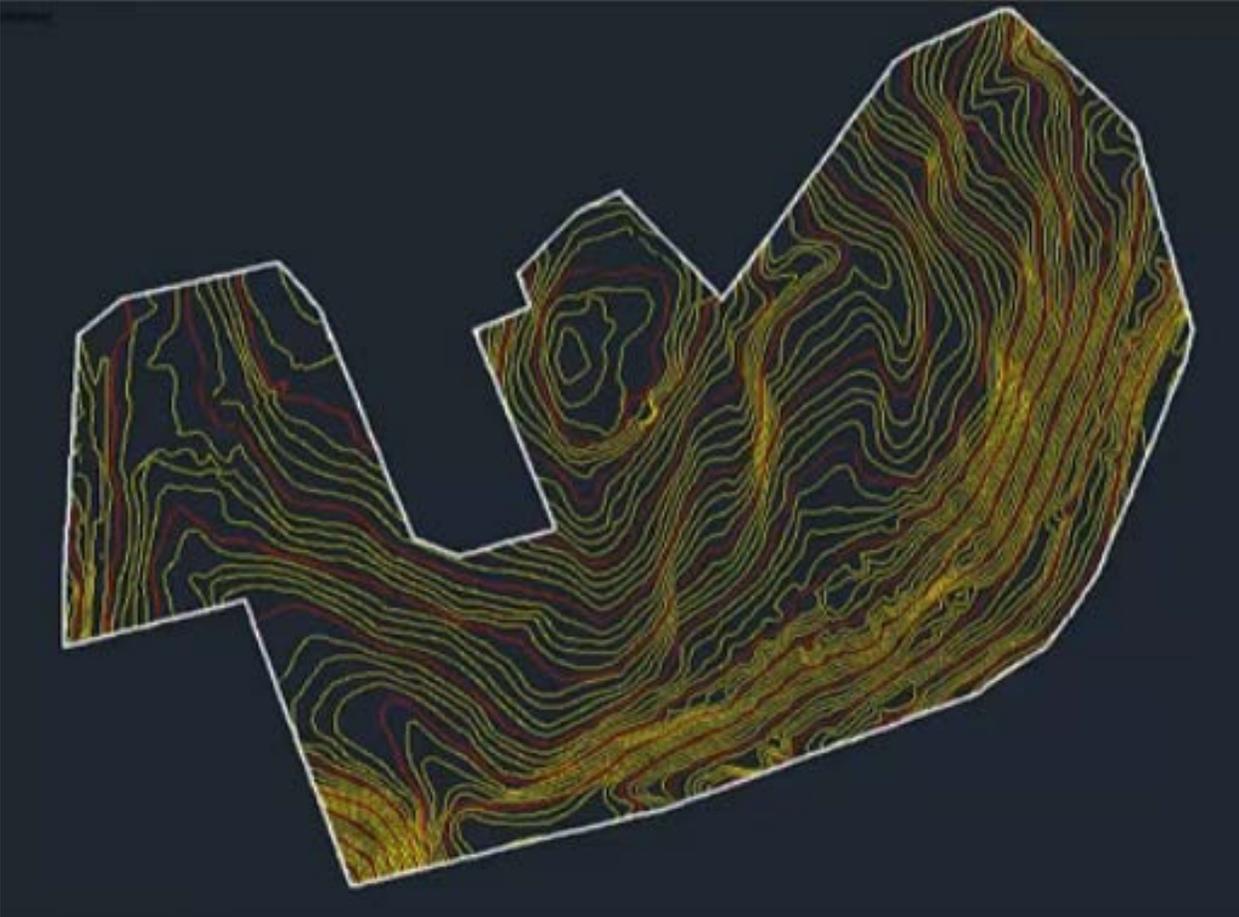
Problem #1: Contaminant mapping: An Application using Trimble Survey Data, AutoCAD Civil 3D

Objectives:

Students will be able to:

1. Download environmental survey data into AutoCAD and Civil 3D software.
2. Develop a contaminant concentration model within Civil 3D using environmental survey data.
3. Visually represent change in concentration between post and pre-treatment data.

Intended for AutoCAD users, this assignment is designed to show environmental land development techniques and nuances for extracting detailed hydraulic floodplain models from a LiDAR terrain. This assignment will explore performing quick and accurate floodplain delineations on detailed 3D surfaces by interacting with the newly released and publicly available RAS Mapper in Hydrologic Engineering Centers River Analysis System.



Problem #2: Civil 3D – Using Volume Surfaces to Inspect Changes

Objectives:

Student will be able to: 1. Download environmental data into 3D software. 2. Develop volume surfaces to inspect changes. 3. Calculate volume surface for pond bottom.

We often have to verify the condition of Stormwater basins for our clients. In the example, students have the 2 Grid volume surfaces that establish storage volume to the outfall elevation. What is needed is a **Volume surface that compares the EG surfaces of the two pond bottoms**. Students create a Grid surface and compare the old surface to the new surface.

While there are differences in volume, the problems lied in the inability to visually evaluate where those differences had occurred. EG Contours are shaped similarly, and spot grades are located differently.

