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October 1, 1974

M E M O R A N D U M

TO: Roger E. Batzel

FROM: Milo D. Nordyke

SUBJECT: More on the Indian Explosion

REF: Memo Nordyke to Distribution, May 29, 1974, re: The Indian Explosion

DECLASSIFICATION STAMP ON REVERSE.

The information in the 23 September letter from Chuck Gilbert (see Enclosure 1) regarding the Indian explosion is reasonably consistent with information made available earlier (see ref. memo) although more precise. The most significant difference is the somewhat larger depth of burial. Earlier statements had put it at 100 meters. The sketch shows a room with the floor at 110 meters and a 7 meter height. This is a large enough volume to have a significant effect on the initial distribution of energy which makes interpretation difficult, particularly at this scaled depth of burst. In any case, assuming the device was 1 meter off the floor, we have used a depth of burst of 109 meters.

For a depth of 109 meters, the scaled depth of burial is about 49 $m/kt^{1/3.4}$ for a 15 kt yield. Such a scaled depth of burial in an alluvial material or a weak rock with 10-20% water would have resulted in a very dynamic cratering event like Sedan (Z_s = 50 $m/kt^{1/3.4}$). In a dry, hard rock such as that of Danny Boy or Buggy, such a scaled depth of burial would be expected to lead to an event somewhere between Danny Boy and Sulky; namely, very marginal with respect to producing a significant crater (see Figs. 1 and 2). In such a medium, one would expect the diameter of the true crater to be about 220 meters. In general, the true crater diameter would be roughly the same as the lip-to-lip diameter.

We do not have appropriate data for nuclear craters in shale, but in general, we would expect them to be 10-30% larger than in hard rock, depending on the moisture content of the shale. The lip-to-bottom depth of such a crater would be expected to be about 40 meters in hard rock although the curve becomes extremely unreliable in this area (see Fig. 2). If the material is shale, a somewhat deeper crater would be expected, depending on the moisture content. Thus, the reported crater is smaller than what we would expect for 15 kt at 109 meters in shale, particularly with respect to depth, but it is a quite credible result, particularly in view of the large room in which the device was located.

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LAWRENCE LIVERMORE LABORATORY

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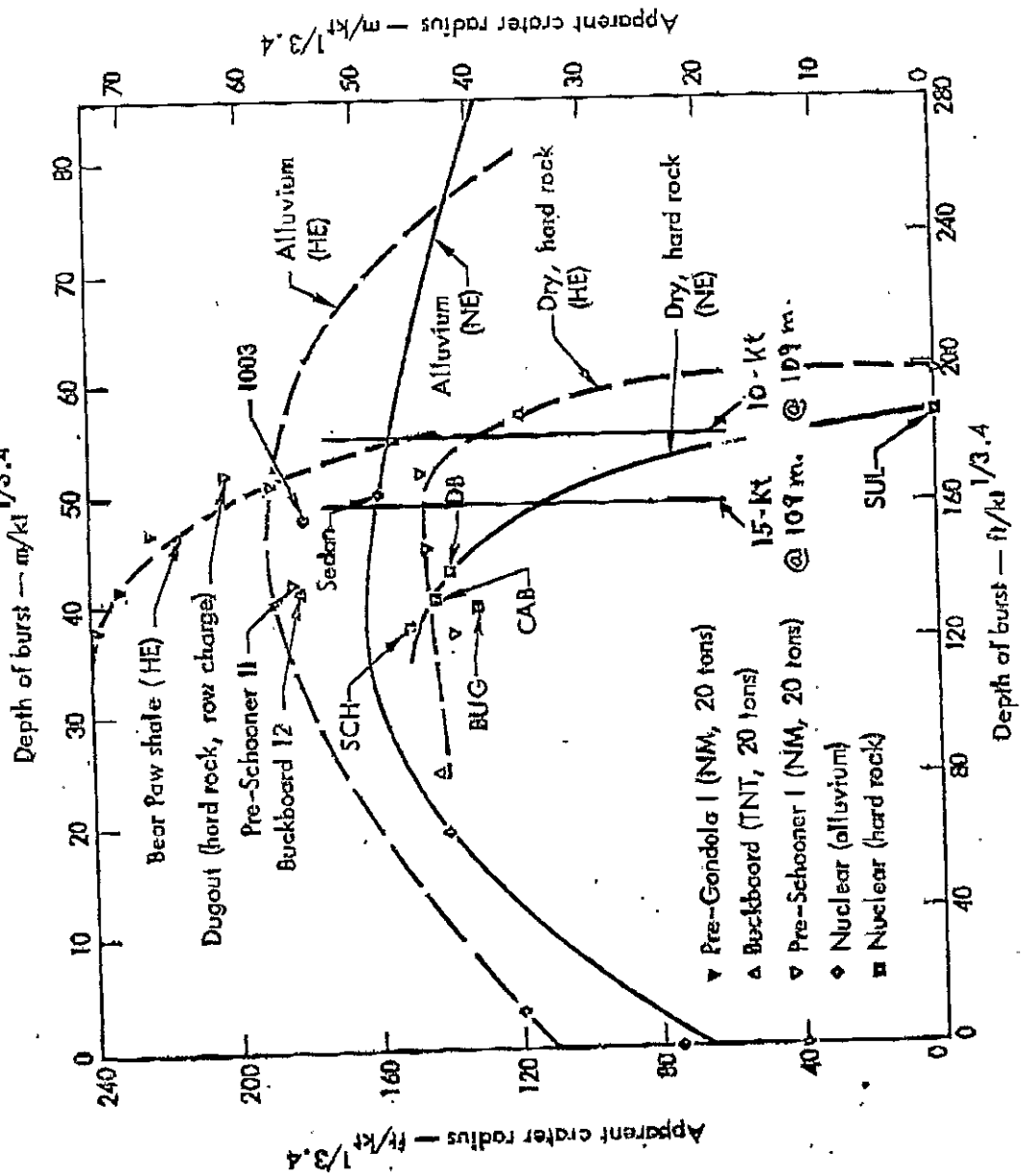
It should be pointed out that if the yield were only 10 kt, as has been reported elsewhere, the situation is quite different. The scaled depth of burial is now 55 $m/kt^{1/3.4}$ which is almost the same scaled depth of burial as Sulky. In hard rock such an event would lead to a retarc with a diameter of roughly 200 meters. In shale, 10 kt at 109 meters would probably result in a positive crater. The lip-to-lip diameter could be quite variable but would probably lie somewhere between 150 and 200 meters depending on moisture content. The depth could be almost any number in this area of the depth-of-burst curve.

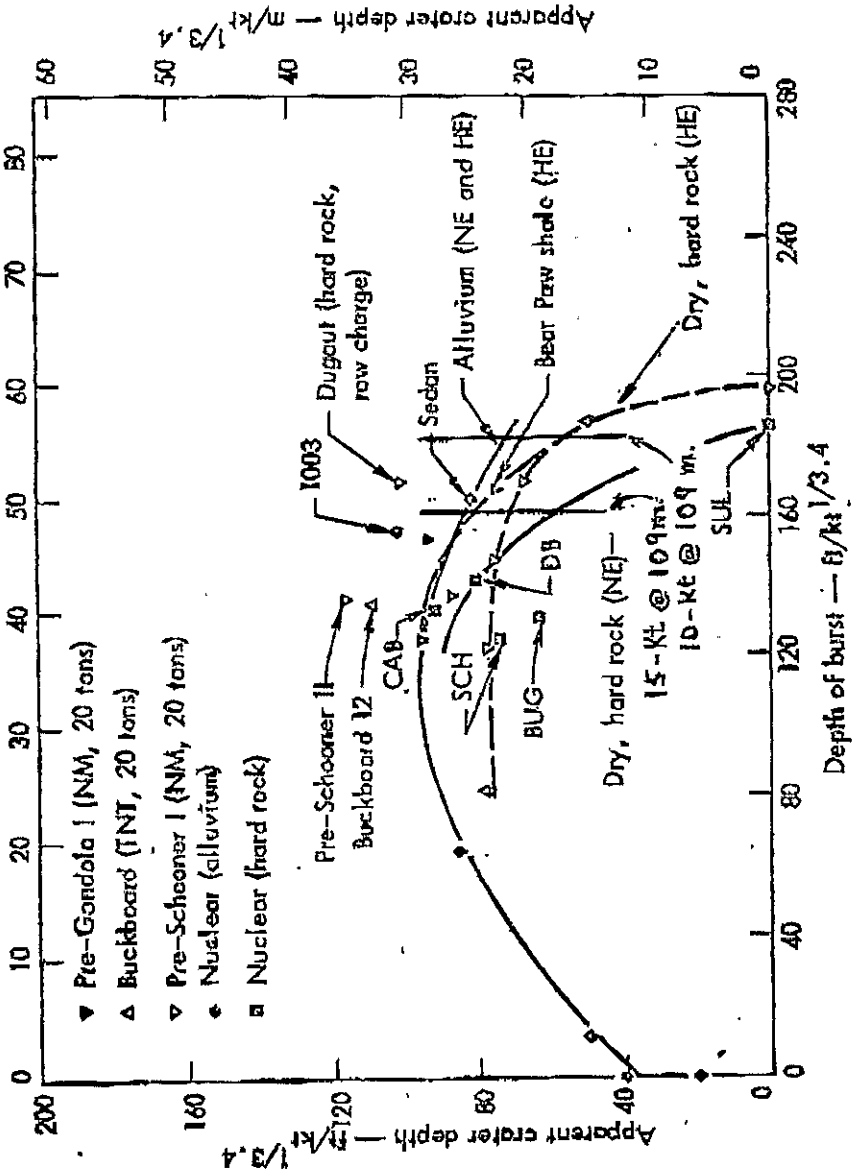
In summary, on the basis of the 109 meter depth of burst, the reported results would appear to most closely satisfy a yield of 10 kt.

Milo D. Nordyke

MDN:sbp
Attachments

cc: F. Holzer
J. King
J. Landauer
L. Schwartz
K. Street
J. Toman
G. Werth


Apparent crater radius — m/kt^1/3.4
Depth of burst — m/kt^1/3.4
Apparent crater radius — ft/kt^1/3.4
Depth of burst — ft/kt^1/3.4
Alluvium (HE)
Alluvium (NE)
Dry, hard rock (HE)
Dry, hard rock (NE)
1003
10-Kt @ 109 m.
15-Kt @ 109 m.
Bear Paw shale (HE)
Dugout (hard rock, row charge)
Pre-Schooner II
Buckboard 12
Sedan
DB
SUL
SCH
BUG
CAB
▼ Pre-Gondola I (NM, 20 tons)
▲ Buckboard (TNT, 20 tons)
▽ Pre-Schooner I (NM, 20 tons)
◆ Nuclear (alluvium)
■ Nuclear (hard rock)


Depth of burst — m/kt 1/3.4
Apparent crater depth — m/kt 1/3.4
Depth of burst — ft/kt 1/3.4
Apparent crater depth — ft/kt 1/3.4
Pre-Gondola I (NM, 20 tons)
Buckboard (TNT, 20 tons)
Pre-Schooner I (NM, 20 tons)
Nuclear (alluvium)
Nuclear (hard rock)
Pre-Schooner II
Buckboard 12
1003
Dugout (hard rock, row charge)
Sedan
Alluvium (NE and HE)
Bear Paw shale (HE)
Dry, hard rock (HE)
CAB
SCH
BUG
DB
Dry, hard rock (NE)
15-Kt @ 109 m.
10-kt @ 109 m.
SUE