M.R.O. 1—77,006—8-6-37.

(1) Number of pages

(2) Date of repair

(3) Initials of the Referencer

MADRAS RECORD OFFICE.

Government of Madras.

PUBLIC WORKS DEPARTMENT.

G.O. No. 367 C. Press / Mis.

689-690

Dated 22-12- 1864.

Not to be folded or roughly handled

No. 489. Read the following Proceedings of the Governor General of India in Council, Public Works Department, dated Fort William, 10th November 1864, Circular No. 79 :—

Connection and reduction to one standard datum, of the levels taken for various purposes all over India.

Read again—

Public Works Department No. 1,785, dated 12th May 1862, to the address of the Surveyor General of India.

Read also—

Letter No. 75—497, dated 26th August 1862, from the Officiating Superintendent, Great Trigonometrical Survey, to the Secretary, Public Works Department.

RESOLUTION.—This proposal originated from a suggestion made by the President of the late Special (Cholera) Commission, for remedying the absence of systematic connection with one another, of lines of levels in and around Military Stations, with reference to which Circular No. 10 of 1862 was issued.

2. The question in a more general form was referred for consideration in the Surveyor General's Department, and a suggestion made that a Table of Heights above the sea-level of points accurately determined should be compiled and published by that Department. This suggestion was acted upon, and the first volume has already appeared.

3. A Circular (No. 37 of 1862) was also issued desiring that all Public Works Officers and Railway Consulting Engineers should supply the Surveyor General's Department, on requisition, with any information they may possess regarding the levels of the country.

4. Major Walker, the Superintendent of the Trigonometrical Survey, in the letter above noted, recommends that charts of levels, showing the water-sheds and water-courses and all the most important particulars connected with the levels of a District should be prepared. The scales he considers advisable, whenever practicable, are, for Cities and Cantonments, six inches to the mile, for Districts one inch to the mile, and for the general index charts one-fourth of an inch to the mile, the scale of the sheets of the Indian Atlas.

5. Such charts and tables, though they could never do away with the necessity of a detailed survey for any particular project, would be of great value, affording, in a systematic form and at a glance, general results which would be useful to a variety of persons and invaluable to any Engineer projecting works. But the Government of India, whilst fully recognizing these advantages, is of opinion that to *publish* maps such as are recommended would be next to impossible ; the bulk they would occupy would be enormous on any scale that could be of use. All that seems practicable is to stimulate the Local Authorities to do what is in their power to get manuscript maps of the description in question prepared either in the provincial Chief Engineer's Office or in the several Executive Engineer's Offices, embodying the known data as to levels and bringing into one connected system, as soon as possible, all the levels of their main lines of roads and canals, and, through their Consulting Engineers, of Railways.

6. An immense extent of India has been gone over with the level, and the rapid extension of Railways and Roads adds daily to the stock of data already existing. Unfortunately, much of the work is lost again immediately, for these purposes at least, from the want of system in recording the results. Increased attention should be paid to this point, and the following suggestions might, as far as practicable, be attended to.

7. The standard datum which was ordered to be adopted in all Military Stations in Circular No. 10 of 1862, should in every case, when practicable, be referred to the zero of the Great Trigonometrical Survey. The same rule should be followed with reference to the levels of all canals, roads, embankments, &c. In running fresh levels, particular care should be taken to connect the new work with some known level datum, or to leave a bench-mark to be connected afterwards.*

* This bench-mark, wherever practicable, should be on some tomb, temple or well, or other building of a permanent character.

8. It should be understood that the operations of the Public Works Department should, as far as possible, be made to aid the general scheme for obtaining a system of levels all over the country; but no expenditure of money or time by this Department should be permitted for the execution of levelling operations, not required in connection with the prosecution of public works, unless as an exceptional matter, and to obtain a connection between a Great Trigonometrical Survey fixed point and an extensive series of local levels or places of importance, as suggested in paragraph 10 of Major Walker's letter.

9. The special attention of all Superintending and Executive Engineers should be directed to the importance of these subjects, and measures should be taken for the gradual and systematic adoption in every Executive Division of one invariable standard datum for all projects involving levelling operations appertaining to the Division. This datum should, as soon as practicable, be referred to the Great Trigonometrical Survey Zero by connexion with one of the fixed points given in the published tables. When the connexion has been made, the whole of the levels will of course be given with reference to the Great Trigonometrical Survey Zero. The connexion of the datum points of out-stations may frequently be accomplished by help of the levels along lines of road or canal. Want of attention to these points should be checked by superior authority in dealing with all Engineering projects.

10. It will be desirable to encourage so far as is found compatible with the prosecution of the regular work of the department, the compilation of maps such as have been referred to in paragraph 5.

11. The various Local Governments and Administrations will no doubt be quite alive to the benefits which will result from the systematic collating and mapping of the data at their disposal, and His Excellency in Council invites the co-operation of all in this important work in some such manner as above suggested, so far as it may be found practicable. The Surveyor General might usefully take the subject into further consideration in communication with the various Governments and Administrations, and refer in his annual reports to the progress made in various parts of the country in carrying out the intention.

ORDER.—Ordered, that this Resolution and the letter, with annexure, from the Superintendent, Great Trigonometrical Survey, be circulated to the various Governments and Administrations marginally noted, for information; also to the Military Department for communication to the Surveyor General of India, and the Superintendent, Great Trigonometrical Survey.

Madras.	British Burmah.
Bombay.	Straits Settlements.
Bengal.	Mysore.
N. W. P.	Hyderabad.
Punjab.	G. G.'s Agents, Rajahpootna and Central India.
Oudh.	
Central Provinces.	

(Signed) R. STRACHEY, Colonel, R. E.,
Secretary to the Government of India.

To the Secretary to the Government of Madras, Public Works Department.

Enclosure to Public Works Circular, No. 179 of 1864.

No. 157, dated 26th August 1862.

From—Major J. T. WALKER, *Engrs., Offg. Supdt., Great Trigonometrical Survey.*

To—*Secretary to Government of India, P. W. Dept.*

1. With reference to your No. 1,785, dated 12th May, to the Surveyor General, I have the honor to inform you that I am preparing for publication a table of heights above the sea level of points already determined by the operations of the Trigonometrical Survey, to serve as a basis of connexion for the levels taken all over India, by means of which they may be reduced to a common datum.

2. I conceive, however, that this is but the first step towards the completion of a measure which may be made of considerable practical utility, if it so combines and collates the labours of the past, as to render them available for the future, in the form which will be most appreciated by the public. I am persuaded that practical men will greatly value charts of levels, showing

the water-sheds and water-courses and all the most important particulars connected with the levels of a District. Such charts convey information at a glance, which would require so much time to extract from a table of numerical results, that the table would probably be merely referred to for initial and verificatory elements, and not as a guide to future enquiries, the purpose for which it is most wanted.

3. Colonel Turnbull, the Superintendent General of Irrigation in the North Western Provinces, has obliged me by calling on all the officers of experience under his orders for their opinions of the form in which the reduced and connected levels should be published. All are unanimous in favor of charts, though there are considerable differences of opinion as to the scale to be adopted, and the amount of detail to be given. I enclose a copy* of Major Brownlow's valuable suggestions on this subject.

* Letter No. 101, dated 1st July 1862, to Superintendent General of Irrigation.

4. Mr. Dodsworth's excellent chart of the levels of the Ganges Canal, its branches, and the surrounding country, is on the scale of an inch to a mile. It contains about eight determinations of level in each mile of line, and has drawings of all the buildings referred to as bench-marks.

5. I would recommend that wherever a map of this nature exists, a copy of it, showing the numerical results reduced to the mean sea level, should be prepared in the Office in which it was originally compiled, and forwarded to this Office for examination and publication, as it cannot fail to be exceedingly useful.

6. Probably few similar maps are in existence. As the preparation of new ones, expressly for the present object, would be liable to retard matters indefinitely, I think that Executive Officers, who do not already possess such charts, might be called on to project their lines of levels on the best published maps available.

7. Where none exist, copies might be prepared of all existing manuscript charts of levels which may be considered worth the cost of publication. Whenever practicable, it will be advisable to have the charts on uniform scales as follows:—Six inches per mile for cities and cantonments, one inch per mile for district detail, and a quarter of an inch per mile, the scale of the sheets of the Indian Atlas, for general index charts. Whatever valuable maps and charts already exist, simple copies of them, with the numerical values reduced to the mean sea level, will, if sent in speedily, be preferable, to making reduction to either of the above scales for the sake of uniformity, which may entail much trouble and indefinite delay.

8. This six inch, and one inch, charts might be lithographed in this country, but those on the quarter inch scale should, I think, be sent to England to be engraved, after re-compilation in this Office, as will be subsequently suggested.

9. The officers of the Public Works and Railway Departments will, I trust, be called on to connect their levels with those of the Trigonometrical Survey, as soon as the latter are published. In the course of our operations, care has invariably been taken to connect our levels with all the canal and Railway bench-marks within reach. In the Province of Sindh, in particular, several lines of levels previously isolated were thus connected together; and the necessary data to enable them to be reduced to a common origin have already been furnished to the Chief Engineer in Sindh. But in many instances it will be necessary for officers of the Public Works Department to run special lines of levels to form a junction with those of this survey.

10. For instance the height of Lahore is of considerable importance in connexion with the Railways from Delhi and Mooltan, the Baree Doab Canal, and the Grand Trunk Road to Peshawur. Our nearest point to Lahore is Ferozepoor. I would suggest that the Secretary to Punjab Government, in Public Works Department, be called on to make the necessary arrangements for fixing a permanent stone bench-mark at Lahore, and having it connected with our bench-mark at Ferozepoor, and with the Railway, Canal, and Trunk Road levels.

11. Numerous similar instances will suggest themselves, so numerous in fact that without the cordial co-operation of the Officers of the Public Works Department, it will be impossible for the connexion to be satisfactorily effected. The necessary correspondence on the subject will, perhaps, be best carried on between the respective Secretaries to the Local Government in the Public Works Department, and myself.

12. It will be advisable that the shares to be borne by the Public Works and the Survey Department, in this undertaking, should be clearly defined at the outset, to prevent future misunderstanding. I consider that preliminary charts and tables of numerical results, should, in the first instance be prepared and reduced to the mean sea level, in the Offices in which the original field books, or the charts prepared from them, are lodged. They should then be forwarded to this Office, when the charts will have their errors of projection corrected, and be prepared for publication, and the tables of numerical results will be printed as appendices to the Trigonometrical Survey Tables of levels. From these preliminary charts, final index maps should be prepared in this Office, for the Districts included in the respective atlas sheets, as soon as final details of the whole of the various series of Canal, Railway, and Road levels taken in that District are received. These maps will then be available for being engraved and published.

13. I propose prefacing the tables of levels of this Department with an account of the manner in which our spirit levelling operations were conducted, and a general introduction to the subject, with suggestions regarding the connexion of other levels with those of this survey. I hope to be ready to send the first volume to press about six weeks hence, and shall be obliged by your informing me how many copies will be required for the Department of Public Works.

No. 101, dated 1st July 1862.

From—MAJOR H. A. BROWNLOW, *Superintendent, Eastern Jumna Canal.*

To—Superintendent General of Irrigation, North Western Provinces.

In reply to your letter No. 799 of the 26th ultimo, requesting my opinion as to the shape of record in which the various levels taken over India should be presented to the public when collected and reduced to a common datum, I have the honor to state that I would have prepared on a scale of two miles to one inch a series of skeleton maps showing accurately :—

1st.—Course and reduced levels at each mile of the various water-shed and water-course lines in each district.

2ndly.—Course followed by reduced levels at each mile of all lines of levels taken by the Great Trigonometrical Survey parties including levels of all bench-marks left by them.

3rdly.—Positions of all principal towns, main lines of road, and era for purposes of identification.

2. These skeleton maps should be accompanied by larger maps (on a scale of say six inches to a mile,) showing in detail the principal features of ground for three miles round every cantonment or large native city, the outfall of all nullahs and water-courses, included in survey, and *especially the high-water mark of floods in these channels.* Systems of drainage are usually laid out in the dry season, and the contrivers are apt to neglect effects of back-water from receiving channels which should be given their due influence in the design.

3. Printed volumes of numerical results would be most useful as a check on the reduced levels entered on the maps, and should contain descriptions and sketches of the bench-marks which it would be unadvisable to encumber the maps.

4. I would dispense entirely with sections which would add largely to cost of work, and convey no information, that is not afforded to a practical eye by reduced levels on a map. To the general public the distorted scale of vertical distances would prove so deceptive as greatly to neutralize any other supposed advantage derivable from them.

5. Nor do I think that the levels of every station where an instrument has been set up should be recorded, excepting always in the vicinity of cantonments and large towns. In fact, I think, that too great detail would be positively objectionable as tending to confuse the eye, and lead the mind away from the general results which alone the scheme under consideration can be intended to convey. Unless done on an enormous scale and covered with contour lines, the proposed maps could never do away with the necessity of a detailed survey for any particular project. Accurately fixed bench-marks, and a correct idea of condition of receiving channel are invaluable aids in designing any system of drainage, and as much as any Engineer has a right to expect from a general plan embracing levels taken over all India.

No. 490. ORDER THEREON, 22nd December 1864, No. 3,674.

Communicated for information and guidance to Superintending Engineers, with reference to Proceedings of Government No. 1,462, dated 24th June 1862, appended to the Chief Engineer's Circular No. 1,897 of the 4th July 1862.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

To the Superintending Engineers.

Exd. T. O'Connor.

7

CIRCULAR No. 79 of 1864.

PUBLIC WORKS.

PROCEEDINGS OF THE GOVERNOR GENERAL OF INDIA IN COUNCIL.

PUBLIC WORKS DEPARTMENT,
Fort William, 10th November, 1864.

Civil Works.
Miscellaneous.

Connection, and reduction to one standard datum, of the levels taken for various purposes all over India.

Read again—

Public Works Department No. 1785, dated 12th May 1862, to the address of the Surveyor General of India.

Read also—

Letter No. 75—497, dated 26th August 1862, from the Officiating Superintendent, Great Trigonometrical Survey, to the Secretary, Public Works Department.

RESOLUTION.—This proposal originated from a suggestion made by the President of the late Special (Cholera) Commission, for remedying the absence of systematic connection with one another, of lines of levels in and around Military Stations, with reference to which Circular No. 10 of 1862 was issued.

2. The question in a more general form was referred for consideration in the Surveyor General's Department, and a suggestion made that a Table of Heights above the sea-level of points accurately determined should be compiled and published by that Department. This suggestion was acted upon, and the first volume has already appeared.

3. A Circular (No. 37 of 1862) was also issued desiring that all Public Works Officers and Railway Consulting Engineers should supply the Surveyor General's Department, on requisition, with any information they may possess regarding the levels of the country.

4. Major Walker, the Superintendent of the Trigonometrical Survey, in the letter above noted, recommends that charts of levels, showing the water-sheds and water-courses and all the most important particulars connected with the levels of a District should be prepared.

The scales he considers advisable, whenever practicable, are, for Cities and Cantonments, six inches to the mile, for Districts one inch to the mile, and for the general index charts one-fourth of an inch to the mile, the scale of the sheets of the Indian Atlas.

5. Such charts and tables, though they could never do away with the necessity of a detailed survey for any particular project, would be of great value, affording, in a systematic form and at a glance, general results which would be useful to a variety of persons and invaluable to any Engineer projecting works. But the Government of India, whilst fully recognizing these advantages, is of opinion that to *publish* maps such as are recommended would be next to impossible; the bulk they would occupy would be enormous on any scale that could be of use. All that seems practicable is to stimulate the Local Authorities to do what is in their power to get manuscript maps of the description in question prepared either in the provincial Chief Engineer's Office or in the several Executive Engineers' Offices, embodying the known data as to levels and bringing into one connected system, as soon as possible, all the levels of their main lines of roads and canals, and, through their Consulting Engineers, of Railways.

6. An immense extent of India has been gone over with the level, and the rapid extension of Railways and Roads adds daily to the stock of data already existing. Unfortunately, much of the work is lost again immediately, for these purposes at least, from the want of system in recording the results. Increased attention should be paid to this point, and the following suggestions might, as far as practicable, be attended to.

7. The standard datum which was ordered to be adopted in all Military Stations in Circular No. 10 of 1862, should in every case, when practicable, be referred to the zero of the Great Trigonometrical Survey. The same rule should be followed with reference to the levels of all canals, roads, Embankments, &c. In running fresh levels, particular care should be taken to connect the new work with some known level datum, or to leave a bench-mark to be connected afterwards. ※

8. It should be understood that the operations of the Public Works Department should, as far as possible, be made to aid the general scheme for obtaining a system of levels all over the country; but no expenditure of money or time by this Department should be permitted for the execution of levelling operations, not required in connection with the prosecution of public works, unless as an exceptional matter, and to obtain a connection between a Great Trigonometrical Survey fixed point and an extensive series of local levels or places of importance, as suggested in para. 10 of Major Walker's letter.

※ This bench mark, wherever practicable, should be on some tomb, temple or well or other building of a permanent character.

9

9. The special attention of all Superintending and Executive Engineers should be directed to the importance of these subjects, and measures should be taken for the gradual and systematic adoption in every Executive Division of one invariable standard datum for all projects involving levelling operations appertaining to the division. This datum should, as soon as practicable, be referred to the Great Trigonometrical Survey Zero by connexion with one of the fixed points given in the published tables. When the connexion has been made, the whole of the levels will of course be given with reference to the Great Trigonometrical Survey Zero. The connexion of the datum points of out-stations may frequently be accomplished by help of the levels along lines of road or canal. Want of attention to these points should be checked by superior authority in dealing with all Engineering projects.

10. It will be desirable to encourage so far as is found compatible with the prosecution of the regular work of the department, the compilation of maps such as have been referred to in para. 5.

11. The various Local Governments and Administrations will no doubt be quite alive to the benefits which will result from the systematic collating and mapping of the data at their disposal, and His Excellency in Council invites the co-operation of all in this important work in some such manner as above suggested, so far as it may be found practicable. The Surveyor General might usefully take the subject into further consideration in communication with the various Governments and Administrations, and refer in his annual reports to the progress made in various parts of the country in carrying out the intention.

ORDER.—Ordered, that this Resolution and the letter, with annexure, from the Superintendent, Great Trigonometrical Survey, be circulated to the various Governments and Administrations marginally noted, for information; also to the Military Department for communication to the Surveyor General of India, and the Superintendent, Great Trigonometrical Survey.

Madras.
Bombay.
Bengal.
N. W. P.
Punjab.
Oudh.
Central Provinces.
British Burmah.
Straits Settlements.
Mysore.
Hyderabad.
G. G.'s Agents, Rajpootana and Central India.

Colonel, R. E.,
Secy. to the Govt. of India.

To
The Secretary to the Government of Madras
Public Works Department

24th June 1862 No. 1462

1864 Dept
Pub. Prof. Con. for December
No. 5327

No. 3674

Civil Works.
Miscellaneous.

RESOLUTION.

CIRCULAR No. 79.

To

FROM

SECY. TO GOVT. OF INDIA,
IN THE PUBLIC WORKS, DEPT.

Dated 10th *November*, 1864.

Received 13 Dec 1864

Communicates the views of the Government of India on the method to be followed in connecting and reducing to one standard datum the levels taken for various purposes all over India.

With an Order
No. 3674 - 22nd Dec. 1864.

Communicated for information and guidance to Superintending Engineers with reference to Proceedings of Government No. 1462 dated 24th June 1862 appended to the Chief Engineers Circular No. 1897 of the 4th July 1862.

Chepauk
22nd Dec. 1864

To the Chief Engineers

Dept. 28th December

No. 87

No. 489. 490

15th Dec. 1864