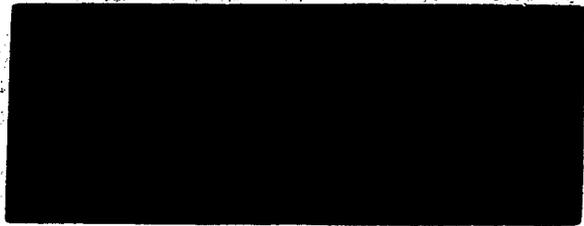


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**THE PRESENT AND FUTURE ROLES
OF
SALTON SEA TEST BASE
AND
TONOPAH TESTING RANGE**

Compiled by

A. P. Gruer, 5210

March 2, 1959

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This report shows that the trend of Sandia Corporation's testing is toward a reduction in water drops and an increase in land-target drops and rocket launchings. There are also immediate and increasing demands for a concrete target, plus added instrumentation with which to cover high-speed, low-level tests. In order to conserve money and manpower and to provide the best possible technical coverage of tests, it is desired to consolidate as much testing as possible at one range.

On the basis of these facts, it appears that the Salton Sea Test Range, with its limited land-target areas, should be phased into a part-time manning status over approximately a two-year period, and that the Tonopah Testing Range -- the only available range area answering the major portion of Sandia requirements -- should be developed into a permanently manned range for most of Sandia Corporation's test programs.

The report contains evidence supporting all phases of the current situation and the proposed changes.



R. A. BICE - 5200



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THE PRESENT AND FUTURE ROLES
OF
SALTON SEA TEST BASE
AND
TONOPAH TESTING RANGE

The purpose of this report is to present information concerning the present status of the AEC-Sandia Corporation test ranges and the planning that must be done to meet the needs of current and future weapon development programs.

The Testing Situation

Since September 1946, Sandia Corporation has maintained one or more bases for the testing of its products. During that period, testing has grown from 2 to approximately 35 programs, or from about 4 tests a month to as high as 30 tests in a month.

The Salton Sea Test Base (SSTB) was established in 1946 and made into a permanent facility in 1949. The original test requirements were:

Bomb Tests

Release	20,000 to 40,000' Level A/C speed up to 300 mph
Flight	Free-fall
Fuze	Air-burst
Target	Water

As new weapon types came into the picture, changes were made to the range. A land target was established within this range as early as 1951 for the Mk 8 program, and various land targets as well as the water target have been in use there since that time. Not until 1953 when thermonuclear weapon programs involving contact fuzes and retarded delivery came into being was it found necessary to move some programs from SSTB to other ranges since SSTB did not have sufficient land area or appropriate terrain to accommodate these tests. Therefore, in 1955 an interim land

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range was established, first at Yucca Lake in the Nevada Test Site and later on at the Air Force Gunnery Range near Tonopah, Nevada (Tonopah Test Range: TTR). In the meantime weapon development trends clearly indicated that more and more use of land targets would be required for contact-fuzing tests and for programs requiring recovery of retarded test units for post-mortem and reuse.

A detailed search for a suitable permanent range was started, covering many of the areas of the United States. Initially this was to be a joint bombing range for use by agencies of the DOD and the AEC. The DOD agencies subsequently dropped out, first the Navy and then the Air Force, but the AEC need remained. The site chosen by the Joint Range Committee and negotiated for by the AEC was on the Navajo Tribal lands near Winslow, Arizona. In the fall of 1958, after approximately a year of negotiations, the Navajo Indians rejected the AEC range proposal and a study of potential sites for a permanent land range was begun anew. In the meantime new programs, starting with the TX-43, demanded that weapons be tested for impact resistance on a 12-inch-thick concrete target. Because of the delay in the establishment of a permanent land range, it was necessary to begin a program to meet these demands by establishing a temporary hard-target facility at an abandoned airfield near Dalhart, Texas (see Appendix A for a detailed correspondence history of the ranges). This range, however, does not provide the necessary conditions for full testing, since the target is only 8 inches thick instead of the required 12 inches, and the concrete is of varying strength. There are also restrictions on means of delivery.

Thus the current weapon development and research programs are requiring a vastly greater diversity of test situations than could be anticipated at the time the range at SSTB was first established. These needs can be listed by types of programs and test conditions as follows:

1. Bomb Tests

Release	50' to 50,000' altitude Level, dive, LABS A/C speed up to 1150 mph
Flight	Free-fall, retarded
Fuze	Air-burst, impact, delay after impact
Target	Water, earth, 12-inch-thick concrete

2. Research Vehicle Tests

Similar to 1, plus test-vehicle speeds rocket-boosted to Mach 5 and above.

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3. Rocket Tests

Release	Ground launch, A/C launch
Flight	Ballistic flight to 300,000' Recoverable instrument head
Target	Earth, point in space

4. Special Tests

Instrument coverage of terminal phase of REGULUS
I and II

Anticipated program on sampler drones.

This trend toward diversification and increased complexity of programs has, of course, been recognized for some time, but the necessary steps taken to meet the demand have now placed Sandia Corporation in the position of operating three ranges, a situation costly in manpower and duplicatory in equipment needs. A program is therefore needed to consolidate the activities as much as possible and to continue actions toward the establishment of a permanent land range.

The decisions that either have been or must be made to accomplish these objectives are discussed in the following paragraphs.

Need to Consolidate Ranges

There is a need to reduce the number of test ranges in current operation in order that economies can be achieved in dollars and manpower and that data coverage can be improved. The consolidation that can most logically be made is to combine the land-target operations of Dalhart with those of TR on a single range.*

* Consideration has also been given to the possibility of consolidating all needs of both water and land use onto one range. An extensive study was made of the SOTB area as well as other sites, but no practicable range location to serve all these needs seems to be available.

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Choice of a Site for a Permanent Land Range

As the result of the joint range study in which consideration was given to many alternative land sites, the Navajo-Windlow site was chosen. Following its rejection by the Indians, the same alternatives and also new possibilities were studied with the conclusion that the Tonopah Test Range is the best site now available for a permanent AEC land range. (See Appendix B for discussion of site.) Thus plans are in process and money has been requested for the construction at Tonopah of concrete target facilities and instrumentation which will make it possible to transfer the Dalhart activities to TTR.

Method of Operating Tonopah Test Range and Salton Sea Test Base

It having been decided that the Tonopah Test Range should be the permanent land range, the next question concerns the relationship between the Tonopah Test Range and Salton Sea Test Base. There has been a distinct trend toward more tests on land targets and fewer on water targets, as shown in Table I.

TABLE I

Land Versus Water Drop Tests

Year	Water target drops at SSTB		Total land drops at SSTB, TTR, et al*	
	No.	%	No.	% of total
1950	151	100	0	0
1951	148	69	67	31
1952	185	68	82	31
1953	113	66	57	34
1954	99	73	36	27
1955	41	35	77	65
1956	64	41	92	59
1957	42	33	85	67
1958	15	11	136	89

However, this trend per se does not lead to an answer as to the training and program emphasis that should be planned for between the two ranges since both ranges are capable of accepting certain land-target drops. This picture is made somewhat more clear by Table II.

* Tests at Tonopah Testing Range, Edwards AFB, Yucca Lake, and Chincoteague, Virginia.

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TABLE II

Location of Sandia Corporation Tests - Drop and Rocket

Year	SSTB		TTR and its Predecessors*				
	Drop tests		Drop tests	Rocket tests	Total		
	No.	%	No.	No.	No.	%	Total
1950	151	100	0		0	0	151
1951	156	72	59		59	28	215
1952	189	71	78		78	29	267
1953	132	73	38		38	22	170
1954	99	73	35		36	27	135
1955	44	37	74		74	63	118
1956	109	70	47		47	30	156
1957	73	59	49	5	54	41	132
1958	65	32	86	51	137	68	202

This table shows that even though a land target is available at SSTB, its limitations have made it necessary to increase the percentage of testing at other land targets, principally at TTR since it became operational in 1957. A detailed breakdown of numbers by ranges is shown in Appendix F.

The predicted future picture in this regard is presented in Table III, which shows that of the bomb-type programs now scheduled for calendar year 1959 and the first half of 1960, 106 or 47 percent can go to either range. Of the remaining 53 percent, all except one drop must go to TTR (assuming that the concrete target is relocated there) and only one drop must go to the SSTB water target. All of the rocket programs except those to be fired at the Pacific Missile Range must go to TTR. This indicates that although practically all of the tests could go to TTR if appropriate construction were completed, no crisis exists for early transfer of the permanent crew there since many of the tests can still be conducted at SSTB.

Finally, in order to give a full picture, the present and future capabilities of the three ranges are listed in Table IV. It shows that Salton Sea Test Base is limited for aircraft and bomb use to maximum speeds in the transonic region and will not allow the construction of a concrete target because of limited land areas. The Dulhart Test Range is also unsuitable for long-term use because of area limitations, proximity to habitations,

* Tests at Tonopah Testing Range, Edwards AFB, Yucca Lake, and Chincoteague, Virginia.

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and insufficient thickness (8 inches) of its concrete-parking-apron target. Tonopah Testing Range is or can be developed into a range satisfactory for all foreseeable aircraft-bomb tests except those specifically requiring a water target or sea-level conditions. It is the only one of the ranges satisfactory for rocket testing.

TABLE III

Test Programs vs Range, Calendar Year 1959 and First 6 Months 1960

<u>Program</u>	<u>Can go to either SSTB or TTR</u>	<u>Must go to TTR</u>	<u>Must go to SSTB</u>	<u>Total</u>
<u>Bombs and Research Vehicles</u>				
TX-25	3	1		4
TX-28	10	4		14
TX-28-X2	5			5
TX-30	10	2		12
TX-41	1	8	1	10
TX-43	20	49		69
TX-53		50		50
RA(TX-53)	2	2		4
Lone Star	13	2		15
R.P.	15			15
Surveillance	27			27
Total Bomb Drops	106	118	1	225
<u>Rockets</u>				
M5TV		12		12
Wind rockets		42		42
Tumbleweed I		1		1
Tumbleweed II		5		5
SPTV		24		24
Low-altitude sampler		10		10
Total Rockets		94		94
GRAND TOTAL	106	212	1	319

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TABLE IV

Present and Possible Future Capacities of Ranges

<u>Requirements</u>	<u>As answered at</u>		
	<u>SSTB</u>	<u>DTR</u>	<u>TTR</u>
Capability for low-level Mach 1.5 releases.	Unsatisfactory. Population encroachment provides safety hazard, and insufficient land area is available for extension of instrument stations.	Unsatisfactory. Too near highways, airways, and settlements.	Satisfactory. Essentially unrestricted approaches in N-S directions.
Concrete target 12 inches thick, of 4,000-psi compressive strength, with crosswind approaches.	Unsatisfactory. Insufficient land areas available.	Satisfactory for temporary use only. Concrete airstrip has variable compressive strengths, has no crosswind approaches possible, and expansion to high-speed capability unfeasible (see above).	Satisfactory area for building target; low-level crosswind approaches restricted but adequate.
Adaptability for rockets.	Generally unsatisfactory. Insufficient area available.	Unsatisfactory. See above items.	Satisfactory for altitudes to 300,000 feet.
Expandability to 30,000-foot Mach 3 capability.	Unsatisfactory. (See above.)	Unsatisfactory. See first item above.	Satisfactory. Adequate expansion feasible; crosswind approaches available.
Impact testing.	Unsatisfactory on land. O.K. on water. Land impact area insufficiently level. Optical seeability often marginal.	Unsatisfactory for unretarded drops. Insufficient instrumentation, with expansion unfeasible.	Satisfactory. Topography and seeability good.
Parachute recovery tests on land target.	Satisfactory for low- and intermediate-altitude releases and speeds up to Mach 0.95.	Not fully instrumented for such tests.	Satisfactory. Expandable to desired delivery speeds and altitudes.
Tests requiring sea-level or water target.	Satisfactory within range limitations.	Unsatisfactory. Altitude 4092.21. No water target.	Unsatisfactory. Altitude 5331.44. No water target.

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From this study it is concluded:

1. That efforts now under way should be vigorously continued to establish the concrete target and necessary instrumentation at Tonopah Test Range so that the Dallart Test Range can be abandoned.
2. A construction program (for which preliminary plans are already under way) must be carried out at TTR during this year and the next 3 years to expand its capabilities to accept high-speed aircraft-bomb tests and to provide adequate coverage for the various rocket programs either planned or currently under way.
3. No abrupt change is required in the present method of manning both SSTB and TTR with one permanent crew stationed at SSTB. Also, the present policy of conducting all tests practicable at SSTB should be continued for as long a time as is feasible. However, program trends, economy of operation, and beneficial coverage of test programs require that action should be in process over approximately the next 2 years to gradually transfer the permanent staff to TTR and place SSTB on an intermittent schedule as required.
4. SSTB must be retained as a test range for the foreseeable future in order to accommodate tests requiring a water target or sea-level conditions.

In order to carry out this program, a number of considerations relating to Tonopah as a support community, to construction budget plans, and to methods of managing the ranges must be considered.

Support Community for Tonopah Testing Range

Aside from the problems of TTR which relate to the distance from Albuquerque and to its geographical orientation, both of which can be solved by adequate operating and construction funds, the major problem is the lack of an adequate support community.

Tonopah, the largest center in the range's vicinity, is a former mining community with a current population of about 1400. There is little housing available, and living costs seem somewhat higher than in Albuquerque. Land available for housing expansion lies chiefly on one side of the town, the other side being taken up with extensive mine tailings. The range is 41 miles from Tonopah, with about 25 miles of the distance being over a paved road. The town of Goldfield (population about 300) lies 25 miles south of Tonopah and only 21 miles from the range, but there are few houses or facilities available there. Appendix C gives a thorough analysis of Tonopah as a

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support community. Judging from this analysis, it is expected that some problems will be encountered in moving families into Tonopah on a permanent-transfer basis. Methods will have to be developed to encourage private construction of homes and to take care of inequities which may arise from such transfers. A study that is currently underway (comparison of the Tonopah situation with other places to which Sandia Corporation personnel are assigned) is expected to provide information necessary for policy guidance on this problem.

Costs Involved in Bringing TTR to Permanent Status

At this writing, the AEC investment in the range at Tonopah is \$685,000. It is envisioned that by the end of the FY 1961 construction program, when work will have been completed necessary to make TTR capable of accepting tests up to Mach 3, the plant investment will be approximately \$2,737,000.* Expansion beyond that point will be based on the need, if any, to accommodate releases above Mach 3.

The construction total for FY 1959 at TTR (exclusive of the concrete target, which will be built on expense) amounts to \$461,000. This will provide for instrument stations on the east side of the flight line and around the proposed concrete target. Fiscal Year 1960 will require \$668,500 for total construction, which will extend the instrument stations as necessary to meet known testing requirements through that year. A total of \$923,000 is projected for FY 1961; this figure includes the major additions to the range which are now judged necessary to provide, among other things, ground instrument stations capable of accommodating releases from 80,000 feet at Mach 3. (The B-70 program, with these requirements, is expected to be active in 1962.) In FY 1962 it is tentatively proposed that \$750,000 will be required for some expansion and for permanent facilities such as range power and road improvement. Beyond this date, predictions have little meaning. (A brief of the proposed budgets appears on the following page, and the detailed budgets appear as Appendix D.)

* The corresponding figure of present construction investment at SSTB is approximately \$2,100,000 for range items only, not including the lodge, housing, or other items not directly associated with range operations (see Appendix E).

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TABLE V

Budget Notes, March 16, 1959

<u>Fiscal year</u>	<u>Objective</u>	<u>Cost</u>
Up to date	Temporary range w/ Mach 1 high and low level. Rocket launching to 300 k.	\$685,000
1959	1. Concrete-target instrument sites. 2. Second flight line and all-day instrument coverage. 3. Replace four Askanias w/ Contraves and add four new Contraves. 4. Replace trailer machine shop w/ building. 5. Concrete target (to be built on expense).	\$461,000
1960	1. Add coverage for research rockets and high-altitude rockets, plus uprange capability for bombing (involving FPS-16 and four ME-16 cameras). 2. Base water and fire lighting. 3. Permanent rocket-assembly buildings. 4. Road improvements and new roads.	\$668,500
1961	1. Modernize rocket-launching complex. 2. Mach 3 uprange capability. 3. Increase CP facilities for permanent use. 4. Improve general instrumentation.	\$923,000
1962 (Tentative)	1. Expand launching facilities. 2. Uprange signal system and access roads. 3. Central electrical power and range distribution system.	\$750,000
1963 plus	1. Extend uprange instrumentation as required for velocities above Mach 3. 2. Construct for special programs unforeseeable at present.	

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Proposed Transfer of Permanent Crew from SSTB to TTR

During the next year and a half, it is expected that almost one half of the drop tests (one third of the tests including rockets) can be conducted at SSTB. This provides a transition period during which activities can be transferred to TTR without major disruption of operations. It is therefore proposed that the relocation of personnel and equipment from SSTB to TTR start in the spring of 1959 and be completed in approximately 2 years.

1. Up to March 1959, test operations were conducted on the basis of 3 weeks a month at SSTB and approximately 1 week at TTR. For the 15 months following that date, a schedule of 2 weeks at each base is expected to be necessary.
2. One technical supervisor and two technicians will be transferred from SSTB during the spring of 1959, so that range-preparation requirements can be met at TTR.
3. Three more technical personnel will be transferred in the late summer of 1959, to provide a permanent group, the duties of which will be range preparation and technical liaison on the proposed addition to range facilities.
4. Additional transfers will be made from time to time thereafter as required.
5. During the transition period, up to the time when the balance of personnel is at TTR, every effort will be made to schedule the maximum possible number of test activities at SSTB. Test continuity will, of course, have to be maintained throughout the transfer period.

Proposed Management for Tonopah Testing Range

At the present time the SSTB range, with one exception, is managed and operated by Sandia Corporation personnel. The base administration is carried out by Department 4580 under the Director of Plant Engineering and Maintenance and includes the security guard force, base maintenance, and base management. The Prophet Company operates the lodge. The technical range operations and their management are carried out by Division 5214 from the Instrumentation Services Department under the Director of Field Testing.

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The management of TTR is somewhat different in that the range maintenance and construction work are performed on contract by the Reynolds Electric Company (REECO), which operates out of Camp Mercury and serves the Nevada Test Site in a similar capacity. The guard force is supplied on contract by Federal Services, Inc., and the technical range management and operations are conducted by the SSTB Field Test group.

As TTR moves toward a permanent-range status, it is proposed that REECO and Federal Services be retained to carry out an expansion of their current roles. The contract with REECO would provide for blanket coverage of all trades requirements, such as maintenance of vehicles and rotating machinery, routine custodial services, minor modifications to existing structures, and general maintenance. The negotiations would include the establishment of a Reynolds office at Tonopah, with assignment of permanent personnel to the TTR project. This should provide a basis for equitable wage structures between the various organizations working at TTR and would prevent problems from arising because of high effective rates of pay currently being paid to personnel from Camp Mercury because they are on a travel status. The Federal Services security function at TTR should be governed by similar considerations. In the event satisfactory arrangements cannot be concluded, other possibilities will have to be considered, including that of Sandia Corporation assuming the responsibilities.

With the ultimate transfer of the permanent crew to TTR will come a need for some additional administrative support now provided by the base management group at SSTB. It is proposed that this support be supplied by Sandia Corporation and that it report to the Field Test technical operating management.

Proposed Management for SSTB

During and after the TTR transfer period, it will be necessary that SSTB be maintained in a ready condition for test programs requiring sea-level conditions (such as high-Q tests for ballistic purposes) or a water target. Examples of tests that require a water target are those of air- and contact-burst fuzing systems; programs in which the water and muddy bottom at SSTB provide the most economical disposal of vehicle debris where no recovery is required or feasible; programs in which water recovery of the vehicle is desired, such as preparation for open-sea recovery of rocket instrumentation heads and sampler drones; and special programs in which the vehicle may be damaged by land impact but could be recovered in the water. Some thought is also being given to the development of water-retarded ballistic shapes, which, if they materialize, will require a water target.

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Although the projected programs shown in Table III do not indicate high activity requirements at SSTB, past experience indicates that because of the fluctuation and unpredictability of program needs, SSTB should be maintained in a ready status for programs of the above types which could develop in the future.

In order to accomplish this, it is proposed that Organization 4580 continue to operate as at present until about 50 percent of the Field Test personnel are transferred to TTR. During the next year and a half, it is expected that the on-roll figure for Organization 4580 will drop, through normal attrition and retirement, from 67 employees to 63. When the Field Test organization transfers reach their 50-percent level, serious consideration should be given to the following proposals, assuming that Quality Assurance surveillance activities are ended by December 1, 1959, and that no changes in objectives or programs arise in the meantime:

1. San Felipe Lodge, including the interior apartments, would be closed, which would mean terminating the present contract with the Prophet Company. The trailer court also would be closed. One of the exterior apartments might be left available for remaining personnel. One of the three-bedroom houses would remain open for the families of the remaining personnel.

2. Personnel should be reduced to a maximum of 23 or 25 employees, as tentatively itemized in Appendix E. These should be sufficient for shipping, receiving, warehousing, ordering, and other routine duties. The number of vehicles would be reduced, with major maintenance work on them to be done under contract with local garages. All heavy maintenance work and necessary range construction would be handled by local contractors. The fire house would be closed, and the guard force and firemen merged so that each man would be both a fire and a security inspector. As the Salton Sea Riviera grows, it may be possible to arrange emergency fire protection from them by contract.

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APPENDIX A

Correspondence History of the Ranges

The following is a chronological list of abstracts of the most significant correspondence that has taken place regarding the establishment and maintenance of Sandia Corporation's various test bases. The letters from which the abstracts were taken are on file.

1953

Memo of Record (K. A. Smith) -- 12/3/53 /// Summary of SSTB investment to date.

1954

Memo Hepplewhite-Gruer -- 6/24/54 /// Proposes Askania Range at El Centro.

CRD Memo Gruer-Bice -- 7/22/54 /// Re land-target range north of Plaster City; El Centro Askania range unacceptable to AEC because of proximity to highway.

SRD Ltr McRae-Worth -- 8/12/54 /// Cites need for land target in SSTB area.

Memo Johnson-Woodruff -- 10/5/54 /// Shows agreement to Sandia's use of Yucca Lake on noninterference basis with NPG.

ODD Ltr Uehlinger-McRae -- 10/12/54 /// Replies to McRae-Worth of 8/12/54; Yucca Lake site found satisfactory for land target with SSTB, except that it must be used on noninterference basis with NPG.

1955

Ltr Leehy-McRae -- 3/28/55 /// Ref. letter ATSMC-McRae 3/28/55 on Joint Bombing Range.

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Memo Bice-Heilsan -- 4/8/55 /// Mentions joint land-target range discussions under way between USAF, SC, and Aberdeen. Needs for new range listed, and reasons given for YL's inadequacies. Asks \$300,000 for SC's responsibility in constructing whatever JBR is picked.

Conf. Report on JBR meeting at SFO -- 6/23/55 /// AF & AEC needs listed; Navy not interested; AEC to be given top priority in testing. Working Committee and Policy Committee established.

Report of action taken by Joint Range Site Evaluation Committee - 8/10/55.

Report of 1st meeting of Joint Bombing Range Review Committee - 8/10/55. Formally requests approval for establishment of JBR; recommends certain sites or areas; proposes plan for joint operation.

Conf. Ltr Bice-Leehey - 9/14/55 /// Lists SC weapons needing new facility, and outlines steps that must be taken if JBR should be delayed.

Memo Scrivner-Bice -- 12/1/55 /// Lists needs for low level supersonic range.

1956

Conf. Ltr McRae-Hertford 2/15/56 /// Need stated for interim TTR while waiting for JBR. Relocation of YL stated necessary.

Memo Bice-Heilsan -- 2/16/56 /// About relocation of YL functions to TTR; proposed facilities at TTR.

Ltr Heilsan-Johnson -- 2/23/56 /// TTR proposed for AEC use only.

OUO Ltr Bice-EECO 3/12/56 /// Cites budget for FY'56-'58. Points out FY'57 budget reflects relocation of YL facilities to TTR.

Report of Facilities Planning Conference for TTR -- 3/28/56.

TWX CO/ARDC to AFMPC et al -- 4/21/56 /// States JBR cannot be included in FY'57 program; cites "aprx Jan 1959" as soonest date unless special funding arrangements can be made.

TWX AEC Wash to AEC AIO 5/10/56 /// Authorizes funding for TTR, and directs Phase I be initiated in FY'56.

Memo North Distribution - 5/24/56 /// Cites limited range-time at SSTB.

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Report on Starbird's talk before House Committee on Interior and Insular Affairs -- 5/28/56 /// Cites selection of TTR for land-target area.

Memo of Record-Gruer -- 6/10/56 /// States Phase I work at TTR to be complete by 7/15/56.

Undated report on survey 6/14-15/56 of Tonopah housing and living costs.

Memo Bice-Uehlinger -- 7/10/55 /// Cites move of YL facilities to TTR.

Ltr Hopper-Uehlinger -- 11/26/56 /// Lists agreements with REICO for services at TTR.

Ltr Uehlinger-McRae -- 11/28/56 /// States AEC has received permission to use TTR for five years ending 11/8/61.

1957

Ltr Bice-Uehlinger -- 1/23/57 /// Establishes name of new range as Tonopah Test Range, and cites 1/25/57 as close-cut date for construction there.

Memo Walker-Kelly -- 1/24/57 /// Cites 2/4/57 as activation of TTR for indefinite intermittent tests.

Construction budget for FY'58 for TTR -- 1/31/57.

Ltr Hopper-Uehlinger -- 3/28/57 /// Gives \$458,512 as construction-cost total to date at TTR.

Ltr Rogers USAF to Starbird -- 5/20/57 /// Refers to USAF decision of 5/2/57; notifies AEC officially that AF funding for Winslow has been deleted from FY'57 budget.

Memo Benjamin-Gruer -- 6/3/57 /// Lists physical construction requirements for TTR in '58.

Memo Gruer-Bice -- 6/19/57 /// Lists factors reducing SSTB's usefulness as test range; recommends that SC establish consolidated range elsewhere which will be capable of handling SC's future needs.

Memo Johnson-McKnight -- 7/10/57 /// Cites average costs for operation of SSTB for four years ending 1957.

Recapitulation of costs re Winslow as of 7/17/57 (Gruer).

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Memo Gruer-Bice -- 7/30/57 /// Cites \$330,000 as estimated budget for REECO's support operations at TTR for FY'58.

Conf. Ltr McRae-Starbird 8/14/57 /// Refers to dubious status of JBR, and cites need of establishing Winslow soonest.

Memo Hertford-Starbird -- 9/6/57 /// Recommends action to clarify possibility of DOD-AEC action establishing JBR; if negative, AEC is to proceed with permanent range at Winslow in lieu of further expenditures at interim TTR.

Memo Starbird-Hertford -- 10/8/57 /// States inappropriate for AEC to press its interest in JBR concept during formative stages of DOD budget; requests review by DMA with AIO and SC of range capabilities and requirements.

1958

Ltr ONO to Chief, Bur of Yards and Docks -- 2/3/58 /// Requests withdrawal of Navy application to have TTR transferred to Navy control.

SRD Ltr McRae-Starbird -- 2/18/58 /// (Followup of McRae-Starbird of 8/14/57) Cites withdrawal of AF from JBR concept; recommends that TTR functions be restricted, with concomitant expansion of SSTB.

Ltr CO/ARDC-Hertford -- 3/4/58 /// Makes it official that AF will not support joint effort for Winslow.

SRD Ltr Hertford-Starbird -- 3/28/58 /// Reviews status of JBR; cites AF withdrawal from Winslow; asks DMA to approve Winslow for AEC, to authorize use of FY'58 funds for Winslow, to budget '59 \$875,000 for transfer of TTR functions and facilities to Winslow, and to take other steps for securing Winslow as AEC base.

Memo Dice-Distribution -- 4/23/58 /// States proposed AEC use of Winslow Range has been approved in concept by DMA; immediate planning should be started; names Range Planning Committee (RPC).

TX Starbird-Hertford -- 6/11/58 /// Approves relocation of TTR to WTB; \$490,000 initially scheduled for JBR now to be used for AEC at WTB.

First Progress Report of RPC -- 6/12/58 /// States that layout proposals for WTB were sent to AEC 6/11/58.

7/10/58 /// On this date, SC representatives conferred with Dalhart phone company re phones for projected test location.

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8/1/58 /// On this date, AEC notified AF that AEC will assume control of WTB (no literature).

Memo Gruer-Benjamin -- 8/14/58 /// Cites need for instrumentation at Dalhart for TX-43 program.

Memo Miller-Benjamin -- 8/25/58 /// Lists needs for Dalhart range; cites that no buildings exist there at time of memo.

TX Hertford-Starbird -- 9/23/58 /// Cites 9/20/58 meeting with Hovajes, at which residents voted 14-7 against Winalow Range. States AEC has withdrawn its WTB proposal as of 9/22/58. Cites immediate need for search for other sites. Suggests funds allocated for WTB be held for use at alternate base.

(Correspondence begins 9/23/58 and continues for some time on the need for more and better facilities at TTR now that WTB possibility is ended.)

Memo Beatson-Gruer -- 10/31/58 /// Reports feasibility of extending instrumentation lines 35 miles south of present lines at TTR.

Memo Moffat-Bice -- 11/5/58 /// Reports investigation of six proposed sites; four are proved impractical; San Luis Valley and St. Augustine Plains worth further look.

Memo Miller-Distribution -- 1/14/58 /// Lists limitations on flight approaches to a TTR concrete target.

Memo Benjamin-Gruer -- 11/19/58 /// Moves Dalhart completion date to 12/15/58 because of behind-schedule construction.

Memo of Record (Gruer) -- 11/24/58 /// Gives info on Tonopah living conditions.

Ltr Fowler-Campbell -- 11/26/58 /// Cites termination of negotiations for WTB. Gives 3/15/59 as critical date for establishing test range. Suggests modifications for TTR to make it more useable. States that six sites have been checked; four found impossible.

Memo Gruer-Distribution -- 12/8/58 /// Cites encroachment of private land-owners, surveyors, etc., on dangerous areas adjacent to SSTB.

Ltr Campbell-Hertford -- 12/17/58 /// Cites Starbird TX of 6/11/58 authorizing \$400,000, originally set for WTB, now to be used at TTR; recommends favorable action on SC's proposal for TTR as in Fowler-to-Campbell, 11/26/58.

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1959

Memo of Record (Sherwin) -- 1/6/59 /// Discusses advance preparations for official announcement that TTR to become permanent test range. ✓

(Correspondence begins 1/12/59 about a meeting to be held between SC representatives and Tonopah civic leaders as groundwork for above announcement.)

Ltr Fowler-Campbell -- 2/3/59 /// Eliminates San Luis Valley and St. Augustine Plains (last two of six possible sites mentioned in above correspondence) as test bases, leaving TTR as obvious best choice for permanence.

SRD Ltr Bice-Campbell -- 2/11/59 /// Supersonic deliveries prohibited at Dallart; proposes immediate concrete target and instrumentation.

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APPENDIX B

Geographical Situation of TTR

TTR lies in the northwest corner of the Air Force's Las Vegas Gunnery Range and is located well inside a large tract of land which is primarily government-owned. The AEC has the range area under a lease from the Air Force which will expire November 8, 1961. New lease terms relating to further geographical expansion and time extension are under consideration by the AEC.

It has been ascertained that the range's instrumentation lines can be readily extended 35 miles south of the present impact area to accommodate Mach 3 deliveries. Beyond this, the flight-line approaches to the range are adequate for foreseeable tests, including those at Mach 5 and higher, providing adequate construction funds are made available for the expensive uprange construction in rugged terrain beyond 35 miles.

Aside from Goldfield and Tonopah, there are no settlements nearby, and there are virtually no inhabitants in the countryside at large for many miles in any direction from the range.

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APPENDIX C

Tonopah Resurvey as of February 15, 1959
(This resurvey is a modification of a survey made June 15, 1957)

The community of Tonopah, while unincorporated and therefore without identity as a township, is the county seat of Nye County, Nevada. It is located approximately in the center of the state at an elevation of 6050 feet above sea level and is considered locally as Nevada's crossroads. Originally a mining community, the town's chief source of income today is from tourists and from ranchers in the surrounding countryside. At the height of the mining activity, Tonopah had a population of about 12,000, but today the population is about 1400.

With the closing of the principal mines, most of the better vacant houses were moved to other communities, leaving only the less desirable places available for rentals. A few of the town's old timers bought these and are renting them without spending much on renovation. There is seldom a vacancy in town if the unit is at all liveable. In mid-February 1959, this pressure was relieved temporarily and to a small degree by the movement of several families from Tonopah to 15 new houses on the settlement's outskirts. These houses were erected by the Air Force to help house the approximately 150 persons employed at a nearby radar station.

There is little new construction underway, and only five or six new houses have been built in the past 5 years. With an increasing demand for rental units, some of the townspeople, on limited capital, are attempting to remodel former business properties, such as the old bank and the abandoned railroad station, into living quarters. Nine houses were recently moved from a nearby abandoned mining town but are said to be submarginal as dwellings.

Most of Tonopah's houses are of "Old West Mining Town" vintage and style (stud wall construction with wood siding and wallboard) and most of them are at least 50 years old. In most cases, the minimum has been spent on maintenance of these units. Rents vary from \$40 to \$75 a month, plus utilities, for one-, two-, and three-bedroom units. Some units include furniture of the same general style and age as the houses, and rents for comparable units are the same whether or not the units are furnished.

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Three things are particularly noteworthy in regard to Tonopah as a support community:

1. The land on which Tonopah was built belonged to a single mining company, the executors of which retain title. This means that, with the exception of some land owned by the district attorney (see "Housing," below) title would have to be cleared as an adjunct of purchase of any land in or around Tonopah. According to Charles Cavanaugh of Tonopah, legal fees for this process average \$50 per lot.
2. Tonopah lots are considered to be about 50 x 35 feet. The Albuquerque office of the Federal Housing Administration states that FHA loans are not available on lots smaller than 5000 square feet, which means that at least two lots would have to be purchased and their titles cleared before FHA financing would be possible on construction.
3. Because Tonopah has no legal identity as a township, the administration is carried on by the Nye County Board of County Commissioners. This arrangement has some disadvantages, particularly in the matter of bond issues, which may be approved for local improvements by Tonopah voters, but disapproved by the voters of the county because of other current or desired commitments. Specifically, this situation has resulted in two defeats for a school bond issue (see "Schools," page 33), and makes it difficult, for example, to improve the Tonopah water system, which is now owned by certain town officials, and which may not be adequate to pump water onto the hillsides on which most new housing will have to be built.

The following is an analysis of specific support facilities in Tonopah.

Housing

William P. Beko, District Attorney (Tel. 1752)

Plans for the Granger Co. of Stockton, Calif., to erect some houses in Tonopah, as mentioned in an earlier report, have either fallen through or are in abeyance. A Dr. Goddard of San Jose, Calif., purchased 40 or 50 lots on the outskirts of Tonopah 2 years ago, stating that he would erect dwellings on them if there seemed to be interest in his doing so. Mr. Beko and Mr. Cavanaugh have been trying to contact Dr. Goddard by phone and by letter, but at this writing had been unable to do so. Mr. Beko himself recently purchased a considerable area of ground west of town from the tax rolls, in order to keep the land out of the hands of speculators. He is said to have stated that he will sell this land at his cost (from \$25 to \$40 for most lots).* Mr. P. H. Fruzza, local bank president, states that the bank will

* Mr. Beko could not be reached on 2/16/55 for comment on this. The information is from Mr. Cavanaugh, who has so far seemed a reliable informant.

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finance up to 60 percent of a home erected on property which has clear title. The only unoccupied land around Tonopah which has clear title at this writing is part of that owned by Mr. Beko. The story is current in Tonopah that FHA financing is unavailable in the town, because prevailing wage rates do not justify loans. This information was not corroborated but can be obtained from the Federal Housing Administration, Nevada Office, Box 171, Reno, Nevada (Tel. Mirview 3-7159).

Colan Terrel, prefab houses (Box 290)

Mr. Terrel has erected three prefab houses in Tonopah. They are of plywood-panel construction. Rental is to be \$65 a month. One of these units will be ready for occupancy in March 1959.

Mrs. Frank Trucba, Owner, Ramona Hotel (Tel. 92)

Mrs. Trucba has a three-bedroom home for rent. The house is of old-fashioned construction but seems in good condition. Rent is \$65 a month.

Allan Douglas

Has four or five houses which may be rentable. No other information.

Mr. and Mrs. William J. Frank (Box 704)

The Franks have seven rental houses. Six are one-bedroom units that rent for \$40, and one is a two-bedroom unit, renting for \$45. At this writing there are some vacancies here because of the move of some families to the Air Force houses mentioned above. The units owned by the Franks are fairly well kept up.

L. A. Rhines

Mr. Rhines has remodeled the second floor of the railroad station into two apartments. The three-bedroom unit rents for \$75 a month, and the two-bedroom unit for \$60. These units would probably be unsatisfactory for families with small children. The downstairs section of the station is a warehouse.

Margaret Peterson

Has some houses available for rent or purchase. No other information.

There are other rental units in Tonopah, but they are considered sub-marginal for Sandia's purposes.

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Comparison of Food Prices

		Prices in Tonopah <u>2/10/59</u>	Everyday prices at Safeway in <u>Albuquerque-3/2/59</u>
Fresh Frozen Eviscerated Fryers	lb.	\$.69	\$.66
Assorted Cold Cuts	lb.	.70-.95	.65-1.25
All-meat Frankfurts	lb.	.55	.59
Del Monte Dill Pickle Halves 24-oz.	Jar	.43	.37
Ht. Whitney Olives-Extra Large No.1	can 2 for	.61	.58
Kraft Mayonnaise	qt.	.80	.80
Tastewell Catsup	12-oz. btl.	.19	.19
Swift's or Banquet Butter	lb.	.79	.77
Banquet Eggs, Large AA Specials	doz.	.67	.69
Stewing Hens	lb.	.69	.59
Fresh Ground Beef	lb.	.59	.55
Frozen Orange Juice	2 for	.72	.99 (large)
Stockton Brand Tomatoes	No. 2 $\frac{1}{2}$ can	.25	.23
New Potatoes	10 lbs.	.93	.63
Kraft Parkay Margarine	lb.	.30	.29
Swiftening	3-lb. can	1.05	.51
Milk	qt.	.27	.23
$\frac{1}{2}$ / $\frac{1}{2}$ Cream	pt.	.41	.29
Kleenex		.33	.27
Coca Cola	6-pack w/carton	.49	.45
Mazola Cooking Oil	qt.	1.05	.59
Std Brand Cigarettes	ctn.	2.60	2.53
	pack	.31	.27
Bacon	lb.	.85-1.05	.49-.73
Maxwell House Coffee	2-lbc.	1.45	1.63

All foods and cigarettes are subject to 2% sales tax in addition to these prices.

The Tonopah prices were compiled by Mr. and Mrs. Pete Chevalier of Sandia's staff at TTR.

The Safeway prices are for comparable brands.

All Albuquerque foods and cigarettes are subject to 3% sales tax in addition to these prices.

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Comparison of Propane Gas and Stove Oil Rates

	<u>Tonopah</u>	Bulk Tank	<u>Albuquerque</u>
Propane	\$.21 per gal. (bulk)* .21 ¹ / ₂ per gal. (retail)		\$.12 to .1245 per gal. .14 to .145 per gal.

* Assuming "reasonably large" amounts ordered.

At Tonopah

Average bill for 5 winter months using Propane -- \$30 a month.
Average bill for 5 winter months using Stove Oil -- \$35 a month.

Southern Union Gas Company - Residence Rates - Natural Gas

First 1,000 Cu. Ft.		\$ 1.50 minimum
Next 3,000 Cu. Ft.	⊙ \$.75 per 1,000	3.75
Next 22,000 Cu. Ft.	⊙ .62 per 1,000	17.39
Next 24,000 Cu. Ft.	⊙ .50 per 1,000	29.39
Next 100,000 Cu. Ft.	⊙ .43 per 1,000	72.39

\$10.00 Deposit required.

Average Albuquerque gas bill for 4 winter months using natural gas - \$15.00.

Gasoline Prices

	<u>Tonopah</u>	<u>Albuquerque</u>
Regular	\$.396 per gal.	\$.289 per gal.
Ethyl	.445 per gal.	.339 per gal.

Fire Insurance Rates
(Single Unit Dwellings)

	<u>Tonopah</u>		<u>Albuquerque</u>	
	<u>1 yr.</u>	<u>3 yr.</u>	<u>1 yr.</u>	<u>3 yr.</u>
Frame, composition roof, per \$100	.33	.891	.15	.455
Contents, per \$100	.47	1.27	.19	.513
Extended Coverage, per \$100	.11	.297	.18	.485

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Sewer Connection and Garbage Rates (Residence)

	<u>Tonopah</u>	<u>Albuquerque</u>
Sewer Connections	\$2.15 per month	\$.80 to 1.20 per month*
Garbage	1.00 per month	1.50 per month

* Albuquerque sewer rates depend on number of outlets.

Water Rates

Water Co. of Tonopah Domestic Rates

First 1,000 gal. @	\$4.00 per 1,000 gal. -	\$ 4.00	
Next 2,000 gal. @	3.25 per 1,000 gal. -	10.50	
Next 3,000 gal. @	2.85 per 1,000 gal. -	19.05	
Next 4,000 gal. @	2.50 per 1,000 gal. -	29.05	
Next 10,000 gal. @	2.20 per 1,000 gal. -	51.05	
Next 90,000 gal. @	2.10 per 1,000 gal. -	219.05	Minimum \$2.50

City of Albuquerque Water Co. Domestic Rates

First 5,000 gal.		\$ 1.50 minimum
Next 13,000 gal. @	\$.25 per 1,000 gal.	3.52
Next 72,000 gal. @	.225 per 1,000 gal.	16.20
Over 90,000 gal. @	.175 per 1,000 gal.	

Special rate from April thru October \$.17 per 1,000 gal.

Telephone Rates

Nevada Telephone-Telegraph Co. - An independent company serving Tonopah, Goldfield, and Manhattan, Nevada.

Residence Service*

Private Line - Wall set	\$5.00 per month
Private Line - Portable Set	\$6.00 per month
Party Line - Wall Set	\$2.50 per month
Party Line - Portable Set	\$3.50 per month

* All prices subject to Federal and State Taxes.

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Telephone Rates (cont)

No installation charges or deposit.

At the time of installation, two month's charges are collected in advance. If tenant moves within the two month period, these charges cannot be transferred to another location.

Mountain States Telephone & Telegraph Company - servicing Albuquerque, N. M.

Residence Service*	Area I	Area II	Area III**
Private Line	\$6.75	\$7.50	\$8.25
2-Party Line	5.50	6.00	6.50
4-Party Line	4.30	4.65	5.00

Wall sets and Portable sets same price.

Installation charges:

With instrument already located in house - \$2.25
Including instrument installation - 4.50

Deposit is dependent upon financial stability, occupation, rank, and past history with telephone company. If deposit is required, it normally amounts to \$20.00.

* All prices subject to Federal and State Taxes.

** Areas are determined by the distance residence is located from central telephone office.

Electric Power Rates

California Electric Power Company - Tonopah, Nevada

Domestic Meter Fixed Lights

Minimum - \$1.80 per month
First 200 kw - \$.10 per kw
Next 300 kw - .08¹/₂ per kw
Next 500 kw - .06 per kw

Heat Meter - Wall Plugs, Appliances, Stoves, etc.

Minimum - \$3.60 per month
First 200 kw - \$.05¹/₂ per kw
Next 800 kw - .03 per kw
Next 3000 kw - .022 per kw
Next 6000 kw - .02 per kw

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Electric Power Rates (cont)

In the case of a larger load, \$.75 per meter per month per kw of load which can be connected at any one time.

Customers are billed every two months.

Public Service Company of New Mexico - Albuquerque, New Mexico

Domestic Meter - Fixed Lights

Minimum - 50 kw @ \$.045 per kw	\$2.25
50 kw @	.03 per kw	3.75
200 kw @	.025 per kw	8.75
Over 200 kw @	.02 per kw	

Deposit required - \$5.00

All electrical usage is established by one meter.

Services

Transportation

Airlines

Bonanza -- To Reno and Las Vegas. Stops at Tonopah Tuesday, Wednesday, and Thursday regularly. Will stop on Sunday, Monday, and Friday for three passengers or more, and if prior arrangements are made.

Bus Lines

Ely-Tonopah Stage Line. Carries passengers three days a week, by appointment only. Transports laundry to Ely and return.

Las Vegas-Tonopah-Reno-Stage Line. Carries freight up to 40 lbs. Two runs per day.

Railroad

None

Freight Line

Ringsby Transportation Company. Runs six days a week.

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Highways

Good highways leading north and south from Tonopah.

Distances from Tonopah to -- Las Vegas	- 207 miles
Renc	- 240 miles
Ely	- 177 miles
Bishop	- 120 miles
Tonopah Test Range	- 41 miles

Medical

M.D.

General Practice -- Dr. Russel A. Joy, County Physician. (Only other doctor at Bishop.)

Hospital

Nye County General Hospital -- 45 beds. Dr. Joy is attending physician.

Pharmacist

None. Prescriptions may be filled at Bishop or Hawthorne, or obtained by mail.

Dentist

None

Eye doctor

None

Ambulance

One, at local hospital.

Amusements and Recreation

Movies

Butler Theatre. Fair condition and presentations.

Fishing and Hunting

Excellent, not too far away.

Rock Hunting, Prospecting, Hiking, Climbing

Unlimited, in immediate vicinity.

Swimming

Public swimming pool, with life guard in attendance.

Bars

Numerous but unspectacular.

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Television

Obtainable for an installation charge of \$120, plus a \$5-a-month rental. Only one station (KPC) receivable. Once an installation has been made, new tenants only have to take up the rental fee. Reception is good. Sandia Corporation owns three TV hookups, of which two are currently available, with a small installation charge to be made if not at the present locations.

Civic Services

Fire and Police

Volunteer fire department. Regular police department in town, plus a county sheriff (resident of Tonopah), and visits by the state highway patrol.

Schools

One grade school, one high school. According to Mr. Franza, the banker, the high school has been condemned. According to Mr. Cavanaugh, it has only been criticized for its condition. There has been considerable fruitless discussion between factions in the town as to whether the building should be replaced or renovated. According to Mr. Chevalier, six of the last eight graduates from the local school have been rejected by the University of Nevada for having insufficient grounding for college work. Mr. Chevalier states that his own daughter will be sent to another high school in the coming year because of this situation. The high school has no gymnasium.

U. S. Mail

No house-to-house delivery. A postoffice box must be obtained. Rental for a box sufficient for the average family is 10 cents for a 3-month period. Mr. Ed Shavin is postmaster.

Newspaper

The Tonopah Times-Bonanza, printed in Tonopah, is a weekly and costs 10 cents per issue. Papers from Las Vegas, Reno, San Francisco, and Los Angeles are also available.

Chamber of Commerce

Mr. Leroy David is president; Fran Palenske is secretary. Tel. 883. Some of the work normally handled by a Chamber of Commerce is performed by the Nye County Board of Economic Development, which is appointed by the County Commissioners, and of which Charles Cavanaugh is chairman.

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Churches

The Presbyterians, Episcopalians, and Catholics have their own churches; the Latter Day Saints and the Four-Square Gospel group meet at the local Lion's Club hall.

Businesses

Dairy

None. Pasteurized milk available at local grocery stores only.

Bakery

None. Bread and pastries, brought into town three times a week, are available at grocery stores only.

Laundry

One laundry and one cleaner in town. Cleaner is considered fair. Some people prefer to send their laundry to Ely by stage line, which gives approximate 4-day service.

Barber Shops

Three, with a total of five chairs. Closed Mondays.

Banks

One. First National Bank of Nevada (branch). Tel. 902. Bank is closed Saturday and Sunday, and during the noon hour daily.

Garages and Service Stations

Several. The Mizpah Garage, Kelly Garage, and Midland Motors have fairly good automotive maintenance capability. There are agencies for Ford, Chevrolet, Buick and Chrysler-Plymouth. Campbell & Kelly Machine Shop does good work on both car parts and on general blacksmithing and hardware work.

National Chain Stores

None

Drug Stores

One. Sells nearly everything except drugs.

Grocery Stores

Three. Coleman's Market is considered the best.

Miscellaneous

Two or three ladies' shops, one men's store, and one or two stores that carry a little of everything.

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Hotels and Motels

Hotels

Mizpah Hotel. 100 rooms, of which 31 have baths. Nine of the other 69 are currently having baths installed and are being renovated, with ten more to receive the same treatment in the near future. Rates are cheaper than in some motels.

Razona Hotel. 20 rooms.

Motels*

David's L & L. Thirty-one quite acceptable units now available, with eighteen more under construction. Weather permitting, these may be ready for occupancy by May 15, 1959. Rates for representatives of large corporations are \$7.00 for a person in a single or double bed, up to \$12.00 for a couple with two double beds. \$2.00 for rollaways. Rates are slightly lower (\$6.00 for a single) for transients. This is by far the best motel in Tonopah.

Me and Jim. Approximately 7 units.

Tonopah. Approximately 6 units.

* A Mr. Joe R. Stossel of 447 Bush Street, DeKalb, Illinois, has been in contact with local leaders about moving to Tonopah and establishing a motel. An encouraging letter was sent to Mr. Stossel on February 12, 1959, but no reply had been received at the time of this survey.

Trailer Parks

There are three in Tonopah. Spaces generally rent for \$20 a month. Average size of spaces is 25 feet by the necessary length, though some are limited to 32 feet by 55 feet.

General Information

There is no state income tax in Nevada, and no city tax in Tonopah, but everything, including groceries, carries a 2-percent state sales tax.

There is no speed limit on Nevada highways except where posted.

The tax rate is \$5 per \$100. The average home-owner's tax is about \$100 a year, not including a personal automobile.

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Auto license plates run about the same in cost as those in New Mexico and California.

Below appears a tabulation showing the average monthly cost actually sustained by a Sandia Corporation employee at TTR who lives in Tonopah. His costs are compared with those sustained by a hypothetical Albuquerque resident, and the difference is cited.

	<u>Rate</u>	<u>Monthly Averages</u>		<u>Difference</u>
		<u>Tonopah</u>	<u>Albuquerque</u>	
Television	\$170 installation charge	\$5.38/mo	None	\$ 5.38
Electricity	10.0/1st 200 kw 8.4/next 300 kw 6.0/balance	30.59	4.5/1st 50 kw 3.0/next 50 kw 2.5/next 200 kw 2.0/balance	21.32
Water	4.00/M/1st 1000 gal 3.25/M/next 2000 gal 2.65/M/next 3000 gal 2.50/M/next 4000 gal 2.25/M/next 10,000 gal	10.40	.30/M/1st 5000 gals. .25/M/next 13,000 gal	6.60
Gasoline - Reg. 50 gals/month assumed	39.6/gal	19.80	28.9/gal	5.35
Kerosene	.214/gal	3.36	.14/gal	1.04
Fuel Oil	.214/gal	5.78	.16/gal	<u>1.86</u>
				\$41.55

Actual living cost of a Tonopah resident in 1958 compared with costs of a hypothetical Albuquerque resident.

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APPENDIX D

Budget for FY 1959

The construction program needed to make TTR a permanent range will take about 3 years.

The 1959 construction budget is in three parts. Part I deals with general range instrumentation emplacements which will include contraves-camera and tracking-telescope stations, plus signal cable for extending the data-collection ability for high-speed releases from low and high altitudes on the present 347/167-degree flight line as well as on the proposed 300/120-degree flight line.

Part II is for instrumentation emplacements directly associated with the concrete target. This instrumentation will replace the very temporary facilities at Dalhart, Texas, and will include any parts of the Dalhart instrumentation which can be used at TTR. The concrete target itself is listed as an expense item.

Part III is for general construction, which includes additions to the water and power-distribution systems, a prefab metal building for a machine shop at the control point, and roads. Additions to the water system will consist of enlargement of storage capacity. The existing well produces only about 6 gallons of water a minute, and the storage tank holds only about 12,800 gallons; the system is therefore inadequate to supply both domestic water and water for construction purposes. Additions to the power-distribution system will consist of conductors and terminations to the various camera stations. Power will be supplied by engine-generator sets. The gravel-surfaced roads will provide access to the camera sites.

Instrumentation to the concrete target, together with the contraves-camera and tracking-telescope stations, will meet data-gathering requirements of the laydown-weapon programs now projected.

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Tonopah Test Range FY 1959 Construction Budget

Plant Construction Items

Part I - General TTR Instrumentation Replacements

3 ea. Contraves Camera Stations	\$ 72,000	
2 ea. Tracking Telescope Bases	15,000	
100,000' 51 pr. Signal Cable-Buried	75,000	
Survey	1,000	
Contingencies	20,000	
A & E Fees	<u>12,000</u>	\$198,000

Part II - Instrumentation Replacements for Concrete Target

7 Pits - (3 ea. RO-1000 and 4 Mitchell)	\$ 63,000	
6 CZR-1 Camera Stations	9,000	
3 RO-1000 Camera Stations	3,000	
2 70-mm Camera Stations	4,500	
1 Profile Plotter	2,500	
1 Signal Terminal Bldg.	500	
1 Telemetry Bldg.	500	
3 Telemetry Antenna Bases	150	
1 Balloon Inflation Bldg.	3,000	
1 Metro Tower Base and 6 Anchors	750	
1 GMD-1A Antenna Pod	1,000	
64 Flight Line Markers	10,000	
26,000' 51 pr. Signal Cable	20,000	
Survey of Target Instrumentation and		
Bore-sight Boards	10,000	
Contingencies	22,400	
A & E Fees	<u>10,200</u>	\$160,500

Total Instrumentation Replacement Items

\$358,500

Part III - General Construction

Additions to Water System	\$ 18,000	
Power Distribution System	10,000	
Butler Bldg. for Machine Shop at C.P.	40,000	
Roads	25,000	
Contingencies	5,300	
A & E Fees	<u>4,200</u>	\$102,500

Total Construction Plant FY'59

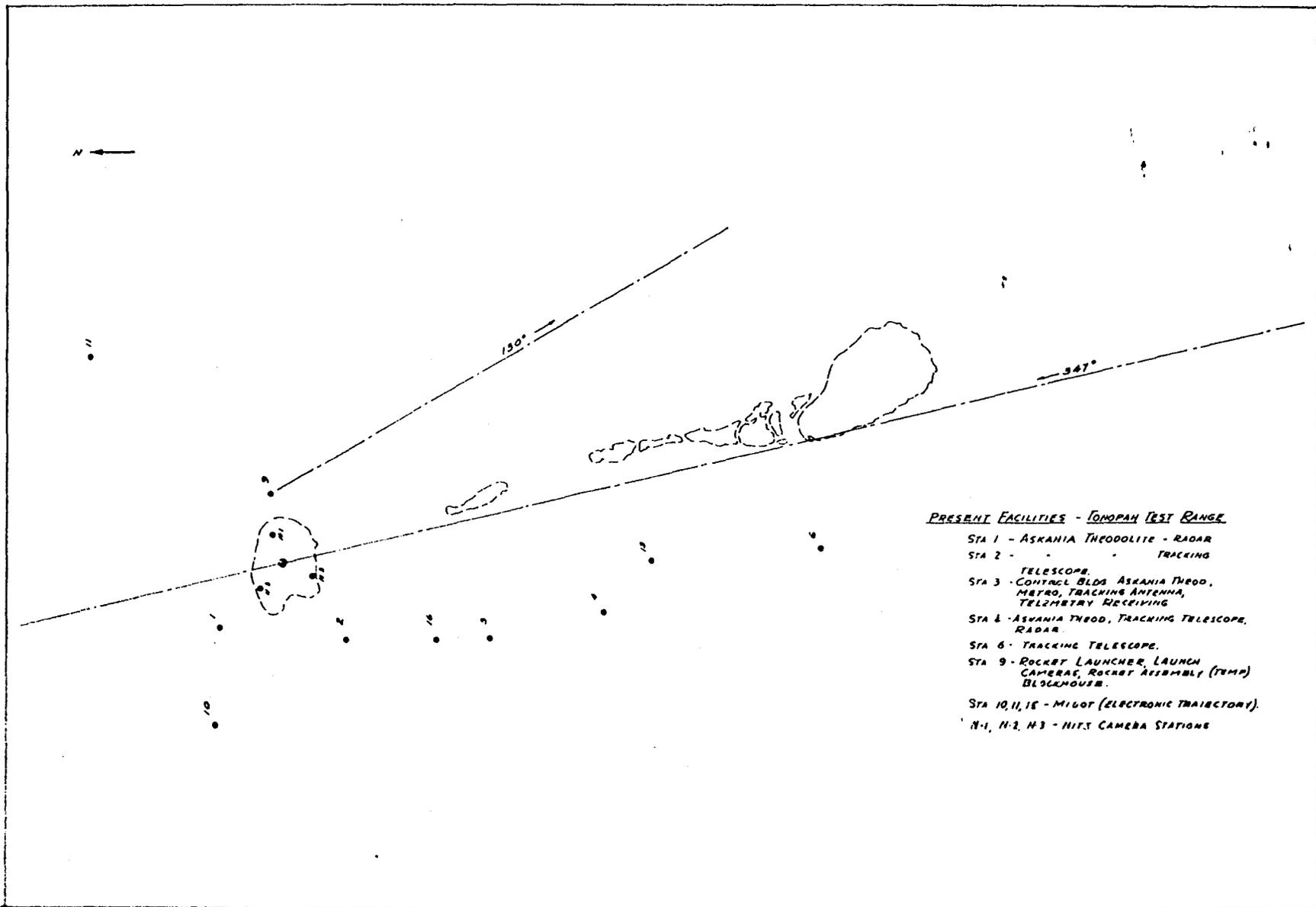
\$461,000

Expense Item

Concrete Target	\$385,000
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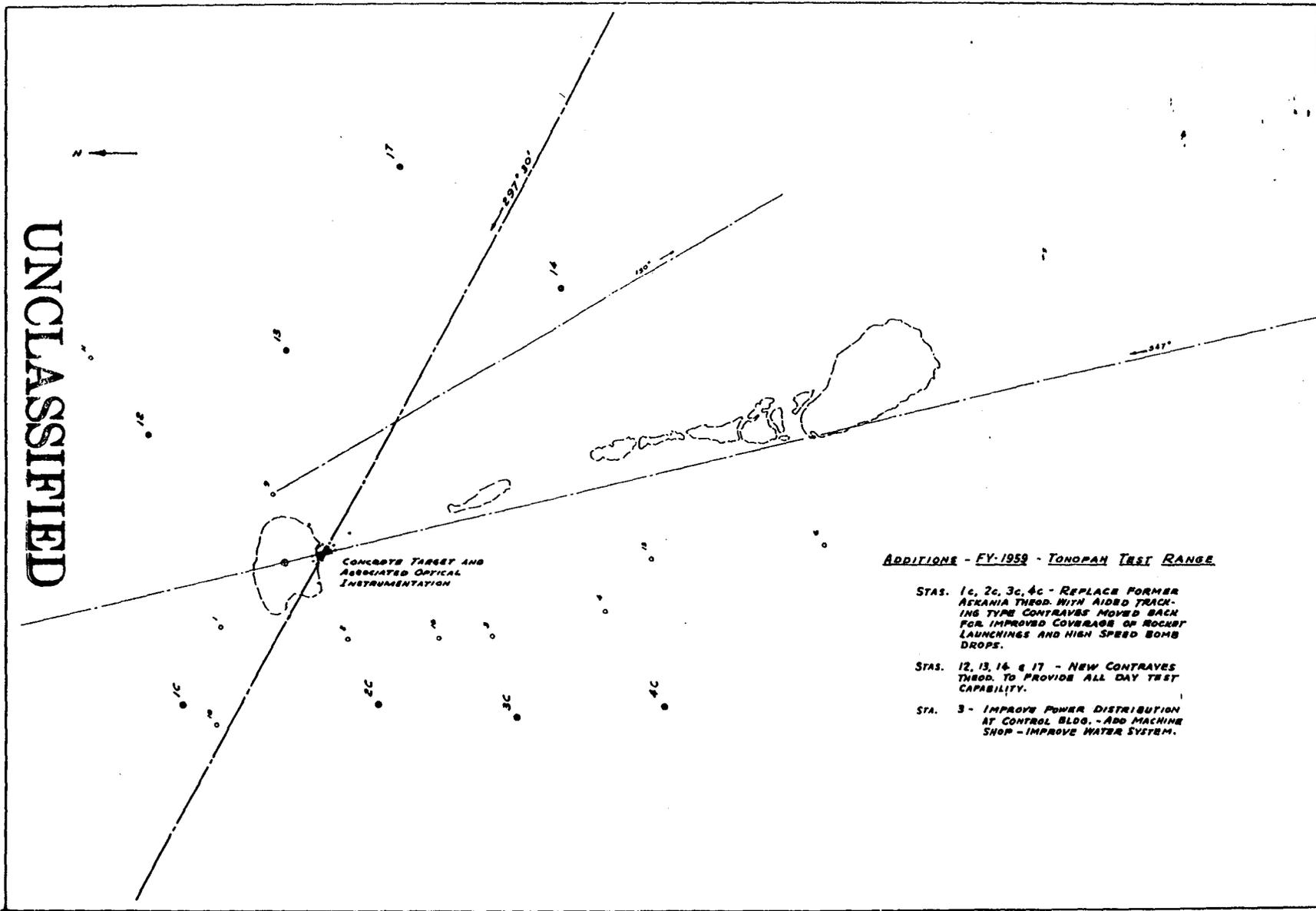
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ADDITIONS - FY-1959 - TONOPAH TEST RANGE

- STAS. 1c, 2c, 3c, 4c - REPLACE FORMER AERIAL TARGETS WITH AIDED TRACKING TYPE CONTRAVES MOVED BACK FOR IMPROVED COVERAGE OF ROCKET LAUNCHINGS AND HIGH SPEED BOMB DROPS.
- STAS. 12, 13, 14 & 17 - NEW CONTRAVES THROD. TO PROVIDE ALL DAY TEST CAPABILITY.
- STA. 3 - IMPROVE POWER DISTRIBUTION AT CONTROL BLDG. - ADD MACHINE SHOP - IMPROVE WATER SYSTEM.

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Budget for FY 1960

The FY'60 construction program will extend TTR's capability to acquire test data under programmed conditions involving higher test speeds, greater accelerations, and increased altitudes of both rockets and aircraft.

The construction budget is in two parts. Part I is for general range facilities, new telescope stations, a signal system, and a first-order survey.

Part II is for general construction, which will include a prefab metal building to replace the inflated building now at the rocket-launch site. Also included is a hazardous-assembly building for rocket preparation. Among necessary water-system additions is a new well. Sprinkler systems, yard hydrants, a fire pump, and a 50,000-gallon elevated water-storage tank are included under fire protection. The item for roads includes about 20 miles of double-penetration asphalt paving on a road from U.S. Highway 6 to the control point. Approximately 20 miles of this would be re-paving of an existing country road, which is in very poor condition and will probably be nearly destroyed by the vehicles used during the FY'59 construction program. Also included in the budget is an item for door alarms and for permanent chain-link security fencing with adequate fence- and area-lighting at the control point.

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Tonopah Test Range
Proposed FY 1960 Construction Budget

Plant Construction Items

Part I - General TTR Instrumentation Emplacements

4 Tracking Telescope Bases	\$ 40,000	
4 Equipment Bldgs. @ Tracking Telescopes	12,000	
Signal System	40,000	
FPS-16 Radar Facility	75,000	
1st Order Survey	25,000	
Contingencies	25,000	
A & E Fees	<u>20,000</u>	\$237,000

Part II - General Construction

Butler Bldg. to Replace Air Bldg. at Rocket Launch Site	\$ 50,000	
Hazardous Assembly Bldg.	50,000	
Water Systems Additions	30,000	
Fire Protection	50,000	
Roads including Paved Road from Highway 6 to Station 3	170,000	
Security Fencing, Lighting & Alarm	15,000	
Contingencies	36,500	
A & E Fees	<u>30,000</u>	\$431,500

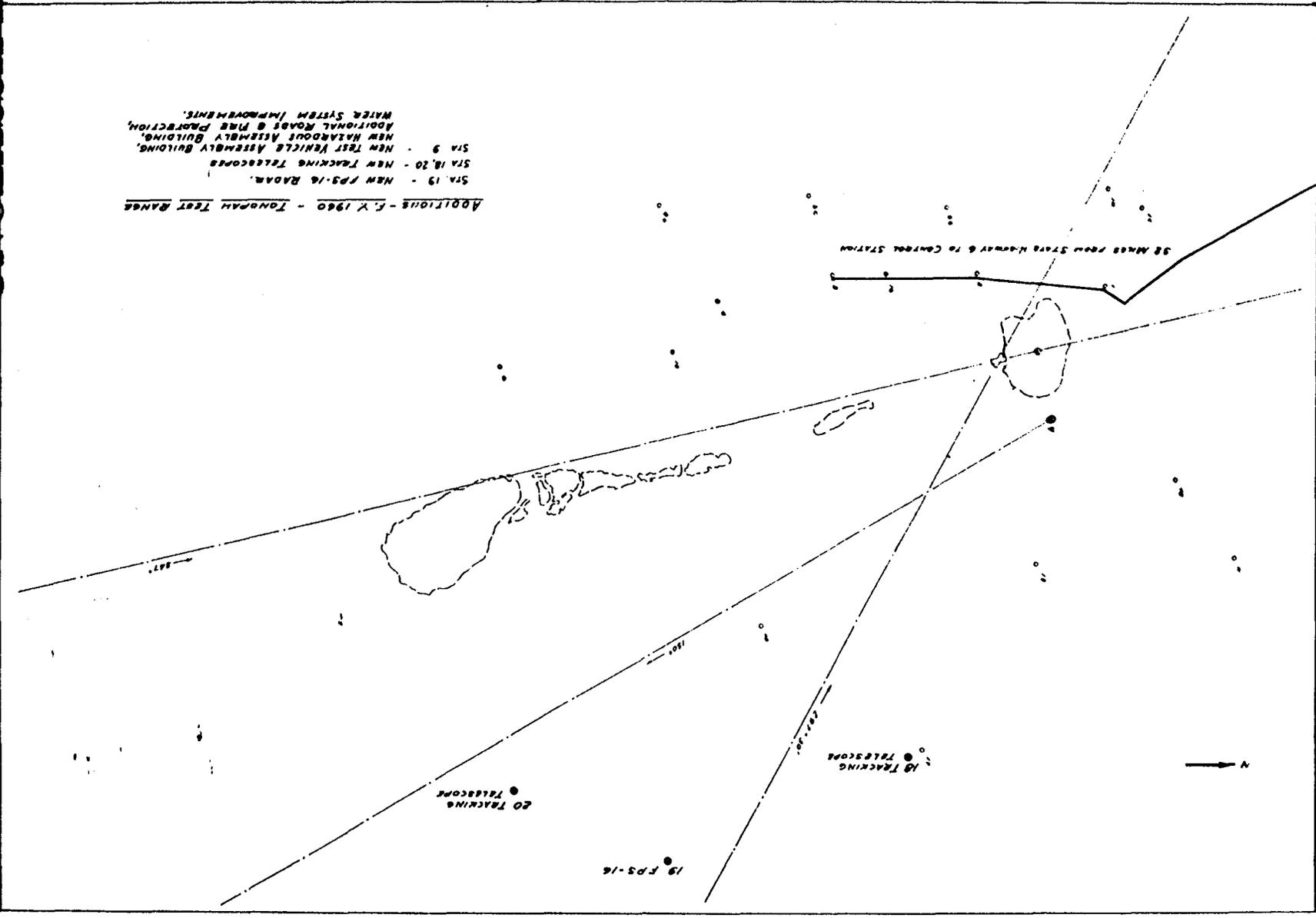
Total Construction Plant FY'60

\$668,500

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ADDITIONS - F.Y. 1960 - ZONPAH TEST RANGE
 STA. 19 - NEW FPS-16 RADAR.
 STA. 18, 20 - NEW TRACKING TELESCOPES
 STA. 9 - NEW TEST VEHICLE ASSEMBLY BUILDING,
 NEW HAZARDOUS ASSEMBLY BUILDING,
 ADDITIONAL ROADS & FIRE PROTECTION,
 WATER SYSTEM IMPROVEMENTS.



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Budget for FY 1961

Present planning establishes FY '61 as the year in which the major construction program will be completed which will make TTR Sandia Corporation's primary and permanent testing facility, with capabilities for Mach 3 bomb releases at 30,000 feet. The need for \$923,000 is estimated. Provisions are in the budget to increase the administrative and technical facilities necessary for full-time operation of TTR. The 347/167-degree flight-line instrumentation will be extended to and possibly beyond the present southern boundary of TTR to meet the requirements of Mach 3 programs. The rocket-testing facility will also be expanded.

A tentative sum of \$750,000 is established for FY '62 which will provide for (1) a central electrical power and distribution system; (2) some expansion to the rocket-launching complex, and (3) additional uprange signal lines and access roads to meet the needs of improved ground instrumentation currently under development for use in the higher-mach test programs expected to be encountered beyond this date.

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Tonopah Test Range
Proposed FY 1961 Construction Budget

Plant Construction Items

Part I - General TTR Instrumentation Emplacements

Optical Instrumentation Sites for High Altitude Rocket Launchings	\$ 75,000	
6 Uprange Trajectory Stations	90,000	
Uprange Remote Telemetry Facility	25,000	
Uprange Signal System	100,000	
Contingencies	<u>45,000</u>	\$335,000

Part II - General Construction

Administration Bldg. at Control Point	\$115,000	
Explosive Igloo	30,000	
Modernize Blockhouse and Rocket-Launching Site	230,000	
Security Fence and Lighting	10,000	
Addition to Fire Protection	15,000	
Addition to Water System	35,000	
Roads to New Sites	50,000	
Engineering and Design	50,000	
Contingencies	<u>53,000</u>	\$588,000

Total Construction Plant FY'61

\$923,000

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APPENDIX E

Salton Sea Investment
as of January 1, 1959

Test Range Facilities

Buildings & Structures		\$1,131,568.71
Improvements to Land		331,173.67
Utility Systems		
Communications	82,999.30	
Electrical	375,752.13	
Fire Alarm	25,280.02	
Sewerage	16,075.76	
Water	<u>146,526.08</u>	
Total Utility Systems		<u>646,633.29</u>
Total General Construction		<u>\$2,109,375.67</u>

Note: These figures exclude all items which can be readily identified as community items, such as lodge, swimming pool, houses, apartments, dike, and landscaping. Also excluded is Building #70, used exclusively by 5500.

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APPENDIX F

SSTB Standby Maintenance After 1960

(NOTE: The following estimates are tentative, and subject to downward revision depending on the level of activity at given points in the test schedule.)

Minimum Personnel

	<u>Land and Water Drops No Dog Site</u>	<u>Water Drops only No Dog Site</u>
Supervisor in charge	1	1
Secretary	1	1
Clerks (shipping, receiving, etc.)	1	1
(1) Plumber, Carpenter, Electrician, Painter, Air-Conditioning, Water Treatment	5	5
(2) Motor Pool Mechanic	1	1
Heavy equipment operators	3	1
(3) Security and Fire (Incl. 4 Sergeants)	13*	13*
	—	—
	25	23

- (1) A new job description should be written for a general maintenance employee covering all six functions.
 - (2) For servicing and minor repairs only.
 - (3) A new job description would be required covering both functions.
- * Can be reduced by at least 5 people, if no classified items remain at the site.

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Minimum Vehicles

	<u>Present</u>	<u>Proposed</u>
Station Wagon	1	1
Sedan	2	2
Ambulance	1	0
Jeep	1	0
Trucks		
3/4 T and Light Duty	24	10
1 and 1-1/2 T	6	0
3 T	1	0
5 T and over	4	1 (Water Tank)
Crane	1	1 (For recoveries)
Carryalls	5	3
Buses	<u>3</u>	<u>2</u>
	49	20

Reduction in personnel would, of course, follow the procedures specified in the agreements with the three Sandia bargaining units (Metal Trades Council, Office Workers, and Guards). Employees to be laid off because of lack of work must be selected in the inverse order of seniority; must be considered for existing vacancies within their bargaining units provided they have previously performed similar duties or have had other Sandia jobs with the same basic requirements; or, if not so placed, be privileged to displace an employee in successively lower grades in the bargaining unit, subject to these same requirements. Stewards and Chief Stewards have top seniority so long as there is work remaining that they are capable of performing.

In other words, employees laid off at Dalton Sea would have the right to displace ("bump") less senior employees in their respective bargaining units occupying the same kinds of jobs, provided they would care to come to Albuquerque and exercise this right. The "bumping" right does not apply to Livermore, or any other place than Albuquerque. No offer of payment for moving or traveling expenses need be made to such employees.

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Union-Represented Employees

	<u>Present</u>	<u>Proposed</u>	<u>Excess</u>	<u>No. of SSTB Excess Employees Who Could Displace Abq. Employees</u>
<u>Guards Unit</u>				
Guards (1)	17)	13	12	9
Fireman (2)	8)			
<u>Office & Clerical Unit</u>				
Clerical	8	1	7	7
<u>Metal Trades Council</u>				
Maintenance,	33	9	24	19
Supply & Service	—	—	—	—
	66	23	43	35

- (1) Can be placed only at Albuquerque; a Contract Guard Service is used at Livermore.
- (2) No "fireman" classification exists at Sandia.

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APPENDIX G

Location of Sandia Corporation Tests

Year	SSTB			TTR and Its Predecessors							Total No. (%)	Total	
	Water Target	Land Target	Total No. (%)	Edwards AFB Land Target		Tonopah Test Range		Ground Launched	Chinicoteague Concrete				
				Chute Retarded	Free Fall*	Yucca Lake Land Target	Land Target	Baskets	Target				
1950	151		151	100							0	0	151
1951	148	8	156	72		59					59	20	215
1952	135	4	139	71	3	72	3				78	29	267
1953	113	19	132	76	39	8					38	22	170
1954	99		99	73	17	16	3				36	27	135
1955	41	3	44	37	24	18	32				74	63	118
1956	64	45	109	70	14	7	26				47	30	156
1957	42	36	78	59	2	3		38	5	6	54	41	132
1958	15	50	65	32				55	51	31	137	68	202

* These tests would normally have been conducted on the water target at SSTB. They were conducted at Edwards AFB as a joint effort with the Air Force to acquire early bombing table data coincidental with weapon development data.

Yucca Lake was first Sandia Corporation interim land range. Activities were moved to TTR.

Chinicoteague was first interim concrete target. Activities now transferred to Dalhart with plans underway to relocate at TTR.

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