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MADRAS RECORD OFFICE.

Government of Madras.

Public works DEPARTMENT.

G.O. No. <u>60</u>	Press ~~Mis.~~
<u>115-16</u>	
Dated <u>8. 1.</u>	<u>1868.</u>

Not to be folded or roughly handled

No. 115. Read the following letter from the Consulting Engineer for Irrigation and Canal Company, to the Secretary to Government, Department Public Works, dated Madras, 16th December 1867, No. 121.—

1. When my last inspection of the Madras Irrigation and Canal Company's works was made in August, the 9th Section, Main Canal, miles 144th to 178th, had hardly been commenced, and I therefore took advantage of the Chief Engineer's intended visit to the section to meet him, and see how the works were progressing, and also settle with him what modifications of some of the masonry works, regarding which some correspondence had passed, would be needed.

2. I find that the earth-works in the upper ten miles of the section have made very good progress, and that they are on the average about three-fourths done. The masonry works have not been commenced, owing to the designs of some of them having been found capable of advantageous modification. They will now, however, be at once started, and, as the collection of materials has already made considerable progress, it may be expected that ere long these works will be made to keep pace with the earth-works.

It is of importance also that the whole of the canal works, of whatever description, should be regularly completed, mile by mile; all the labor that can be advantageously employed on the successive subdivisions* into which the section has

* Of five miles each.

been formed should be there kept, until everything that can be completed has been finished, for in this way each year considerable lengths of the canal may be brought into use, and the commencement of irrigation may be secured in 1869 at the latest, and its extension obtained more rapidly than would otherwise be practicable.

Head Works

3. The designs for the head and under-sluiques have been modified, to adapt the openings the better to the screw-gearing which has been ordered from England. The original design for the under-sluiques showed revolving shutters, like those at Soonkasala. They were not only very expensive, but also far from successful, and the substitution of shutters with a vertical lift will be a decided improvement. The capacity of these sluices will not be altered.

Scouring Sluices
143 miles 28 chains

4. When submitting the original estimates for sanction, it was pointed out that these might be omitted without

inconvenience, and the Chief Engineer has decided not to build them.

Culvert, 3 feet.
143 miles 78 chains

5. The amount of drainage is very trifling, and the construction of a culvert would admit the flood-waters of the

Koondaur across the line of the canal, and render the alteration of the left bank into a flood bank necessary. The Chief Engineer intends, therefore, to substitute an inlet calingulah of 15 feet opening.

6. In designing the aqueducts and culverts originally, sufficient attention was not paid to the amount of head-way which the relative levels of the canal bed and drainages allowed, and consequently the floors of many of these works would, if built as designed, be much below ground, and would require the excavation of

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8th January 1868.*

out-fall channels, for the cost of which no provision was made. With a view to obviate this inconvenience, a general revision of the arrangements for passing drainage, has been made, and for the

Aqueduct, 1 arch, 20 feet.
144 miles 67 chains.

it is intended to substitute a culvert of

two or three spans of twelve feet each. The number of spans was left to be decided after the Executive Engineer should have inspected the nullah and ascertained more accurately the quantity of drainage received by it.

Aqueduct of 1 arch, 20 feet span for road
145 miles 25 chains.

7. The late Chief Engineer entertained very strong objections to over-bridges, and he therefore provided an

aqueduct for the traffic crossing the canal in this mile. An aqueduct, however, would be a very much more expensive work than a bridge, and the present Chief Engineer intends constructing a second class bridge at this point. It was also proposed to insert a culvert of two vents of five feet span for drainage, but it appeared to me that before this was done the existence of any drainage which could not be conveniently diverted to the culvert in the preceding, or to that in the same mile, should be ascertained.

Culvert, 8 feet
145 miles 77 chains.

8. The absence of head-way makes it advisable to construct vents of five feet and of equal capacity for discharge, in lieu of a single vent of eight feet.

Vaikalair aqueduct, 12 spans of 30 feet each.
149 miles 20 chains.

9. The water-way allowed for this river appears to be larger than is necessary, and as far as could be ascertained

from a comparison of the drainage areas of this river and of the Caulee, and from the estimated discharge of the latter, both the Chief Engineer and myself concluded that probably nine arches would suffice, especially as the foundations will be on rock, and there would consequently be no danger were the velocity of discharge increased. However, pending a further investigation, which the Executive Engineer has been requested to make, with a view to ascertain more precisely than is possible near the line of canal, where the river in high freshes overflows its banks, what the sectional area and surface fall of the Vaikalair in extreme floods really is, it has been thought better to leave out only one arch, which seems to have been given solely for the purpose of making a roadway under the canal. The aqueduct will accordingly be gone on with from one end for the present, and before the one abutment and eight piers shall have been completed to the level of the springing, probably data for determining whether nine or eleven arches will be required, will be forthcoming.

Three feet Culvert.
150 miles 12 chains

Kurnool and Cuddapah Road bridge.
150 miles 31 chains.

the Chief Engineer has, on a further consideration of the inconvenience of contracting the water-way and so increasing the current, decided on allowing forty feet as

10. This small work will probably be built with five feet water-way instead of three feet.

11. A design reducing the span to thirty-six feet had been prepared, but

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in the original design. The mean width of the canal is sixty feet, so that forty feet for the bridge do not appear to me to be at all excessive.

Aqueduct, two arches, 20 feet span.
150 miles 52 chains

12. Here, to avoid heavy excavations for an out-fall, five arches of twelve feet span each are to be substituted for two arches of twenty feet, and, similarly, in the 152nd mile a culvert of two low spans of five feet each will be built in lieu of one span of six feet.

Culvert, 6 feet
151 miles 35 chains.

Aqueduct, two arches, 20 feet.
153 miles 35 chains.

13. In the 154th mile this aqueduct was provided in the original estimate. The excavation of an out-fall in hard kunkur would be expensive, and it would under no circumstances make a good crossing for which one arch was intended to be adapted. It is proposed, therefore, to build a second class bridge opposite Cana Goodoor at about 152 miles 50 chains, and to construct the aqueduct with three spans of twelve feet. A two feet culvert is the only other main supply masonry work in this mile, and no alteration of its dimensions is needed.

Aqueduct, two arches, 20 feet.
154 miles 27 chains.

14. For reasons similar to those mentioned in the preceding paragraph, a culvert of two arches of twelve feet, or three of nine feet, is to be substituted for the aqueduct, and a second class bridge is to be built at about 154 miles 75 chains, opposite Jillala.

Aqueduct, two arches, 20 feet.
155 miles 36 chains.

15. Here also a culvert of two spans of twelve feet or three spans of nine feet will be constructed, instead of an aqueduct, and will be a more appropriate work.

Aqueduct, two arches, 20 feet.
157 miles 54 chains.

16. This aqueduct, in addition to passing drainage, has to provide for traffic from Dhoor to the eastward, and particularly for that between the village and the fields on the far side of the canal. I am not quite sure that this double duty can easily be performed, and it should be ascertained whether it will not be cheaper to remove the aqueduct from the list of crossings, and build a second class bridge about half a mile to the northward.

Public road bridge
158 miles 69 chains.

17. In the 159th mile the canal will again cross the Cuddapah road: the design for the bridge is similar to that for the crossing at 150 miles 31 chains.

Aqueduct, one arch, 20 feet.
159 miles 66 chains

18. Instead of this aqueduct a culvert of one arch of twelve feet span will be sufficient, and more suitable to the position.

Aqueduct, three arches, 20 feet span.
162 miles 78 chains

19. For this aqueduct a culvert of three vents of twelve feet span each is proposed to be substituted, and the alteration appears to be advisable.

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Aqueduct, one arch, of 20 feet.
163 miles 75 chains

necessary that the Executive Engineer should ascertain what quantity of surplus water from Chintacoonta tank may be expected.

6 feet Culvert
165 miles 20 chains

Aqueduct, six arches span.
166 miles 15 chains
Aqueduct, six arches, 30 feet span
167 miles 21 chains

the 168th mile. This interference with the road will now be avoided. The aqueducts of thirty feet span are not adapted to the circumstances of the nullahs, and in the 167th mile nine spans of fifteen feet each with eight feet head-way, and in the 168th mile seven spans of fifteen feet with nine feet head-way will be more convenient works. The Chief Engineer is, however, desirous of ascertaining whether it would not be a better arrangement to run the canal through the Pichapad tank, making it single-banked from about 166 miles to 167 miles 50 chains. I see no objection to this plan on the ground of submergence of valuable land, but until the project has been put on paper, and the relative cost ascertained, it will be better to defer expressing any decided opinion.

23 In the 170th mile the first lock occurs, and below this the fall of the country is rapid. The Chief Engineer considers, and I agree with him, that it is not likely that there will be any water available for irrigation under the last nine miles of the section, and that consequently the canal below this point had better be made a still-water navigation. If this be done the calingulahs in connection with the locks may be dispensed with, and all surplus water may be disposed of by means of the irrigation sluices in the 168th and 169th miles, which are intended to be large enough to water 10,000 acres.

24. A short time ago I had some correspondence with the Chief Engineer on the subject of the insufficiency of canal water-way allowed at the aqueducts of this section, and it was noticed that the current, already greatly increased by the contraction of the cross section at these works, from 300 to about 125 square-feet, would be still more, and to a very inconvenient extent, augmented whenever a boat of tolerably large dimensions had to ascend the canal. The Chief Engineer promised to take the facts thus noticed into consideration, and I am glad to be able to report that he intends to make all the aqueducts thirty-one feet wide between the side-walls, thus increasing the water-way to 155 square-feet, and this, I think, will be a very decided improvement.

25. It is expected that all the masonry works of the section, except the locks, will be constructed without exceeding the sanction, Rupees 3,32,441, already given for them. The original sanction

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8th January 1868.*

Proceedings Madras Government, No. 2,786,
dated 10th September last.
This office letter paragraph 5.

for the locks has not as yet been supplemented,* and therefore further sanction on their account will be needed so soon as the Chief Engineer may find himself ready to apply for it.

26. In order to avoid delay, I request that I may be authorized to approve the revised estimates and plans for the masonry works down to the end of the 166th mile, as soon as they may be completed and sent to me, provided the estimated cost of those belonging to the several sub-divisions (five miles) is not in excess of the sanction already given. It will probably be a convenience to the Chief Engineer to send in the plans of each five miles directly they are ready, rather than to wait until the alterations and modifications of all the works throughout the section shall have been decided upon in detail and put on paper.

27. I subjoin, with reference to Proceedings Madras Government, No. 500, dated 9th February 1866, a list of the crossings of this section to which the Chief Engineer has agreed:—

No.	Class.	Description	Position	
			Miles	Chains
1.	2nd	Head sluice	143	23
2.	2nd	Bridge	145	26
3.	2nd	Vaikalair aqueduct	149	20
4.	1st	Bridge, Cuddapah road	150	31
5.	2nd	Bridge	152	50 about.
6.	2nd	Do.	154	75 do.
7.	2nd	Do.	157	54 or if necessary a second class
8.	1st	Aqueduct	158	69 bridge may be built at
9.	2nd	Bridge, Cuddapah road	162	77 about 157 miles 12 chains
10.	2nd	Aqueduct	166	16
11.	2nd	Do.	167	23

Should, however, the canal be made single-banked here, these aqueducts will not be needed, and then second class bridges will be required, one at about 165 miles 68 chains, and another at 167 miles, 15 chains.

No.	Class.	Description.	Position	
			Miles	Chains
12.	2nd	Bridge over tail-bay of Lock No. 1	169	23
13.	2nd	do. do. do. *	171	60
14.	2nd	do. do. do. "	174	46
15.	2nd	do. do. do. "	176	15

This number of crossings will, I think, be found sufficient for the wants of the country, and I beg to recommend the approval of the above list, leaving the particulars of Nos. 7, 10, and 11 to be determined hereafter. In the list printed with the Order of Government above referred to, there were seventeen crossings, of which two, the ferries at 170 miles 60 chains, and 176 miles 25 chains, required to be changed to bridges, which the Supervisor considered should be placed at about 169 miles 20 chains, and 176 miles 40 chains. It is now intended to build bridges over the tail-bays of the locks at 169 miles 23 chains, and 176 miles 15 chains,

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8th January 1868.*

which will afford the accommodation required for the Nundialumpett and Podatoor, and for the Cazeepett and Camlapoor, roads. The crossings not given in the revised list are those at 159 miles 66 chains, and 163 miles 75 chains: of these, at the former, there will be a culvert of twelve feet span, which, though not considered as a regular crossing, will be useful for cattle going to the fields, and there will be a first class bridge within a mile. At 163 miles 75 chains there will not be sufficient head-way for a crossing under the aqueduct, and I do not think there is a necessity for constructing a bridge. Chintacoontah, which is opposite the 165th mile-stone, is the only village interested, and there will be a crossing for it either at the aqueduct 166 miles 16 chains or, should that not be built, at a bridge at about 165 miles 68 chains

28 The Executive Engineer has informed the Chief Engineer that he has found some differences between the levels which he has had taken, and those on which the sanctioned estimates were based, and he states that the cuttings will generally be a foot or a foot and a half deeper than the depth allowed. Consequently he has proposed to change the line of canal from about 158 miles 60 chains to 169 miles, in order to prevent any increase of cost. The Deputy Collector engaged in transferring land informs me that he has settled the compensation for all lands down to Chintacoontah, i.e., to about the 165th mile, I have consequently asked the Chief Engineer to limit the alterations, where the lands have already been settled for or transferred, to those parts in which a change is clearly desirable, and I hope also that before any change is proposed he will satisfy himself that the recent, are more correct than the original, levels. I have requested also that immediate intimation may be given of the numbers of the land plans likely to be affected, so that the Deputy Collector may defer settling for lands included in such plans.

Bungalow at Dhoor

29. This bungalow is being built with stone-in-chunam; its walls have been raised to about six feet in height and it promises to be a substantial building.

From the Consulting Engineer for Irrigation and Canal Company, to the Agent and Manager of the Madras Irrigation and Canal Company, dated Madras, 13th September 1867, No 150

1. In looking over the plans of the masonry works of the 9th Section, it has struck me that the water-way of the aqueducts is so small that, at any rate in the upper miles before water has been disposed of for irrigation, it will be almost impossible for a large boat to ascend the canal.

2 The general width of the aqueducts between the side-walls is 23 feet and the depth 5 feet, and the discharge being 60,000 cubic yards an hour, the ordinary velocity will be 4,700 yards or 2.67 miles an hour. Supposing, however, a boat with a cross section of, say, 52 square feet = 15 x 3½ feet draught nearly, wanted to ascend the canal. on reaching one of these aqueducts it would reduce the water-way to 63 square-feet, and have to stem a current of 4.87 miles an hour, and such a current would be a serious obstacle to traffic. A boat only 9 feet beam and drawing 3 feet would, at these works, meet a current of 3½ miles an hour, and that would probably prevent its getting through without extra towing power

3 I have also noticed that the passages leading to the ingress and egress valves of the locks

* 1 to 5
† 1 to 10

are too small compared with the cross section* of the culvert, and the total area† of the vents leading from the culvert to the lock chamber. Looking to the fact that the velocity of the water is gradually diminished to zero, it appears to me that it would be well to apportion the size of the primary vents, so that their area should be double that required to give the greatest velocity considered proper for the water to attain at the junction

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8th January 1868*

of the small vents with the chamber. Then, on admitting water at the upper valve, the area of the opening would be gradually increased as the head diminished, and similarly for the egress vents. It would be a pity were the capacity of the culvert and minor vents made comparatively useless, by a want of sufficient opening at the valves and valve passages

4. I shall be much obliged if you will bring these remarks under the Chief Engineer's notice.

From the Chief Engineer of the Madras Irrigation and Canal Company, to the Agent and Manager of the Madras Irrigation and Canal Company, dated Kurnool, 8th October 1867, No 717.

Water-way over Aqueducts, 9th Section

1. I have the honor to acknowledge the receipt of Captain Mullins' No 150, of 13th ultimo, with your foot-note, No 48 of 19th ultimo. I communicated at once with Mr. Carnuthers I would have replied earlier had not fever almost interrupted all my work for a week.

2 Where the level of the highest floods in the streams does not render it unsafe to do so, I propose to lower the piers and arches 18 inches or 2 feet, and so increase the depth of water in the aqueduct to 7 feet, and water-way by 50 feet (the area of the boat instanced by Captain Mullins is 52 feet) This will give all the water-way required, and the wash of boats will prevent fine silt depositing on the aqueduct

No 311.

Copy forwarded in reply to the Consulting Engineer's No 150, dated 13th September 1867.
(Signed) F. H. HENSLOWE,
Agent and Manager

MADRAS,
15th October 1867

ORDER THEREON, 8th January 1868, No. 60.
No. 116.

IRRIGATION, No. 7.

1. Forwarded to the Manager of the Madras Irrigation and Canal Company for communication to the Chief Engineer.

2. The Government sanction the proposal contained in paragraph 26, and, with the exceptions specially noted by the Consulting Engineer, sanction the list of crossings appended to paragraph 27.
(True Extract.)

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

To the Consulting Engineer for Irrigation and Canal Company.
do.
do.
Manager for
Superintending Engineer, 3rd Division.

Exd. S. T. Augustin

N^o 150

Consulting Engineer's Office,
Irrigation & Canal Co.
Madras 13 September 1867

From,

Captain J. Mullins R.E.
Cons: Engineer & C.E.

To,

The Agent and Manager
M. J. & C.E.

Sir,

In looking over the Plans of the
Masonry works of the 9th Section, it has
struck me that the waterway of the
Aqueduct is so small that, at
any rate, in the upper miles before
water has been disposed of for
irrigation, it will be almost impossible
for a large boat to ascend the Canal.

2 The general width of the Aqueduct
between the side walls is 20 feet and
the depth 5 feet and the discharge
being 60,000 Cubic yards an hour,
the ordinary velocity will be 4,700
yards or 2.67 miles an hour.
Supposing however a boat with
a cross section of, say, 52 square feet
= $15 \times 3\frac{1}{2}$ feet draught, nearly, wanted
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to ascend the Canal - On reaching one of these Aqueducts it would reduce the waterway to 63 square feet and have to stem a current of 4.87 miles an hour, and such a current would be a serious obstacle to traffic - a boat, only 9 feet beam and drawing 3 feet would, at these works, make a current of $3\frac{1}{2}$ miles an hour, and that would probably prevent its getting through without extra towing power.

3. I have also noticed that the passages leading to the ingresses and egress valves of the locks are too small compared with the cross section of the Culvert, and the total area of the vents leading from the Culvert to the lock chamber - Looking to the fact that the velocity of the water is gradually diminished to zero, it appears to me that it would be well to apportion the size of the primary vents so that their area should be double ~~the~~ that required to give the greatest velocity considered proper for the water to attain at the junction of the small vents with

into the Chamber - Then on ⁹ admitting water at the upper valve the area of the opening would be gradually increased as the head diminished, and similarly for the egress vents. It would be a pity were the Capacity of the Culvert and minor vents made comparatively useless by a want of sufficient opening at the valves and valve passages.

4. I shall be much obliged if you will bring these remarks under the Chief Engineer's notice.

I have the honor to be
Signed J. Mullins Capt R.E.
Consulting Engineer S.W.C.
(True Copy)
John Mullins Captain R.E.
Consulting Engineer S.W.C.

1
Consulting Engineer's Office,
Irrigation & Canal Company,
Madras, 16th Dec^r 1879.

N^o 121

From, Captain, J. Mullins, R.E.
Consulting Engineer for I. & C. Co.

To, The Secretary to Government
Department of Pub. Works.

Sir, When my last inspection of the Madras
Irrigation and Canal Company's works was
made in August, the 9th Section Main Canal,
miles 11^{1/4}th to 17^{3/4}th had hardly been commenced,
and I therefore took advantage of the Chief
Engineer's intended visit to the Section to
meet him and see how the works were pro-
gressing, and also settle with him what
modifications of some of the Masonry works,
regarding which some correspondence had
passed would be needed.

2. I find that the earthworks in the upper
10 miles of the Section have made very good
progress, and that they are on the average
about $3/4$ th done. - The Masonry works have not

Enclosure in a letter
from the Consulting
Engineer dated 16th
December 1879

17th Dec^r 1879

not been commenced, owing to the designs of some of them having been found capable of advantageous modification. They will now however be at once started and, as the collection of materials has already made considerable progress, it may be expected that ere long these works will be made to keep pace with the earthworks.

It is of importance also that the whole of the Canal works of whatever description should be regularly completed mile by mile - all the labor that can be advantageously employed on the successive sub-divisions into which the Section has been formed should be there kept until everything that can be completed has been finished, for in this way each year considerable lengths of the Canal may be brought into use, and the commencement of irrigation may be secured in 1869 at the latest, and its extension obtained more rapidly than would otherwise be practicable.

3. The designs for the head and under sluices have been modified to adapt the openings the better to the screw gearing which has been ordered from England. - The original design for the under sluices shewed revolving shutters

Head works.

like those at Soontkiala. - They were not only very expensive, but also far from successful, and the substitution of shutters with a vertical lift will be a decided improvement. - The capacity of these sluices will not be altered.

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5. The amount of drainage is very trifling, and the construction of a culvert would admit the flood waters of the Koondan across the line of the Canal, and render the alteration of the left bank into flood bank necessary. - The Chief Engineer intends therefore to substitute an inlet Calingulah of 15 feet opening.

6. In designing the Aqueducts and Culverts originally, sufficient attention was not paid to the amount of headway which the relative levels of the Canal bed and drainage allowed and consequently the floors of many of these works would, if built as designed, be much below ground and would require the excavation of outfall channels for the cost of which no provision was made. - With a view to obviate this inconvenience a general

revision of the arrangements for passing drainage has been made and for the Aqueduct of 20 feet in the 145th mile it is intended to substitute a culvert of 2 or 3 spans of 12 feet each. The number of spans was left to be decided after the Executive Engineer should have inspected the nullah and ascertained more accurately the quantity of drainage received by it.

Aqueduct 1 arch 20 ft
145 miles 67 chains

7. The late Chief Engineer entertained very strong objections to over bridges, and he therefore provided an aqueduct for the traffic crossing the canal in this mile - An Aqueduct ^{however} would be a very much more expensive work than a Bridge, and the present Chief Engineer intends constructing a 2nd Class Bridge at this point. It was also proposed to insert a culvert of 2 vents of 8 feet span for drainage, but it appeared to me that before this was done the existence of any drainage which could not be conveniently inserted to the culvert in the preceding, or to that in the same, mile should be ascertained.

Aqueduct of 1 arch 20 ft
Span for road -
145 miles 25 chains

8. The absence of headway makes it inadvisable to construct vents of 8 feet and of equal capacity for discharge in lieu of a single vent of 8 feet.

Culvert 8 feet
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9. The waterway allowed for this river appears to be larger than is necessary and as far as could be ascertained from a comparison

Vaitthalair Aqueduct 12 spans of
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of the drainage areas of this river and of the Canals, and from the estimated discharge of the latter, both the Chief Engineer and myself concluded that probably 9 arches would suffice, especially as the foundations will be on rock and there would consequently be no danger were the velocity of discharge increased. However pending a further investigation, which the Executive Engineer has been requested to make, with a view to ascertain more precisely than is possible near the line of Canal, where the river in high freshes overflows its banks, what the sectional area and surface fall of the Vaitthalair in extreme floods really is, it has been thought better to leave out only one arch, which seems to have been given solely for the purpose of making a roadway under the Canal. The Aqueduct will accordingly be gone on with from one end for the present and before the one abutment and 8 piers shall have been completed to the level of the springing probably data for determining whether 9 or 11 arches will be required, will be forthcoming. This

10 This small work will probably be built with 5 feet waterway instead of 3 feet
3 feet Culvert.
150 miles 12 chains

11 A design reducing the span to 36 feet had been prepared but the Chief Engineer has, on a further consideration of the inconvenience of contracting the waterway and so increasing the current, decided on allowing 40 feet as in the original design. The mean width of the Canal is 60 feet, so that 40 feet for the bridge does not appear to me to be at all excessive.
Turnool & Cuddapah Road Bridge.
150 miles 31 chains

12. Here to avoid heavy excavations for an outfall, 5 arches of 12 feet span each are to be substituted for 2 arches of 20 feet, and similarly in the 152nd mile a culvert of 2 low spans of 5 feet each will be built in lieu of 1 span of 6 feet.
Aqueduct 2 arches 20 feet span.
150 miles 52 chains.
Culvert 6 feet.
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13. In the 154th mile this Aqueduct was provided in the original Estimate. The excavation of an outfall in hard flint was to be expensive, and it would under no circumstances make a good crossing for which one arch was intended to be adapted. This proposed therefore to build a 2nd Class Bridge opposite Cana Goodoor at about 152 miles 50 chains, and to construct the Aqueduct with 3 spans of 12 feet. A 2 feet culvert

culvert is the only other main supply Mason work in this mile, and no alteration of its dimensions is needed.

14 For reasons similar to those mentioned in the preceding paragraph a culvert of 2 arches of 12 feet, or 3 of 9 feet, is to be substituted for the Aqueduct, and a 2nd Class Bridge is to be built at about 154 miles 75 chains opposite Jilla.
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155 miles 36 chains.

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153 miles 69 chains

Bridge is similar to that for the crossing
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substituted, but before the revised design is
prepared it will be necessary that the Civil
Engineers should ascertain what quantity
of surplus water from Chintavonta Tanti
may be expected.

21. This Culvert will need subdivision, I
think, into 3 spans of 2 or 3 feet, as there are
3 irrigation channels to be passed across
the Canal. — *6 feet Culvert.
165 miles 20 chains.*

22. In the 167 and 168 miles the line of Canal crosses
two very considerable drainages and as laid out it
crossed and recrossed the Cuddapah Road in the 168th
mile. — This interference with the road will now
be avoided. — The Aqueducts of 30 feet span are
not adapted to the circumstances of the nullahs,
and in the 167th mile 9 spans of 15 feet each with
3 feet headway, and in the 168th mile 7 spans of
*Aqueduct 6 arches
166 miles 15 chains.
Aqueduct 6 arches 30 ft span.
167 miles 21 chains.*

15 feet with 9 feet headway will be more convenient
and works. — The Chief Engineer is however
desirous of ascertaining whether it would not
be a better arrangement to run the Canal
through the Pichapudi Tanti, making it single
banked from about 166 miles 0 chains to 167
miles 50 chains. — I see no objection to this
plan on the ground of submergence of valuable
land, but until the project has been put
on paper and the relative cost ascertained it
will be better to defer expressing any decided
opinion. —

23. In the 170th mile the first lock occurs,
and below this the fall of the country is rapid. —
The Chief Engineer considers, and I
agree with him, that it is not likely that
there will be any water available for irrigation under
the last 9 miles of the Section, and that consequently
the Canal below this point had better be made a still
water navigation. — If this be done the Calingulabs
in connection with the locks may be dispensed
with, and all surplus water may be disposed
of by means of the irrigation sluices in the
168th and 169th miles, which are intended to be
large enough to water 10,000 acres. —

A short time ago I had some correspondence
with the Chief Engineer on the subject of
the

the insufficiency of Canal water may allowed at the Aqueducts of this Section, and it was noticed that the current, already greatly increased by the construction of the cross section at these works from 300 to about 125 Square feet, would be still more, and to a very inconvenient extent, augmented whenever a boat of tolerably large dimensions had to ascend the Canal. The Chief Engineer promised to take the facts thus noticed into consideration, and I am glad to be able to report that he intends to make all the Aqueducts 31 feet wide between the side walls, thus increasing the waterway to 155 Square feet, and this I think will be a very decided improvement.

25 It is expected that all the Masonry works of the Section except the locks will be constructed without exceeding the sanction, Rupees 3,32,441, already given for them. The original sanction for the locks has not as yet been supplemented, and therefore further sanction on their account will be needed as soon as the Chief Engineer may find himself ready to apply for it.

26 In order to avoid delay I request that I may be authorized to approve the revised Estimates.

Estimates and Plans for the Masonry works down to the end of the 166th mile, as soon as they may be completed and sent home, provided the estimated cost of those belonging to the several subdivisions (5 miles) is not in excess of the sanction already given. - It will probably be a convenience to the Chief Engineer to send in the Plans of each 5 miles directly they are ready, rather than to wait until the alterations and modifications of all the works throughout this Section shall have been decided upon in detail and put on paper. -

27 I subjoin with reference to Proceedings Madras Government N^o 500 dated 9th February 1866 a list of the crossings of this Section to which the Chief Engineer has agreed.

N ^o .	Class.	Description.	Position. Miles - Chams.
1	2 nd	Head sluice	143 - 23
2	2 nd	Bridge	145 - 26
3	2 nd	Vaikatair Aqueduct	149 - 20
4	1 st	Bridge - Cuddapah Road	150 - 31
5	2 nd	Bridge	152 - 50 about
6	2 nd	Do	154 - 75 do
7	2 nd	Aqueduct	157 - 54 or if necessary a 2 nd Class Bridge may be built at about 157 - 12 -
8	1 st	Bridge - Cuddapah Road	158 - 69
9	2 nd	Aqueduct	162 - 77
10	2 nd	Do	166 - 16
11	2 nd	Do	167 - 23

Should

Should however the Canal be made single banked here, these Aqueducts will not be needed, and then 2nd Class Bridges will be required, one at about ^{M. Ch.} 165-63, and another at ^{M. Ch.} 167-15:-

No. Class	Description.	Position. Miles-Chains
12 2 nd	Bridge over tail bay of Lock No. 1	169-23
13 2 nd	Do Do Do No. 4	171-60
14 2 nd	Do Do Do No. 6	174-46
15 2 nd	Do Do Do No. 8	176-15

This number of crossings will, I think, be found sufficient for the wants of the country, and I beg to recommend the approval of the above list leaving the particulars of Nos. 7-10 and 11 to be determined hereafter. In the list printed with the Order of Government above referred to there were 17 crossings of which two, the Services at 170-60 and 176-25 required to be changed to Bridges, which the Supervisor considered should be placed at about 169-20 and 176-40 - It is now intended to build bridges over the tail bays of the locks at 169-23 and 176-15, which will afford the accommodation required for the ^{Mundialumpett & Podapoor, & for the} ~~Arcepett and Camlapoor, Roads.~~ The crossings not given in the revised list are those at 159-66 and 163-75: of these, at the former, there will be a culvert of 12 feet span, which, though not considered as a regular crossing, will be useful for cattle going to the fields, and

and there will be a first class Bridge within a mile. At 163-75 there will not be sufficient headway for a crossing under the Aqueduct, and I do not think there is a necessity for constructing a Bridge. - Chintacootah which is opposite the 165th milestone is the only village interested, and there will be a crossing for it further at the Aqueduct 166-16 or, should that not be built, at a Bridge at about 165-63. 23. The Executive Engineer has informed the Chief Engineer that he has found some differences between the levels which he has had taken, and those on which the sanctioned estimates were based, and he states that the cuttings will generally be a foot or 1 1/2 feet deeper than the depth allowed - Consequently he has proposed to change the line of Canal from about 158-60 to 169-0 in order to prevent any increase of cost. - The Deputy-Collector engaged in transferring land informs me that he has settled the compensation for all lands down to Chintacootah, i.e. to about the 165th mile, I have consequently asked the Chief Engineer to limit the alterations, where the lands have already been settled for or transferred, to those parts in which a change is clearly desirable, and I

hope also that before any change is proposed he -
will satisfy himself that the recent, are more cor-
-rect than the original, levels. - I have requested
also that immediate intimation may be given
of the numbers of the Land Plans likely to be af-
-fected, so that the Deputy Collector may defer set-
-tling for lands included in such Plans. -

29. This Bungalow is being built with stone Bungalow at
in chumam; its walls have been raised to about 5000 -
6 feet in height and it promises to be a sub-
-stantial building. -

I have the honor to be,
Sir,
Your most obedient servant
Wm. Mullins Captain, R.L.
Commanding L.V.C. Company. -

Public Works Department

evb, 60

PROCEEDINGS of the MADRAS GOVERNMENT.

Under date the 8th Jan^y 1868

Read the following

From the Consulting Engineer
Feb 2

(Here enter No. 121 dated 16th December 1867)

Forwarded to the
Manager of the Madras
Irrigation and Canal
Company for communica-
tion to the Chief En-
gineer.

The Government
sanction the proposal con-
tained in para 26, and,
with the exceptions specially
noted by the Consulting
Engineer, sanction the
list of crossings append-
ed to para 27.

To the Consulting Engineer
Manager.
S. Eng 3rd Div.

dec 9/1/68

AL

To the Consulting Engineer
Feb 2
The Secretary to Govt
D. P. N.

Recd 16th
Feb 20th December 1867
Enclosures 2

evb, 60 - 8th Jan^y 1868

Offers certain remarks
on his inspection of the
Madras Irrigation and
Canal Company's works.
of Madras Main Canal.

1/15

115-116
P. W. 1868. Department.
Pro of Govt for Summary
No. 60

PROCEEDINGS OF GOVERNMENT

Dated 8th Summary

Sanctioning the ^{needed} estimated formative
works down to the end of
the 166 mile of the I & B. Co's
main canal in Punjab.

Sanctioning with
remarks the list of crossings
proposed to be provided
between the 169th mile of the
Company's main canal
and the Pannoor river.

Op 115-116

c. 20th Dec 1867 A. 21m

(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. 61	Press
117-18	~~Mis~~
Dated 8. 1.	1868.

Not to be folded or roughly handled

No. 117. Read the following Proceedings of the Government of India, Public Works Department, (Railway,) dated Fort William, 3rd December 1867, No. 1,050 R:—

Extension of Railways in India.

Read the following —

Extract from a Minute by HIS EXCELLENCY THE VICEROY, dated 16th August 1867.

“ The second main point raised by this Despatch is the virtual abandonment by the Secretary of State of the attempt to accomplish the construction of Railways in India without a guarantee of interest. This result, no doubt, is one for which every one must have been prepared. It has long been known that capital could not be obtained in India to any useful extent, and now it has become manifest that it cannot be raised in England for such purposes as these without the security of a guaranteed return of income. The Government adopted a very proper and natural course when it endeavoured to induce capitalists to come forward to undertake Railways in India without this description of assistance from the State, and the failure to accomplish this end is much to be regretted. But such a result having been conclusively established, the Government should, I think, now review its position in relation to this very important and very costly class of public works.

So long as it was hoped that Companies might come forward to undertake Railways in India under such terms as had before been proposed, that is, with the aid of a moderate fixed payment for a term of years, it did not seem important for the Government to take any special steps in the direction of attempting to settle before-hand what lines should be taken up. It was reasonable to wait until some body of capitalists voluntarily proposed to accept the risk of carrying out any selected line of Railway. It did not appear likely that the payment of the subsidy which had been approved by the Secretary of State would lead to any serious burden being put on the finances, or that any great or sudden charge would be occasioned in such a manner. In truth, the subsidy has not been taken advantage of at all, excepting by the Indian Branch Company, and then it entirely failed to induce capitalists to provide money, and has, as we now know, been finally given up.

But the position in relation to Railway construction will be entirely changed now that the system of guarantee has been again adopted, and that it has been practically admitted that the Government must, for the future, give assistance in this form to ensure the construction of Railways in India. There can be no doubt that, under a guarantee of interest, the Government may without difficulty at once secure the formation of a Company to carry out any line of Railway which it desires to see executed. This being the case, there is no reason whatever why the Government should henceforth be influenced by anything but its own conclusions as to what is desirable in relation to Railway construction. The entire position is in the hands of the Government, and it seems to me most inadvisable to allow the advantages which it presents to be lost. It is very certain that the knowledge that the Government has re-opened the system of guarantee will bring up many speculative projectors who will take up schemes for which they will without difficulty obtain the support of colourable authority at least. Such schemes they will press on the Government under such patronage as they may secure, and unless preparation is made before hand to meet such projectors and their schemes, it is exceedingly

probable that the Government may find itself involved in undertakings which have been forced upon it in a way which it may see cause to regret hereafter.

Having regard to the necessary limit to the sum that will from year to year be available from the Indian revenues for the purpose of paying guaranteed interest, and also to the like limit which there will be to obtaining capital from the English money market, it is certain that any extension of Railways in India must be practically restricted to a limited number of miles in any one year. It will, therefore, follow that every pledge of the Government to assist any particular project will, *pro tanto*, prevent the prosecution of all other projects, at all events for a time. Hence, it is obviously important for the Government to do what is in its power, to make a selection of those lines which shall be first constructed, and so far as it can to regulate the order and manner in which all future extensions of Railways shall take place.

Although I have already on other occasions expressed my opinion that any considerable extension of Railways at the present time had not commended itself to me, because I saw much difficulty in providing the necessary funds, yet it is no doubt essentially a question of finance at bottom. And if, on a further examination, it were shown that the burden on the finances would not be increased in an objectionable manner by any moderate yearly extension of Railways, the question is one which is well worthy of consideration.

On these grounds, therefore, I am of opinion that it is expedient for the Government of India at the present time to take a comprehensive view of the probable future requirements of the whole of India in respect to Railways, in a manner somewhat similar to that in which Lord Dalhousie reviewed the question when the introduction of Railways was first discussed. I see no reason for doubting that a very useful, and comparatively very correct, estimate may now be made of the essential of Railways wants of India for the next 20 or 30 years, and that a scheme of a system of Railways could be prepared, which would indicate with tolerable precision the best method of meeting all these wants.

One consideration of much importance in relation to these works is, the degree to which the several Companies should be allowed to extend their undertakings, be permitted to run.

The danger of allowing too great a development to any one Company has formed a topic of discussion for the Government of India in former years in relation to some of the existing Railways, and the question is one which should not be lost sight of in such a review of Railway extension as I have suggested. An overgrown Company is likely to be a source of embarrassment, or even danger, to the Government, from the power of personal influence which it must possess, while its efficiency for the essential purposes for which it was created is almost certain to be diminished.

At the same time, I think that a financial review should be made of the actual working of the guarantee system to the present time, with the intention of placing before the Government its results, having reference to the actual money payments it has involved, and the probable course of such payments in the future, if a certain moderate annual extension of Railway construction were allowed to go on. In the

present year, I observe that, although the whole Railway capital paid up by the Companies is rather above 68 millions, yet the net payment of interest will amount only to about £580,000, which is hardly 1 per cent on the whole amount under guarantee. Most of the Railways are steadily increasing their income, and a permanent diminution of the interest charge is going on.

In connexion with this part of the subject, it will be well to consider carefully a proposal made by His Excellency Sir William Mansfield, to the effect that some fixed sum should be appropriated by the Government of India from the annual revenues, within which the payment of guaranteed interest should be limited, an extension of the capital only being allowed as the increase of the net Railway receipts reduced the actual charge on the Government for guaranteed interest. If it were found practicable to make such an arrangement, it would appear to be unobjectionable on general grounds.

I do not, of course, suppose that any scheme of Railways, or plan of operations which may now be prepared in the sort of way I have spoken of, is to be looked upon as anything more than a sketch to assist future progress. But from such a general review of the whole subject, the Government will certainly derive much advantage, even if it only serves to place before us, in a somewhat more definite manner than has hitherto been done, the real magnitude of the task of fully supplying India with Railways. I shall in the sequel advert to some other considerations bearing on the general character of these great undertakings, which I cannot help thinking have till now hardly received the attention which they deserve from us."

RESOLUTION—With a view to giving effect to the desire expressed by His Excellency the Governor General, that a comprehensive review should be taken at the present time of the requirements of India as regards Railway extension, the Government of India thinks that it will be desirable to consult all Local Governments, and to request them to forward to this Department at their early convenience, a statement of their opinions on the whole subject.

2 The Governor General in Council would wish each Local Government to consider what lines of Railway it would regard as desirable to construct, should the necessary funds be available, either within its own territories, or to communicate with the most important points in the territories adjacent, whether British or Foreign. It will, of course, be understood that in making any recommendations on such a subject, regard must be had to the great cost of these works, and that only a few main lines of chief importance should be indicated, or the object which it is desired to attain will be frustrated. It is easy to say in a general way that Railways in all possible directions are desirable, and in a certain sense this is true. But the manifest intention of His Excellency the Viceroy is that such a review of all possible lines should be taken as will enable the Government of India and Secretary of State to make a selection of those particular lines which are most needed, and which most commend themselves for early construction.

3. In making a choice of lines of Railway, it would appear necessary to direct the first attention to the prospects of their proving remunerative at an early period. The progress of Railway construction must obviously depend on the available means being forthcoming to meet the guarantee of interest, or

other aid which, under all circumstances, it may be considered essential for the State to give. Every mile of Railway which does not repay the guarantee forms an absolute obstacle to the extension of like works elsewhere. A burden is placed on the finances which, so long as it continues, completely cuts off the power of the Government to deal with so much of its revenue as is thus hypothecated to meet the interest charge. It is to be remembered that the resources of the State are strictly limited, and that the desire of the Government of India to advance improvement is not at all to be measured by its power to do so.

4. In order to provide a reliable standard of comparison in estimating the probable prospects of a Railway, it will be useful to supply for any line recommended, a Statement of the average population and revenue per square mile of the portion of each district traversed by it. The population of all important towns on the line should be stated as nearly as possible; also, in case of Seaports, the import and exports both in tonnage and value.

5. So far as it is possible, on these data, and by the help of the actual receipts on neighbouring lines in existence, an estimate should be formed of the probable income from the proposed Railways. Such an estimate will commonly be more trustworthy than one based on any attempt to reckon the actual traffic. It will be desirable to make such an estimate show the probable return on first opening, and the gradual growth of the income. These data it should be possible to estimate with some approach to truth from the data given by existing lines of Railway.

6. At the same time, a general appreciation should be made of the engineering difficulties or facilities of construction, and if possible, a sum should be named as likely to represent what a line of a certain character would cost.

7. The importance of the effect of the first cost of a Railway on its ultimate financial success, cannot be overstated. Whether as regards the question of obtaining the funds in the first instance, or covering the necessary interest afterwards, it may safely be said that the first consideration in Railway construction in India should be the most strict limitation of cost which is consistent with a permanent structure, thus, of course, being an essential condition. Having regard to this point, the Governor General in Council would not exclude from consideration, under special circumstances, the expediency of constructing Railways of a narrower gauge than the standard 5 feet 6 inches. Where a Railway would be forbidden by reason of its expense, if made of the full gauge, if adopting a narrower gauge it could be shown to be feasible, it might become a question whether the latter, with all its disadvantages, should not be accepted.

8. Another matter of much practical moment is the proper distribution of any projected lines of Railway among the Companies to be entrusted with their construction. It is objectionable, both on the ground of proper and economical supervision, to have a Railway undertaking either very large or very small. A proper medium should be arrived at, and probably a length of not less than 400 or 500 miles, and not more than double that distance, should be found commonly suitable.

9. It will also be expedient to indicate the order in which such recommended lines should be taken up, and the probable length which might be opened yearly, or the number of years necessary to complete each; attention being paid to the

adoption of such a system of extension as will bring each portion of a new Railway, as it is opened, into useful connexion with the already existing lines. In connexion with this point, it should be remembered that the probable amount of English Capital available for such works is limited, and that it is perhaps not likely that a larger sum than 7 or 8 millions yearly could, under any circumstances, be expected to be forthcoming for Indian Railways.

10. The Government of India will be glad to receive from each Local Government and Administration an expression of its views on the general question that has been stated, as well as on any of the points above referred to, so far as they shall affect any conclusions adopted.

ORDER.—Ordered, that the foregoing Resolution be forwarded to the Local Governments and Administrations noted in the margin, for information and guidance.

Government of Madras	Chief Commissioner, Central Provinces
" " Bombay	Commissioner, Mysore
" " Bengal	Resident, Hyderabad
" " N.W.P.	Agent, Governor General, Rajpootana
" " Punjab	" " Central India
Chief Commissioner, Oudh	" "

(Signed) C. H. DICKENS, Colonel, R. A.,
Secretary to the Government of India.

No. 118. ORDER THEREON, 8th January 1868, No. 61.

RAILWAY, No. 9.

Communicated to the Consulting Engineer for Railways for an expression of his views on the general question of the requirements of this Presidency as regards the extension of its Railway system under the conditions indicated, and on such of the other matters referred to in the papers as may demand notice. Major Shaw Stewart will be requested to submit his report in the fullest detail, and with information on all the points on which it is sought, and he will place himself in communication with the Board of Revenue and with any Collectors of districts whom he may deem it advisable to consult on the subject.

(True Extract.)
(Signed) CHARLES A. OKR, Colonel, R. E.,
Secretary to Government.

To the Consulting Engineer for Railways.
" Board of Revenue.

No. 1050 R.
GOVERNMENT OF INDIA.
PUBLIC WORKS DEPARTMENT.
RAILWAY.

FORT WILLIAM, DECEMBER 3, 1867.

Extension of Railways in India.

Read the following:—

Extract from a Minute by HIS EXCELLENCY THE VICEROY, dated 16th August 1867.

“The second main point raised by this Despatch is the virtual abandonment by the Secretary of State of the attempt to accomplish the construction of Railways in India without a guarantee of interest. This result, no doubt, is one for which every one must have been prepared. It has long been known that capital could not be obtained in India to any useful extent, and now it has become manifest that it cannot be raised in England for such purposes as these without the security of a guaranteed return of income. The Government adopted a very proper and natural course when it endeavoured to induce capitalists to come forward to undertake Railways in India without this description of assistance from the State, and the failure to accomplish this end is much to be regretted. But such a result having been conclusively established, the Government should, I think, now review its position in relation to this very important and very costly class of public works.

So long as it was hoped that Companies might come forward to undertake Railways in India under such terms as had before been proposed, that is, with the aid of a moderate fixed payment for a term of years, it did not seem important for the Government to take any special steps in the direction of attempting to settle before-hand what lines should be taken up. It was reasonable to wait until some body of capitalists voluntarily proposed to accept the risk of carrying out any selected line of Railway. It did not appear likely that the payment of the subsidy which had been approved by the Secretary of State would lead to any serious burden being put on the finances, or that any great or sudden charge would be occasioned in such a manner. In truth, the subsidy has not been taken advantage of at all, excepting by the Indian Branch Company, and then it entirely failed to induce capitalists to provide money, and has, as we now know, been finally given up.

But the position in relation to Railway construction will be entirely changed now that the system of guarantee has been again adopted, and that it has been practically admitted that the Government must, for the future, give assistance in this form to ensure the construction of Railways in India. There can be no doubt that, under a guarantee of interest, the Government may without difficulty at once secure the formation of a Company to carry out any line of Railway which it desires to see executed. This being the case, there is no reason whatever why the Government should henceforth be influenced by anything but its own conclusions as to what is desirable in relation to Railway construction. The entire position is in the hands of the Government, and it seems to me most inadvisable to allow the advantages which it presents to be lost. It is very certain that the knowledge that the Government has re-opened the system of guarantee will bring up many speculative projectors who will take up schemes for which they will without difficulty obtain the support of colourable authority at least. Such schemes they will press on the Government under such patronage as they may secure, and unless preparation is made before-hand to meet such projectors and their schemes, it is exceedingly probable that the Government may find itself involved in undertakings which have been forced upon it in a way which it may see cause to regret hereafter.

Having regard to the necessary limit to the sum that will from year to year be available from the Indian revenues for the purpose of paying guaranteed interest, and also to the like limit which there will be to obtaining capital from the English money market, it is certain that any extension of Railways in India must be practically restricted to a limited number of miles in any one year. It will, therefore, follow that every pledge of the Government to assist any particular project will, *pro tanto*, prevent the prosecution of all other projects, at all events for a time. Hence it is obviously important for the Government to do what is in its power, to make a selection of those lines which shall be first constructed, and so far as it can to regulate the order and manner in which all future extensions of Railways shall take place.

Although I have already on other occasions expressed my opinion that any considerable extension of Railways at the present time had not commended itself to me because I saw much difficulty in providing the necessary funds, yet it is no doubt essentially a question of finance at bottom. And if, on a further examination, it were shewn that the burden on the finances would not be increased in an objectionable manner by any moderate yearly extension of Railways, the question is one which is well worthy of consideration.

On these grounds, therefore, I am of opinion that it is expedient for the Government of India at the present time to take a comprehensive view of the probable future requirements of the whole of India in respect to Railways, in a manner somewhat similar to that in which Lord Dalhousie

reviewed the question when the introduction of Railways was first discussed. I see no reason for doubting that a very useful, and comparatively very correct, estimate may now be made of the essential Railway wants of India for the next 20 or 30 years, and that a scheme of a system of Railways could be prepared which would indicate with tolerable precision the best method of meeting all these wants.

One consideration of much importance in relation to these works is, the degree to which the several Companies should be allowed to extend their undertakings, and the limits that should be placed to the districts into which their lines should be permitted to run.

The danger of allowing too great a development to any one Company, has formed a topic of discussion for the Government of India in former years in relation to some of the existing Railways, and the question is one which should not be lost sight of in such a review of Railway extension as I have suggested. An overgrown Company is likely to be a source of embarrassment, or even danger, to the Government, from the power of personal influence which it must possess, while its efficiency for the essential purposes for which it was created is almost certain to be diminished.

At the same time, I think that a financial review should be made of the actual working of the guarantee system to the present time, with the intention of placing before the Government its results, having reference to the actual money payments it has involved, and the probable course of such payments in the future, if a certain moderate annual extension of Railway construction were allowed to go on. In the present year, I observe that, although the whole Railway capital paid up by the Companies is rather above 68 millions, yet the net payment of interest will amount only to about £5,80,000, which is hardly 1 per cent. on the whole amount under guarantee. Most of the Railways are steadily increasing their income, and a permanent diminution of the interest charge is going on.

In connexion with this part of the subject, it will be well to consider carefully a proposal made by His Excellency Sir William Mansfield, to the effect that some fixed sum should be appropriated by the Government of India from the annual revenues, within which the payment of guaranteed interest should be limited, an extension of the Capital only being allowed as the increase of the net Railway receipts reduced the actual charge on the Government for guaranteed interest. If it were found practicable to make such an arrangement, it would appear to be unobjectionable on general grounds.

I do not, of course, suppose that any scheme of Railways, or plan of operations which may now be prepared in the sort of way I have spoken of, is to be looked upon as anything more than a sketch to assist future progress. But from such a general review of the whole subject, the Gov-

ernment will certainly derive much advantage, even if it only serves to place before us, in a somewhat more definite manner than has hitherto been done, the real magnitude of the task of fully supplying India with Railways. I shall in the sequel advert to some other considerations bearing on the general character of these great undertakings, which I cannot help thinking have till now hardly received the attention which they deserve from us."

RESOLUTION.—With a view to giving effect to the desire expressed by His Excellency the Governor General, that a comprehensive review should be taken at the present time of the requirements of India as regards Railway extension, the Government of India thinks that it will be desirable to consult all Local Governments, and to request them to forward to this Department at their early convenience, a statement of their opinions on the whole subject.

2. The Governor General in Council would wish each Local Government to consider what lines of Railway it would regard as desirable to construct, should the necessary funds be available, either within its own territories, or to communicate with the most important points in the territories adjacent, whether British or Foreign. It will, of course, be understood that in making any recommendations on such a subject, regard must be had to the great cost of these works, and that only a few main lines of chief importance should be indicated, or the object which it is desired to attain will be frustrated. It is easy to say in a general way that Railways in all possible directions are desirable, and in a certain sense this is true. But the manifest intention of His Excellency the Viceroy is that such a review of all possible lines should be taken as will enable the Government of India and Secretary of State to make a selection of those particular lines which are most needed, and which most commend themselves for early construction.

3. In making a choice of lines of Railway, it would appear necessary to direct the first attention to the prospects of their proving remunerative at an early period. The progress of Railway construction must obviously depend on the available means being forthcoming to meet the guarantee of interest, or other aid which, under all circumstances, it may be considered essential for the State to give. Every mile of Railway which does not repay the guarantee forms an absolute obstacle to the extension of like works elsewhere. A burden is placed on the finances which, so long as it continues, completely cuts off the power of the Government to deal with so much of its revenue as is thus hypothecated to meet the interest charge. It is to be remembered that the resources of the State are strictly limited, and that the desire of the Government of India to advance improvement is not at all to be measured by its power to do so.

4. In order to provide a reliable standard of comparison in estimating the probable prospects of a Railway, it will be useful to supply for any

line recommended, a statement of the average population and revenue per square mile of the portion of each district traversed by it. The population of all important towns on the line should be stated as nearly as possible; also, in case of Sea-ports, the import and exports both in tonnage and value.

5. So far as it is possible, on these data, and by the help of the actual receipts on neighbouring lines in existence, an estimate should be formed of the probable income from the proposed Railways. Such an estimate will commonly be more trustworthy than one based on any attempt to reckon the actual traffic. It will be desirable to make such an estimate show the probable return on first opening, and the gradual growth of the income. These data it should be possible to estimate with some approach to truth from the data given by existing lines of Railway.

6. At the same time, a general appreciation should be made of the engineering difficulties or facilities of construction, and, if possible, a sum should be named as likely to represent what a line of a certain character would cost.

7. The importance of the effect of the first cost of a Railway on its ultimate financial success, cannot be overstated. Whether as regards the question of obtaining the funds in the first instance, or covering the necessary interest afterwards, it may safely be said that the first consideration in Railway construction in India should be the most strict limitation of cost which is consistent with a permanent structure, this, of course, being an essential condition. Having regard to this point, the Governor General in Council would not exclude from consideration, under special circumstances, the expediency of constructing Railways of a narrower gauge than the standard 5 feet 6 inches. Where a Railway would be forbidden by reason of its expense, if made of the full gauge, if adopting a narrower gauge it could be shown to be feasible, it might become a question whether the latter, with all its disadvantages, should not be accepted.

8. Another matter of much practical moment is the proper distribution of any projected lines of Railway among the Companies to be entrusted with their construction. It is objectionable, both on the ground of proper and economical supervision, to have a Railway undertaking either very large or very small. A proper medium should be arrived at, and probably a length of not less than 400 or 500 miles, and not more than double that distance, should be found commonly suitable.

9. It will also be expedient to indicate the order in which such recommended lines should be taken up, and the probable length which might be opened yearly, or the number of years necessary to complete each; attention being paid to the adoption of such a system of extension as will bring each portion of a new Railway, as it is opened, into useful connexion with the already existing lines. In connexion with this point, it should be remembered that the probable amount of English Capital available for such

works is limited, and that it is perhaps not likely that a larger sum than 7 or 8 millions yearly could, under any circumstances, be expected to be forthcoming for Indian Railways.

10. The Government of India will be glad to receive from each Local Government and Administration an expression of its views on the general question that has been stated, as well as on any of the points above referred to, so far as they shall affect any conclusions adopted.

ORDER.—Ordered, that the foregoing Resolution be forwarded to the Local Governments and Administrations noted in the margin, for information and guidance.

Government of Madras	Chief Commissioner, Central Provinces
" " Bombay	Commissioner, Mysore
" " Bengal	Resident, Hyderabad
" " N W P.	Agent, Governor General, Rajpootana.
" " Punjab	" " Central India.
Chief Commissioner, Oudh.	

(Signature) Colonel, R. A.,
Secy. to the Govt. of India.

To
The Secy to the Govt. of Madras
P.W. Dept. (Railways)

22 1867 Dept

GOVERNMENT OF INDIA
PUBLIC WORKS DEPARTMENT.
RAILWAY.

To

N. 4761

No. 1050 R.

Dated December 3, 1867.

Received 16 Decr/67.

Extension of Railways in India.

N. 117

20 Decr/67 - R. 230

ex. 61- 8th January 1868.

Public Works Dept

No. 61 61

Proceedings of the Madras Government
Under date the 8th December 1867
Had the following

From the Secretary to the
Govt of India.

(Here enter No. 1050 R. 3rd Decr 1867)

Communicated to the
Consulting Engineer for
Railways for an expression
of his views on the general
question of the requirements
of this Presidency as regards
the extension of its Railway
system under the conditions
indicated, and on each
of the other matters referred
to in the papers as may
demand notice. Draft -

I must tell the
Consulting Engineer
to place himself in
communication with the
Board of Revenue & with
any other authorities
who may deem it
advisable to consult
Shaw Stewart will be re-
quested to submit his re-
port in the fullest detail.

6

P. W. 186 . Department.

No.

PROCEEDINGS OF GOVERNMENT.

Dated

and with information on
the points on which
as sought, - and he will
place himself in communi-
cation with the Board of Revenue
and with any Collectors of Districts
whom he may deem it advisable
to consult on the subject

x
the subject.

[Signature]

3
The Comg Engr for
the B. & N. W. R. Co.

27
Sept 9/1880

Pub. Works 1868 Dep^t

Ro: of Govt for January

N^o 61

Ro: of the Madras Govt

D^d 8th January 1868

Communicating to the
Consulting Engineer for report
the P^r of the Govt of India
calling for the view of this
Govt on the subject of the exten-
sion of Railways in this
Presidency.