APPENDIX NUMBER 1

GROVES-CONANT LETTER

This is the original directive of the Los Alamos Laboratory, referred to in Chapter I.
February 25, 1943

Dr. J. R. Oppenheimer
University of California
Berkeley, California

Dear Dr. Oppenheimer:

We are addressing this letter to you as the Scientific Director of the special laboratory in New Mexico in order to confirm our many conversations on the matters of organization and responsibility. You are at liberty to show this letter to those with whom you are discussing the desirability of their joining the project with you; they of course realizing their responsibility as to secrecy, including the details of organization and personnel.

I. The laboratory will be concerned with the development and final manufacture of an instrument of war, which we may designate as Projectile S-1-T. To this end, the laboratory will be concerned with:

A. Certain experimental studies in science, engineering and ordnance; and

B. At a later date large-scale experiments involving difficult ordnance procedures and the handling of highly dangerous material.

The work of the laboratory will be divided into two periods in time: one, corresponding to the work mentioned in section A; the other, that mentioned in section B. During the first period, the laboratory will be on a strictly civilian basis, the personnel, procurement and other arrangements being carried on under a contract arranged between the War Department and the University of California. The conditions of this contract will be essentially similar to that of the usual OSRD contract. In such matters as draft deferment, the policy of the War Department and OSRD in regard to the personnel working under this contract will be practically identical. When the second division of the work is entered upon (mentioned in B), which will not be earlier than January 1, 1944, the scientific and engineering staff will be composed of commissioned officers. This is necessary because of the dangerous nature of the
work and the need for special conditions of security. It is expected that many of those employed as civilians during the first period (A) will be offered commissions and become members of the commissioned staff during the second period (B), but there is no obligation on the part of anyone employed during period A to accept a commission at the end of that time.

II. The laboratory is part of a larger project which has been placed in a special category and assigned the highest priority by the President of the United States. By his order, the Secretary of War and certain other high officials have arranged that the control of this project shall be in the hands of a Military Policy Committee, composed of Dr. Vannevar Bush, Director of OSRD, as Chairman, Major General W. D. Styer, Chief of Staff, SCS, Rear Admiral W. R. Purnell, Assistant Chief of Staff to Admiral King; Dr. James B. Conant serves as Dr. Bush's deputy and alternate on this Committee, but attends all meetings and enters into all discussions. Brigadier General L. R. Groves of the Corps of Engineers has been given over-all executive responsibility for this project, working under the direction of the Military Policy Committee. He works in close cooperation with Dr. Conant, who is Chairman of the group of scientists who were in charge of the earlier phases of some aspects of the investigation.

III. Responsibilities of the Scientific Director.

1. He will be responsible for:
   
a. The conduct of the scientific work so that the desired goals as outlined by the Military Policy Committee are achieved at the earliest possible dates.

b. The maintenance of secrecy by the civilian personnel under his control as well as their families.

2. He will of course be guided in his determination of policies and courses of action by the advice of his scientific staff.

3. He will keep Dr. James B. Conant and General Groves informed to such extent as is necessary for them to carry on the work which falls in their respective spheres. Dr. Conant will be available at any time for consultation on general scientific problems as well as to assist in the determination of definite scientific policies and research programs. Through Dr. Conant complete access to the scientific world is guaranteed.
IV. Responsibilities of the Commanding Officer.

1. The Commanding Officer will report directly to General Groves.

2. He will be responsible for:
   a. The work and conduct of all military personnel.
   b. The maintenance of suitable living conditions for civilian personnel.
   c. The prevention of trespassing on the site.
   d. The performance of duty by such guards as may be established within the reservation for the purpose of maintaining the secrecy precautions deemed necessary by the Scientific Director.

V. Cooperation.

The closest cooperation is of course necessary between the Commanding Officer and the Scientific Director if each is to perform his function to the maximum benefit of the work. Such a cooperative attitude now exists on the part of Dr. Conant and General Groves and has so existed since General Groves first entered the project.

Very sincerely yours,

[Signatures]

Dr. J. R. Oppenheimer - 3 - February 25, 1943
APPENDIX NUMBER 2

HIROSHIMA TELETYPE

Copy of teletype announcing success of Hiroshima mission received at Los Alamos from Washington office, prepared by Manley (see Chapter XIX).

Note comments by teletype operators at end. They were T/3 Flora L. Little of Jackson, Mississippi, in the Washington office and T/3 Mildred Weiss of New Orleans, Louisiana, in the Los Alamos office.
FLANNED FROM THE PLANE BY PERSON, ONE FIVE MINUTES AFTER RELEASE
AND RAYED HERE WAS THIS INFORMATION QUOTE PAPER HE DID NOT
FOR OPENHESTER FROM GENERAL CROES THIS RESULT IS HUNGARY PREPARED
BY DOCTOR MARKLEY PAPER CLEAR CUT RESULTS COMMA IN ALL RESPECTS SUCCESS
FUL PO EXCEEDED TR TEST IN VISIBLE EFFECTS PO NORMAL CONDITION
CONDITIONS OBTAINED IN AIRCRAFT AFTER DELIVERY WAS ACCOMPLISHED PD
VISUAL ATTACK ON NEBRASKA AT ZERO FIVE TWO THREE O ONE FIVE Z WITH
ONLY ONE TENTH CLOUD COVER PO FLICK AND FIGHTER ABSENT UNAFTER
RETURN TO EASE AND GENERAL INTERROGATION FARVELL SENT THE
FOLLOWING FOLLOWING INFORMATION QUOTE ALONG OPENING IN CLOUD
COVER DIRECTLY OVER TARGET MADE Bombing Favorable PD EXCELLENT RECORD
REPORTED FROM FASTER PO FLICK NOT YET PAUCED BUT OTHER OBSERVING
MEMORABLE AL THE ANTICIPATE GOOD TRACK RECORD PO NO APP'RE

DEEO OFA
R MIL
X HOW MANY LINES DID U GET
R IZ LIMNA
PLANES ALSO ANTICIPATE GOOD TRACK RECORD PO NO APPRECIABLE NOTICE OF
SOUND PO BRIGHT DAYLIGHT CAUSING PRESS TO BE LESS BLINING THAN THEXX
TR PD A BALL OF FIRE COMMENCED IN A FEW SECONDS TO JULIE CLOUDS AND
BOILING AND UPWARD SWIRLING PLAMES PD THEN JUST COMPLETED WHEN FLASE
WAS AXE OBSERVED PO INTENSELY BRIGHT LIGHT COMBINED BY ALL AND RATE
OF RISE OF WHITE CLOUD FASTER THAN AT TR PO IT WAS ONE THIRD GREATER
IN DIAMETER REACHING THIRTY THOUSAND FEET IN THREE MINUTES PD MAXIMUM
ALTITUDE AT LEAST FORTY THOUSAND FEET WITH FLATTENED TOP AT THIS
LEVEL PD COMBAT AIRPLANE THREE HUNDRED SEVENTY THREE MILES AWAY AT

MELCHS DEVO AND FEET OBSERVED IT PO D

N ILS
.4 OK OPR WILL JUST HAVE TO KEEP THING AS THESE MESSAGES AS UMP

NIN PLS

OPR U STARTED THIS MSG AS PART TWO ISNT IT PART OF PART ONE
M NIN OPR I TOLD U I NO START PART TWO WHERE PART ONE NILED
IS THAT CLEAR

BUT OPR I DIDNT GET PART ONE COMPLETE

AND THE I TOLD TO U TO AT START WITH IZ LINE
AND THE IZ LINE U L O WELL I TOLD U MEANT U GET IZ OK
M THIS IS A AWFUL MESS ISN'T IT IT SH SURE IS DON'T THINK WHERE

NIN PLS

TRY ANOTHER MACHINE MAYBE IT WILL DO BETTER
OPR IT ISNT UC MACH AND I KNOW IT IT'S NINE AND THERE ISN'T
A THING CAN BE DONE AS THE REPAIR MAN SAID THERE ISN'T ANYTHING WRONG
WITH IT HAS BEEN HERE ALL DAY AND THIS IS AS GOOD AS IT WILL RUN
I HAVE LOADS TO DO ON U TONIGHT BUT WELL HAVE TO DO IT THIS WAY
A FEW LINES AT A TIME HERE I WANT TO TALK TO THE LT A NIN
OK
OPR U CALL U BACK IN A BT 5 MINUTES
OK
Scale - 1.8" = 1 mile, squares are 1/2 mi. × 1/2 mi.

- Hard surfaced roads
- Trails (foot)
\( \nabla \ \text{VI} \) Site and Designation Number
--- Water supply main
--- Power line
☆ Firing sites

<table>
<thead>
<tr>
<th>Number</th>
<th>Site</th>
<th>Division</th>
<th>NS Coordinate</th>
<th>EW Coordinate</th>
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<td>II</td>
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<td>Beta</td>
<td>G</td>
<td>69</td>
<td>94</td>
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<td>X</td>
<td>74</td>
<td>171</td>
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<td>VII</td>
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<td>IX</td>
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<tr>
<td>X</td>
<td>Bayo</td>
<td>G</td>
<td>107</td>
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<td>XI</td>
<td>K</td>
<td>G</td>
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<td>XII</td>
<td>L</td>
<td>X</td>
<td>59</td>
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<td>XIV</td>
<td>Q</td>
<td>X</td>
<td>52</td>
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<td>X</td>
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<td>Pajarito</td>
<td>O-X</td>
<td>45</td>
<td>91</td>
</tr>
<tr>
<td>XIX</td>
<td>E. Gate Lab</td>
<td>R</td>
<td>93</td>
<td>72</td>
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<tr>
<td>XX</td>
<td>Sandia</td>
<td>G</td>
<td>77</td>
<td>82</td>
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TRINITY PROJECT DETAIL LOCATION PLAN

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<tr>
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<th>Symbol</th>
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</thead>
<tbody>
<tr>
<td>Piezo Gauge</td>
<td>Walker</td>
<td>x</td>
</tr>
<tr>
<td>Sentinel (Type A)</td>
<td>Moon</td>
<td>●</td>
</tr>
<tr>
<td>Sentinel (Type B)</td>
<td>Moon</td>
<td>✫</td>
</tr>
<tr>
<td>Geophone</td>
<td>Houghton</td>
<td>△</td>
</tr>
<tr>
<td>Paper Box Gauge</td>
<td>Hoogterp</td>
<td>⊙</td>
</tr>
<tr>
<td>Flash Bomb</td>
<td>Mack</td>
<td>⬤</td>
</tr>
<tr>
<td>R 4 Ground Station</td>
<td>Segrè</td>
<td>♊</td>
</tr>
<tr>
<td>R 4 Balloon Winch</td>
<td>Segrè</td>
<td>♊</td>
</tr>
<tr>
<td>E. D. G.</td>
<td>Moon</td>
<td>♊</td>
</tr>
<tr>
<td>Mack Slit Camera</td>
<td>Mack</td>
<td>♊</td>
</tr>
<tr>
<td>Impulse Meter</td>
<td>Jorgensen</td>
<td>⊗</td>
</tr>
<tr>
<td>Condenser Gauge</td>
<td>Bright</td>
<td>✡</td>
</tr>
<tr>
<td>Excess Velocity Gauge</td>
<td>Barschall</td>
<td>⊗</td>
</tr>
<tr>
<td>Tank Range Poles</td>
<td>Anderson</td>
<td>△</td>
</tr>
<tr>
<td>Tank Flag Poles</td>
<td>Anderson</td>
<td>⊗</td>
</tr>
<tr>
<td>Primacord Station</td>
<td>Mack</td>
<td>⊤</td>
</tr>
<tr>
<td>Metal Stake (Earth Disp)</td>
<td>Penney</td>
<td>○</td>
</tr>
<tr>
<td>Piezo Gauge Amplifier</td>
<td>Walker</td>
<td>⊙</td>
</tr>
<tr>
<td>Balloon</td>
<td>Richards</td>
<td>●</td>
</tr>
<tr>
<td>Balloon Winch</td>
<td>Richards</td>
<td>●</td>
</tr>
<tr>
<td>Ground Station</td>
<td>Richards</td>
<td>●</td>
</tr>
</tbody>
</table>

Note: Angles are Azimuths on "OA" Line
Distances thus (800) are Radial Yards from "O"
Distances thus (75') are Offsets from L of Roads and Center Lines.

Scale: 1500 Yard circle - 1" = 300 Yards, - Sheet 1
10,000 Yards - 1" = 2750 Yards. - Sheet A

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APPENDIX NUMBER 5

TECHNICAL AREA PLOT MAP

Map showing building layout of the Technical Area, as drafted in December 1942. Technical Buildings T, U, V, W, X, Y and Z were constructed as map indicates. Dashed lines show removed ranch houses.
## TECHNICAL AREA AS OF DECEMBER 1942

<table>
<thead>
<tr>
<th>Building No.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Infirmary</td>
</tr>
<tr>
<td>16</td>
<td>Gatehouse</td>
</tr>
<tr>
<td>25</td>
<td>T - Main Tech Building</td>
</tr>
<tr>
<td>26</td>
<td>U - Chem. and Phys. Labs</td>
</tr>
<tr>
<td>27</td>
<td>V - Shop (Machine)</td>
</tr>
<tr>
<td>28</td>
<td>W - Van de Graaff</td>
</tr>
<tr>
<td>29</td>
<td>Y - Cryogenics Lab</td>
</tr>
<tr>
<td>30</td>
<td>X - Cyclotron</td>
</tr>
<tr>
<td>31</td>
<td>Z - Cockcroft-Walton</td>
</tr>
<tr>
<td>32</td>
<td>Covered walk</td>
</tr>
<tr>
<td>33-36</td>
<td>Ranch houses</td>
</tr>
<tr>
<td>37</td>
<td>Chem. Stock</td>
</tr>
<tr>
<td>41</td>
<td>Warehouse</td>
</tr>
<tr>
<td>42</td>
<td>Icehouse</td>
</tr>
<tr>
<td>44</td>
<td>Boiler</td>
</tr>
<tr>
<td>47</td>
<td>Guard tower</td>
</tr>
<tr>
<td>48</td>
<td>Ranch house - PX</td>
</tr>
<tr>
<td>56</td>
<td>Cooling towers</td>
</tr>
</tbody>
</table>
GLOSSARY OF TERMS
GLOSSARY OF TERMS

(α, n) Reaction. Any nuclear reaction in which an alpha particle (helium nucleus) is absorbed by a nucleus, with subsequent emission of a neutron.

Autocatalytic Assembly. Any method of assembling supercritical amounts of nuclear explosive, in which the initial stages of the explosion are made to assist the further assembly of the explosive, e.g., by expulsion or compression of neutron absorbers placed in the active material.

Baratol. A castable explosive mixture of barium nitrate and TNT.

Baronal. A castable explosive mixture of barium nitrate, TNT, and aluminum.

Betatron. Induction electron accelerator for generating electron beams of very great energies.

Branching Ratio. The ratio of the capture cross section to the fission cross section.

Cockcroft-Walton Accelerator. An accelerator using voltage multiplication of the rectified output of a high voltage transformer to obtain a high potential.

Composition B. A castable explosive mixture containing RDX, TNT, and wax in the proportion 60/40/1.

Critical Mass. That amount of fissionable material which, under the particular conditions, will produce fission neutrons at a rate just equal to the rate at which they are lost by absorption (without fission) or diffusion out of the mass.

Tamped Critical Mass. The critical mass when the active material is surrounded by a tamper.

Critical Radius. The radius of a spherical arrangement of fissionable material equal to one critical mass under existing conditions.

Cross Section. A quantitative measure of the probability per particle of the occurrence of a given nuclear reaction. It is defined as the number of nuclear reactions of a given type that occur, divided by the number of
target nuclei per square centimeter and by the number of incident particles.

__Absorption Cross Section.__ The cross section for the absorption of a neutron by a given nucleus.

__Capture Cross Section.__ The cross section for the \((n, \gamma)\) reaction, in which a neutron is absorbed by a nucleus, with subsequent emission of gamma radiation.

__Fission Cross Section.__ The cross section for the absorption of a neutron, followed by fission.

__Scattering Cross Section.__ The cross section for the scattering of a neutron by the nuclei of some target material. Since scattering is a quantitative matter, the definition is incomplete. The differential scattering cross section is the cross section for scattering at an angle between \(\theta\) and \(\theta + d\theta\). The transport cross section is an average or integral scattering cross section, so defined as to give the average scattering in the forward direction:

\[
\sigma_T = 2\pi \int_0^\pi (1 - \sin \theta) \sigma_s(\theta) \sin \theta \, d\theta
\]

where \(\sigma_s(\theta)\) is the differential scattering cross section defined above.

__Cyclotron.__ Magnetic resonance accelerator, used in investigating atomic structures.

__D(d, n) Reaction.__ The nuclear reaction produced by bombarding deuterons with deuterons, producing high energy neutrons.

__D-D Source.__ The above reaction used as a source of high energy neutrons. At Los Alamos, the Cockcroft-Walton accelerator was principally used for this purpose.

__Deuterium.__ Heavy hydrogen, \(D_2\) or \(H_2^2\), the hydrogen isotope of mass two.

__Deuteron.__ A nucleus of deuterium or heavy hydrogen.

__Electron Volt.__ An electron volt is the energy acquired by an electron falling through a potential of 1 volt. One electron volt is about \(1.6 \times 10^{-12}\) ergs. In thermodynamic units, 1 electron volt corresponds to a temperature of about 12,000 degrees absolute. Thus a fortieth of a volt per particle corresponds to "room temperature." Energies of this order are called "thermal." One million electron volts corresponded to a temperature of \(1.2 \times 10^{10}\) degrees absolute.
Fission Spectrum. The spectrum, or energy distribution, of neutrons emitted in the fission process.

Inelastic Scattering. The scattering of neutrons in which energy is lost to excitation of target nuclei.

Li(p, n) Reaction. The nuclear reaction in which neutrons are produced by bombardment of lithium by protons.

Neutron Number. The number of neutrons emitted per fission. This number is statistically variable; the expression refers therefore to the average number per fission.

(n, γ) reaction. A nuclear reaction in which a neutron is captured by a nucleus, with subsequent emission of gamma radiation.

PETN. Pentaerythritol tetranitrate.

RDX. Cyclotrimethylenetrinitramine.

Thermonuclear reaction. A mass nuclear reaction induced by thermal agitation of the reactant nuclei. The reaction is self-sustaining if the energy release is sufficient to counter-balance the energy losses that may be involved.

Tamper. A neutron reflector placed around a mass of fissionable material to decrease the neutron loss rate.

Taylor Instability. A hydrodynamical principle which states that when a light material pushes against a heavy one, the interface between them is unstable, and that when a heavy material pushes against a light one, the interface is stable.

Tritium. The hydrogen isotope of mass three. This isotope was discovered in the Cavendish Laboratory by Oliphant in 1934. It was there produced by deuterium-deuterium bombardment. Tritium is a radioactive gas with a half-life of about twenty years.

Triton. A nucleus of tritium.

Thermal Neutrons. Neutrons of thermal energy - see Electron Volt.

T-D Reaction. The nuclear reaction of tritons with deuterons.

Torpex. A castable explosive mixture of RDX, TNT, and aluminum.

Van de Graaff Generator. An accelerator using the electrostatic charge collected on a mechanically driven belt to obtain a high potential.
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