

U.S. GEOLOGICAL SURVEY  
 CHARLES D. WALCOTT, DIRECTOR

# AREAL GEOLOGY

WYOMING-SOUTH DAKOTA  
 NEWCASTLE QUADRANGLE



## LEGEND

- SEDIMENTARY ROCKS**  
*(Areas of synchronous deposits are shown by patterns of parallel lines; alluvial deposits by patterns of dots and circles)*
- Recent**
    - Qal Alluvium (only the larger deposits represented)
    - Qd Older terrace deposits (gravel and loam)
  - QUATERNARY**
    - Kl Laramie formation (sandstone and carbonaceous shale)
    - Kfh Fox Hills formation (sandstone and sandy shale)
    - Kp Pierre shale (dark gray shale or clay with concretions)
  - Upper Cretaceous series**
    - Limestone lenses in Pierre shale (form *Tyrannosaurus*)
    - Kn Niobrara formation (limy shale and impure chert)
    - Kcr Carlisle formation (gray shale and thin sandstone)
    - Benton group
      - kg Greenhorn limestone (massive shaly limestone)
      - kgf Graneros formation exclusive of sandstone lentil (dark fissile shale containing an extensive sandstone lentil)
      - ks Sandstone lentil in Graneros formation
      - kd Dakota sandstone (brownish sandstone, mostly massive)
  - Lower Cretaceous series**
    - Fusion formation (shale and sandstone)
    - klk Lakota sandstone (massive buff sandstone with local coal beds near base)
    - km Morrison shale (massive sandy shale, gray, greenish, and maroon)
  - JURASSIC**
    - jsd Sundance formation (buff sandstone and red and greenish-gray shale)
  - TRIASSIC?**
    - ks Spearfish formation (red sandy shale with beds of gypsum, red beds)
  - Permian series?**
    - cmk Minnekahta limestone (very thin bedded gray limestone)
    - co Opeche formation (bright red sandy shale)
  - Pennsylvanian?**
    - cm Minnelusa sandstone (gray red and buff long sandstone)
  - Mississippian**
    - cp Pallasapa limestone (massive gray limestone)

E.M. Douglas, Geographer in charge.  
 Triangulation by Frank Tweedy and R.H. Chapman.  
 Topography by W.H. Herron.  
 Surveyed in 1899.

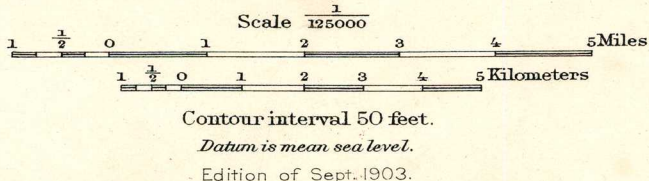
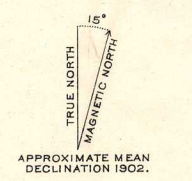


DIAGRAM OF TOWNSHIP

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36

Geology by N.H. Darton.  
 Assisted by C.A. Fisher.  
 Surveyed 1899-1901.

