

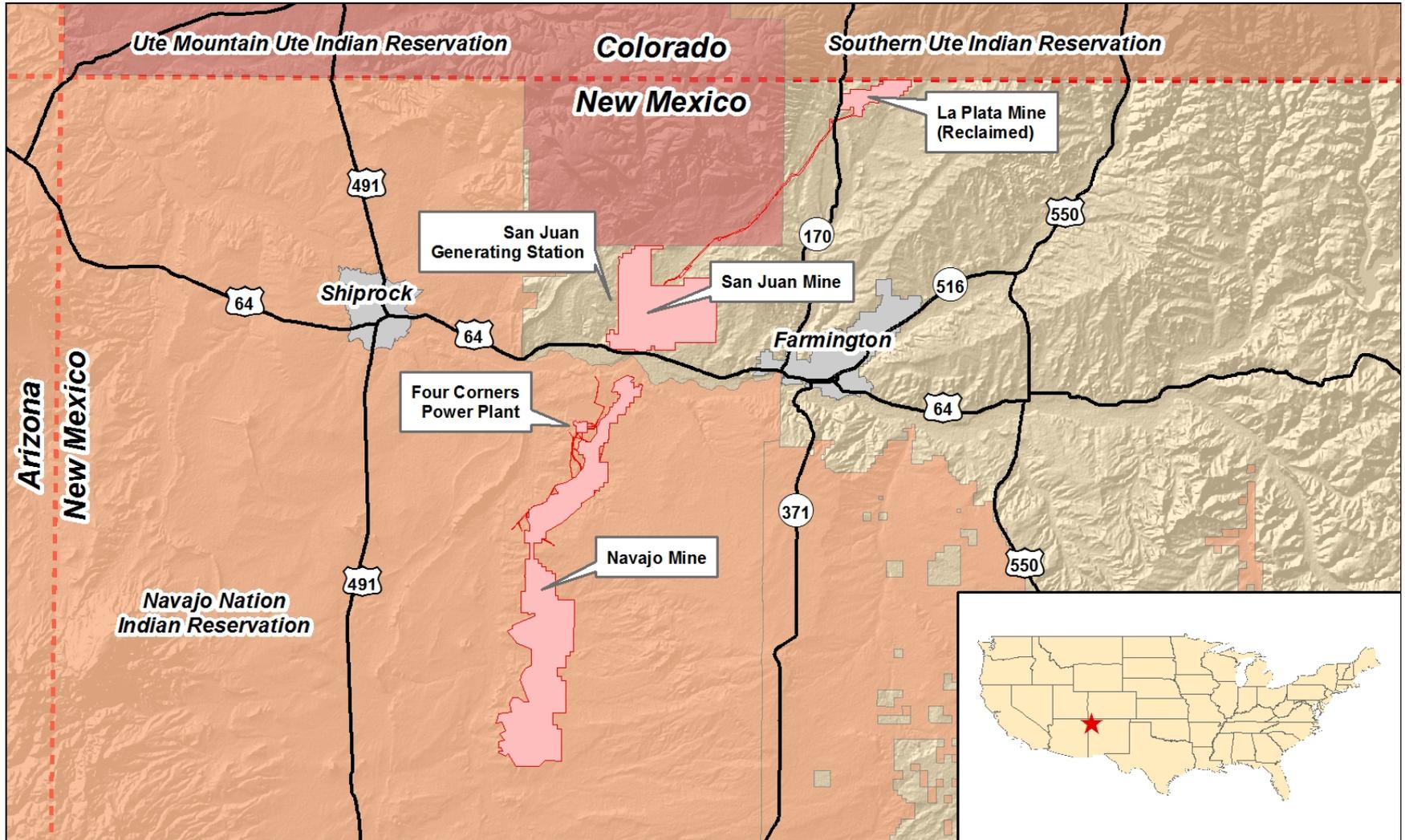


Topographic Comparison Of Traditional And Geomorphic Reclamation Approaches At A Surface Coal Mine In Northwestern New Mexico

Matt Owens, C. Brandt, and C.K. Applegate
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Navajo Mine



Navajo Mine

Navajo Mine

- Operations began in 1963
- Open-cut dragline operation and sole supplier to Four Corners Power Plant (FCPP)
- Annual production 7-9 million tons (through December 2013)
- Annual production 5-6 million tones (post June 2013)



Reclamation Objectives

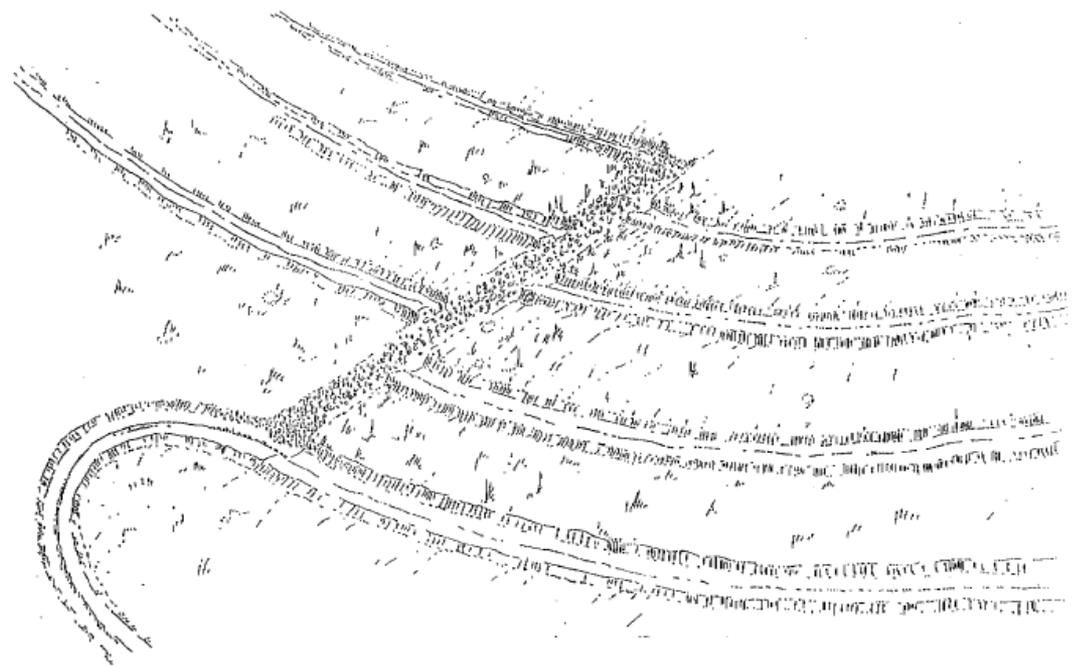
Navajo Mine final surface configuration (FSC) design objectives:

1. Achieve mass balance while maximizing contemporaneous regrade between pit ramps
2. Achieve positive drainage from all areas including pits and ramps
3. Develop an adequate drainage density, while aligning with pre-mining or offsite drainages
4. Allow development of stable drainage channels, and
5. Support the approved post mining land use.

Reclamation Approaches

Traditional Reclamation Approach

Typified of FSC surfaces dependent on rip-rap, gradient terraces, or other “hard engineered” structures to stabilize drainages and control erosion.

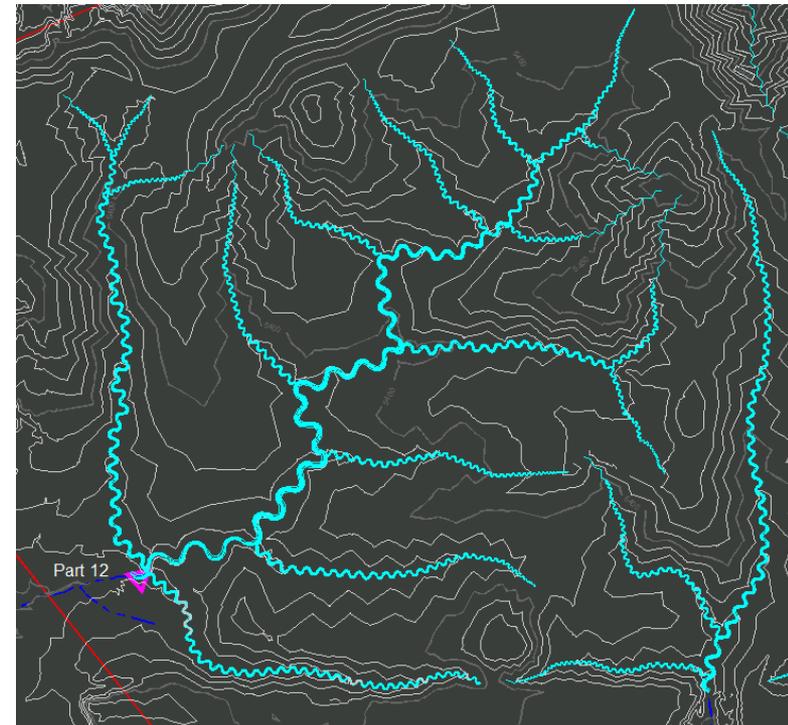


Confluence of a series of typical gradient terraces with a drop structure connecting to a reclaimed channel.

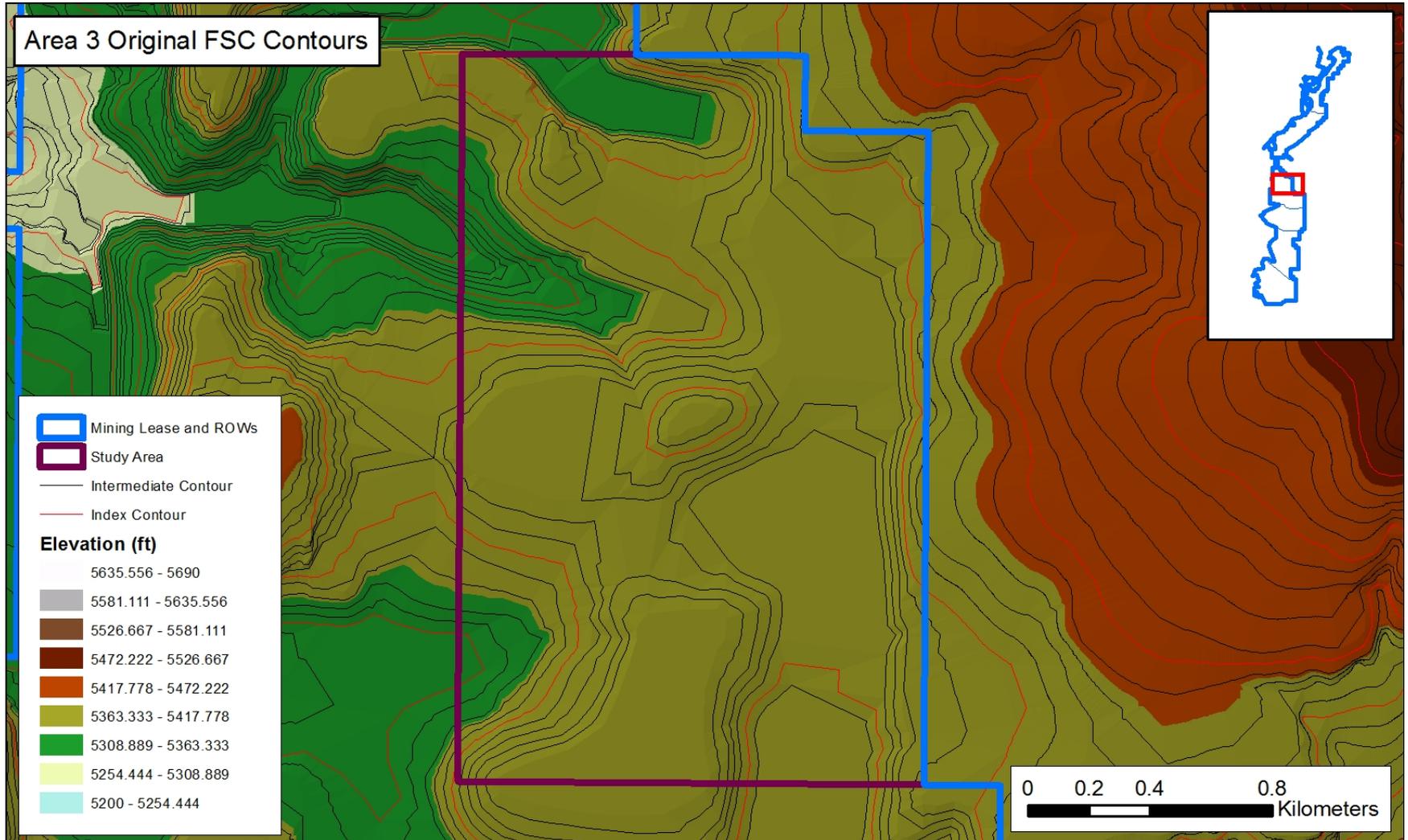
Geomorphic Reclamation Approach

FSC surfaces designed utilizing fluvial geomorphic principles such as;

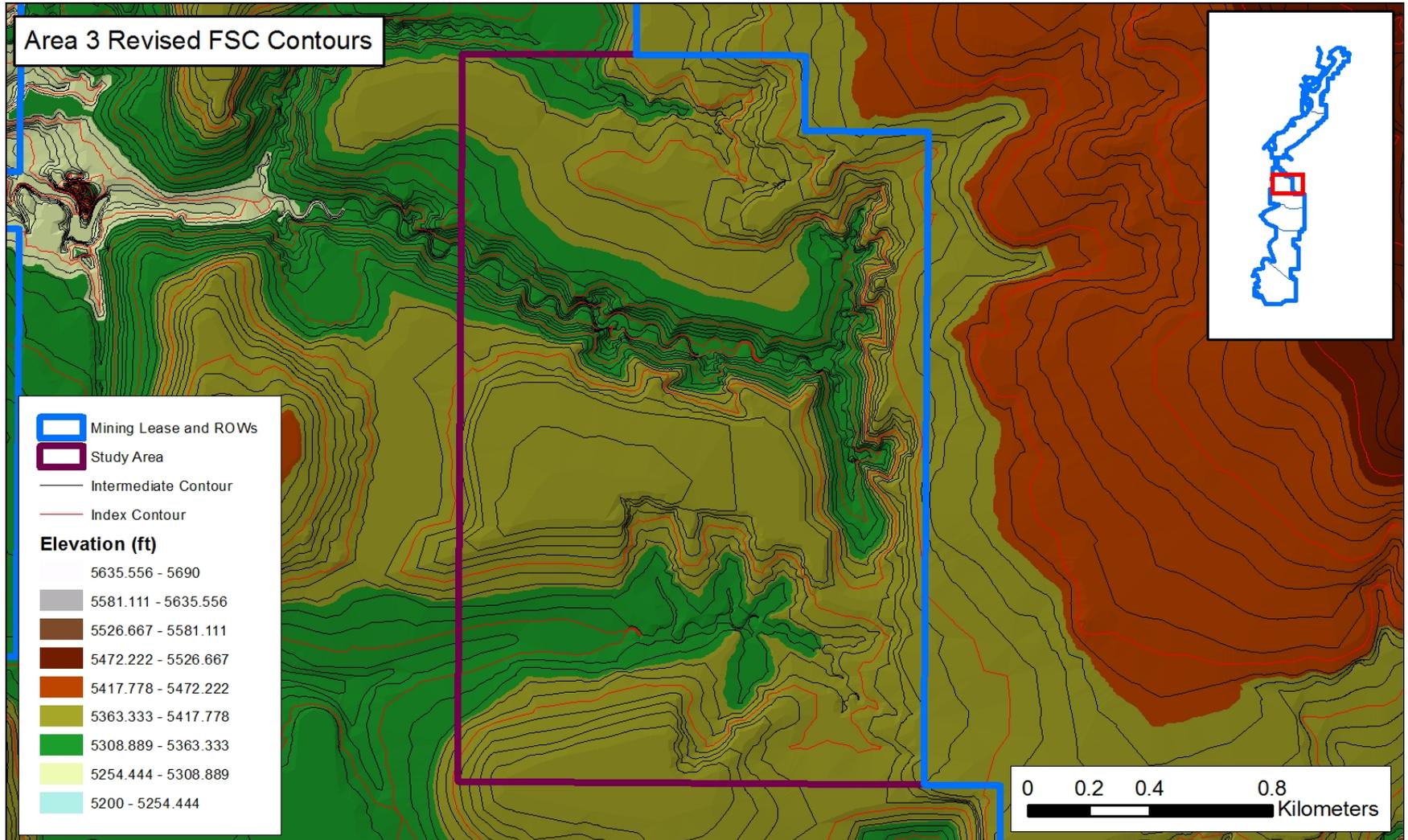
- Utilizing geomorphically appropriate slopes, drainage densities, and channel profiles;
- Constructing geomorphically appropriate channel slopes, channel meander lengths, and cross sections; and
- Configuring reclaimed channel configuration based on bed and bank (substrate) material.



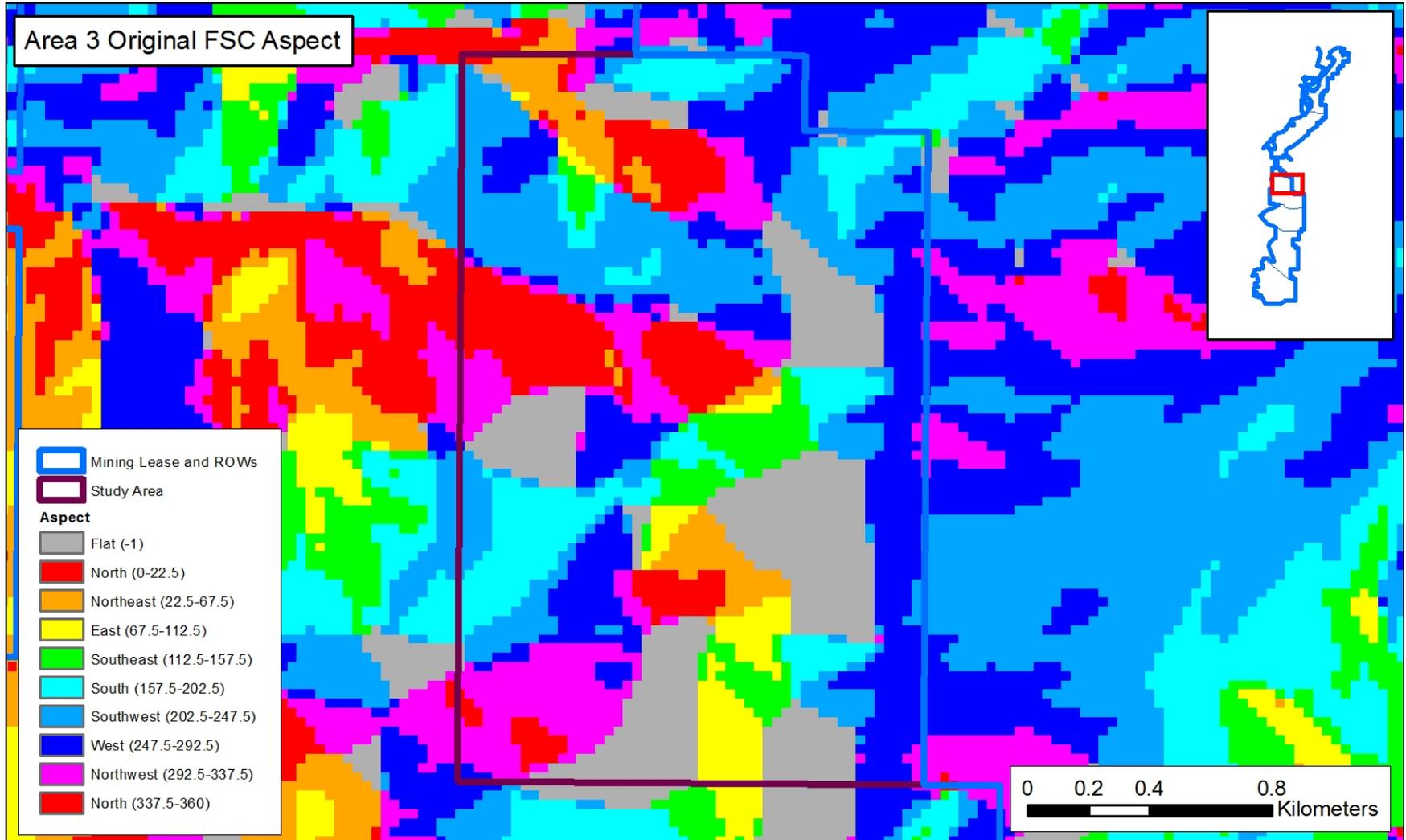
Area 3 Contours



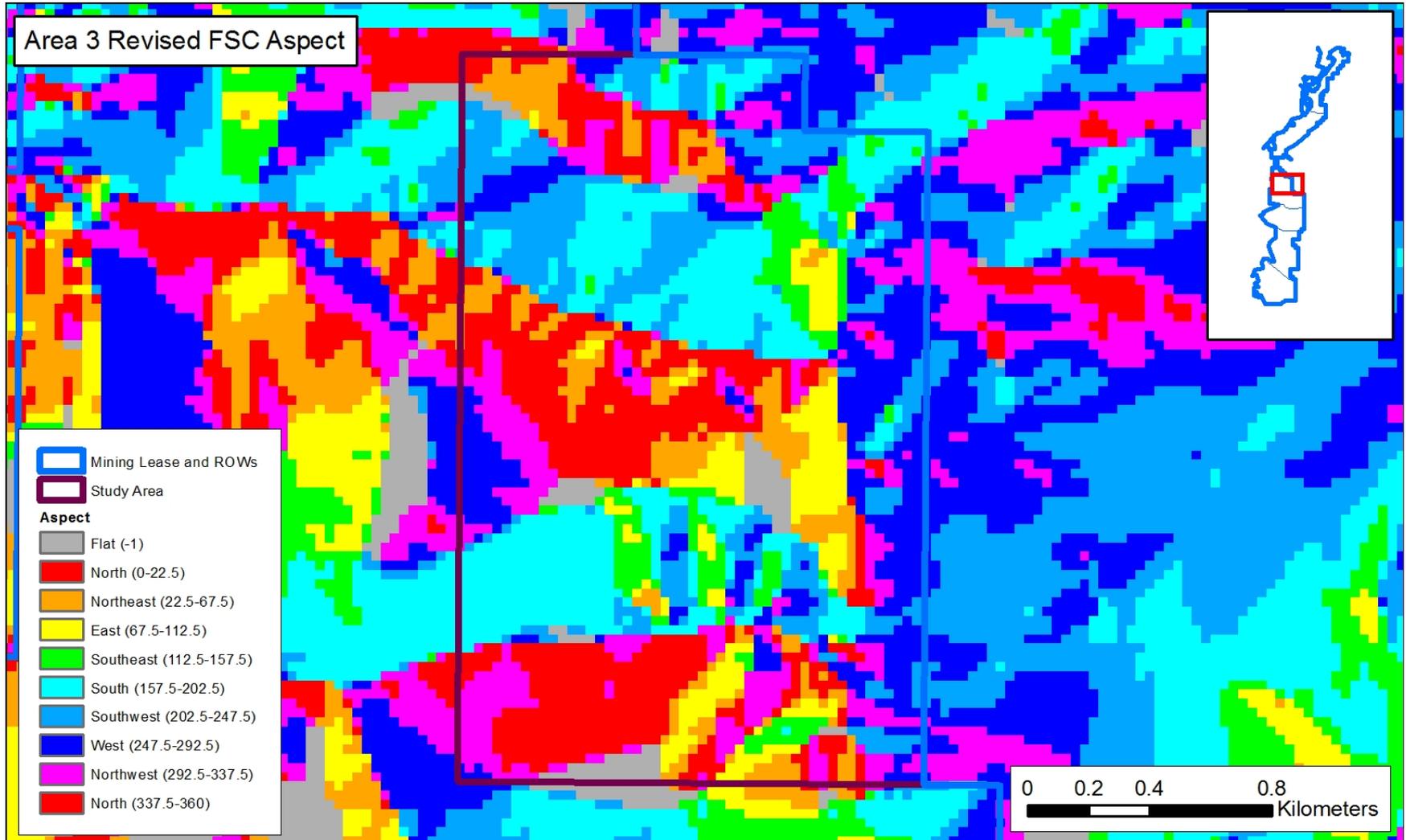
Area 3 Contours



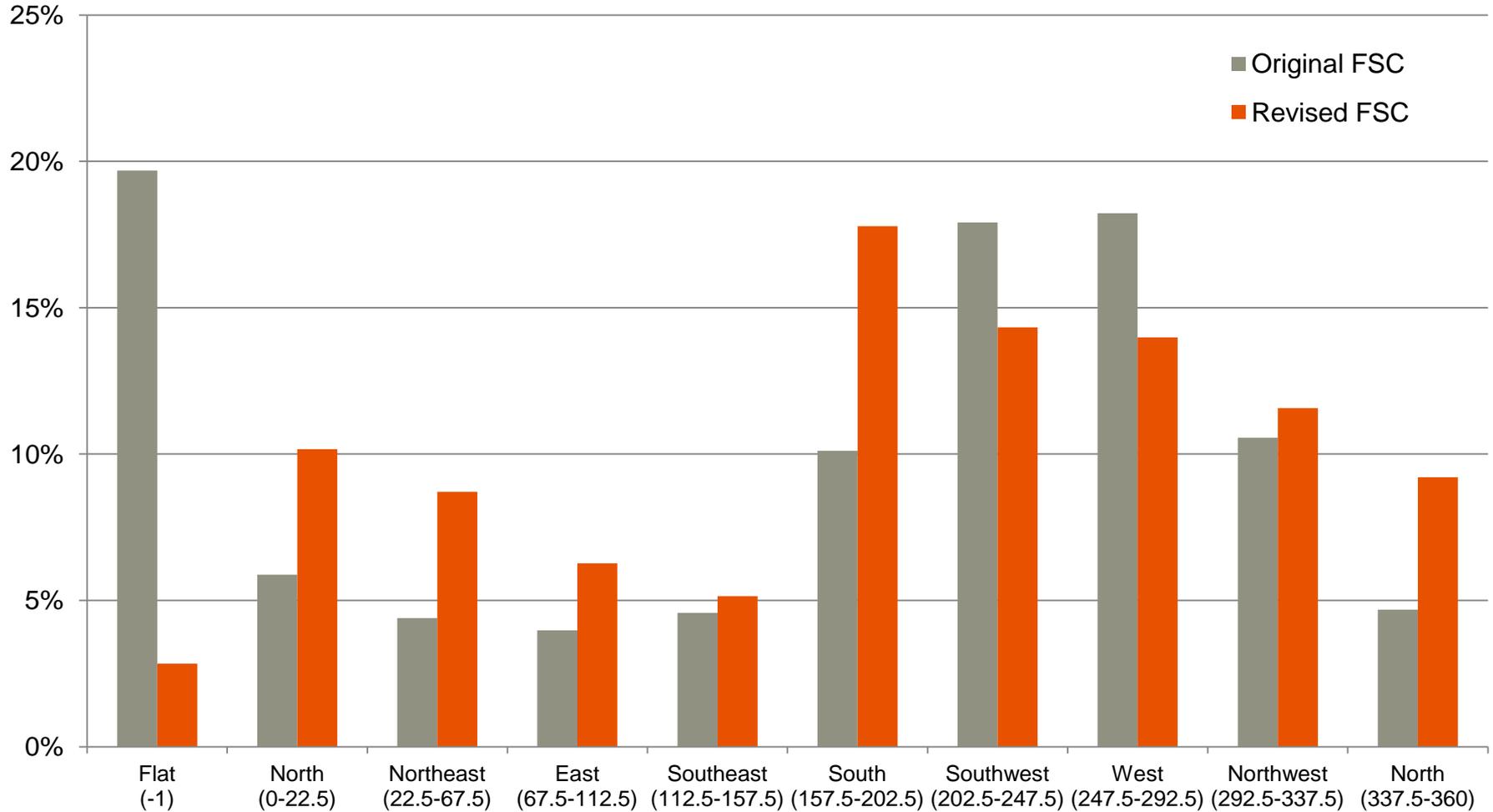
Area 3 Aspect



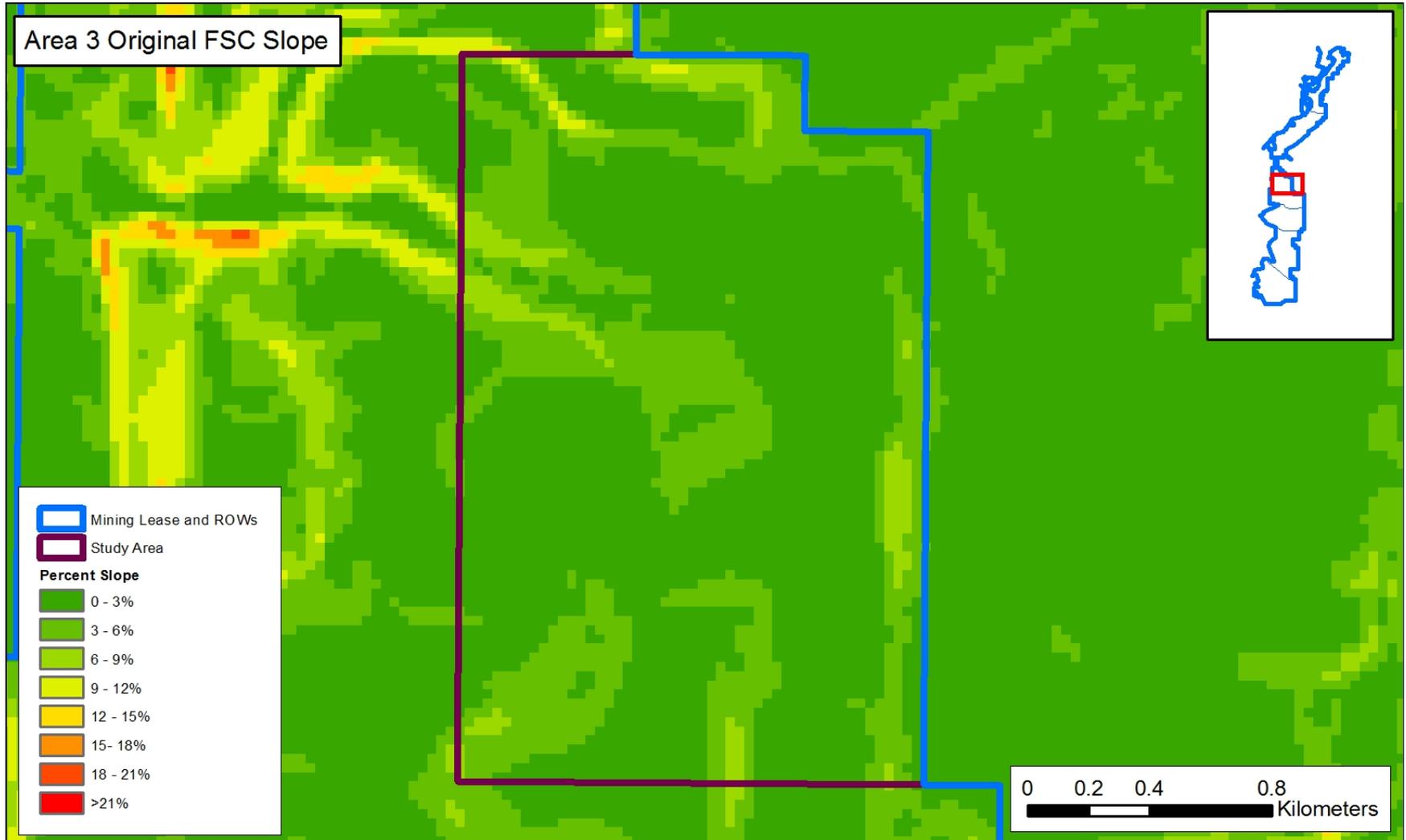
Area 3 Aspect



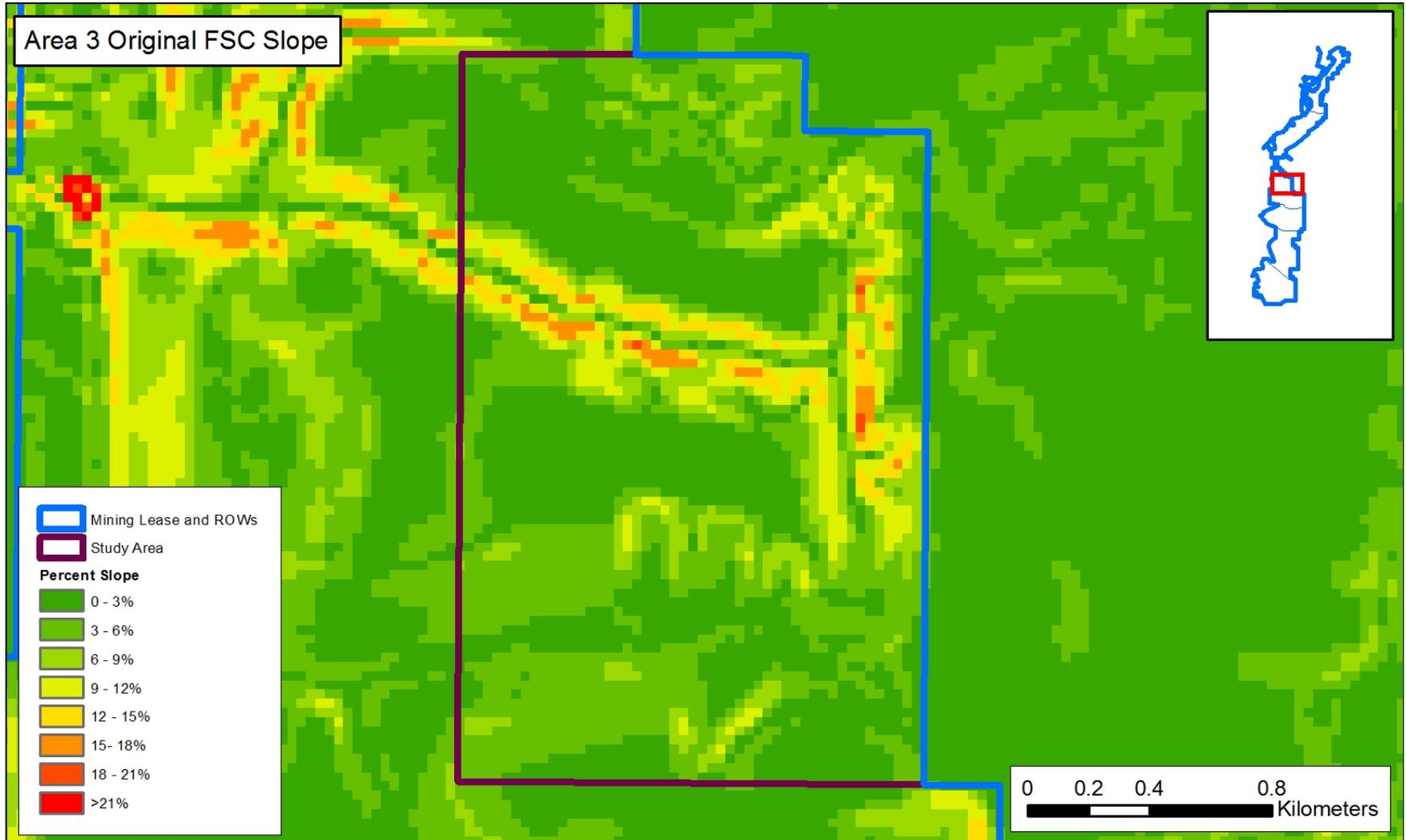
Area 3 Aspect Histogram



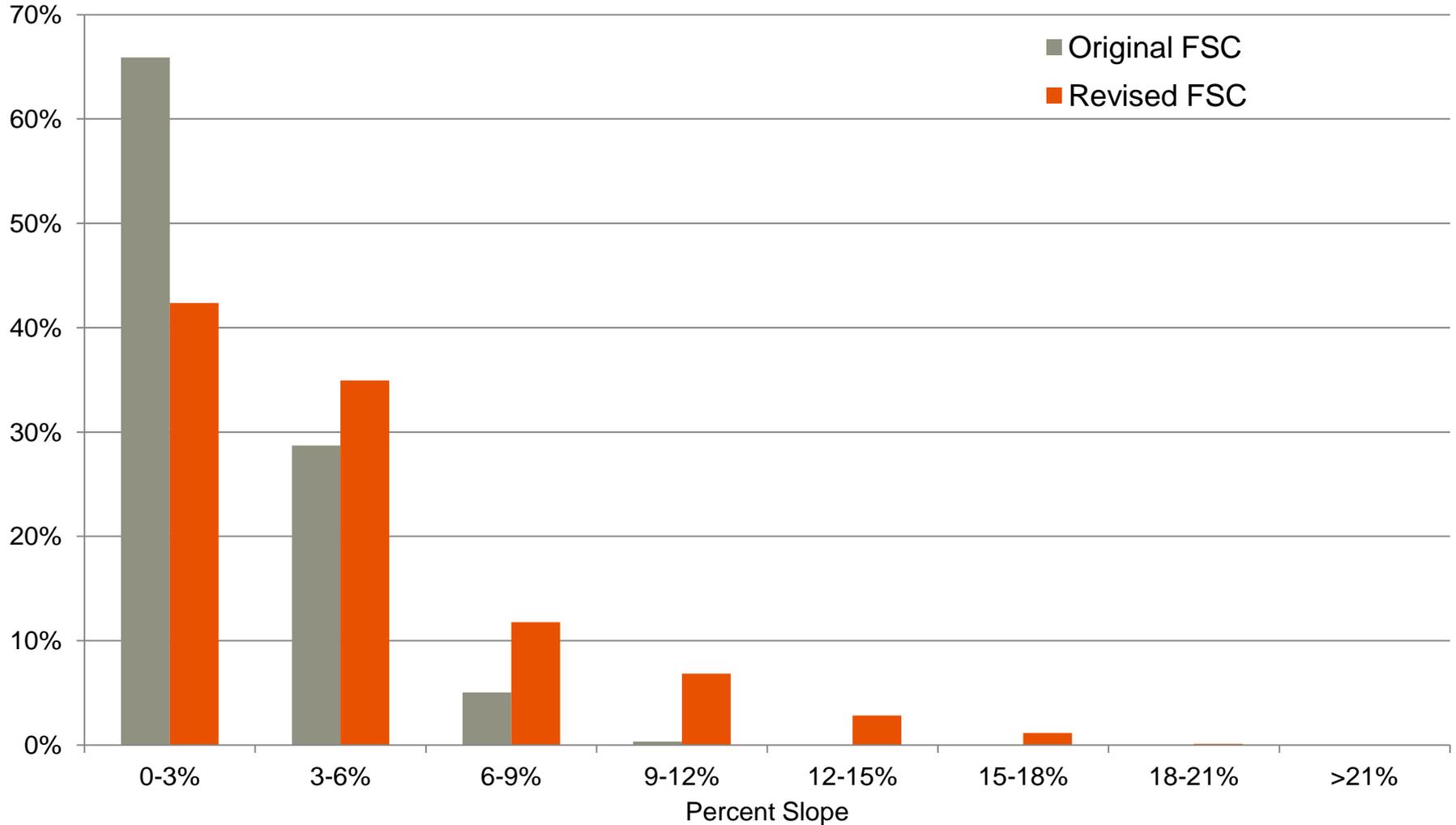
Area 3 Slope



Area 3 Slope



Area 3 Slope Histogram



Expected Benefits of Geomorphic Surfaces

Erosional stability

- Geomorphically designed channels will provide for reduced long-term maintenance costs.

Revegetation community

- The varying slope and aspects will promote greater revegetation species diversity.

Wildlife community

- The varying slopes, aspects and drainages will promote increased wildlife habitat by providing opportunity for viewing, hiding and resting.

Acknowledgements

Co-authors:

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C. Kent Applegate, Superintendent, Environmental Projects, BHP Billiton Mine Management Company



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