Technical Memorandum  
Barrel and McCleary Alternative  
Stormwater Assessment

To: Kathy Arnold  
From: David R. Krizek P.E.  
Company: Rosemont Copper Company  
Date: March 05, 2010  
CC: Mike Zeller (Tetra Tech)  
Doc #: 058/10-320871-5.3  

1.0 Introduction
This Technical Memorandum presents a Stormwater Assessment for the Barrel and McCleary Alternative being considered in the US Forest Service Environmental Impact Statement (EIS) for the proposed Rosemont Copper Project (Project). This analysis quantifies the potential impact of the Barrel and McCleary Alternative on downstream stormwater flows and average-annual runoff.

In order to determine the potential stormwater impact associated with the Barrel and McCleary Alternative, predictions were made for the 100-year regulatory flood peak [in cubic feet per second (cfs)] and the average-annual runoff (in acre-feet) at a common point associated with the affected drainages. The affected drainages on the east side of the Santa Rita Mountains converge at the United States Geological Survey (USGS) Gauging Station No. 09484580 before storm flows pass beneath State Route 83 (SR 83) in a double-barrel box culvert. Per information associated with the station, the contributing watershed area is calculated to be 14 square miles in size. Figure 1 shows the watershed areas contributing to this gauging station.

2.0 Pre-Mining/Baseline Hydrology
Figure 1 shows the pre-mining or baseline watershed conditions associated with the Barrel and McCleary Alternative. These contributing watershed areas drain to the USGS Gauging Station prior to storm flows passing beneath SR 83. The baseline stormwater analysis associated with this location is detailed in the Technical Memorandum titled *Mine Plan of Operations Stormwater Assessment* (Tetra Tech, 2010) prepared as part of the alternatives analysis for the Project.
Memorandum

To: Beverly Everson
Cc: Tom Furgason
From: Kathy Arnold
Doc #: 010/10 – 15.3.2
Subject: Transmittal of Stormwater Assessment Memoranda
Date: March 15, 2010

Rosemont Copper is pleased to present a series of Technical Memoranda on Stormwater Assessments prepared by Tetra Tech and dated March 15, 2010. These analysis include the following alternatives:

1. Mine Plan of Operations
2. Barrel and McCleary Alternative
3. Barrel Only Alternative
4. Scholefield and McCleary Alternative and
5. Sycamore and Barrel Alternative

There is also a discussion of the Visual Analysis as it relates to Partial Backfill.

These Technical Memoranda are dated March 5, 2010 and I am providing two hardcopies and one electronic file to the Forest Service and one hardcopy and one electronic file to SWCA.
The baseline assessment is assumed to be the same for all the alternatives, including the Mine Plan of Operations (MPO), for storm flows generated on the east side of the Santa Rita Mountains. An additional baseline assessment was made for the Sycamore Tailings and Barrel Waste Alternative. This is the only alternative with facilities located on the west side of the Santa Rita Mountains.

Table 1.0 shows the pre-mining results for the 100-year regulatory flood-peak and the average-annual runoff arriving at USGS Gauging Station No. 09484580, based on the analysis performed for the MPO stormwater assessment. These values also apply to the baseline or pre-mining conditions associated with the Barrel and McCleary Alternative.

<table>
<thead>
<tr>
<th>Point of Concentration</th>
<th>Baseline Conditions (DA = 14.0 square miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USGS Gauging Station</td>
<td>Peak Discharge: 8072 cfs</td>
</tr>
<tr>
<td></td>
<td>Average-Annual Runoff: 1407 acre-feet</td>
</tr>
</tbody>
</table>

DA = Discharge Area

3.0 Post-Mining Watershed Conditions

For the Barrel and McCleary Alternative, it was assumed that the following stormwater controls would be applied:

- Stormwater drainage channels would be placed at every 100 feet of vertical rise on the outer slopes of the Dry Stack Tailings Facility. Stormwater would flow off these benches to stilling pools/drop-structures, located on the outer slopes of the tailings area, to natural ground, or to stormwater control basins located on wide benches in the Waste Rock Storage Area. Drop-structures located on the west side of the Dry Stack Tailings Facility would drain to the USGS Gauging Station.

- Drop-structures would be located on the north and west sides of the landform that comprises the Barrel and McCleary Alternative. These drop-structures would convey runoff to flow-through drains. The flow-through drains are large rock drains intended to provide a hydraulic connection between the up-gradient side of the landform and the down-gradient side.

- Stormwater control basins would be constructed on wide benches in the Waste Rock Storage Area to contain up to the 500-year, 24-hour storm event. Stormwater generated from flows in excess of the 500-year, 24-hour storm event would be routed to containment areas located between the toe of the Waste Rock Storage Area and adjacent natural ridge areas. These areas would generally be sized to contain the Probable Maximum Precipitation (PMP) event. Stormwater routing to these perimeter containment areas would be via rocked slopes connecting the benches to the perimeter areas.

- Decant structures would be installed on top of the North Dry Stack Tailings Facility to pass stormwater to stilling pools/drop-structures for flows in excess of the 500-year,
24-hour storm event. Storm flows less than this event would be retained on top of the facility in large, depressed areas.

- Storm flows in excess of the 500-year, 24-hour storm event generated on top of the South Dry Stack Tailings would be routed to a flow-through drain located on the west side of the landform comprising the Barrel and McCleary Alternative.

- The majority of the AMEC Earth & Environmental, Inc. (AMEC) Diversion Channel, located to the north and west of the Open Pit, discharges stormwater to flow-through drains located on the west and north sides of the landform.

- The Pit Diversion, located to the south of the Open Pit, is expected to discharge to an area located between the toe of the Waste Rock Storage Area and an adjacent natural ridge and will not drain to the USGS Gauging Station.

Drainage benches would also be placed on a small portion of the Waste Rock Storage Area adjacent to the closed and encapsulated Heap Leach Facility. These drainage benches would be similar to those planned for the outer surface of the Dry Stack Tailings Facility. Runoff from these benches would be to the up-gradient side of the landform.

Stormwater control basins located in the Waste Rock Storage Area would not be located above the closed and encapsulated Heap Leach Facility.

4.0 Post-Mining Hydrology

Figure 2 depicts the estimated post-mining watershed area draining to the USGS Gauging Station for the Barrel and McCleary Alternative. The contributing basin shown on Figure 2 (about 7.06 square miles) is only applicable to the 100-year regulatory flood-peak and to the average-annual runoff, based on the following assumptions:

- The top of the Dry Stack Tailings Facility is assumed to contain storm runoff from up to the 500-year, 24-hour storm event.

- The stormwater control basins in the Waste Rock Storage Area are assumed to contain storm runoff from up to the 500-year, 24-hour storm event, and the perimeter areas associated with the Waste Rock Storage Area are assumed to contain storm runoff from up to the PMP event.

- No downstream stormwater contribution is expected from the flow-through drains associated with average-annual conditions. Therefore, runoff from any watershed located up-gradient of the landform associated with the Barrel and McCleary Alternative is not expected to arrive at the USGS Gauge Station.

- Should runoff from a 100-year regulatory event reach the down-gradient end of the flow-through drains, the flood-peak would be significantly attenuated, and is not expected to affect the flood-peak value experienced at the USGS Gauging Station.

- Storm runoff from the Pit Diversion is not anticipated to reach the USGS Gauging Station.
Table 2.0 shows the anticipated post-mining results for the 100-year regulatory flood-peak and the average-annual runoff arriving at the USGS Gauging Station No. 09484580 for the Barrel and McCleary Alternative. Alternative 1 provides the backup data for the post-mining stormwater assessment.

### Table 2.0  Barrel and McCleary Post-Mining Hydrology Results

<table>
<thead>
<tr>
<th>Point of Concentration</th>
<th>Post-Mining Conditions (DA = 7.06 square miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak Discharge</td>
</tr>
<tr>
<td>USGS Gauging Station</td>
<td>4044 cfs</td>
</tr>
</tbody>
</table>

5.0 Conclusions
The results of the baseline and post-mining hydrology assessment for the Barrel and McCleary Alternative indicate that flood-peaks generated by the 100-year regulatory event arriving at the USGS Gauging Station, would likely be reduced by 49.9%, when compared to pre-mining conditions. Correspondingly, the average-annual runoff would likely be reduced by 44.3%, when compared to pre-mining conditions.

6.0 References
FIGURES
### Subbasin Area (MI2)

<table>
<thead>
<tr>
<th>Subbasin</th>
<th>Area (MI2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scholefield Canyon</td>
<td>3.3</td>
</tr>
<tr>
<td>Unknown Canyon</td>
<td>2.5</td>
</tr>
<tr>
<td>R McCleary Canyon</td>
<td>0.68</td>
</tr>
<tr>
<td>R Barrel Canyon</td>
<td>0.58</td>
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</tbody>
</table>

### Subbasin Lag Time (MIN)

<table>
<thead>
<tr>
<th>Subbasin</th>
<th>Lag Time (MIN)</th>
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</thead>
<tbody>
<tr>
<td>Scholefield Canyon</td>
<td>70.10</td>
</tr>
<tr>
<td>Unknown Canyon</td>
<td>71.79</td>
</tr>
<tr>
<td>R McCleary Canyon</td>
<td>20.2</td>
</tr>
<tr>
<td>R Barrel Canyon</td>
<td>29.6</td>
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### Subbasin Initial Abstraction (IN) Curve Number Impervious (%)

<table>
<thead>
<tr>
<th>Subbasin</th>
<th>Initial Abstraction (IN)</th>
<th>Curve Number</th>
<th>Impervious (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scholefield Canyon</td>
<td>85.75</td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Unknown Canyon</td>
<td>73.42</td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>R McCleary Canyon</td>
<td>85.14</td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>R Barrel Canyon</td>
<td>83.19</td>
<td></td>
<td>0.0</td>
</tr>
</tbody>
</table>

### Met Name: Type 2, 24 hr Mean ARF-H40

**Description:**

**Precipitation:** SCS Storm

**Evapotranspiration:** --None--

**Snowmelt:** --None--

**Unit System:** U.S. Customary

### Met Name: Type 2, 24 hr Mean ARF-H40

**Method:** Type 2

**Depth (IN):** 4.23