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Dear Erik,

**RE: KRRP - COPCO NO. 1 AND COPCO NO. 2 TEMPORARY CONSTRUCTION  
 ACCESS ROAD – DESIGN CRITERIA**

This letter is intended to outline the design criteria for the temporary construction access road to access Copco No. 1 and Copco No. 2 dam sites from the right bank as part of the Klamath River Renewal Project. Following acceptance of the criteria herein, KP will proceed with detailed stability analysis of the proposed alignment (appended).

**1.0 PRIMARY DESIGN OBJECTIVES**

- Design a stable temporary haul road to access Copco No. 1 and Copco No. 2 dams.
- Avoid any material entering the wetted perimeter of the Klamath River.
- Maximize usable excavated rock for use as erosion protection and general fill in other project areas.
- Locate spoil areas within the project limits to reduce labor and haul costs.
- Design will be California PE stamped by GeoServ.

**2.0 DESIGN CRITERIA**

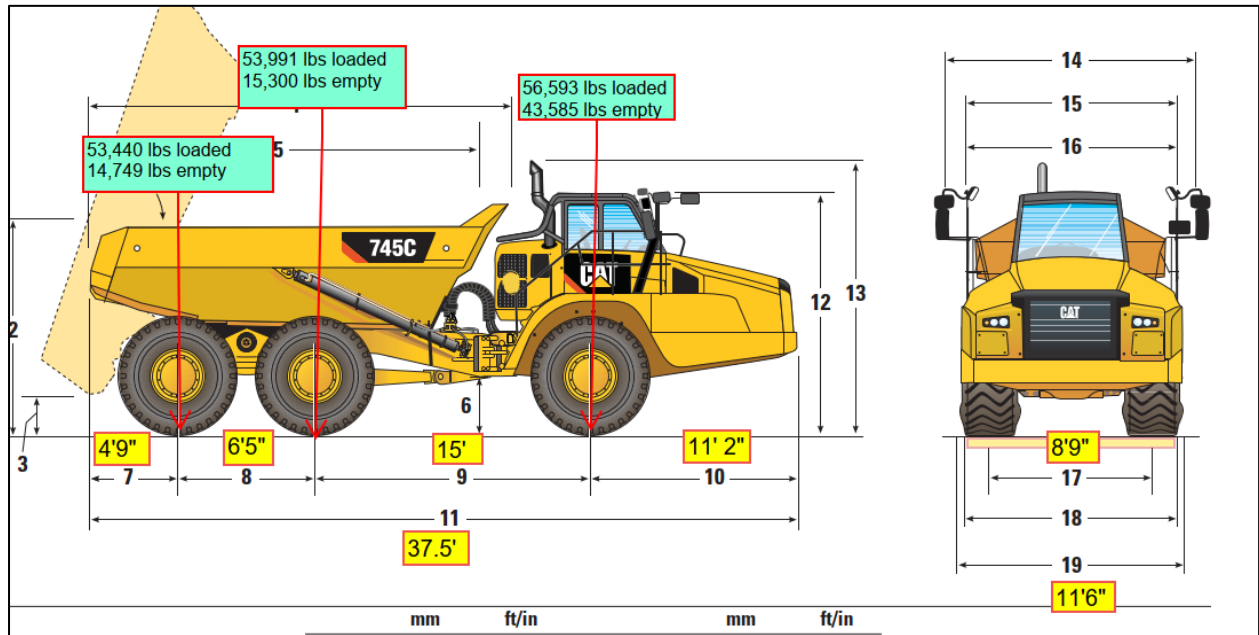
**2.1 GENERAL HAUL ROAD DESIGN CRITERIA**

- Copco 1 Access Road shall be designed as a temporary structure (i.e., 2 - 3-year design life).
- Copco 1 Access Road is for Contractor (and PacifiCorp temporarily) use only during construction and will be left as-is following Project completion. Following Project completion, road access will be blocked or prevented via rock/earthfill berm or other approved methods. A posted permanent sign will be needed at project completion at the barrier indicating danger of rock fall and slope stability for pedestrians. Proceed at your own risk.
- Runaway vehicles are not considered in this design due to tight spatial constraints.
- The road design is based on site conditions, temporary haul road industry best practices, equipment specifications and Contractor inputs.
- Copco 1 Access Road maintenance of driving surfaces, and any daily or weekly maintenance required for continued compliance to the design geometry for the duration of use, will be the responsibility of the Contractor.
- Following a snow event - road shall be ploughed clear and if icy, adhesion shall be improved through placing cinder/salts etc. or as per Contractor's road maintenance plan.
- Slope hazard mitigation shall be managed by the Contractor.

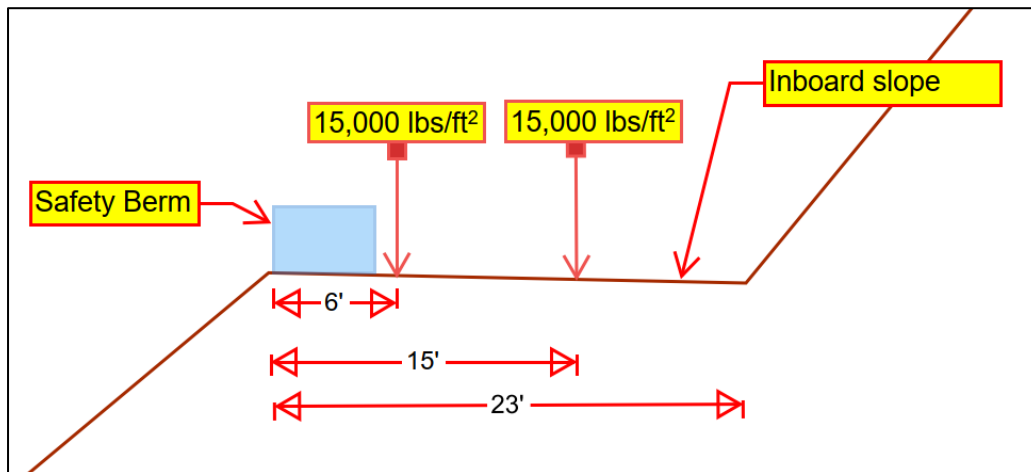
- Temporary road signage will be as required by the Contractor.
- Best Management Practices (BMP's) will be implemented.
- On-site materials will be used for haul road construction.

**2.2 VEHICLE LOADING**

- The road is designed to accommodate the maximum imposed tire contact pressure due to a fully loaded CAT 745C haul vehicle, as defined by the Contractor.
- Other construction equipment may be used, provided the maximum applied loads do not exceed the fully loaded CAT 745C.
- Vehicle Load Factor (dynamic impact/braking etc.) = 1.25.



**Figure 1 CAT 745C Articulated Truck – Unfactored Nominal Axle Loads**  
[\(CAT Product Specifications Sheet\)](#)



**Figure 2 2D Slope Section, CAT 745C Axle Loading (based on tire contact pressure)**

### 2.3 ROAD DESIGN CRITERIA

- 23 ft wide road - single lane (one way) traffic only.
  - 5 ft wide x 3 ft high safety berm (gabion baskets or earthfill/rock berm - TBD by Contractor).
  - 18 ft wide driving surface.
- Safety Berm is not designed for impact. Safety berm provides operators with visual/tactile feedback for vehicle alignment and road vehicular positioning.
- Maximum allowable road grade is 20%.
- Road will slope inwards from the outer edge to direct surface run-off. Drainage culverts and water management to be provided by the Contractor.
- Minimum allowable outside vehicle turning radius = 35 ft.

### 2.4 SLOPE STABILITY (GRANULAR MATERIALS)

- Includes all slopes comprised of loose/granular material (soils, gravel, rubble).
- Required factor of safety for limit equilibrium under static conditions will be 1.5.
- Inputs based on site investigation (conduction by GeoServ, January 2021) and industry best practice for temporary haul roads (per MSHA and best practices for Forestry/Mining Haul road applications).
- Peak Flood Events (considered for toe stability of sidecast material zones)
  - Copco No. 1 Flood Event (1% Probable Flood, Post Drawdown WSL) EL. 2,503.6
  - Copco No. 2 Flood Event (1% Probable Flood, Post Drawdown WSL) EL. 2,480.3
  - Copco Access Road (1% Probable Flood, Post Drawdown WSL) EL. 2,488.0
  - Freeboard Assumed for long term slope stability 2 ft
- Seismic Peak Ground Acceleration (100 Year Return Period) 0.036g
- Sidecast spoiled material - slope stability factor of safety (FOS) 1.05

### 2.5 SLOPE STABILITY (ROCK)

- Includes all slopes cut into solid rock (e.g., columnar basalt).
- Required factor of safety for limit equilibrium under static conditions (deep rock slope plane failure, toppling failure) will be 1.05.
- Required factor of safety for limit equilibrium under seismic conditions will be 1.05.



- Design does not include assessment of overhangs, detached portions of basalt, potential surface raveling, surface freeze thaw action, or other similar rock face hazards.
- Rock slope hazard mitigation (i.e., weathered/fractured rock in the first 5 ft of rock slope surface) will be managed by the Contractor.

**3.0 CLOSING**

We trust the information contained herein meets your needs at this time.

Please do not hesitate to contact any of the undersigned if you have any questions or comments.

Yours truly,  
**Knight Piésold**

Prepared: \_\_\_\_\_ Reviewed: \_\_\_\_\_  
 James O'Reilly Norm Bishop

Approval that this document adheres to the Knight Piésold Quality System:

**References:**

U.S. Department of Interior, Bureau of Mines. Design of Surface Mine Haulage Roads – A Manual, Information Circular 8758, 2001.

Weaver, W.E., Weppner, E.M. and Hagans, D.K., Handbook for Forest, Ranch and Rural Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Upgrading, Maintaining and Closing Wildland Roads (Rev. 1st ed.), Mendocino County Resource Conservation District, Ukiah, California, 2015.

Oregon Department of Forestry, State Forests Program, Forest Roads Manual, 2000.

Copy To: Nick Drury  
 Gary Jara  
 Jim Fitzgerald  
 Chuck Schlumberger