Introduction
Laytona Subdivision, located in Layton, UT, currently uses traditional curb and gutter to transport storm runoff. This system is no longer adequate due to lack of slope and aging curb and gutter. Layton City will replace the current system with an underground storm drain system. Storm water runoff will be collected and transported to an existing detention pond.

Alternatives
Three other alternative storm drain systems were considered for this project.

Cost Estimate
The estimated cost of completion is $831,710.00.

Design Software
ASE used AutoCAD Civil 3D, Excel, and Autodesk Storm and Sanitary Analysis.

Design Standards
All design was done in accordance to Layton City Storm Drainage Improvements Manual.

The design of the Laytona storm drain system was completed from January 2018 to April 2019. Aqua Solutions would like to thank our external Professional Engineers Ashley Thoman and Stephen Jackson and Faculty Advisor Blake Tullis.

Surveying
ASE obtained topography data from Layton City. Data was provided via AutoCAD Civil 3D files and GIS data. ASE used data from land surveys to compute the runoff calculations.

Hydrological Analysis

<table>
<thead>
<tr>
<th>Area</th>
<th>Total (SF)</th>
<th>Total (ac)</th>
<th>Runoff Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement</td>
<td>363,213.0</td>
<td>8.34</td>
<td>.43*</td>
</tr>
<tr>
<td>Rooftop</td>
<td>0.0*</td>
<td>0.0*</td>
<td>.43*</td>
</tr>
<tr>
<td>Landscape</td>
<td>1,337,883</td>
<td>30.71</td>
<td>.43*</td>
</tr>
</tbody>
</table>

*Layton City Public works instructed Aqua Solutions to use a Weighted Runoff Coefficient of 0.43. An alternative method would have been to calculate rooftop area and use individual runoff coefficients for each respected Area.

Alternatives
Alternative systems were evaluated based on impact to properties, environmental impacts, overall cost, systems efficiency, slope steepness, maintenance, and ease of construction.

Design-Hydrological Analysis
ASE conducted a hydrological analysis of the Laytona subdivision using the rational method (Q=CIA), per Layton city Standards.

- ASE calculated storm runoff based on a 10-year storm per Layton City standards.
- Layton city uses a weighted runoff coefficient of 0.43.
- Rainfall intensity data was taken from Davis County Flood Control.

Hydraulic Analysis
Pipe elevations were derived in AutoCAD Civil 3D according to Layton City Standards. Elevations were used to calculate the different slopes for each pipe in the system to meet a minimum slope of 0.4%.

Pipe sizes were developed using Autodesk Storm and Sanitary Analysis. Pipes were sized correctly based off of runoff calculations. The depth the pipe were corrected and slopes verified to meet city standards.

Based on Layton City Standards pipes must be placed on the South-East side of the road way and the storm drain centerline shall not extend more than 3 feet beyond the lip of the gutter on either the pavement side or property side of the gutter.

Existing curb and gutter on 1150 N that is no longer adequate for storm drain removal.