

1875.

NEW ZEALAND.

REPORT BY INSPECTOR OF SURVEYS.

Presented to both Houses of the General Assembly by Command of His Excellency.

Mr. T. HEALE to the Hon. the NATIVE MINISTER.

SIR,—

Inspector of Surveys' Office, Auckland, 28th May, 1875.

The work of my department during the past year has had relation chiefly to the numerous and extensive surveys of lands purchased by the Government from Natives, and to surveys of Native land claims, the duty of executing which was imposed upon me by "The Native Lands Act, 1873." The extension of triangulation over new country has necessarily had to a great extent to be subordinated to these urgent duties.

My chief assistant, Mr. Smith, has been occupied during the whole summer and autumn in filling up interstices and breaking down large triangles, in the former trigonometrical survey of the mountainous and heavily-wooded district north of Auckland, and in supervising, checking, and closing with the triangulation the surveys made by numerous private surveyors, whom it was found necessary to employ, in some cases by reason of the great number of surveys required at once, and in several instances owing to arrangements entered into by land purchase agents independently of this department. Several surveys in the most difficult and most inaccessible parts of the country were at the same time made by the junior officers of the department. The results of all this work, as set out in the return annexed, show very strikingly the relative economy of surveys under official direction as compared with those executed as formerly by licensed surveyors employed by the Native claimants, the advantage in accuracy and completeness being at the least equally remarkable. For the same purpose of forwarding the large block surveys made by officers of this department for land claims, a considerable number of triangles have been fixed and observed in the Seventy-Mile Bush, in the Province of Wellington, connecting on one side with the Hawke's Bay triangulation, and on the other with that of Mr. Jackson, of the Province of Wellington.

Early in the year I hoped to have been able to extend the triangulation of Hawke's Bay in regular course to the north and east, to embrace Poverty Bay; but the number of surveys which were undertaken on the East Coast by private surveyors, under the auspices of land purchase agents, became so great, and from the want of any official control or check by triangulation the risk of gross error became so alarming, that I was obliged to break through the regular plan of the work, and to despatch my second assistant, Mr. Baker, to look after them, as Mr. Smith had done those in the North, and for this purpose, while exercising supervision over the private surveyors around, to commence a triangulation from an excellent independent base near Gisborne. This work will extend over upwards of a million acres of land, and will ultimately, I hope, next year be closed with the Bay of Plenty triangulation near Opotiki, and with that of Hawke's Bay at the Wairoa, and so will furnish an excellent means of verification for both, and a positive test of the magnitude of the error of discrepancy to which the work is subject, an error which, in the various closures hitherto made, has never amounted to anything near the limit of one foot in a mile, which I consider theoretically possible and admissible in work of this nature.

A large amount of block surveying for the General Government has also been carried on for some time past inland from the north shore of Cook Strait. This was formerly placed under an occasional supervision by Mr. Marchant, then acting as draftsman in the Crown Lands Office at Wellington. A great extension of this work towards Taupo having this year been required, Mr. Marchant has been made an officer of my department, and the system as recommended and pursued by me has been most energetically and ably initiated by him over that great area of country, and I look with confidence to his bringing up the triangulation from the coast, where it is based on the sides determined by Mr. Jackson, to Taupo, to close with mine at Kaimanawa and on the Upper Waikato.

With the same object of drawing the hitherto detached survey system together and securing unity of action, and the means of obtaining complete and consistent records for a central department at the Seat of Government whenever the right time shall have arrived for this obvious want to be supplied, Mr. Humphries, the active Chief Surveyor of Taranaki, has also been brought into connection with my department, a portion of his salary being defrayed by the General Government. In his hands the surveys of confiscated lands and of land purchases, as well as the provincial surveys, will be well looked after as far as his means will admit. He is most ready to adopt every precaution laid down. The new work in progress is tied by fairly determined meridional lines, and by well-checked main traverse, so that there is no danger of any new confusion arising; but the multifarious duties with which Mr. Humphries is still loaded by the Provincial Government, and the difficulties inseparable from acting under two authorities, will necessarily prevent any active reforms being made by him for my department, at all events beyond the re-survey of some blocks of sections allotted, but for the most part not yet granted, and which imperatively require re-adjusting and marking. The country generally, of which portions are now being surveyed inland from New Plymouth, and the condition of Native affairs in it, are ill adapted for trigonometrical survey unless on a large scale, and I foresee no inconvenience from postponing the absorption of this district into the general triangulation of the country until after the purchases of Native territory are sufficiently extended for the trigonometrical survey to be carried on without regard to proprietary rights. The surveys necessary for the purchase of some blocks now under negotiation are, in deference to Native prejudices, being made very slightly. As reconnaissance surveys only, these will afford useful geographical knowledge, and will facilitate future survey; but they are available only for the purpose of purchase, and the real survey will have to be made hereafter.

It is clear that these affiliations of the surveys of remote districts to my office in Auckland are far from constituting a highly organized department, but it is still a great step towards securing unity of system, and it enables one establishment to be supported at need from another, at which the work is less pressing, and it will remove all difficulty in keeping pace with the requirements of survey, however large they may be.

The imperative demand on the department for block surveys has caused the area of new triangulation to be much less than it otherwise would have been, and its work appears less showy and extensive, but its practical utility has been signally demonstrated in the facility it has afforded for the block surveys, and for the investigation of Native land claims, sketch maps having often been taken from the trigonometrical diagrams which have been found sufficiently complete in detail for the action of the Native Lands Court.

Maps are now being reduced for publication in four sheets through the photo-lithographic establishment at Wellington, which, though subject to some defects incidental to that very rapid and convenient process, will show very clearly the extent to which the work has been carried. These maps are absolutely necessary to furnish surveyors with a clue to the information they require for survey of large blocks in Native districts, and it is hoped that they will not be without use to the general public. I think that, considering the moderate amount which has been expended on the trigonometrical survey,—that in fact it was long carried on, under very slight encouragement, as a mere voluntary adjunct to the regular duties of the supervision of surveys made for Native Land Court purposes without any separate appropriation of funds for its cost,—it will not be made a ground of blame to this department that the work is not more extensive, or that a more elaborate and therefore more costly system has not been adopted. By the steady pursuance of a system of a rather humble but admittedly sound triangulation, we have gradually spread it over almost every accessible portion of the North Island, and have at last arrived at such a position that I can insist on all surveys being connected with it. We have accumulated a number of excellent instruments, and have trained a thoroughly efficient staff of officers both for field and office work, so that, if the Government should determine to make a sound system of survey universal and compulsory, it can be done without delay, and with scarcely any even temporary inconvenience.

Having thus explained the steps which have been taken by the department at the head of which I have been placed, to keep pace with the current work, and the means with which I hope to meet the urgent demands of the immediate future, I apprehend that it may be expected of me to furnish some views, based upon the experience I must have gained as the senior General Government survey officer, as to the practical method of dealing with the whole surveys of the colony on a permanent basis, and of uniting the hitherto detached survey establishments over the whole colony into one highly organized department, and gradually but speedily eliminating the errors and discrepancies which have necessarily arisen from the employment not merely of an inadequate and make-shift process of survey, but of a great number of different and diversely inadequate and make-shift processes pursued over long periods in each different portion of the colony.

The excellent means which the Government has taken of obtaining undeniable information, and the soundest professional views on these matters, by the employment of Major Palmer, releases from the necessity of any repetition of the urgent need for reform, and of the undeniable fact that the only remedy must lie in the rapid extension of connected triangulation over the whole colony, and the basing of *all* surveys upon it—propositions which I have on every occasion, I fear pertinaciously, urged during the last nine years; and the report which he has

furnished is so complete in its facts, so unanswerable in its deductions, and its practical recommendations are so nearly accordant with my own often expressed views, that all that I can have to say necessarily resolves itself into comments on the mode of carrying them into effect.

The only point on which I think Major Palmer's views are open to modification is his recommendation, as a fundamental framework, of a system of major triangles of as large size, up to fifty or sixty miles side, as the form of the country will allow, these to be *afterwards broken down* into secondary and tertiary triangles as required. I do not wish in the smallest degree to impugn Major Palmer's views as to the general desirableness of this course; but I think, in recommending its adoption here, he has somewhat under-estimated some of the difficulties which are presented by circumstances peculiar to this colony, and that the condition of things which has grown up (in the North Island, at least) by the force of circumstances necessarily involves some modification of the plan proposed. I cannot think that Major Palmer would recommend that in any case the progress of the minor triangulation, as now being carried on, should be arrested while a major triangulation is being made, and since, in fact, the former is already always pushed forward over every part of the North Island, as soon as ever Native prejudices and exclusiveness are overcome, so it is now inevitable that a major triangulation, if made, *must* follow the secondary, and must therefore resolve itself into that which I contemplated in the original plan of triangulation—a selection of “a few prominent stations” out of those already adopted in the minor triangulation, “which would cover the whole area with a few well-conditioned large triangles,” the observation and computation of which, with every mathematical exactitude, would thoroughly establish the accuracy of every part of the work. I believe that even if the now large extension of the minor triangulation had not necessarily caused it to precede a major one, it would have been found necessary to execute the work in that order; for though it is true that “the old difficulties of Native interference and want of roads are fast disappearing,” these are still so great that to push forward triangles of forty or fifty-mile sides in unexplored country, with the heavy instruments and the arrangements for signalling which such work involves, would even now be quite impracticable in the North Island. We have found that, in carrying forward triangles of even ten-mile sides, it continually occurs that the Natives can give no information as to access or rivers to cross, or objections likely to be taken by inhabitants at the stations in advance; and we have to seek out these matters, and to modify our plans accordingly—frequently having to cut lines to enable our comparatively light instruments to be carried by men, where to take horses would be impossible. After the minor triangulation the difficulty is entirely removed: we have explored the country, and we know where lines of sight can be obtained, what roads or tracks are available, and in planning large triangles we can avoid those points where the difficulties, from badness of access or from other causes, are too great to be surmounted.

In the Middle Island the case is different: there, no doubt, east of the mountains at least, a major triangulation may be conducted with every advantage; but even there triangles of a smaller size would be very early required, since the detached triangulations in Otago are so very small and numerous, and each one would have to be closed with the major triangulation in order to obtain the constant of error to be applied to its sides in meridian and standard. In other parts of the island, too, minor triangulation is so urgently needed to arrest the spread of error, that it would seem very undesirable to delay its course for a purpose purely scientific. I conclude, therefore, that in the North Island the minor triangulation has already preceded the major, and that it is undesirable in the South to delay the prosecution of minor triangulation in order to give precedence to the major. Assuming that triangulation, such as executed by me, is not subject to a greater error than one foot per mile, it is clear that it will suffice for every purpose of settling the boundaries of properties, and of rectifying past and preventing future errors of detail; and a major triangulation afterwards will prove that it does not exceed that limit in any part, and will afford the means of reducing its error, whatever it may be, to very narrow limits indeed, and so give a satisfactory and scientific completeness to the whole.

The question of revision of imperfect surveys—the most difficult part of the whole subject—has necessarily been left by Major Palmer in rather slight outline. Such a work as a revision of all erroneous section surveys *en bloc* would not only be inordinately difficult and expensive in itself, but it is one certain to excite suspicion and opposition from many landholders, to a degree which it would be very undesirable to encounter. I believe it to be wholly unnecessary. That which I conceive to be required is, to establish certainty in all future surveys, and to afford easy and certain means to enable the documents representing the older-granted estates to be brought into accordance with the actual holdings, whenever the proprietors desire to have it done. The mode of effecting this would be to carry the minor triangulation over the whole area which has been imperfectly sub-divided, then to accurately survey the roads in connection with it, and to establish permanent marks at the road intersections and at certain definite intervals along straight roads. Every section-holder would then have irrefragably fixed marks at a moderate distance on either side of the frontage of his estate, which marks would of course be laid down on the record maps. Then it should be made a rule of the Land Transfer Office that before land could be bought under that system it should first be surveyed (as now, at the expense of the applicant) in relation to those fixed points, and be laid down on the record map. The sections would then only be filled in on the record map gradually as they were accurately surveyed, and a truly cadastral map would ultimately result without any great expense to the

Government, and without opposition and heartburning. I am aware that under present rules the Land Transfer Office only registers land as represented in Crown grants: it would, therefore, be necessary in each case first to amend the grant by indorsing on it the correct boundaries of the land as provided in "The Crown Grants Correction Act, 1866."

Some system of symmetrizing by equivalent right lines the excessively sinuous and impracticable boundaries often insisted on by Natives in the adjudication of their claims, might also be requisite before a record map could be made the final evidence of property boundary—but this, and many other details, would probably have to be made the subject of legislative enactment—as soon as an energetic department had fairly appreciated the task before it.

The work no doubt appears formidable, and the opponents of accurate surveys can easily magnify the difficulties involved, and the cost of surmounting them, but I am satisfied that when fairly grasped they will be found very greatly to diminish; and, however great they may be, they will be most certain to become greater, and even in an increasing ratio, with every year through which the reform is postponed.

I enclose the usual return of the number of maps and their areas received in this office during the past year, and also of the area and cost of the triangulation.

I have, &c.,

THEOPH. HEALE,

The Hon. the Native Minister, Wellington.

Inspector of Surveys.

RETURN showing AREAS and COST of BLOCKS of LAND NORTH of AUCKLAND, surveyed under the direction of the Inspector of Surveys during the Year 1874-1875.

Return "A."—Surveys under Contract Mileage Rates.

Blocks.	Area.			Cost.		
	A.	R.	P.	£	s.	d.
Wairua	27,800	0	0	228	12	2
Waoku	17,650	0	0	242	3	0
Tangihua	14,500	0	0	121	2	2
Purua	15,410	0	0	154	18	4
Uwhiroa	7,219	0	0	63	0	9
Puwhata	3,352	0	0	41	8	4
Takahue, Nos. 1 and 2	28,527	0	0	331	17	0
Tutamoe and Kairara	31,576	0	0	220	15	0
Pakanae	20,000	0	0	240	0	0
Kauae Ruru Wahine	9,800	0	0	180	0	0
Mangataira	2,944	0	0	62	9	6
Ponewhenua	73	0	0	11	17	10
Tokawhero	2,727	0	0	53	17	10
Maunganui	40,000	0	0	500	0	0
Waipoua	41,421	0	0			
Native Reserves	11,913	0	0			
Waimamaku	18,000	0	0			
	292,912	0	0	£2,452	2	1

Or a little over 2d. per acre.

Return "B."—Contract Acreage Rates.

Blocks.	Area.			Cost.		
	A.	R.	P.	£	s.	d.
Taungako	2,115	0	0	52	17	6
Awarua	3,100	0	0	77	10	0
Waihoanga	1,380	0	0	34	10	0
Opouteke	43,622	0	0	545	5	6
Tukuwhenua	2,680	0	0	34	10	0
Omahuta	8,532	0	0	142	4	0
	61,429	0	0	£886	17	0

Or 3½d. per acre.

Return "C."—By Surveyors on Daily Salary.

Blocks.	Area.			Cost.		
	A.	R.	P.	£	s.	d.
Pukewharariki	6,080	0	0	132	0	0
Rakauwahi						
Oikura						
Unuhia	4,395	0	0	95	5	9

Return "C."—continued.

Blocks.	Area.			Cost.		
	A.	R.	P.	£	s.	d.
Wai Tapu	783	0	0	16	6	3
Te Huia	1,470	0	0	30	12	6
Opuhiti	186	0	0	3	17	6
Omataroa (near Waitoroto)	3,320	0	0	27	7	0
Ngapipito and Wharoro	1,734	0	0	68	6	0
Ngapukehaua, Okorihi, and Oue No. 2	4,515	0	0	146	2	0
Okaka	915	0	0	64	4	0
Punakitere	7,557	0	0	95	3	6
Whakarongoua	810	0	0	140	0	0
Whataipu	3,000	0	0			
Kahumaku	8,517	0	0			
Mangakino	752	0	0	86	13	0
Mokau*	451	0	0	38	7	0
Waoku, No. 3	12,431	0	0	*89	16	0
Waimatanui (estimated)	8,000	0	0	111	3	0
	64,916	0	0	93	16	0
				£1,238	19	6

Or 4½d. per acre.

* Considerably larger area surveyed, but owing to Native opposition was abandoned.

Return "D."—By Surveyors on the Staff (Mr. Clayton).

Blocks.	Area.			Cost.			Remarks.
	A.	R.	P.	£	s.	d.	
Te Takanga	20,000	0	0	260	0	0	Very mountainous country, covered with dense forest.
Otangoaroa							
Rakauhongi							
	(Estimated.)						

Or 3d. per acre.

Return "E."—Cost of Surveys under "Native Lands Act, 1865."

Blocks.	Area.			Cost.		
	A.	R.	P.	£	s.	d.
Hauarahi	1,576	0	0	110	0	0
Te Kauri	50	0	0	21	0	0
Tametepo	37	0	0	10	10	0
Maketawa	112	0	0	15	15	0
Te Komata	1,564	0	0	80	0	0
Wharekawa No. 4	15,950	0	0	350	0	0
Tapakanga	737	0	0	62	0	0
Pukewhau	301	0	0	40	0	0
Te Rata	226	0	0	29	0	0
Wainui	490	0	0	37	10	0
Te Reureu	122	0	0	40	0	0
Tahanui	875	0	0	44	0	0
Kaiwaka	410	0	0	32	0	0
Waipu	3,780	0	0	149	4	3
Rakautawa	3,415	0	0	63	11	4
	29,645	0	0	£1,084	10	7

Or 8½d. per acre.

In the greater number of these surveys the lines were cut by the Native claimants.

RETURN showing NUMBER and GROSS AREA of MAPS of NATIVE LAND COURT CLAIMS, &c., received at the Inspector of Surveys' Office, from 1st July, 1874, to the 30th June, 1875.

Province of Auckland—	No. of Maps.	Area.		
		A.	R.	P.
Prior to June, 1874	2,152	3,679,735	0	0
In year ending 30th June, 1875	99	541,427	0	0
	2,251	4,221,162	0	0
Province of Hawke Bay—				
Prior to June, 1874	239	1,239,409	0	0
In year ending 30th June, 1875	7	125,216	0	0
	246	1,364,625	0	0

					No. of Maps.	Area. A.	s.	d.
<i>Province of Wellington—</i>					445	1,235,027	0	0
Prior to June, 1874					17	98,177	0	0
In year ending 30th June, 1875					462	1,333,204	0	0
<i>Middle Island—</i>					57	21,769	0	0
Prior to June, 1874					Nil.	Nil.		
In year ending 30th June, 1875					57	21,769	0	0
<i>Public Works Department—</i>								
Plans, Sections, &c.:								
Prior to June, 1874					57			
In year ending 30th June, 1875					11			
					68			

THEOPH. HEALE,
Inspector of Surveys.

Inspector of Surveys' Office, Auckland, 1st June, 1875.

GRAND TOTALS.								
Province of Auckland .. .. .	..	..	..	..	2,251	4,221,162	0	0
Province of Hawke Bay .. .. .	..	..	..	..	246	1,364,625	0	0
Province of Wellington .. .. .	..	..	..	..	462	1,333,204	0	0
Middle Island .. .. .	..	..	..	..	57	21,769	0	0
Public Works Departments .. .. .	..	..	..	..	68			
					3,084	6,940,760	0	0

THEOPH. HEALE,
Inspector of Surveys.

Inspector of Surveys' Office, Auckland, 1st June, 1875.

RETURN showing EXTENT and COST of TRIANGULATION executed by the Inspector of Surveys' Department during the Year from 1st July, 1874, to 30th June, 1875.					Acres—Area.	Cost. £	s.	d.
From 1867 to June, 1874 .. .. .	..	..	..	..	6,617,790	9,865	4	3
Province of Auckland .. .. .	..	..	..	..	819,200			
Province of Wellington (Seventy-Mile Bush) .. .. .	..	..	..	..	200,400			
					1,019,600	£2,400	8	0

At a cost of .565 of a penny per acre.

THEOPH. HEALE,
Inspector of Surveys.

Inspector of Surveys' Office, Auckland, 1st June, 1875.