MS4 Project – Alternative 1B – grass channel with stone check dams added

Examining the effect of putting stone check dams in the grass channel:

Note: To utilize stone check dams in a channel in order to increase infiltration (retention):

- Soils must be suitable for infiltration
- Channel must have freeboard at design flow w/stone dikes (functioning as weirs)
- Maximum 18” tall stone dikes
- The height of the stone check dams and their spacing will be related to the channel slope to provide the best chance for a retaining and infiltrating the WQV to the extent practicable.

For this example, assume the stone check dams are 12” high and 50’ apart for a length of 150’.

Using the Stage/Discharge Table provided on the “Trap. Channel” tab of the MS4 Water Quality Worksheet, ..\MS4 Water_Quality_Volume__Water_Quality_Flow_Worksheet.xlsx

for the 4’ bottom trapezoidal channel with a water depth of 12”, the cross sectional area of the channel at the downstream dike is 7.0 s.f.

At 2% slope, (for this example,) the depth of water is 0 ft. at the previous stone check dam 50’ away. (Note: a depth of zero at the previous check dam is not required.)

Therefore by Average End Area, the volume ponded by each dike will be:

\[(0s + 7sf)/2 \times 50ft = 175 \text{ c.f.}\]

For three stone check dams the total ponded area is: 175 c.f. \times 3 = 525 c.f. = 0.012 ac-ft
Enter WQV Retained (infiltrated) by Stone Check Dams in Section 4 of the worksheet.

Enter the new total WQV Retained and WQV Treated into DC2 and DC3 in Section 3 of the worksheet to obtain a new Total WQV that now includes disconnection, the grass channel and stone check dams.

The change in DCIA associated with the installation of stone check dams will be based on the percentage % of the contributing drainage area WQV retained by the stone check dams.

<table>
<thead>
<tr>
<th>Water Quality Calculations</th>
<th>30% Design</th>
<th>60% Design</th>
<th>90% Design</th>
<th>FDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC1 WQV retention design goal</td>
<td>1/2-WQV</td>
<td>ac-ft</td>
<td>ac-ft</td>
<td>TBD</td>
</tr>
<tr>
<td>DC2 WQV goal retained (refer to page 2)</td>
<td>ac-ft</td>
<td>0.024 ac-ft</td>
<td>ac-ft</td>
<td>TBD</td>
</tr>
<tr>
<td>DC3 WQV goal treated (refer to page 2)</td>
<td>ac-ft</td>
<td>0.022 ac-ft</td>
<td>ac-ft</td>
<td>TBD</td>
</tr>
<tr>
<td>DC4 Total WQV retained and treated</td>
<td>ac-ft</td>
<td>0.046 ac-ft</td>
<td>0 ac-ft</td>
<td>TBD</td>
</tr>
<tr>
<td>DC5 Post-construction DCIA(acre)</td>
<td>ac</td>
<td>0.42 ac</td>
<td>ac</td>
<td>TBD</td>
</tr>
<tr>
<td>DC6 Pre-construction DCIA (refer to EC2 above)</td>
<td>0.62 ac</td>
<td>ac</td>
<td>ac</td>
<td>TBD</td>
</tr>
<tr>
<td>DC7 Change in DCIA from pre- to post-construction</td>
<td>0 ac</td>
<td>-0.2 ac</td>
<td>0 ac</td>
<td>TBD</td>
</tr>
</tbody>
</table>

It was determined that the stone check dams retained 0.012 ac-ft. The WQV for the drainage area to the Grass Channel was previously calculated to be 0.067
\[ \frac{0.012}{0.067} = 17.9\% \text{ of the WQV Goal} \]

Referring back to the drainage area to the grass channel: of the total 3.37 acre drainage area, 0.7 acres was impervious.

\[ 17.9\% \times 0.7 \text{ ac} = 0.13 \text{ acres} \]  
(This area is now considered to be also disconnected.)

Revising Post-Construction DCIA (DC5):

Previous DCIA to this point was 0.55 ac (Example 1A)

\[ 0.55 - 0.13 = 0.42 \text{ acres} \]  
(entered into DC5)

DC7: The change in DCIA automatically self-calculates. There is a 0.2 acre reduction in Directly Connected Impervious Area. The three stone check dams help to provide a DCIA reduction for the project.