NOAA Technical Memorandum NOS NGS-2

FINAL REPORT ON RESPONSES TO GEODETIC DATA QUESTIONNAIRE

John F. Spencer, Jr.

National Geodetic Survey
Rockville, Md.
March 1976

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UNITED STATES
DEPARTMENT OF COMMERCE
Elliot L. Richardson, Secretary

NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator

National Ocean
Survey
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ABSTRACT. Prior to the mailing of the geodetic data questionnaires and information packets to every licensed land surveyor in the U.S., there was virtually no information available to the National Geodetic Survey that could be used to evaluate user requirements for geodetic data or to determine surveyor awareness of its availability from this office.

This office's evaluation of responses to the questionnaire is contained herein. The results of this evaluation will have considerable influence on the development of programs and priorities by the National Geodetic Survey of the National Ocean Survey, National Oceanic and Atmospheric Administration.

INTRODUCTION

The primary mission of the National Geodetic Survey Information Center (NGSIC) is the collection, publication, and dissemination of geodetic data. To evaluate this program and determine interest within the user public, a questionnaire and geodetic data information packet (appendix 1), were distributed to all licensed land surveyors in the U.S. (approximately 36,000). Based on approximately 6,000 responses NGSIC received, we suggest:

(1) new programs be developed to respond to surveyor's needs,
(2) increased participation in recovery information and mark maintenance assistance will save the National Geodetic Survey time and money,
(3) information from this survey will assist the NGSIC in devising an automated system for efficient data dissemination, and
(4) follow-up action will be directed toward those areas that were unaware of various NGSIC services.

IMPLEMENTATION

Mailing began in September 1973, after approval by the Office of Management and Budget. The mailings were originally scheduled over a 24-month period; however, because of high interest in the program, and the enthusiasm of the Information and Distribution Branch, NGSIC, the last mailing was completed October 1974. For its concerted effort in handling these mailings, the NOAA Unit Citation was awarded to the Information and Distribution Branch, NGSIC, and each member of the Branch received a cash award.

Appendix 2 contains a list by States, of the units mailed, and the response to the mailing (table 8). As responses to the questionnaire were received, a computer generated listing of comparative and accumulative statistics was tabulated. (For sample computer listings, see figures 5 and 6, appendix 2.) The evaluation of responses is discussed in the next section.

ANALYSIS OF RESPONSES

Analyses of responses to the questionnaire are presented under the next five headings and the Summary section. Questions are grouped as they apply to the procedure under discussion. Table 1 lists the percentages of "yes" responses by each State to the 20 questions of the questionnaire.

1. Availability of Data and Ordering Procedures

A. Question 1. Were you previously aware of data available from NGS?

Approximately 73% of all land surveyors answered yes, with a maximum of 91% from Maryland and minimums of 58% from Connecticut and New Hampshire (table 1).

Analysis based on percentages:*

Mean = 73

σ_s = 6.9 (σ_s, standard deviation)

$2\sigma_s$ = 13.8

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*Statistics of questionnaire results are based on percentages of affirmative responses by State; i.e., mean is the average of total collective "yes" responses by State; the standard deviation is $\sigma_s = \pm[\Sigma v^2/n-1]^{\frac{1}{2}}$, where v is equal to the number of responses from each State minus the mean; n is equal to 50 (total number States); and Σv^2 is the sum of the v's squared for the 50 States.

Table 1.--Yes responses by States to questions 1 through 20 (in percent)

State	Question no. 1	2	3	4	5	6	7	8	9	10
Ala.	66	35	45	06**	05	43	22	68	34	41
Alaska	74	43	31	20	10	23	39	71	33	52
Ariz.	77	44	28	07	4	26	44	77	33	44
Ark.	70	35	43	11	8	41	31	70	24	34
Calif.	84	51	38	28	16	32	44	75	30	51
Colo.	64	36	34	17	9	45	31	70	34	46
Conn.	58**	14**	42	09	3	41	17**	48**	30	24
Del.	65	47	47	29	12	47	29	71	35	24
Fla.	76	46	42	21	12	46	37	73	29	40
Ga.	75	37	41	12	7	53	29	67	37	44
Hawaii	65	46	54	08	0**	58*	23	65	27	38
Idaho	78	50	28	11	6	44	28	83*	50*	33
Ill.	83	64	64*	37*	17	58*	52*	66	22	53
Ind.	77	51	50	24	35*	42	40	73	27	40
Iowa	68	47	35	18	7	31	41	65	32	34
Kans.	75	46	32	17	3	39	34	69	29	53
Ky.	75	40	30	8	5	34	29	70	30	41
La.	64	44	42	20	10	29	35	67	28	36
Maine	59	25	23	9	2	43	18	68	28	41
Md.	91*	65*	44	14	9	40	33	58	47	37
Mass.	64	33	31	11	5	39	25	62	36	30
Mich.	71	43	42	14	4	40	33	64	24	38
Minn.	74	41	38	12	3	32	38	65	24	38
Miss.	79	53	57	21	14	41	49	79	20	34
Mo.	67	41	39	14	5	38	39	65	33	39
Mont.	79	54	38	21	5	41	49	72	23	46
Nebr.	77	51	56	21	8	38	51	72	33	44
Nev.	76	50	50	24	19	48	40	76	19	52
N.H.	58**	34	24	17	7	32	19	56	24	34
N.J.	61	28	38	8	4	35	21	54	38	27
N.Mex.	68	40	37	26	13	34	34	68	32	41
N.Y.	73	44	37	18	8	31	27	57	27	34
N.C.	73	39	34	14	4	52	27	66	32	27
N.Dak.	71	46	43	21	14	21**	43	82	14**	50
Ohio	66	34	31	11	7	28	33	66	27	22**
Okla.	71	39	30	18	4	32	40	72	32	46
Oreg.	74	44	38	19	12	29	38	65	26	36
Pa.	69	46	33	18	7	28	35	66	26	37
R.I.	67	26	19**	15	19	48	26	59	26	22**
S.C.	73	38	27	8	4	42	31	69	38	36
S.Dak.	71	54	39	18	4	32	39	75	36	36
Tenn.	68	31	25	8	2	42	25	68	42	31
Tex.	79	56	45	26	11	42	46	74	30	49
Utah	70	36	36	11	11	55	23	75	14**	41
Vt.	71	38	27	19	19	44	27	69	21	29
Va.	81	48	49	16	11	43	41	70	28	44
Wash.	76	44	33	17	9	38	35	65	30	36
W.Va.	74	55	35	13	10	35	35	71	45	58*
Wisc.	77	52	44	18	6	36	34	67	32	37
Wyo.	80	41	43	18	11	43	39	77	30	52
Mean of Yes Responses	73	43	37	17	9	39	35	68	29	39

*Maximum
**Minimum

Table 1.--Continued

State	Question no. 11	12	13	14	15	16	17	18	19	20
Ala.	39	11	48	53	89	59	91	25	29	20
Alaska	52	33	41	69	89	79*	95	29	34	25
Ariz.	54	33	40**	47	94	68	96	21	40	21
Ark.	46	19	55	61	94	60	94	25	30	36
Calif.	43	36	47	68	92	71	95	35	41	30
Colo.	49	29	57	51	94	56	96	21	39	34
Conn.	67	15	48	44	91	59	94	14	30	29
Del.	65	41*	71	59	76**	53	88	6**	29	35
Fla.	50	30	60	58	91	59	94	29	32	23
Ga.	58	24	69	60	95	59	96	19	41	30
Hawaii	77*	27	69	65	92	50	92	15	54	38
Idaho	72	27	78*	72	100*	61	100*	28	39	39
Ill.	49	37	68	68	98	69	98	39	58*	40
Ind.	49	29	45	70	97	70	97	33	38	26
Iowa	44	24	51	60	92	67	91	30	31	27
Kans.	56	30	56	56	95	61	97	31	24	29
Ky.	42	23	49	61	92	62	91	21	38	31
La.	42	32	43	55	88	66	87	19	25	22
Maine	54	23	45	55	90	58	92	19	31	24
Md.	60	35	51	56	93	65	98	33	30	19
Mass.	55	22	51	48	82	53	86	24	34	24
Mich.	32**	27	53	59	95	56	97	28	43	30
Minn.	44	32	44	62	91	71	91	32	38	24
Miss.	51	43	61	73*	93	74	97	41*	21	21
Mo.	41	24	49	60	89	63	91	29	33	25
Mont.	38	36	54	62	92	77	90	33	31	18
Nebr.	56	23	56	69	97	67	97	26	36	26
Nev.	43	31	62	45	83	52	93	24	19	26
N.H.	46	12	56	34**	90	63	92	15	37	24
N.J.	58	10	51	41	84	50	86	32	27	27
N.Mex.	50	32	40**	60	85	63	87	24	32	24
N.Y.	42	24	49	54	86	59	88	25	37	29
N.C.	64	25	59	54	91	59	91	21	34	23
N.Dak.	32**	21	46	57	89	71	93	39	29	25
Ohio	39	19	40	50	82	58	83**	13	28	25
Okla.	57	30	49	52	93	65	94	22	24	26
Oreg.	45	36	45	59	86	64	91	31	36	26
Pa.	51	26	46	57	89	63	91	22	30	27
R.I.	63	19	48	52	89	52	89	19	15**	11**
S.C.	61	15	52	41	90	53	92	14	36	30
S.Dak.	50	29	46	71	93	71	89	36	21	36
Tenn.	62	8**	55	49	90	67	95	15	36	25
Tex.	42	35	52	57	90	64	94	34	31	27
Utah	59	27	70	61	95	66	95	16	55	41*
Vt.	46	23	40**	54	90	60	92	17	35	27
Va.	53	25	60	47	91	49**	93	27	42	28
Wash.	49	30	49	66	84	62	89	36	42	31
W.Va.	55	23	61	61	97	68	97	26	35	29
Wisc.	42	23	55	69	92	72	94	32	37	32
Wyo.	59	34	50	61	93	70	95	27	23	16
Mean of Yes Responses	51	27	53	57	91	62	93	26	34	27

*Maximum
**Minimum

Connecticut, New Hampshire, and Maine exceeded the $-2\sigma_s$; Alabama, Colorado, Delaware, Hawaii, Louisiana, Massachusetts, New Jersey, and Ohio exceeded the $-\sigma_s$. Therefore, it is assumed the northeastern sector of this country is the one most unaware of the data availability from NGS. These States should be given highest priority on follow-up contracts, which are now in the planning stages.

B. Question 2. Were you aware of how to order these data?

Approximately 43% of all land surveyors answered yes, with a maximum of 65% from Maryland and a minimum of 14% from Connecticut (table 1).

Analysis based on percentages:

Mean = 43

σ_s = 9.6

$2\sigma_s$ = 19.2

$3\sigma_s$ = 28.8

Connecticut exceeded the $-3\sigma_s$; Maine, Massachusetts, New Jersey, Rhode Island, and Tennessee exceeded the $-\sigma_s$. Therefore, it is assumed the northeastern sector of this country is the most unaware of how to order these data from NGS. This is in agreement with the replies to question 1. However, the important factor to be inferred from the answers to this question is that the comparison of the mean values of questions 1 and 2 shows approximately one-half of the users who know of data availability from NGS really understood how to order these data. By enclosing the geodetic data information packet with the questionnaire, it was anticipated that most of the users of these data would understand the NGS ordering system. However, additional contacts with the users of geodetic control are planned, primarily through the NGS mark maintenance engineers, State advisors, and mobile field parties.

C. Question 7. Were you familiar with the 30' quad system of ordering data?

Approximately 35% of all land surveyors answered yes with the maximum of 52% from Illinois and the minimum of 17% from Connecticut (table 1).

Analysis based on percentages:

Mean = 35

σ_s = 8.5

$2\sigma_s$ = 17.0

Connecticut exceeded the $-2\sigma_s$; Alabama, Hawaii, Maine, Massachusetts, New Hampshire, New Jersey, Rhode Island, Tennessee, and Utah exceeded the $-\sigma_s$. These results are fairly consistent with the results of question 2. The comparison of mean results of questions 2 and 7 shows that 43% "thought" they understood how to order data whereas 35% "actually" understood how to order data using the 30' quad system. Here again, the information packet enclosed with the questionnaire explained the 30' quad system, and the results are evident by the responses to question 8.

D. Question 8. Do you find the 30' quad system acceptable for ordering?

Approximately 68% of all land surveyors answered yes, with a maximum of 83% from Idaho and a minimum of 48% from Connecticut (tables 1 and 2).

Analysis based on percentages:

Mean = 68

σ_s = 6.8

$2\sigma_s$ = 13.6

Connecticut and New Jersey exceeded the $-2\sigma_s$; Maryland, New Hampshire, New York and Rhode Island exceeded the $-\sigma_s$. The inference to be gained from these statistics is in direct relationship with the 30' quad conversion program of the geodetic control data. The horizontal and vertical control data for the above States have not both been converted to the new system.

Conversely, Idaho and North Dakota exceeded the $+2\sigma_s$; California, Mississippi, Nevada, South Dakota, Utah, and Wyoming exceeded the $+\sigma_s$. The horizontal control of these States has all been converted to the 30' quad system and, with the exception of Mississippi and Nevada, all of the vertical control data have also been converted.

The status on July 1, 1975, of conversion to 30' quad publication systems for vertical and horizontal control data is depicted in figures 1 and 2, respectively. The comparison of mean results of questions 7 and 8 is most important. Only 35% responded yes to question 7. However, after reviewing the enclosed information packet, 68% responded yes to question 8. To show the degree of understanding and acceptance of the 30' quad system, a comparison by States is given in table 2.

Table 2.--Yes responses to questions 7 and 8, and comparison, *Δ(8-7), indicating increased understanding and acceptance (in percent).

State	7	8	Δ(8-7)	State	7	8	Δ(8-7)
Ala.	22	68	46	Mont.	49	72	23
Alaska	39	71	32	Nebr.	51	72	21
Ariz.	44	77	33	Nev.	40	76	36
Ark.	31	70	39	N.H.	19	56	37
Calif.	44	75	31	N.J.	21	54	33
Colo.	31	70	39	N. Mex.	34	68	34
Conn.	17 (min)	48 (min)	31	N.Y.	27	57	30
Del.	29	71	42	N.C.	27	66	39
Fla.	37	73	36	N. Dak.	43	82	39
Ga.	29	67	38	Ohio	33	66	33
Hawaii	23	65	42	Okla.	40	72	32
Idaho	28	83 (max)	55	Oreg.	38	65	27
Ill.	52 (max)	66	14	Pa.	35	66	31
Ind.	40	73	33	R.I.	26	59	33
Iowa	41	65	24	S.C.	31	69	38
Kans.	34	69	35	S. Dak.	39	75	36
Ky.	29	70	41	Tenn.	25	68	43
La.	35	67	32	Tex.	46	74	28
Maine	18	68	50	Utah	23	75	52
Md.	33	58	25	Vt.	27	69	42
Mass.	25	62	37	Va.	41	70	29
Mich.	33	64	31	Wash.	35	65	30
Minn.	38	65	27	W. Va.	35	71	36
Miss.	49	79	30	Wisc.	34	67	33
Mo.	39	65	26	Wyo.	39	77	38
				Mean	35	68	33

*Δ is used in this text to indicate a difference.

In all cases, responses to questions 7 and 8 indicated increased understanding and acceptance of the 30' quad system, which ranged from differential increases of 14% to 55%, the average being 33%. It is assumed from these comparisons and results of question 9, "Would you prefer to order a single station?", (table 1) to which an average of 71% answered no, most geodetic data users not only understand the 30' quad system of ordering but prefer to receive data in 30' quad booklets rather than as single stations. Since the user prefers to receive data by quad units, use of quad units greatly enhances the NGSIC automated system, and more efficiency will be realized in filling data requests and maintenance of records; the NGS adopted a new user-charge system on February 1, 1975.

2. Automatic Mailing Service

A. Question 3. Do you presently maintain a geodetic data file for your area?

Approximately 37% of all land surveyors answered yes, with a maximum of 64% from Illinois and a minimum of 19% from Rhode Island (table 1).

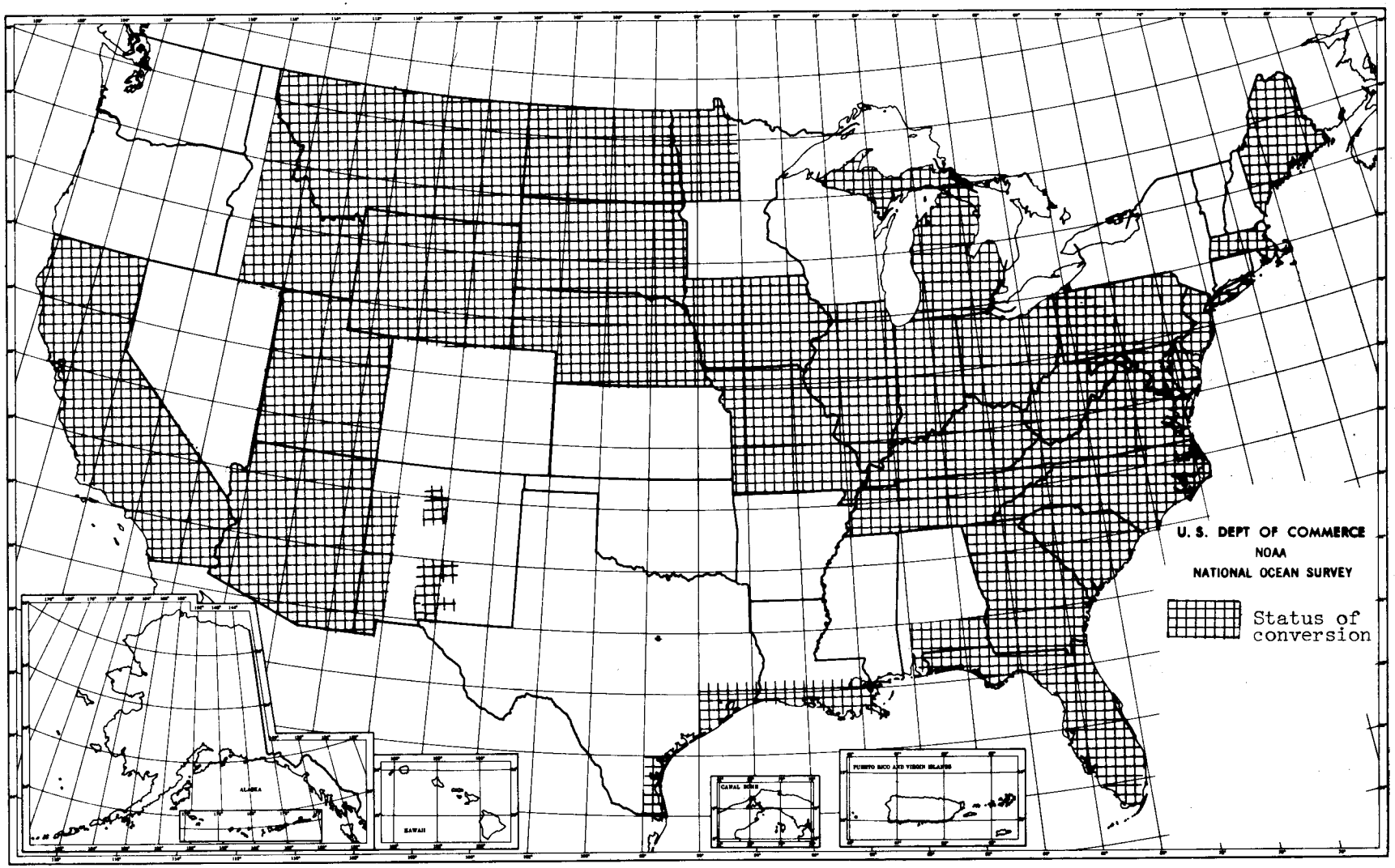

Figure 1.--Conversion to 30' quad publication system. Vertical control data as of July 1, 1975.

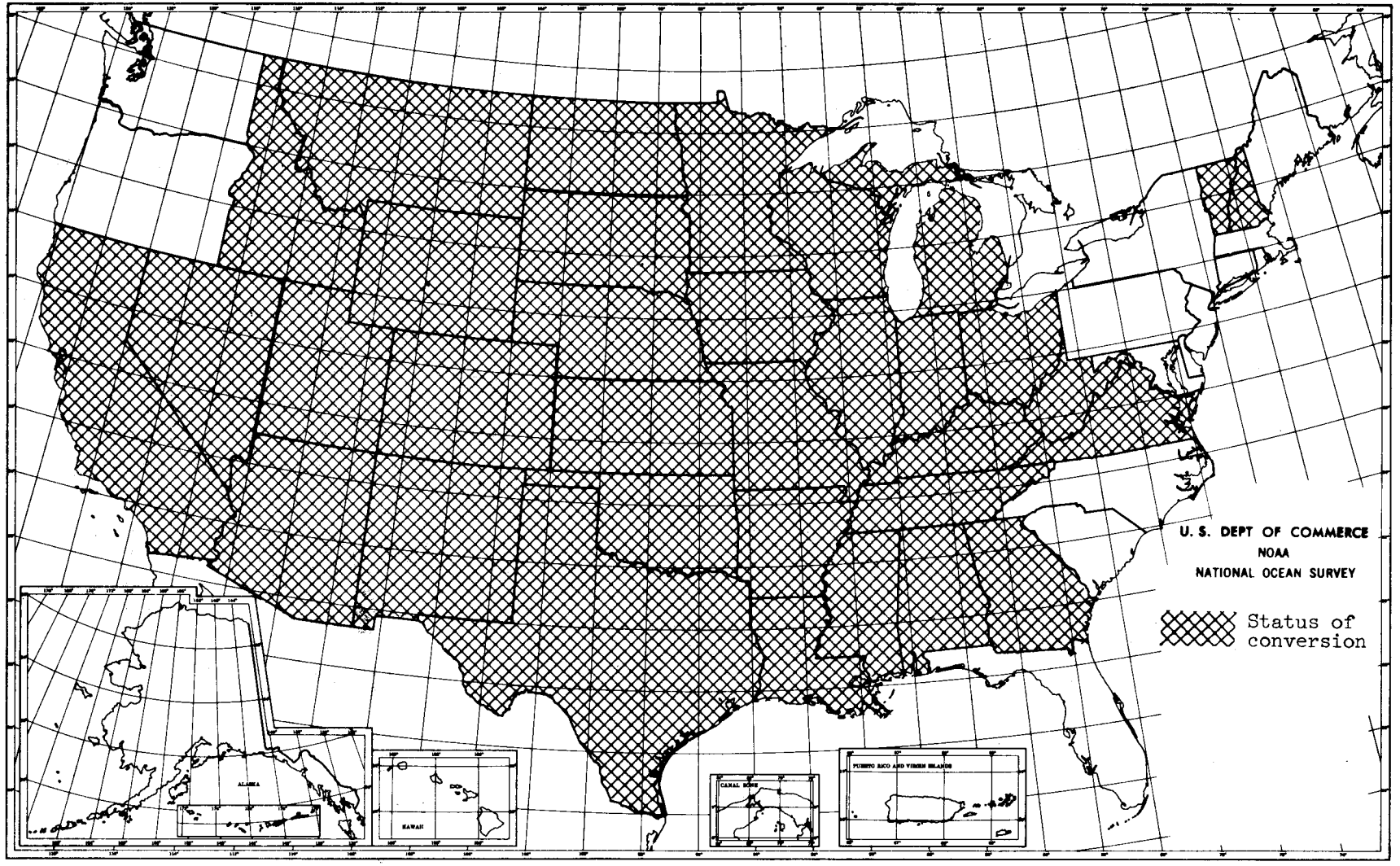

Figure 2.--Conversion to 30' quad publication system. Horizontal control data as of July 1, 1975.

Analysis based on percentages:

Mean = 37

σ_s = 9.2

$2\sigma_s$ = 18.4

The only discernible information to be reported concerning σ_s is that the New England States are less prone to maintain geodetic data files. There is a great degree of scatter throughout the Nation as to the extent to which land surveyors maintain geodetic data files. The important factor is that, according to responses to the questionnaire, 37% of all land surveyors do maintain geodetic data files.

B. Question 4. Were you previously aware of the NGS Automatic Mailing System?

Approximately 17% of all land surveyors answered yes, with the maximum of 37% from Illinois and the minimum of 6% from Alabama (table 1). The land surveyors of Alabama, Arizona, Connecticut, Hawaii, Kentucky, Maine, New Jersey, South Carolina, and Tennessee answered no to this question more than 90% of the time.

The indications from responses to this question are that this Nation's surveyors must be further informed of NGS's Automatic Mailing System through follow-up contacts by NGS Mark Maintenance engineer and State advisors, NGS geodetic field parties, NGS Information Center, professional society meetings, workshops, etc., in conjunction with fulfilling primary missions.

C. Question 5. Do you now subscribe to the Automatic Mailing System?

It is no surprise that the surveyors responded 91% negatively to this question considering the responses to question 4. The advantages of enclosing the geodetic information packet in mailing the questionnaire to all land surveyors are great when the responses to question 5 are compared with those to question 6. (Tables 1 and 3.)

D. Question 6. Do you plan to subscribe to the Automatic Mailing System?

Approximately 39% of all land surveyors answered yes, with a maximum of 58% from Illinois and Hawaii and a minimum of 21% from North Dakota. Even though this mean of 39% is much lower than NGS anticipates in the future, it still represents a differential improvement of 30% over the situation (tables 1 and 3).

Table 3.--Yes responses to questions 5 and 6, and comparison, Δ(6-5), indicating planned increases to subscription (in percent).

State	5	6	Δ(6-5)	State	5	6	Δ(6-5)
Ala.	5	43	38	Mont.	5	41	36
Alaska	10	23	13	Nebr.	8	38	30
Ariz.	4	26	22	Nev.	19	48	29
Ark.	8	41	33	N.H.	7	32	25
Calif.	16	32	16	N.J.	4	35	31
Colo.	9	45	36	N. Mex.	13	34	21
Conn.	3	41	38	N.Y.	8	31	23
Del.	12	47	35	N.C.	4	52	48
Fla.	12	46	34	N. Dak.	14	21 (min)	7
Ga.	7	53	46	Ohio	7	28	21
Hawaii	0 (min)	58 (max)	58	Okla.	4	32	28
Idaho	6	44	38	Oreg.	12	29	17
Ill.	17	58 (max)	41	Pa.	7	28	21
Ind.	35 (max)	42	7	R.I.	19	48	29
Iowa	7	31	24	S.C.	4	42	38
Kans.	3	39	36	S. Dak.	4	32	28
Ky.	5	34	29	Tenn.	2	42	40
La.	10	29	19	Tex.	11	42	31
Maine	2	43	41	Utah	11	55	44
Md.	9	40	31	Vt.	19	44	25
Mass.	5	39	34	Va.	11	43	32
Mich.	4	40	36	Wash.	9	38	29
Minn.	3	32	29	W. Va.	10	35	25
Miss.	14	41	27	Wisc.	6	36	30
Mo.	5	38	33	Wyo.	11	43	32
				Mean	9	39	30

The immediate results of the mailing with respect to the NGS automatic mailing system are graphically displayed below:

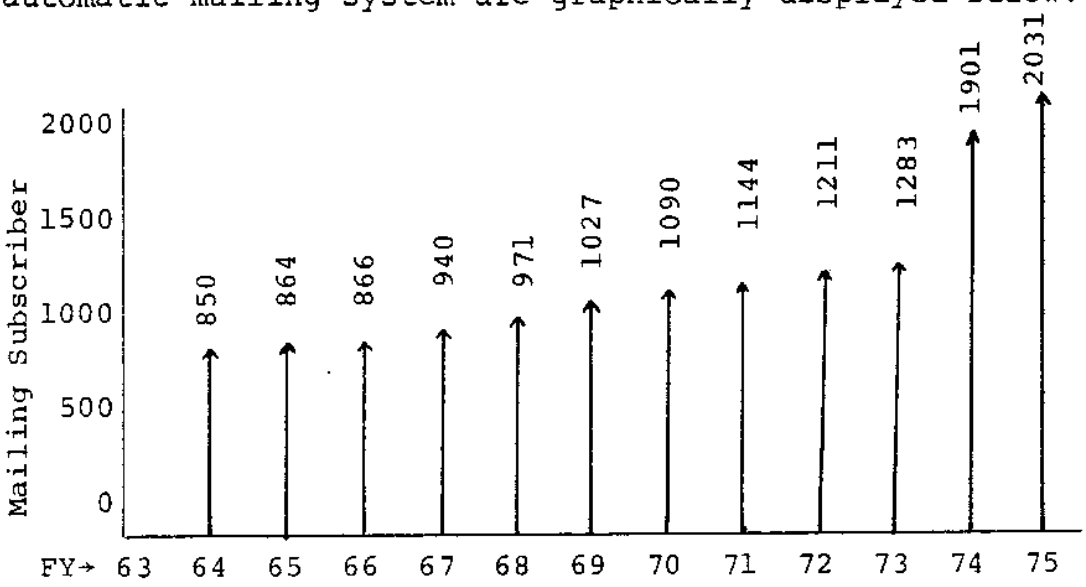

Figure 3.--Number of subscribers, shown by fiscal years.

The NGS automatic mailing system has been operational since FY 63. The number of subscribers has increased over the last 9 years at an average rate of 4%. However, because of the 1973 mailing to all land surveyors, the total number of new subscribers increased from 1283 in 1973 to 2013 in 1975, an average increase of 18%. This indicates not only that the users were not well informed of this service in the past, but also the dynamic need and requirement of such a system for this Nation's surveyors. It is anticipated that the average growth rate of subscribers will increase at a much greater rate as the Nation's surveyors realize where, when, and how they can obtain geodetic control data, and as the NGS awareness program to inform and assist users is improved through the State Geodetic Advisor program.

3. Control Diagrams and Unadjusted Data

A. Control Diagrams (questions 10 and 11)

The two major series of diagrams prepared and published by NGS are the Geodetic Control Diagrams (GCD) 1° × 2° (1:250,000) and the horizontal and vertical State Control Diagrams (various scales). These diagrams are used as cartographic indexes to geodetic control stations and networks. They are used primarily in survey project planning and control station selection. From all indications, neither series are used as often as anticipated. See responses in tables 1 and 4 to question 10, "Do you prefer the 1:250,000 Geodetic Control Diagrams?" and question 11, "Do you prefer the State Control Diagrams?". A reason for low responses (average of 39% yes for question 10 and 51% yes for question 11) could be a weakness in the questionnaire. A possible question should have been "Were you aware of the Geodetic Control Diagrams of NGS?" By not having such a question, we were not able to obtain information on who was knowledgable about the diagrams. Furthermore, the land surveyors did not receive copies of State Control or Geodetic Control Diagrams as part of the information packet. If these diagrams had been included, the cost of the mailing would have increased considerably. Since each diagram costs 50¢, the increased mailing cost would have been $36,000.

The following differential table (table 4) of mean comparisons indicates that in most cases, State Control Diagrams are preferred over GCD's.

Table 4.--Yes responses to questions 10 and 11, and comparison, Δ(11-10), indicating preference for State Control Diagrams over GCD's (in percent).

State	10	11	Δ(11-10)	State	10	11	Δ(11-10)
Ala.	41	39	-2	Mont.	46	38	-8
Alaska	52	52	0	Nebr.	44	56	+12
Ariz.	44	54	+10	Nev.	52	43	-9
Ark.	34	46	+12	N.H.	34	46	+12
Calif.	51	43	-8	N.J.	27	58	+31
Colo.	46	49	+3	N. Mex.	41	50	+9
Conn.	24	67	+43	N.Y.	34	42	+8
Del.	24	65	+41	N.C.	27	64	+37
Fla.	40	50	+10	N. Dak.	50	32 (min)	-18
Ga.	44	58	+14	Ohio	22 (min)	39	+17
Hawaii	38	77 (max)	+39	Okla.	46	57	+11
Idaho	33	72	+39	Oreg.	36	45	+9
Ill.	53	49	-4	Pa.	37	51	+14
Ind.	40	49	+9	R.I.	22 (min)	63	+41
Iowa	34	44	+10	S.C.	36	61	+25
Kans.	53	56	+3	S. Dak.	36	50	+14
Ky.	41	42	+1	Tenn.	31	62	+31
La.	36	42	+6	Tex.	49	42	-7
Maine	41	54	+13	Utah	41	59	+18
Md.	37	60	+23	Vt.	29	46	+17
Mass.	30	55	+25	Va.	44	53	+9
Mich.	38	32 (min)	-6	Wash.	36	49	+13
Minn.	38	44	+6	W. Va.	58 (max)	55	-3
Miss.	34	51	+17	Wisc.	37	42	+5
Mo.	39	41	+2	Wyo.	52	59	+7
				Mean	39	51	+12

To prove or disprove which series of diagrams are preferred and to assist this office in determining the best course of action to satisfy user needs in the most economical manner, a small random sample, 500 to 600, of university, State and Federal agencies, and professional societies concerned with surveying and mapping, should be taken. The results of this sampling could be used in combination with the results of this questionnaire.

From this questionnaire alone, it is quite evident that both series of diagrams must be maintained. The idea of replacing the State Control Diagrams with the GCD's is totally unjustifiable as indicated by responses of the primary users of such diagrams. However, consideration must be given to a more appropriate base that will satisfy a larger percentage of users and possibly replace both series now in use.

B. Unadjusted Geodetic Data - (Questions 12 and 13)

Unadjusted geodetic data may be defined as control data that have not been adjusted to, or adjusted as part of the National Horizontal and Vertical Networks for various reasons, such as more field data are required to complete particular projects, more observations are required to improve geometric relationships or accuracy of work, time lag between completion of field project and final adjustment. It is important to compare the responses to question 12, "Were you aware that unadjusted and unpublished data are available?" - 27% answered yes - and question 13, "Would you desire to receive such data?" - 53% answered yes (tables 1 and 5). Many of the users of geodetic data who previously were unaware of the availability of unadjusted and unpublished data desire to receive such data. Unadjusted data have always been available to the user. However, as indicated by responses, a very low percentage of users realized these data were available. Table 5 indicates these data are required by a surprisingly high percentage of users.

Table 5.--Yes responses to questions 12 and 13, and comparison, Δ(13-12), indicating increased requirement for unadjusted and unpublished data (in percent).

State	12	13	Δ(13-12)	State	12	13	Δ(13-12)
Ala.	11	48	+37	Mont.	36	54	+18
Alaska	33	41	+8	Nebr.	23	56	+33
Ariz.	33	40 (min)	+7	Nev.	31	62	+31
Ark.	19	55	+36	N.H.	12	56	+44
Calif.	36	47	+11	N.J.	10	51	+41
Colo.	29	57	+28	N. Mex.	32	40 (min)	+8
Conn.	15	48	+33	N.Y.	24	49	+25
Del.	41 (max)	71	+30	N.C.	25	59	+34
Fla.	30	60	+30	N. Dak.	21	46	+25
Ga.	24	69	+45	Ohio	19	40	+21
Hawaii	27	69	+42	Okla.	30	49	+19
Idaho	27	78 (max)	+51	Oreg.	36	45	+9
Ill.	37	68	+31	Pa.	26	46	+20
Ind.	29	45	+16	R.I.	19	48	+29
Iowa	24	51	+27	S.C.	15	52	+37
Kans.	30	56	+26	S. Dak.	29	46	+17
Ky.	23	49	+26	Tenn.	8 (min)	55	+47
La.	32	43	+11	Tex.	35	52	+17
Maine	23	45	+22	Utah	27	70	+43
Md.	35	51	+16	Vt.	23	40 (min)	+17
Mass.	22	51	+29	Va.	25	60	+35
Mich.	27	53	+26	Wash.	30	49	+19
Minn.	32	44	+12	W. Va.	23	61	+38
Miss.	43	61	+18	Wisc.	23	55	+32
Mo.	24	49	+25	Wyo.	34	50	+16
				Mean	27	53	+26

The information packet mailed with the questionnaire explained the availability of unadjusted data and, from all indications, it was noted in a most positive manner.

4. Mark Preservation Program

A. Question 14 - Were you aware of the NGS Mark Preservation Program?

Approximately 57% of all land surveyors answered yes, with a maximum of 73% from Mississippi and a minimum of 34% from New Hampshire (tables 1 and 6).

Analysis based on percentages:

Mean = 57

σ_s = 8.7

$2\sigma_s$ = 17.4

New Hampshire exceeded the $-2\sigma_s$; Arizona, Connecticut, Massachusetts, Nevada, New Jersey, South Carolina, and Virginia exceeded the $-\sigma_s$. From these results, it is evident the surveyors from these States are not very aware of the NGS Mark Preservation Program. Informing them will be given highest priority. Conversely, Alaska, California, Idaho, Illinois, Indiana, Mississippi, Nebraska, South Dakota, Washington, and Wisconsin exceeded the $+\sigma_s$ and are considered as the States most aware of the NGS Mark Preservation Program; low priority will be assigned to follow-up contacts. The importance of mailing information packets with the questionnaire is realized when comparing question 14 with question 15 - "Are you willing to assist NGS Engineers in the preservation program?" (Tables 1 and 6.) Approximately 91% of all land surveyors answered yes to question 15.

The Mark Preservation Program is the most cost-effective program of NGS. Through this initial mail contact with the surveyors of the Nation, and the resultant propagation of knowledge of the NGS Mark Preservation Program, it is anticipated that an ever-increasing cost avoidance will be realized. The mean comparison between questions 14 and 15 in table 6 indicates very favorable results.

B. Question 16 - Do you know how to report a monument in danger of being disturbed?

Approximately 62% of all land surveyors answered yes, with a maximum of 79% from Alaska and a minimum of 49% from Virginia (table 1).

Table 6.--Yes responses to questions 14 and 15, and comparison, Δ(15-14), indicating increased willingness to participate in Mark Preservation Program (in percent).

State	14	15	Δ(15-14)	State	14	15	Δ(15-14)
Ala.	53	89	36	Mont.	62	92	30
Alaska	69	89	20	Nebr.	69	97	28
Ariz.	47	94	47	Nev.	45	83	38
Ark.	61	94	33	N.H.	34 (min)	90	56
Calif.	68	92	24	N.J.	41	84	43
Colo.	51	94	43	N. Mex.	60	85	25
Conn.	44	91	47	N.Y.	54	86	32
Del.	59	76 (min)	17	N.C.	54	91	37
Fla.	58	91	33	N. Dak.	57	89	32
Ga.	60	95	35	Ohio	50	82	32
Hawaii	65	92	27	Okla.	52	93	41
Idaho	72	100 (max)	28	Oreg.	59	86	27
Ill.	68	98	30	Pa.	57	89	32
Ind.	70	97	27	R.I.	52	89	37
Iowa	60	92	32	S.C.	41	90	49
Kans.	56	95	39	S. Dak.	71	93	22
Ky.	61	92	31	Tenn.	49	90	41
La.	55	88	33	Tex.	57	90	33
Maine	55	90	35	Utah	61	95	34
Md.	56	93	37	Vt.	54	90	36
Mass.	48	82	34	Va.	47	91	44
Mich.	59	95	36	Wash.	66	84	18
Minn.	62	91	29	W. Va.	61	97	36
Miss.	73 (max)	93	20	Wisc.	69	92	23
Mo.	60	89	29	Wyo.	61	93	32
				Mean	57	91	34

Analysis based on percentages:

Mean = 62

σ_s = 7.3

$2\sigma_s$ = 14.6

No state exceeded the $-2\sigma_s$; Delaware, Hawaii, Massachusetts, Nevada, New Jersey, Rhode Island, South Carolina and Virginia exceeded the $-\sigma_s$. Conversely, Arizona, California, Indiana, Minnesota, Mississippi, North Dakota, South Dakota, Wisconsin, and Wyoming exceeded the $+\sigma_s$. These results indicate States least and most aware, respectively, of how to report a monument in danger of being disturbed. These, in conjunction with other results of the questionnaire, will be used to determine the priority list of follow-up contacts (as explained in the report summary) and planned actions.

By comparing responses to question 16 above with question 18, "Have you previously submitted such reports?" (table 1), the need for immediate action is indicated. Even though 62% of the surveyors knew how to report endangered marks, only 26% actually submitted such reports. However, because of this mailing of information packets and questionnaires to the land surveyors, considerable improvement in the situation is indicated. More surveyors understand the procedures and actually plan to submit "Report on Condition of Survey Marker" reports. Table 7 shows a comparison between questions 18 and 17, "When applicable, are you willing to submit 'Report on Condition of Survey Marker' cards?" and the responses indicate this willingness.

Table 7.--Yes responses to questions 17 and 18, and comparison, Δ(17-18), indicating willingness of land surveyors to report on condition of survey markers (in percent).

State	17	18	Δ(17-18)	State	17	18	Δ(17-18)
Ala.	91	25	66	Mont.	90	33	57
Alaska	95	29	66	Nebr.	97	26	71
Ariz.	96	21	75	Nev.	93	24	69
Ark.	94	25	69	N.H.	92	15	77
Calif.	95	35	60	N.J.	86	32	54
Colo.	96	21	75	N. Mex.	87	24	63
Conn.	94	14	80	N.Y.	88	25	63
Del.	88	6 (min)	82	N.C.	91	21	70
Fla.	94	29	65	N. Dak.	93	39	54
Ga.	96	19	77	Ohio	83 (min)	13	70
Hawaii	92	15	77	Okla.	94	22	72
Idaho	100 (max)	28	72	Oreg.	91	31	60
Ill.	98	39	59	Pa.	91	22	69
Ind.	97	33	64	R.I.	89	19	70
Iowa	91	30	61	S.C.	92	14	78
Kans.	97	31	66	S. Dak.	89	36	53
Ky.	91	21	70	Tenn.	95	15	80
La.	87	19	68	Tex.	94	34	60
Maine	92	19	73	Utah	95	16	79
Md.	98	33	65	Vt.	92	17	75
Mass.	86	24	62	Va.	93	27	66
Mich.	97	28	69	Wash.	89	36	53
Minn.	91	32	59	W. Va.	97	26	71
Miss.	97	41 (max)	56	Wisc.	94	32	62
Mo.	91	29	62	Wyo.	95	27	68
				Mean	93	26	67

5. Future Data Products

A. Question 19. "Would you desire recommended NGS specifications for: 1:100,000 Traverse; 1:50,000 Traverse; 1:20,000 Traverse; 1:15,000 Traverse; 1:10,000 Traverse; or 1:5,000 Traverse?" was asked to ascertain whether any great differences occur in types of data needed or surveys performed with regard to desired accuracies. As anticipated, surveyor's needs were fairly equal between 1:100,000 to 1:5,000 with slightly more requirements toward the lower end of this range. Results from the questionnaire indicate that 44% of land surveyors require data of greater than or equal to 1:20,000 and 56% require data of less than 1:20,000. This substantiates the need for inclusion of third- or lower-order geodetic data in the NGS Data Base; this is now in the pilot test stages of design.

B. Question 20. "If available, would you prefer data to be furnished as: Paper copy; Microfiche; Microfilm; Magnetic tape; or other (indicate form)?" This question was asked to determine future user needs with regard to type media on which data are available. The results are as follows: paper copy, 95.1%; microform (microfilm or microfiche), 4.8%; magnetic tape, 0.1%.

The percentages clearly indicate that land surveyors are primarily interested in paper copy. Most of the individuals contacted operate small offices at the local level and have no real or justifiable need for microform or magnetic tapes, nor do they have the equipment to use such media.

Even though this question was biased in favor of paper copy, it is surprising that 5% of those questioned prefer to receive microform. If this question were asked of Federal, State or local government, the reverse response would likely be received; i.e., microform or magnetic tape would be preferred to paper copy.

As the NGS Data Base develops, the user of geodetic control data will have the option of receiving data in paper copy, microform, or magnetic tape form.

SUMMARY

A. A total of 6005 questionnaires was received and evaluated (table 1, and figure 6 of appendix 2). Evaluation showed the following:

1. 39% of the land surveyors planned to join the automatic mailing service; previously only 9% were subscribers. Net gain 30%.

2. 91% of the land surveyors planned to provide assistance to NGS Mark Maintenance engineers; previously 57% provided assistance. Net gain: 34%.

3. 93% of the land surveyors planned to report condition of survey marks; previously 26% submitted such reports. Net gain 67%.

An estimate of the net value of assistance promised as a result of this questionnaire is tabulated below:

	Net gain	Value of public assistance* per unit (man hours)	Total value of public assistance (man hours)
1.	30% of 6005≈1802	¼	450
2.	34% of 6005≈2042	2	4,084
3.	67% of 6005≈4023	4	16,092
			20,626

20,626 man hours≈10 man years at $25,000 each. Total value of public assistance: $250,000 per year.

In the supporting statement to OMB, prior to mailing, an estimated total value of $155,000 in voluntary assistance per year was predicted. The large difference in these figures resulted primarily because a much higher percentage of respondents indicated willingness to assist NGS Mark Maintenance engineers than was anticipated.

Similarly, an estimated cost of $37,000 was predicted. However, the total cost of mailing questionnaires and evaluating results was approximately $43,000. The difference between the estimated and actual cost was caused by the need to type address labels for 43 states; only 7 states furnished computer generated address labels. Through this initial mailing to all U.S. land surveyors (36,000), at the cost of $43,000, the NGS will be provided a projected $250,000 in voluntary assistance per year from those who responded to the questionnaire (6,000). To continue the awareness of availability of geodetic data and to perpetuate even larger voluntary actions by this Nation's surveyors to assist the Federal Government, the NGS plans to continue its awareness program by various methods as mentioned in this report summary. (See B. and C.)

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*Voluntary actions by the surveying profession to assist the Federal Government, directly (field) or indirectly (office).

Pre-and post-questionnaire accumulative values of public assistance are shown in figure 4.

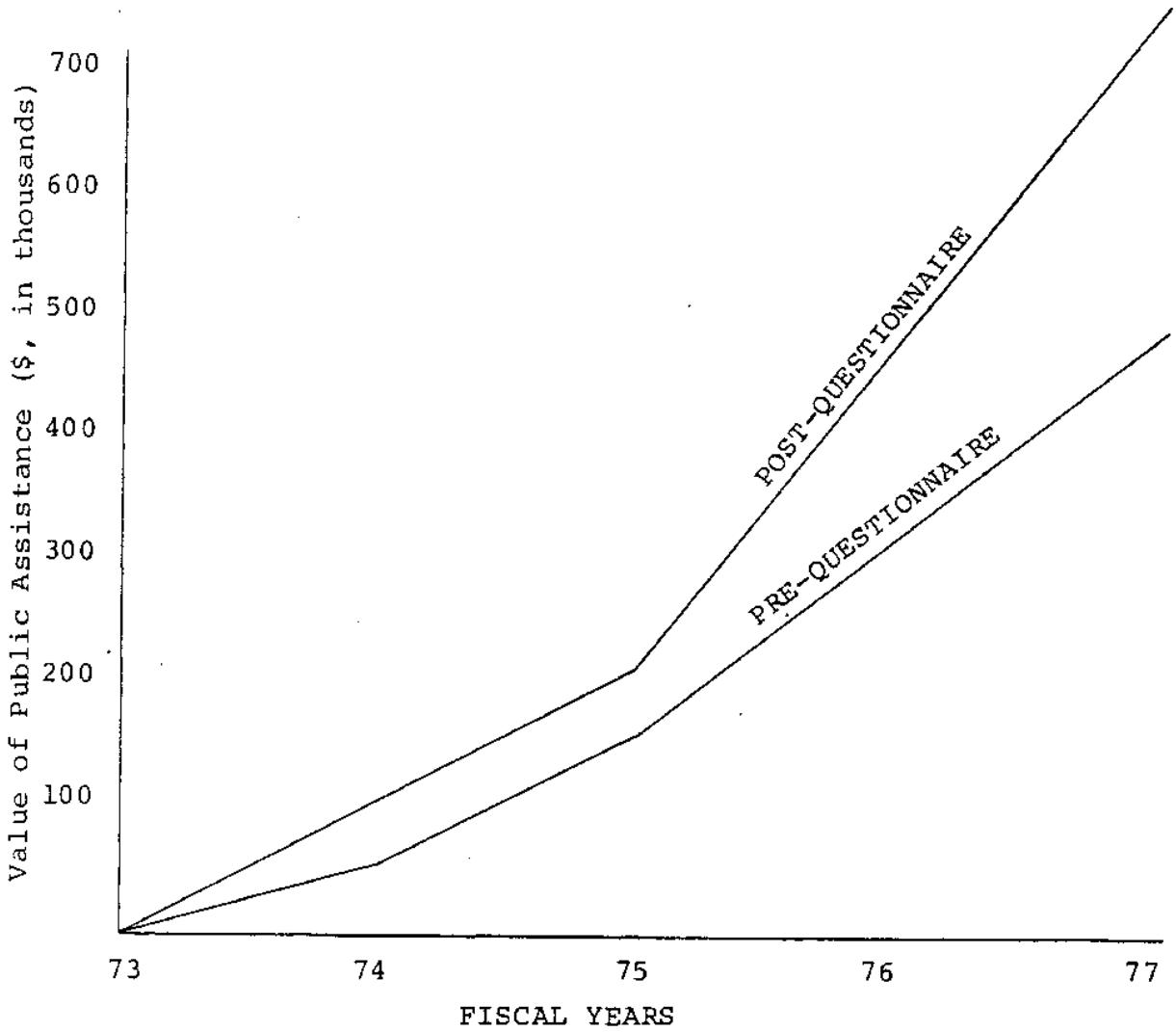

Figure 4.--Estimated values of public assistance before and after Geodetic Data Questionnaire was circulated.

B. This study was directed to the grass roots of the surveying profession, the land surveyor, who, in essence, represents small business. However, because of their number, approximately 36,000, they collectively represent a large percentage of the surveying and engineering public. For this reason, the results of this survey are of extreme importance and will have considerable influence on the development of future programs and priorities of the National Geodetic Survey. Actions are

planned or have been taken in the following areas as a result of this questionnaire.

1. The implementation of a quadrangle pricing and distribution system will provide the following:

a. Expedite the response time to user requests for geodetic control data.

b. Provide the data in the most desirable format for user.

c. Reduce NGS processing and billing expenditures (estimated as equivalent to ½ man year of effort).

d. Reduce NGS file space requirements by 1,680 square feet at an annual cost avoidance of approximately $10,000.

2. Initial steps have been taken toward developing a National Geodetic Data Center from which all control data can be obtained by the user. Currently, only first- and second-order control is available from NGS. The need for such a Center is evident, because of the high percentage of organizations that maintain geodetic files. The justification for such a Center is strengthened by the requirement for unadjusted data, which indicates that sufficient control data do not exist or are not readily available to the user in many areas.

3. There will be increased emphasis on educating users of geodetic control data as to their availability and the proper procedures for obtaining them. Examples of this would be:

a. Direct contact with the users through the Mark Maintenance Program and the geodetic field parties.

b. Increased participation by NGS at State surveying and engineering meetings.

c. Preparation of slide shows for use at meetings below the state level, or at meetings not attended by NGS representatives.

d. Publication of articles on NGS data availability by surveying and engineering publications.

e. Mailing of information packets to selected users.

4. As the present diagram series do not appear to fully satisfy user requirements, studies are under way to develop

cartographic procedures that can fulfill individual needs. As mentioned earlier, approval should be given to conduct a random sampling to determine user needs for control diagrams (of which NGSIC now maintains approximately 900). With the results of this questionnaire and future sampling, the development of a entirely new series of diagrams, or a continuation of the present series with special-purpose overlays may be required. This office will investigate the procedures required.

5. As data in the quadrangle format are the most desired, emphasis is being placed on the conversion of all data to this format. The National Geodetic Survey Data Base, now under development, will enable users to receive data in various formats, such as microfilm and magnetic tape, in addition to paper. The 5% requirement for data in other than paper form is considered extremely high as most land surveyors are neither familiar with these kinds of data, nor with the associated hardware required for their use.

C. On the basis of the results of this questionnaire and input from the NGS Information Center and Operations Division, a priority list of follow-up contacts was developed. The priority list is:

Priority	Area	Number codes (See figure 5*)	Total Number of States
1	New England States	1 and A	7
2	Northeastern States	2 and 6	8
3	North Central States	7, 8, and 9	11
4	South Central States	10, 13, and B	7
5	Southeastern States	3, 4, and 5	8
6	Northwestern States	11, 12, and Alaska	5
7	Southwestern States	14, 15, C, and Hawaii	4

D. The following guidelines will be used in formulating the NGS plan of follow-up contacts.

1. All states should be visited within 18 months commencing about January 1, 1976 and ending July 1977.

2. The plan must be developed with respect to:

   a. State or country officials to be visited based on known contacts. (See sample found on pages 25 and 26.) These contacts should be made by NGS office personnel.

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*Figure 5 shows the regions of NGS Network Maintenance engineers; this explains the numbers coded above.

b. Local land surveyors at professional society meetings, etc., should be contacted collectively. These contacts should be made by each Network Maintenance engineer for his area of responsibility.

c. During all contacts, the mission, products, and services of NGS will be discussed.

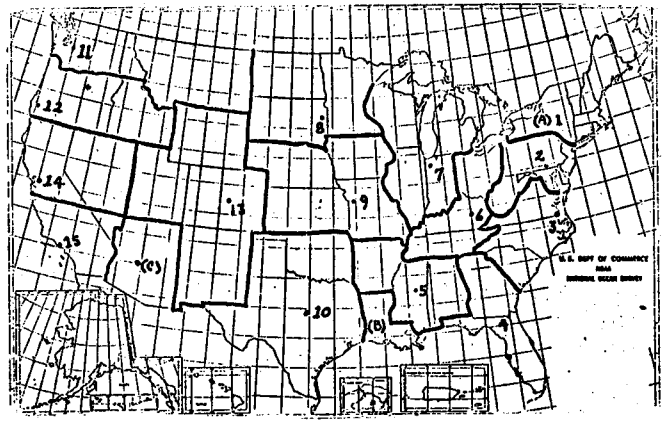
d. Impact on office personnel and network engineers must be documented early during the planning stage.

e. During the implementation stage, continuous monitoring of actual and projected voluntary assistance to NGS is mandatory.

The National Geodetic Survey, NOS, (formerly the C&GS), NOAA, has been responsible for establishing and maintaining the nation's horizontal and vertical control networks for more than 160 years. These networks now consist of more than half a million marked control points in the U. S.

The maintenance of these networks is presently the responsibility of 15 full-time field engineers who regularly recover, repair, or reset markers in danger of being disturbed. Personnel representing areas "A", "B" and "C" are on a cooperative program with the State as Geodetic Advisors in addition to contributing to our Network Maintenance Program.

Anyone having information regarding markers that are in need of repair, in danger of being destroyed, or destroyed, is requested to notify our Rockville Office. The address is given to the right. Also listed are the names and addresses of the Network Maintenance Engineers assigned to the regions as shown on the diagram. Collect calls are accepted.



ALL REQUESTS FOR GEODETIC CONTROL DATA SHOULD BE DIRECTED TO:

THE DIRECTOR
NGS INFORMATION CENTER, C18
NATIONAL OCEAN SURVEY, NOAA
ROCKVILLE, MARYLAND 20852

PHONE: 301-443-8631

THE DIRECTOR
NATIONAL GEODETIC SURVEY, NOS, C17
ROCKVILLE, MARYLAND 20852

PHONE: 301-443-8319

1. Rolland D. Sveum
   1485 Bame Road
   Castleton-On-Hudson, N.Y. 12033

2. Ralph G. Poust
   Route 1 Box 194
   Newport, Pa. 17074

3. Martin E. Zimmer
   439 West York St.
   Norfolk, Virginia 23510

4. Robert P. Konrady
   844 San Juan Avenue
   Lake City, Florida 32055

5. Donald D. Rexrode
   P. O. Box 6366
   Pearl Branch
   Jackson, Miss. 39208

6. Floyd K. Stuart
   P. O. Box 851
   Middlesboro, KY. 40965

7. John D. Rigney
   1621 N. Michigan St.
   Lot #39
   Plymouth, Indiana 46563

8. John S. Rindal
   P. O. Box 693
   Watertown, S. D. 57201

9. James E. Fuchs
   103 Fine Street
   Excelsior Springs, MO 64024

10. Percy E. Chamley
    P. O. Box 10266
    Oaks Branch Station
    Fort Worth, TX 76114

11. James T. Stapleton
    1801 Fairview Ave.
    Seattle, Washington 98102

12. Floyd A. Martin
    P. O. Box 340
    Lake Oswego, Oregon 97034

13. Norman E. Matlock
    P. O. Box 466
    Brighton, Colorado 80601

14. Leo A. Critchlow
    260 Reichling Avenue
    Pacifica, Calif. 94044

15. Jay L. Gummow
    P. O. Drawer 3279
    W. Riverside, Calif. 93509

GEODETIC ADVISORS

A. Richard F. Hanson
   N.Y. Dept. of Trans.
   Aerial Survey Section
   State Campus RT. 20
   1220 Washington Ave.
   Bldg. 4 Room 203
   Albany, N.Y. 12201

B. A. K. Hansen
   Louisiana State Highway Dept.
   Location and Survey Division
   P. O. Box 44245
   Baton Rouge, La. 70804

C. Larry W. Wakefield
   P. O. Box 49
   Black Canyon City, Arizona 85324

Figure 5.--Geographical areas of network maintenance and addresses of network maintenance engineers for respective areas.

NETWORK MAINTENANCE ENGINEERS AND STATES SERVED

1. Rolland D. Sveum
   a. Maine
   b. New Hampshire
   c. Rhode Island
   d. Connecticut
   e. Vermont
   f. Massachusetts
   g. New York
2. Ralph G. Poust
   a. Pennsylvania
   b. New Jersey
   c. Maryland
   d. West Virginia
   e. Delaware
   f. D.C.
3. Martin E. Zimmer
   a. Virginia
   b. North Carolina
   c. South Carolina
4. Robert P. Konrady
   a. Georgia
   b. Florida
5. Donald D. Rexrode
   a. Alabama
   b. Mississippi
   c. Arkansas
6. Floyd K. Stuart
   a. Ohio
   b. Tennessee
   c. Kentucky
7. John D. Rigney
   a. Indiana
   b. Illinois
   c. Wisconsin
   d. Michigan
8. John S. Rindal
   a. Minnesota
   b. North Dakota
   c. South Dakota
9. James E. Fuchs
   a. Missouri
   b. Iowa
   c. Kansas
   d. Nebraska
10. Percy Chamley
    a. Texas
    b. Oklahoma
11. James T. Stapleton
    a. Washington
    b. Montana
    c. Idaho
       North of latitude 46°
12. Floyd A. Martin
    a. Oregon
    b. Idaho
       South of latitude 46°
13. Norman E. Matlock
    a. Colorado
    b. New Mexico
    c. Utah
    d. Wyoming
14. Leo A. Critchlow
    a. CA + NV
       North of latitude 37°
15. Jay L. Gummow
    a. CA + NV
       South of latitude 37°

GEODETIC ADVISORS

A. Richard F. Hanson
   New York

B. A. K. Hansen
   Louisiana

C. Larry W. Wakefield
   Arizona

Vermont

District 1:

Gleason Ayers
Box 320
Bowlen Road
Bennington 05201

442-2051

District 2:

John Clifford
Box 636
Rattleboro 05301

254-5011

District 3:

Marinum Van Kleef
Box 666
Rutland 05701

District 4:

Frank Auldrich
Box 995
White River Junction 05001

295-2815

District 5:

Donald Remick
Box 168
Essex Junction 05452

655-1581

District 6:

Milan W. Lawson
Box 857
Montpelier 05602

828-2691

District 7:

Hugh Elder
Box 370
St. Johnsberry 05819

748-2911

District 8:

Sanford Brigham
P.O. Box 228
St. Auburn 05478

524-5926

District 9:

Franklin Round
Box 187
Newport 05855

334-7934

COUNTIES

Addison
Bennington
Celedonia
Chittenden
Essex
Franklin
Grand Isle
Lamoille
Orange
Orleans
Rutland
Washington
Windham
Windsor

APPENDIX 1. Questionnaire and information packet.

A. Letter of transmittal

B. Notice of relocation of National Geodetic Survey Information Center

C. Geodetic data questionnaire, NOAA Form 75-69

D. Network maintenance information sheet

E. Geodetic Survey Mark Preservation notice (NOAA/PA 73022(Rev.)1974)

F. Geodetic Control Data Automatic Mailing List Agreement, NOAA Form 29-3

G. Bibliography

APPENDIX 1.

A. Letter of Transmittal

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SURVEY
Rockville, Md. 20852
Reference: C18

Dear Sir:

We have taken the liberty of sending the enclosed materials concerning the availability of services and/or geodetic data furnished by the National Geodetic Survey. This information is being sent because you are a registered land surveyor in your state and this may be useful to facilitate the accomplishment of your surveying goals. The National Geodetic Survey was formerly a component of the Coast and Geodetic Survey and is now a component of the National Ocean Survey.

The primary mission of the National Geodetic Survey is the establishment and maintenance of the horizontal and vertical geodetic control networks of the United States. Geodetic control is a primary necessity in the surveying and mapping field.

To assist this office in developing future programs which will provide better service to the users, it is requested that you complete the enclosed questionnaire and return it to this office. This questionnaire has been prepared on a pre-addressed card requiring no postage to minimize time and effort required in its preparation. Your cooperation in this program is greatly appreciated.

The relationship of land surveying and reliability of control is a mutually inclusive problem. Therefore, if you wish to receive control data, please write to: The Director, NGS Information Center, C18, Rockville, Maryland 20852. For additional information regarding our services, please contact this office.

Sincerely,

Allen L. Powell
Rear Admiral, NOAA
Director
National Ocean Survey

Enclosure

B. Notice of Relocation of National Geodetic Survey Information Center

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SURVEY
Rockville, Md. 20852

NOTICE - RELOCATION

On July 31, 1972, the operations of the National Geodetic Survey Information Center, ATTN: C18, and the National Geodetic Survey Information Center, Distribution Branch, ATTN: C185, Federal Building, Asheville, N.C., of the National Geodetic Survey, was relocated in Rockville, Md.

All correspondence and inquiries requesting geodetic control data should be directed to:

The Director
National Geodetic Survey
NGS Information Center, C18
Rockville, Maryland 20852

Telephone Number:
Area Code 301-443-8631

On March 31, 1973, the National Geodetic Survey Operations Center, located in Kansas City, Missouri, was closed, and the functions of this office were transferred to the NGS headquarters in Rockville, Maryland. All requests for relocation of geodetic survey monuments should be directed to:

Director, National Geodetic Survey
6001 Executive Boulevard
ATTN: C172
Rockville, Maryland 20852

Telephone Number:
Area Code: 301-443-8319

C. Geodetic Data Questionnaire, NOAA Form 75-69

NOAA FORM 75-69
(5-73)

FORM APPROVED
OMB. NO. 41-S73040

GEODETIC DATA QUESTIONNAIRE

	YES	NO
1. WERE YOU PREVIOUSLY AWARE OF DATA AVAILABLE FROM NGS ?	( )	( )
2. WERE YOU AWARE OF HOW TO ORDER THIS DATA ?	( )	( )
3. DO YOU PRESENTLY MAINTAIN A GEODETIC DATA FILE FOR YOUR AREA ?	( )	( )
4. WERE YOU PREVIOUSLY AWARE OF THE NGS AUTOMATIC MAILING SYSTEM ?	( )	( )
5. DO YOU NOW SUBSCRIBE TO THE AUTOMATIC MAILING SYSTEM?	( )	( )
6. DO YOU PLAN TO SUBSCRIBE TO THE AUTOMATIC MAILING SYSTEM ?	( )	( )
7. WERE YOU FAMILIAR WITH THE 30' QUADRANGLE SYSTEM OF ORDERING DATA ?	( )	( )
8. DO YOU FIND THE 30' QUADRANGLE SYSTEM ACCEPTABLE FOR ORDERING ?	( )	( )
9. WOULD YOU PREFER TO ORDER A SINGLE STATION ?	( )	( )
10. DO YOU PREFER THE 1:250,000 GEODETIC CONTROL DIAGRAMS ?	( )	( )
11. DO YOU PREFER THE STATE CONTROL DIAGRAMS ?	( )	( )
12. WERE YOU AWARE THAT UNADJUSTED AND UNPUBLISHED DATA ARE AVAILABLE ?	( )	( )
13. WOULD YOU DESIRE TO RECEIVE SUCH DATA ?	( )	( )
14. WERE YOU AWARE OF THE NGS MARK PRESERVATION PROGRAM ?	( )	( )
15. ARE YOU WILLING TO ASSIST NGS ENGINEERS IN THE PRESERVATION PROGRAM ?	( )	( )
16. DO YOU KNOW HOW TO REPORT A MONUMENT IN DANGER OF BEING DISTURBED ?	( )	( )
17. WHEN APPLICABLE, ARE YOU WILLING TO SUBMIT " REPORT ON CONDITION OF SURVEY MARKER" CARDS ?	( )	( )
18. HAVE YOU PREVIOUSLY SUBMITTED SUCH REPORTS ?	( )	( )
19. WOULD YOU DESIRE RECOMMENDED NGS SPECIFICATIONS FOR: 1:100,000 TRAVERSE ( ); 1:50,000 TRAVERSE ( ); 1:20,000 TRAVERSE ( ); 1:15,000 TRAVERSE ( ); 1:10,000 TRAVERSE ( ) ; 1:5,000 TRAVERSE ( ) .	( )	( )
20. IF AVAILABLE WOULD YOU PREFER DATA TO BE FURNISHED AS: PAPER COPY ( ) ; MICROFICHE ( ) ; MICROFILM ( ) ; MAGNETIC TAPE ( ) ; OTHER _____ .	( )	( )

_____
SIGNATURE (OPTIONAL)

FIRM ADDRESS:

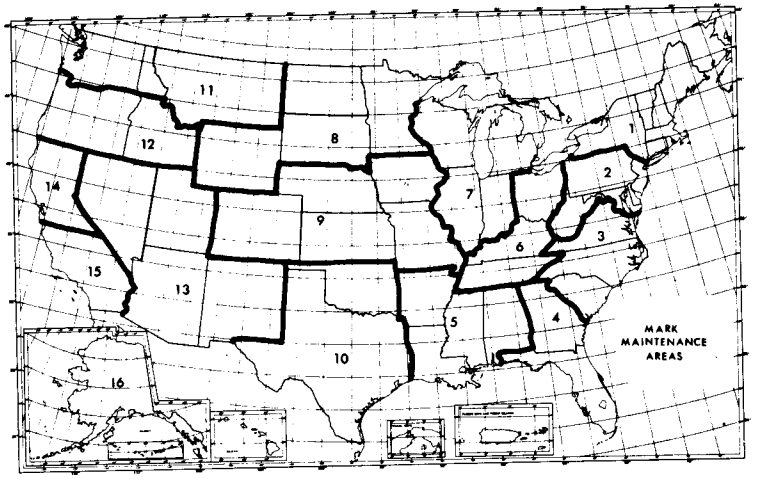
COMMENTS :

D. Network Maintenance Information Sheet

MARK MAINTENANCE

The National Geodetic Survey, NOS, (formerly the C&GS), NOAA, has been responsible for establishing and maintaining the nation's horizontal and vertical control networks for more than 160 years. These networks now consist of more than half a million marked control points in the U.S.

The maintenance of these networks is presently the responsibility of 15 full-time engineers who regularly recover, repair, or reset markers in danger of being disturbed. Anyone having information regarding markers that are in need of repair, are destroyed, or are in danger of being destroyed is requested to notify Bureau Headquarters. Collect calls are accepted. The address of this office is given to the right. Also listed are the names and addresses of the mark maintenance engineers assigned to the regions as shown on the diagram.



ALL REQUESTS FOR GEODETIC CONTROL DATA SHOULD BE DIRECTED TO:

THE DIRECTOR
NGS INFORMATION CENTER, C18
ROCKVILLE, MARYLAND 20852
PHONE: 301-443-8631

THE DIRECTOR
NATIONAL GEODETIC SURVEY
NATIONAL OCEAN SURVEY, NOAA
ROCKVILLE, MARYLAND 20852
PHONE: 301-443-8141

1. Richard F. Hanson
28 Clearview Boulevard
Castleton-on-Hudson,
New York 12033

2. Ralph G. Poust
c/o Nat'l Weather Service
P.O. Box 1185
Harrisburg, PA 17108

3. Martin E. Zimmer
439 West York Street
Norfolk, VA 23510

4. Robert P. Konrady
844 San Juan Avenue
Lake City, FL 32055

5. A. K. Hansen
Imperial Office Building
3301 North Causeway
Metairie, LA 70002

6. Wilson A. Ziegler
114 Hepplewhite Drive
Hendersonville, TN 37075

7. Floyd K. Stuart
c/o Nat'l Weather Service
St. Joseph County Airport
South Bend, IN 46624

8. John S. Rindal
P.O. Box 693
Watertown, S.D. 57201

9. James E. Fuchs
Route #2 Box 297
Excelsior Springs,
Missouri 64024

10. Percy E. Chamley
P.O. Box 10266
Oaks Branch Station
Fort Worth, TX 76114

11. James T. Stapleton
1801 Fairview Ave., East
Seattle, WA 98102

12. Floyd A. Martin
P.O. Box 340
Lake Oswego, OR 97034

13. Larry W. Wakefield
P.O. Box 1291
Flagstaff, AZ 86001

14. Leo A. Critchlow
260 Reichling Avenue
Pacifica, CA 94044

15. Jay L. Gummow
P.O. Drawer 3279
W. Riverside, CA 93509

16. Vacant

E. Geodetic Survey Mark Preservation Notice
(NOAA/PA 73022(Rev.)1974)

GEODETIC SURVEY MARK PRESERVATION

During the past century and a half, the U.S. Department of Commerce's National Ocean Survey (formerly the Coast and Geodetic Survey) has been determining with great accuracy the latitude and longitude and/or elevation of thousands of locations throughout the United States. At each point a bronze marker is imbedded in cement or bedrock. More than half a million of these markers have been placed in the U.S. and its possessions.

The bronze disks, measuring about three and one-half inches in diameter, mark survey points for latitude and longitude, elevation, gravity, and azimuth or direction. They are used by engineers, surveyors, and mapping agencies as the basis or framework for maps, charts, local control and boundary surveys, and for various public and private engineering projects.

The cost of surveying and placing a single mark ranges from around $100 to several thousand, depending on the type of survey, accuracy, and proximity to other survey monuments.

Resurveying operations throughout the United States have revealed the destruction of an alarming number of permanent survey marks. To remedy this situation as much as possible, NOAA, the National Oceanic and Atmospheric Administration, asks the public's cooperation in preserving these marks.

Many of the marks have been covered with dirt or debris and destroyed because construction crews were not aware of their location. To prevent this, the practice of marking the location of the survey disks with wooden posts set nearby was begun in the 1940's. As these wooden posts deteriorated, metal signs bolted to metal fence posts were later substituted. These white signs, called Witness Posts, are set near survey marks to aid in their recovery and protection.

Here's how the public can help preserve these marks:

Never remove or disturb a survey marker unless authorization is obtained from NOAA. The National Geodetic Survey has a team of Mark Maintenance Engineers who will normally perform the necessary maintenance. If a mark is removed or displaced, its value as a survey point is lost and expensive re-surveying is usually required.

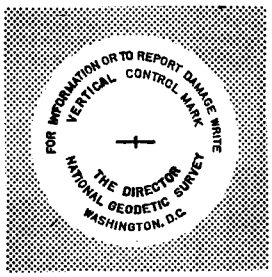
If you see a survey mark which appears in danger of destruction or damage by erosion, construction, or other causes, please take appropriate steps to preserve it. If danger is by construction, call it to the attention of the foreman or flag the mark by stakes.

You will be performing a commendable public service in helping to preserve these valuable survey markers.

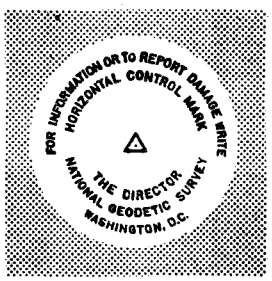
In all cases, submit a report of your actions or finding to Director, National Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland, 20852.

U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Survey

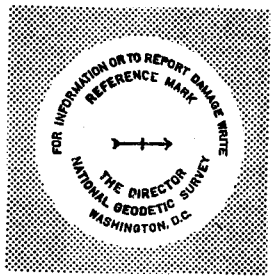
KNOW THESE MARKS



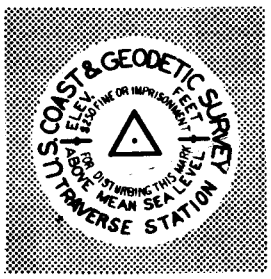
VERTICAL
(NEW)



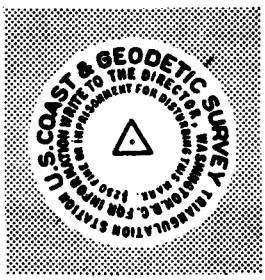
HORIZONTAL
(NEW)



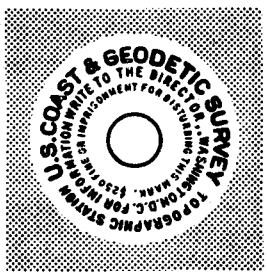
REFERENCE
(NEW)



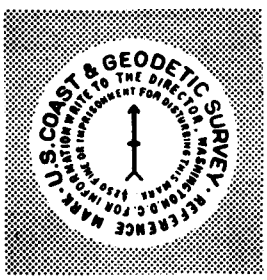
TRAVERSE
(OLD)



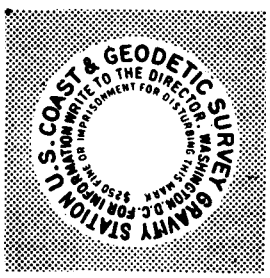
TRIANGULATION
(OLD)



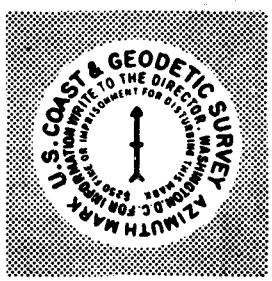
TOPOGRAPHIC
(OLD)



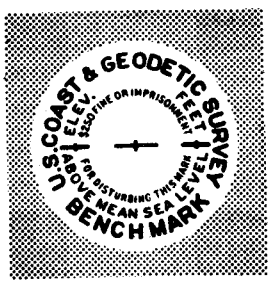
REFERENCE
(OLD)



GRAVITY
(OLD)



AZIMUTH
(OLD)



VERTICAL
(OLD)

FACE LEGENDS

Standard bronze station marks of the National Geodetic Survey (formerly marks of the Coast and Geodetic Survey) are set in concrete or bedrock to serve as a permanent mark for the particular station it represents. Additional information concerning these marks may be obtained by writing to:
Director, National Geodetic Survey, NOAA, Rockville, Md., 20852.

NOAA/PA 73022 (Rev.) 1974

F. Geodetic Control Data Automatic Mailing List Agreement, NOAA Form 29-3

NOAA FORM 29-3 (11-74)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMIN.

GEODETIC CONTROL DATA AUTOMATIC MAILING LIST AGREEMENT

1. REQUISITION OR ORDER NO.

2. NOAA AGREEMENT NO.

INSTRUCTIONS – (See reverse side). Return original and one copy to the National Geodetic Survey Information Center, C18, National Oceanic and Atmospheric Administration, Rockville, Maryland 20852.

3. DATE

4. APPLICANT

5. DELIVERY INSTRUCTIONS

6. ☐ New subscribers are requested to complete all applicable items.

7. IMPORTANT NOTICE

☐ A renewal of free subscriptions is required annually by the Congressional Joint Committee on Printing. Your signature below indicates that you wish to continue receiving this service. Your name will be removed from the mailing list if these forms are not returned within 21 days. EXPIRATION DATE

8. ☐ User charge subscriber – Review your requirements and confirm your subscription agreement by signing item 13.

9. DESCRIPTION OF MATERIAL DESIRED, INCLUDING AREA. Horizontal and vertical data may be ordered separately.

☐ NUMBER OF COPIES ☐ VERTICAL CONTROL ☐ HORIZONTAL CONTROL ☐ DIAGRAMS

LATITUDE °

LONGITUDE °

10. ☐ Check here if the applicant desires an initial shipment of all available material described above. The purpose of this shipment is to establish initial file. Prepayment for this shipment is requested.

11. The applicant agrees to accept all material sent under the agreement and to pay for the same upon receipt. Prices will be based on the current price list

12. This organization is qualified to receive free data and diagrams as:
☐ Federal Government ☐ State or Local Government ☐ Educational Institution ☐ Library

13. AUTHORIZED OFFICIAL (Applicant)	NAME	TITLE	
	SIGNATURE		DATE
14. ACCEPTED FOR NATIONAL GEODETIC SURVEY	NAME	TITLE Director, National Geodetic Survey Information Center National Geodetic Survey, NOS, NOAA	
	SIGNATURE		DATE

SUPERSEDES PREVIOUS EDITION.

GEODETIC DATA
AUTOMATIC MAILING SERVICE

The automatic mailing service for geodetic control data provides the mechanism through which users maintaining active files receive newly published data automatically for a specific area. To facilitate this service, it is necessary that the desired area be composed of complete quadrangle units.

The standard quadrangles of geodetic control data are 30' of latitude by 30' of longitude. However, in congested control areas, standard quads are 15' of latitude by 15' of longitude, and in Alaska, due to the sparsity of control, quadrangle units are 1° of latitude by 1° of longitude. Data are now available in these formats for approximately 75 percent of the U.S. with the remaining 25 percent being in a different format and available by county. In the latter areas, it will be necessary to furnish complete county coverage for all counties falling in your defined area until the data has been converted to the quadrangle format. Unadjusted data are also available through the automatic mailing service, but only on special request.

The prices for initial data furnished through the automatic mailing service are the same as for individual orders. Revised or additional published data for the requested area will be furnished thereafter for an annual charge of $2.00 and no additional charge for the data. Prices include first class postage; data for unadjusted projects and special handling charges are additional.

A bill for the initial shipment will accompany the data. A bill for the $2.00 annual charge will be forwarded annually thereafter. It is necessary that a copy of each bill accompany your payment to insure proper credit.

Federal, State and Local Government organizations may be furnished limited quantities of these data free for their jurisdiction. In addition, tax supported educational institutions and libraries which are designated depositories for government publications may be furnished free one copy of all data within their area or State. Such organizations should complete this form, check the appropriate blocks in Item 12, and certify by the signature of a responsible official.

INSTRUCTIONS FOR COMPLETION OF FORM

Items 1, 2, and 3	For bureau use only.
Item 4	Correct if necessary. It is preferred that the mailing address be an office or position rather than an individual. Please include your zip code.
Item 5	Any special instructions for mailing data, if other than shown in Item 4.
Items 6 - 8	Self-explanatory.
Item 9	Area requirements may be described by a detailed written description or by filling in the appropriate boxes and outlining the geographic area on the printed grid. A small attached map outlining the area of interest is also acceptable. Data will be furnished to meet your requirements within the limitations described previously.
Item 10	If an initial set of data for the area described in Item 6 is required, check this block.
Items 11 - 14	Self-explanatory.

G. Bibliography

Geodetic Control Data of the National Geodetic Survey, (information packet), 1972. (Available on request from NOS, Director, National Geodetic Survey, NGS Information Center, C18, Rockville, Maryland 20852.)

Dracup, Joseph F., 1973: National Geodetic Survey Data; Availability, Explanation, Application. (Preprint). (Available as above.) To be published in the NOAA NOS/NGS Technical Memorandums series.

APPENDIX 2. Summaries of replies.

Table 8.--Questionnaires mailed and returned.

Figure 6.--Computer analysis of total replies to questionnaire.

Figure 7.--Sample computer analysis of replies to questionnaire, State of Alabama.

Table 8.--Questionnaires mailed and returned

State	No. Mailed	No. Returned	Percent Returned
Alabama	862	87	10.0
Alaska	330	97	29.4
Arizona	189	57	30.2
Arkansas	595	80	13.4
California	1653	423	26.6
Colorado	700	126	18.0
Connecticut	637	66	10.4
Delaware	104	17	16.3
Florida	794	139	17.5
Georgia	781	104	13.3
Hawaii	158	26	16.5
Idaho	81	18	22.2
Illinois	286	59	20.6
Indiana	1243	86	06.9
Iowa	478	113	23.6
Kansas	533	59	11.1
Kentucky	1417	130	09.2
Louisiana	1646	171	10.4
Maine	955	110	11.5
Maryland	342	43	12.6
Massachusetts	1465	152	10.4
Michigan	664	112	16.9
Minnesota	269	34	12.6
Mississippi	440	70	15.9
Missouri	1014	112	11.0
Montana	298	39	13.1
Nebraska	218	39	17.9
Nevada	172	42	24.4
New Hampshire	262	59	22.5
New Jersey	1493	146	09.8
New Mexico	529	101	19.1
New York	1948	391	20.1
North Carolina	709	56	07.9
North Dakota	168	28	16.7
Ohio	2710	493	18.2
Oklahoma	807	139	17.2
Oregon	514	141	27.4
Pennsylvania	1033	175	16.9
Rhode Island	152	27	17.8
South Carolina	499	96	19.2
South Dakota	125	28	22.4
Tennessee	371	84	22.6
Texas	1114	261	23.4
Utah	187	44	23.5
Vermont	280	48	17.1
Virginia	662	81	12.2
Washington	841	198	23.5
West Virginia	303	31	10.2
Wisconsin	679	163	24.0
Wyoming	299	44	14.7
Miscellaneous	2919	560	19.2
No. Not Received or Returned	-665		
Total	36263	6005	16.6

TED STATES

TOTALS FOR INDIVIDUAL QUESTIONS

	1		2		3		4		5	
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
005	4367	1390	2566	3166	2239	3462	1074	4665	542	5171

	6		7		8		9		10	
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
	2201	2772	2087	3581	4052	472	1755	2747	2393	1553

	11		12		13		14		15	
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
	2816	1382	1623	3938	2952	2137	3446	2175	5356	213

	16		17		18		19		20	
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
	3748	1921	5482	134	1549	4086	2028	1014	1047	274

TOTAL NO. COMMENTS 1461

TOTALS FOR COMBINATIONS

YES1 -NO2	YES3 -NO4	YES3 -NO5	NO5 -YES6	YES1 -YES7	YES8-NO9	YES10-YES11	YES10-NO11	YES12-YES13
1803	1484	1734	2013	1883	2368	1157	965	857

NO12-YES13	NO16-YES17	YES16-NO18	YES3-NO5-YES6
2082	1612	2302	820

QUESTION 19

	A(1/100,000)	B(1/50,000)	C(1/20,000)	D(1/15,000)	E(1/10,000)	F(1/5,000)
NO. CHECKED	958	1367	1671	1502	1895	1701

QUESTION 20

	PAPER COPY	MICROFICHE	MICROFILM	MAGNETIC TAPE
NO. CHECKED	4723	114	165	09

Figure 6.--Print-out of computer analysis of total replies to questionnaire.

QUESTIONNAIRE TABULATIONS FOR ALABAMA

TOTALS FOR INDIVIDUAL QUESTIONS

TOTAL NO. OF RETURNS 87

1 YES	1 NO	2 YES	2 NO	3 YES	3 NO	4 YES	4 NO	5 YES	5 NO
57	26	30	52	39	44	05	77	04	77

6 YES	6 NO	7 YES	7 NO	8 YES	8 NO	9 YES	9 NO	10 YES	10 NO
37	35	19	62	59	06	29	36	36	18

11 YES	11 NO	12 YES	12 NO	13 YES	13 NO	14 YES	14 NO	15 YES	15 NO
34	20	10	68	42	25	46	33	77	03

16 YES	16 NO	17 YES	17 NO	18 YES	18 NO	19 YES	19 NO	20 YES	20 NO
51	31	79	01	22	59	25	14	17	03

TOTAL NO. COMMENTS 30

TOTALS FOR COMBINATIONS

YES1 -NO2	YES3 -NO4	YES3 -NO5	NO5 -YES6	YES1 -YES7	YES8-NO9	YES10-YES11	YES10-NO11	YES12-YES13
27	34	35	35	16	30	14	17	03

NO12-YES13	NO16-YES17	YES16-NO18	YES3-NO5-YES6
39	31	32	21

QUESTION 19

	A(1/100,000)	B(1/50,000)	C(1/20,000)	D(1/15,000)	E(1/10,000)	F(1/5,000)
NO. CHECKED	06	15	19	22	[illegible]	33

QUESTION 20

	PAPER COPY	MICROFICHE	MICROFILM	MAGNETIC TAPE
NO. CHECKED	73	00	01	00

Figure 7.--Sample computer analysis of replies to questionnaire, State of Alabama.

☆ U.S. GOVERNMENT PRINTING OFFICE 1976— 210-801/220