

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
WESTERN ZONE BENCH AT PUNE
ORIGINAL APPLICATION NO. 28 OF 2020 (WZ)**

Sarang Yadwadkar & Ors ...Applicants
Versus
Pune Municipal Corporation & Ors ...Respondents

I N D E X

Sr. No.	Particulars	Page Nos.
1.	Affidavit-in-Reply to OA 28-2020	95- 109
2.	<u>Exhibit "1"</u> Alignment of the metro rail in Pune notified by the Central Govt under the provisions of the Metro Railways (Construction of Works) Act, 1978	110- 118
3.	<u>Exhibit "2"</u> Minutes of meeting dated 20/11/2019 and directions/recommendations issued by the Expert Committee supervised by the Divisional Commissioner	119- 122
4.	<u>Exhibit "3"</u> Order dated 18/9/2017 of the Hon'ble Apex Court passed in the Civil Appeal No.14941 of 2017	123- 124
5.	<u>Exhibit "4"</u> Letter dated 21/11/2019 and the data received from the irrigation department	125- 264
6.	<u>Exhibit "5"</u> Technical note submitted by MMRCL to the Expert Committee vide email dated 5/12/2019	265- 296
7.	<u>Exhibit "6"</u> Relevant portion of the Electrical Resistivity data of the Vertical Electrical Sounding (VES) measurements carried out	297- 298
8.	<u>Exhibit "7"</u> Memorandum of Understanding and Terms of Reference dated 25/11/2018, executed between MMRCL and the GWSDA	299- 303
9.	<u>Exhibit "8"</u> HEC RAS 4.0 Beta Software and the results h shared	304- 362

	with Expert committee via E-mail and by a formal letter Maha-Metro/Pune/EMD/C01 dated 15/7/2020	
10.	Exhibit "9" Letter dated 13/7/2020 addressed by CWPRS to the Expert Committee.	363
11.	Exhibit "10" Minutes of meeting held by the Divisional Commissioner on 24/9/2020	364- 371

LAST PAGE- 371

P.D.P.

Advocate for the Respondent No.6

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
WESTERN ZONE BENCH AT PUNE
ORIGINAL APPLICATION NO. 28 OF 2020 (WZ)**

Sarang Yadwadkar & Ors

...Applicants

Versus

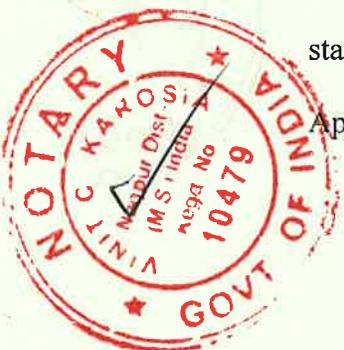
Pune Municipal Corporation & Ors

...Respondents

**AFFIDAVIT-IN-REPLY ON BEHALF OF THE RESPONDENT NO.6 TO THE
ORIGINAL APPLICATION NO.28/2020**

I, Kumkum Mishra, the AGM-Legal and authorised signatory of the Respondent No.6 –Maharashtra Metro Rail Corporation Limited having my office at Metro Bhawan, Opposite Deeksha Bhoomi, Ramdaspath, Nagpur 440010 do hereby state on solemn affirmation as under:

1. I am filing this preliminary Affidavit-in-Reply to oppose the contents of the Original Application preferred and reliefs sought by the Applicant in the above captioned matter and in order to place on record certain important and correct facts. I have perused the documents brought on record by the Original Applicant and have understood the contents of the Original Application and on the basis of the documents and information available in relation to the said issue, I am filing this present preliminary Affidavit-in-Reply to oppose the grant of any reliefs to the Applicant as prayed for in the present Original Application. I crave leave to file a further and detailed Affidavit-in-Reply as and when sought necessary.
2. At the outset, I deny each and every averment and allegation made in the present Original Application, which is contrary to and/or inconsistent with what has been stated in the present Affidavit-in-reply and nothing stated in the Original Application shall be construed as an admission for the want of any specific and



para-wise denial or non-traverse unless and until the same is specifically admitted hereinafter.

3. I say that in order to place true and correct factual position especially relating to the recommendations of the Expert Committee constituted by the Hon'ble NGT and the necessary steps taken by the answering respondent in accordance with the said recommendations made by the Expert Committee. I crave leave to file a detailed and para-wise response if the Hon'ble Court deems necessary. I repeat and reiterate that I deny the contents of the Original Application especially those as regards the impact of the metro pillars, about the aspect of the fixation of flood lines (blue line), about the discharge in cusecs during the monsoons, and about the veracity of the other similar allegations made.

4. I say that the Original Applicant has preferred the present Original Application seeking the following reliefs:

In light of the above facts and circumstances, it is most respectfully prayed by the Applicants that this Hon'ble Tribunal may be pleased to pass the following directions:-

- a. *Direct the Respondents to hold the ongoing construction of the Pune Metro in Mutha riverbed till the case is decided;*
- b. *Direct the Respondents to shift the metro alignment away from the riverbed to an alternate alignment as shown in Annexure A-8 or the sanctioned Development Plan of Pune;*
- c. *Direct that costs of the Application may kindly be reimbursed to the Applicants by the Respondents;*



d. Grant an exemption to the Applicants for notarization of the affidavits due to the Covid-19 pandemic;

To pass any other orders as they may deem fit and proper in facts and circumstances of the case.

5. I say that the present Original Application is filed by the Applicant under Section 14, Section 15 r/w Section 20 of the National Green Tribunal Act, 2010. The case of the Applicant in the present Original Application is based on an Expert Committee Report being claimed by the Applicant as a final report and given by the said Expert Committee on 21/5/2020 to the Applicant (annexed at Page Nos.57 to 67 of the present Original Application).
6. At this juncture it is important to note a few facts about the present original application and the background behind it. I say that this is the third round of litigation filed by the Applicant against the Maharashtra Metro Rail Corporation. The cause of action and the area in dispute is a 1.5 km stretch of Metro corridor (Vanaz- Ramwadi) running through the blue line of river Mutha and consisting of two stations namely Deccan and Sambhaji Park in the city of Pune.
7. I say that the answering Respondent is the executing agency for the Pune Metro rail project. The alignment of the metro rail in Pune is notified by the Central Govt under the provisions of the Metro Railways (Construction of Works) Act, 1978. Hereto annexed and marked as Exhibit "1" is a copy of the said alignment. I say that out of the said route, the stretch in dispute is on elevated pillars and has been selected and approved after considering all required parameters and in accordance with the provisions of the Metro Railways (Construction of Works) Act, 1978.



8. Initially Original Application No.67/2016 (renumbered as OA 130/2018) was filed by the Applicant challenging the said route and by a Judgment dated 3/8/2018, the said matter was disposed of by the Hon'ble NGT (Principal Bench). It is important to note that the Hon'ble NGT in the said Judgment has relied upon a report submitted by the Expert Committee on 05/01/2018, which was constituted in accordance with the order of the NGT dated 13/10/2017 passed in the said Original Application No. 67/16 (Renumbered as OA 130/2018).

9. I say that the Applicant has annexed the order dated 13/10/2017 but the final order dated 3/8/2018 disposing off the Application has not been annexed. In the final order dated 3/8/2018 in Para 16 and 17 following observations have been made:

16. In view of the above, we are of the opinion that it will not be in public interest to prohibit the project. However, the project may be completed by following all the safeguards suggested by the Expert Committee. We also direct that the Committee will inspect the ongoing project once in two months and if any further directions are given by the Committee, the Project Proponent will be bound by the same.

17. We also direct the Divisional Commissioner of Pune to associate with the Committee and supervise the project specially the environmental aspects. It will be open to the applicants or any other stakeholders to continue to give their suggestions to the Committee so that any damage to the environment can be prevented or minimized. In case it is found that the Project Proponents are not complying with the directions of the Expert Committee, the Committee will be at liberty to bring the same to the notice of this Tribunal by moving an appropriate application."



10. I say that being aggrieved with the said Judgment, the Applicant thereafter carried the matter to the Hon'ble Apex Court and the Hon'ble Apex Court by its order dated 15/2/2019 has permitted the Applicant to raise his grievances before the Expert Committee constituted in the said matter and it is in accordance with this order that the Applicant had approached the Expert Committee raising various grievances against principally the report submitted by the Expert Committee on 05/01/2018 in view of the earlier order of the NGT.
11. From the record, it appears that the Applicant's case is that his grievances were not addressed by the Expert Committee and thus being aggrieved by the same the Applicant filed a Second Original Application No.70/2019, before the Hon'ble NGT assailing the report of the Committee.
12. By an order dated 5/11/2019, the Hon'ble NGT directed the Applicants to place his grievance before the Expert Committee. And thereafter it can be noticed that on 16/1/2020, the Applicant was called for submission of various documents and grievances by the Expert Committee.
13. I say that in view of the order of the NGT dated 3/8/2018, the Divisional Commissioner has been regularly supervising the Pune Metro project and in its fourth such meeting held on 20/11/2019, the Expert Committee has given various recommendations/directions to the answering respondent. Hereto annexed and marked as **Exhibit "2"** are the minutes of meeting dated 20/11/2019 and directions/recommendations issued by the Expert Committee supervised by the Divisional Commissioner.
14. I say that accordingly the answering Respondent had initially already submitted all the details, but in accordance with the order the Applicant was heard and his view

and the grievances raised by the Applicant were considered and on 21/5/2020, various recommendations were given by the Expert Committee to the answering respondent which are from Page 57 to Page 63 of the present Original Application and which were also forming part of the minutes of meeting dated 20/11/2019. I say that the said directions have been assailed again by the Applicant as a final report in the third round of litigation being the present Original Application. I say that a bare perusal of the recommendations and the report at Page 62 will go on to reveal that the Applicant has totally misconstrued the nature of the recommendations and has challenged the same by the preferring the present Original Application.

15. The answering Respondent submits that the Expert Committee has in the said report issued recommendations/directions and has called upon the answering respondent to submit its say and to provide details about various parameters which are stated in the said report. The answering Respondent states that thus the report which is sought to be assailed cannot be called as a final report at all

16. I say that immediately after receiving the said Expert Committee recommendations, the answering Respondent has started gathering various information and has provided the same to the expert committee by way of its detailed submissions along with the necessary data and documents.

17. I say that on the merits of the Expert Committee recommendations/directions, considering the fact that the apprehension of the Applicant was as regards the flooding and submergence of the metro pillars and crossing of the blue line, one of the recommendations by the Expert Committee was that *due to the recent flood and past history of floods in Pune, EC strongly recommends that a fresh hydrodynamic study (two dimensional) is required to assess the impact of metro piers, footings and pile cap on afflux and submergence. EC also recommends that this study needs to*



be conducted by The Central Water and Power Research Station (CWPRS), Pune and all the data and support needs to be provided by MMRCL in consultation with irrigation Department.

18. I say that thus the study as regards the impact of metro pillars and its submergence and the levels of discharge (principal bone of contention of the Applicant) have been left to the expert body in that field, i.e, the Central Water Power Research Station (hereinafter for the sake of brevity referred to as “*the CWPRS*”), Pune and thus all data is supposed to be provided by answering respondent in consultation with the Irrigation Department to the CWPRS and the same has been provided by answering respondent to CWPRS. I say that the final report to be prepared by CWPRS is awaited as can be seen in letter received in July 2020 which states the present pandemic situation as the reason for delay in preparing the final report which is due from CWPRS. I crave leave to file a further and detailed affidavit as and when the final report is available.

19. I say that it is important to note at this juncture that a prayer for interim relief of stopping the project work is made by the Applicant now. I say that similar relief was sought by the Applicant earlier (OA 67/16) and which was granted by the NGT in earlier round of litigation and that the order of the NGT was challenged by the Applicant the same was stayed by the Hon’ble Supreme Court in the Civil Appeal No.14941 of 2017.

20. The Hon’ble Apex Court in the Appeal challenging the jurisdiction of the Hon’ble NGT has specifically clarified that there was no stay of the project which was undertaken by the Applicant (MMRCL) and MMRCL will have a right to continue with the said project. Hereto annexed and marked as **Exhibit “3”** is the copy of the order dated 18/9/2017 of the Hon’ble Apex Court passed in the Civil Appeal

No.14941 of 2017. Eventually by virtue of the final order, the said matter has been withdrawn but it is clear that the Hon'ble Supreme Court had also permitted MMRCL to go on with the said project.

21. I say that briefly stated there are about 6-7 recommendations issued by the Expert Committee and I will now deal with them in a para-wise manner for the sake of brevity:

- a. The Expert Committee has stated that *“MMRCL has to provide the reason and justification for the riverbed widths discrepancies and subsequent calculation of flood levels rise due to construction of 59 piers of Metro. EC also recommends that MMRCL has to inform Hon'ble NGT for any changes in design, pile cap, footing, alignment etc. after the submission of report by EC on 04.01.2018. For this MMRCL has to immediately submit all the relevant data, details, documents, drawings, reports etc. through committee chaired by Hon'ble Divisional Commissioner, Pune as per NGT case No.130/2018 in NGT Principal Bench, New Delhi order dated 03.08.2018”*.

MMRCL's Response:

- i. Subsequent to NGT order dated 3/8/2018, in the earlier round of litigation bearing O.A. No. 67 of 16 (renumbered as OA No.130/2018), an Expert Committee meeting chaired by Hon'ble Divisional Commissioner, Pune was convened on 20/11/2019. The Minutes of Meeting and more particularly point No.5 - column No.3 directed the answering respondent to verify the river dimensions with the Irrigation Department of the State of Maharashtra and provide appropriate computations in case of discrepancy.



ii. Thereafter for complying with the directions, the answering respondent approached the Irrigation Department, State of Maharashtra seeking fresh data of cross section and discharge vide letter no. Maha-Metro/Pune/ENV/02 dated 21/11/2019. Hereto annexed and marked as Exhibit "4" is a copy of the letter dated 21/11/2019 and the data received from the irrigation department. I say that upon receipt of data from Irrigation Department, the revised Hydrological Simulation Study by HEC RAS for revised structural changes in 2.45 km including 0.5 km upstream & 0.5 km downstream stretch was conducted and the detailed technical note on various aspects was submitted to the Expert committee via e-mail dated on 5/12/2019. Hereto annexed and marked as Exhibit "5" is a copy of the technical note submitted to the Expert Committee by MMRCL vide email dated 5/12/2019. I say that thus the answering respondent has taken proper steps to comply with directions of Expert Committee expeditiously.

b. *"In the EIA report ground water recharge was not mentioned hence EC recommends that MMRCL have to provide the assessment report on ground water recharge in the study stretch from Ground Water Department of Government of Maharashtra".*

MMRCL's Response:

i. I say that the Ground water recharge study was carried out by Savitribai Phule Pune University and is referred to in section 3.7 (Pages 62-125) of the Environmental Impact Assessment and Hydraulic Studies of River report submitted to the Expert Committee. Vertical Electrical soundings were carried out at 14



different locations to understand the shallow subsurface geological and aquifer conditions extending up to >30 meters depth. This has also been summarised in the Executive Summary of the Environmental Impact Assessment and Hydraulic Studies of River Report.

- ii. With reference to Geology, the Vertical Electrical Sounding (VES) shows that the strata below soil are not favourable to form aquifer. Hereto annexed and marked as **Exhibit “6”** is relevant portion of the Electrical Resistivity data of the Vertical Electrical Sounding (VES) measurements carried out. However, unconfined aquifer reported from the project area has poor potential. It is envisaged that construction of Piers on the bank are not likely to cause significant impact on any aquifers. Natural springs are not observed in the area during the study period. Hence no adverse impacts during construction phase are envisaged on existing hydrogeological Condition.

- iii. Further, Maha Metro has an existing Memorandum Of Understanding with the Ground Water Surveys & Development Agency (GSDA) dated on 25/11/2018 for a duration of five years. Hereto annexed and marked as **Exhibit “7”** is a copy of the Memorandum of Understanding and Terms of Reference dated 25/11/2018, executed between MMRCL and the GWSDA. The GWSDA will provide all the technical help while implementing the Rainwater harvesting as stated below:
 - a. Undertake the Activities for comprehensive hydrological surveys and geo physical surveys.



- b. Supervision of Rainwater Harvesting structures during construction period, as per the progress/implementation status submitted by Maha Metro Pune to GSDA for onsite monitoring.
 - c. To finalise the feasible sites for rain water harvesting structures in the area
 - d. Recharge activity for the entire stretch will be undertaken with the guidance of GSDA including their supervision. This will also apply to the stations of Sambhaji and Deccan station.
- c. *“Initial Calculations were based on the dimension of footing, its level, pile cap and pier, provided by MMRCL earlier. Further MMRCL changed the dimensions, which require revised afflux and submergence calculations.”*

MMRCL’s Response:

- i. Upon structural changes, the afflux and submergence calculation was revised in study using HEC RAS 4.0 Beta Software and the results have been shared with Expert committee via E-mail and by a formal letter Maha-Metro/Pune/EMD/C01 dated 15/7/2020. Hereto annexed and marked as **Exhibit “8”** is a copy of the letter dated 15/7/2020.
- ii. Water afflux and submergence at a discharge of 100,000 cusecs and 60,000 cusec is presented in below Table:

Sr.	Flow in cusecs	Max. Water Afflux	Location of afflux	Max. submergence (in m)



1	100,000cusecs	180	P-160,P-161,P162	DE-7-4.158
2	60,000Cusecs	100	P168	P175-2.736

d. *“EC members has conveyed many times to the committee supervising the progress of Metro Construction that Hydrodynamic study of the stretch including 0.5 km upstream and 0.5 downstream (total 2.45 km)is need to be carried out by MMRCL to assess the impact of metro piers, piles and footings on the flood level rise and submergence .EC members had also suggested that Pune has already experienced many floods in the past (as mentioned by the applicant also) therefore flood frequency analysis as well as hydrologic analysis need to be carried out for afflux and submergence due to 60,000 cusecs and 100,000 cusecs with present cross sections and modified cross sections of the river bed due to footings ,pile cap and pier obstruction”.*

MMRCL Response:

- i. I say that the Blue line and Red line provide the data for discharge of 60,000 cusecs and 100,000 cusecs without the metro pillars. The results of the Hydrological Simulation Study by HEC RAS 4.0 Beta Software for revised structural changes proposed in 2.45 km including 0.5km upstream & 0.5 km downstream stretch with reference to afflux and submergence has been submitted to Expert committee via E-mail on 5/12/2019 and by a formal letter Maha-Metro/Pune/EMD/C01 dated 15/7/2020 (enclosed hereinabove) and also given in Table stated above.



- e. *“To avoid any confusion, Expert committee members recommends the detailed longitudinal and cross sections survey of the study stretch and additional 0.5km stretch in upstream and downstream by MMRCL in consultation with Irrigation Department”.*

MMRCL Response:

- i. As per the suggestions of the Expert committee members, this study has been awarded to Central Water & Power Research Station (CWPRS) in the month of December, 2019. The CWPRS proposal states that this study has to be completed in 4 months’ timeline but due to pandemic situations, the work has been stuck and study could not be completed so far. MMRCL is pursuing this matter with CWPRS for earliest completion of the study. Hereto annexed and marked as **Exhibit “9”** is a copy of the letter dated 13/7/2020 received from CWPRS for extension of time.

22. I say that thereafter the Divisional Commissioner Pune has conducted a meeting on 24/9/2020 to review the compliances of the Answering Respondent, wherein it has considered the detailed study of the impact of the project in the said stretch and the recommendations given by the Expert Committee and acceptance of the recommendations and actions taken by the answering respondent have been considered. I say that as stated earlier various steps and measures to see to it that the recommendations are followed and measures have been taken by the answering respondent. I say that the CWPRS has also given its preliminary report on the afflux levels during discharge of 60,000 cusecs and 100,000 cusecs. The answering respondent states that the CWPRS has also stated in the said meeting that for the preparation of submergence map. A Digital elevation Model is required which is developed using properly oriented cross section data. The orientation of such cross



section data is awaited and that the final report will be submitted by the 15th November 2020 which will include the feasibility measures for mitigating afflux levels. The Committee has also opined that the metro work can continue and that the answering respondent has provided all the reports as directed by the Committee in its earlier meeting (4th meeting- 20/11/2019) and that answering respondent is taking due care of the construction. Hereto annexed and marked as **Exhibit "10"** is the copy of the minutes of meeting held by the Divisional Commissioner on 24/9/2020.

23. The answering Respondent states that thus from all of the above submissions it is evident that MMRCL has been continuously following up on all suggestions/recommendations given by the Expert Committee and has also submitted various data as required and as sought by the Expert Committee. The answering Respondent thus states that the Expert Committee be allowed to go through all the data that MMRCL is submitting including the last part of CWPRS report which is awaited and after hearing all concerned parties, finally decide based upon the submissions made by MMRCL and all parties in order to formulate the final report which can be submitted to the Hon'ble NGT.

24. Thus it is submitted that the reliefs sought by the Applicant in the Original Application ought not to be granted for the preliminary reason that the Original Application has been filed on a misconceived notion that the final report has been prepared and infact the Expert Committee is monitoring the project in terms of Hon'ble NGT order dated 03.08.2018. I say that it is not upto the Applicant to decide which alignment the answering respondent should follow and that the present alignment has been notified and approved by the Government of India.



25. In view of all of the above, the answering Respondent states that, the present Original Application being devoid of merits and premature and based on an incorrect premise, ought to be dismissed. The answering Respondent craves leave to file a further detailed and para-wise Affidavit-in-Reply as and when found necessary.

Solemnly affirmed at Mumbai
Dated this 25 September 2020

)
)

Respondent No.6
Mrs. Kumkum Mishra
AGM (Legal)
Maharashtra Metro Rail Corp. Ltd.

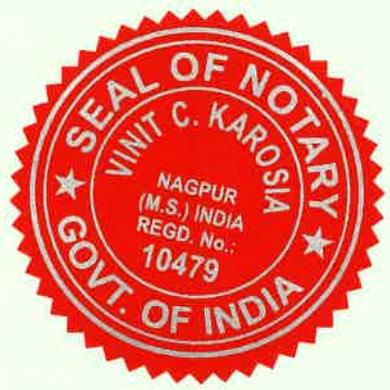
P.D.P.

Advocate for the Respondent No.6



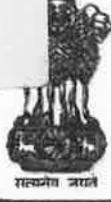
SWORN/SOLEMNLy AFFIRMED
BY: As above
WHO IS PERSONALLY/KNOWN
TO ME IDENTIFIED BY: Niceepur
BEFORE ME THIS THE
DAY OF 25/9/2020
AT NAGPUR

V. C. KAROSIA
NOTARY
DIST NAGPUR (M.S.) INDIA



रजिस्ट्री सं० डी० एल०-33004/99

REGD. NO. D. L.-33004/99



भारत का राजपत्र

The Gazette of India

असाधारण

EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (ii)

PART II—Section 3—Sub-section (ii)

प्राधिकार से प्रकाशित

PUBLISHED BY AUTHORITY

सं. 77]

नई दिल्ली, शक्रवार, जनवरी 5, 2018/पौष 15, 1939

No. 77]

NEW DELHI, FRIDAY, JANUARY 5, 2018/PAUSHA 15, 1939

आवासन और शहरी कार्य मंत्रालय

अधिसूचना

नई दिल्ली, 5 जनवरी, 2018

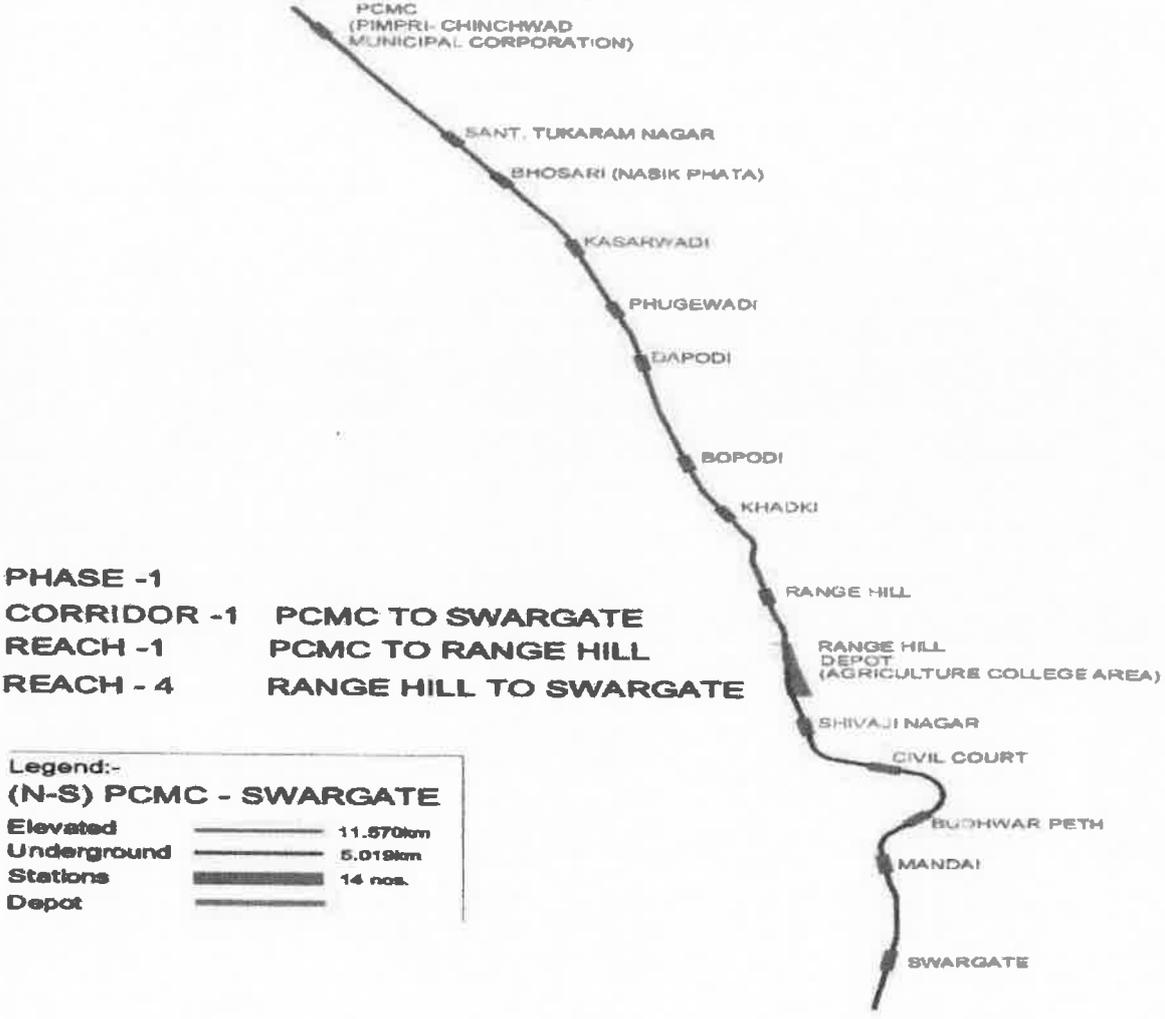
का.आ. 95(अ).—केन्द्रीय सरकार ने भूमिगत रेल (संकर्म - संनिर्माण) अधिनियम, 1978 (1978 का 33) (जिसे इसमें इसके पश्चात् उक्त अधिनियम कहा गया है) की धारा 1 की उप-धारा (3) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, भारत सरकार के आवासन और शहरी कार्य मंत्रालय की अधिसूचना सं. का.आ. 2732 (अ), तारीख 20 अक्टूबर, 2014 द्वारा 21 अक्टूबर, 2014 में महाराष्ट्र राज्य में पुणे महानगर क्षेत्र को उक्त अधिनियम के उपबंधों के लागू होने को विस्तारित किया था।

अतः अब केन्द्रीय सरकार, उक्त अधिनियम की धारा 32 की उप-धारा (1) के खंड (क) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, उक्त अधिनियम की अनुसूची में पुणे महानगर क्षेत्र की बाबत पुणे में मेट्रो रेल परियोजना के निम्नलिखित मेट्रो एलाइनमेंट को जोड़ती है, अर्थात्:

" पुणे महानगर क्षेत्र

पुणे मेट्रो रेल कॉरीडोर फेज-1	
कॉरीडोर 1: पिंपरी-चिंचवाड से स्वारगेट	पिंपरी-चिंचवाड नगर निगम, संत तुकाराम नगर, भोमरी (नाशिक फाटा), कासारवाडी, फुगेवाडी, दापोदी, बोपोडी, खडकी, रेंज हिल, शिवाजी नगर, सिविल कोर्ट, बुधवार पेठ, मंडई, स्वारगेट।
डिपो	रेंज हिल डिपो (कृषि महाविद्यालय क्षेत्र)
कॉरीडोर 2 : वनाज से रामवाडी	वनाज, आनंद नगर, आइडियल कॉलोनी, नल स्टॉप, गरवारे कॉलेज, दक्कन जिमखाना, छत्रपति संभाजी उद्यान, पुणे नगर निगम, सिविल कोर्ट, मंगवार पेठ, पुणे रेलवे स्टेशन, रूबी हॉल क्लिनिक, बंध गार्डन, येरवाडा, कल्याणी नगर, रामवाडी ..
डिपो	वनाज डिपो (कोथरूड में कचारा डिपो भूमि) "

पुणे मेट्रो रेल परियोजना

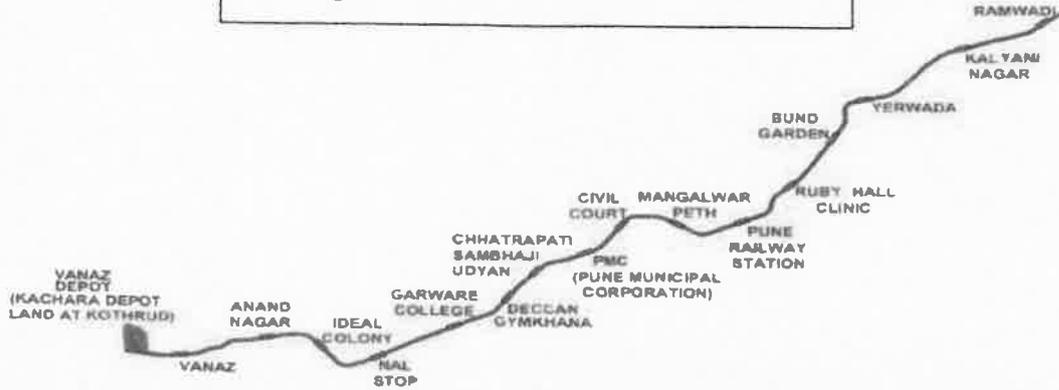


PHASE -1
CORRIDOR -1 PCMC TO SWARGATE
REACH -1 PCMC TO RANGE HILL
REACH -4 RANGE HILL TO SWARGATE

Legend:-
(N-S) PCMC - SWARGATE

Elevated		11.570km
Underground		5.019km
Stations		14 nos.
Depot		

पुणे मेट्रो रेल परियोजना



PHASE - 1
CORRIDOR - 2 VANAZ TO RAMWADI
REACH - 2 VANAZ TO CIVIL COURT
REACH - 3 CIVIL COURT TO RAMWADI

Legend:-

(W-E) VANAZ - RAMWADI

Elevated (Fully) 14.665km

Stations 16 nos.

Depot

[फा.सं.के-14011/16/2017-एमआरटीएम-II]

अम्बुज वाजपेई, अवर सचिव

MINISTRY OF HOUSING AND URBAN AFFAIRS

NOTIFICATION

New Delhi, the 5th January, 2018

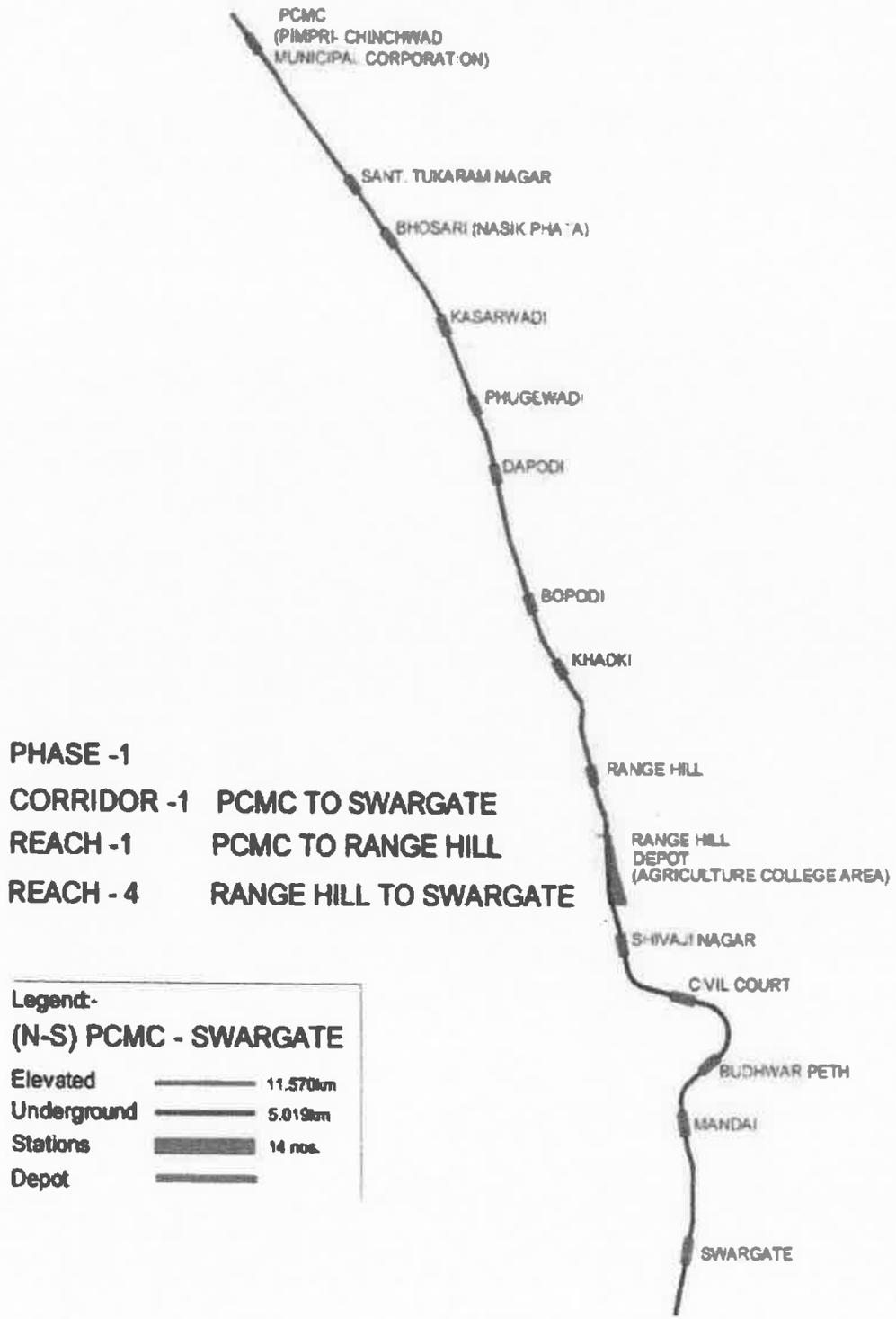
S.O. 95 (E).—Whereas, in exercise of the powers conferred by sub-section (3) of section 1 of the Metro Railways (Construction of Works) Act, 1978 (33 of 1978), (hereinafter referred to as the said Act), the Central Government had extended the application of the provisions of the said Act to the metropolitan area of Pune in the State of Maharashtra with effect from the 21st day of October, 2014, vide notification of the Government of India in the Ministry of Housing and Urban Affairs, number S.O. 2732 (E), dated the 20th October, 2014.

Now, therefore, in exercise of the powers conferred by clause (a) of sub-section (1) of section 32 of the said Act, the Central Government hereby adds to the Schedule to the said Act, the following metro alignments of Pune Metro Rail Project in respect of the metropolitan area of Pune, namely:-

“The Metropolitan Area of Pune

Pune Metro Rail Corridors-Phase-1	
Corridor 1: Pimpari - Chinchwad to Swargate	Pimpri- Chinchwad Municipal Corporation, Sant Tukaram Nagar, Bhosari (Nasik Phata), Kasarwadi, Phugewadi, Dapodi, Bopodi, Khadki, Range Hill, Shivajinagar. Civil Court, Budhwar Peth, Mandai, Swargate.
Depot	Range Hill Depot (Agriculture College Area)
Corridor 2 : Vanaz to Ramwadi	Vanaz, Anand Nagar, Ideal Colony, Nal Stop, Garware College, Deccan Gymkhana, Chhatrapati Sambhaji Udyan, Pune Municipal Corporation, Civil Court, Mangalwar Peth, Pune Railway Station, Ruby Hall Clinic, Bund Garden, Yerwada, Kalyani Nagar, Ramwadi..
Depot	Vanaz Depot (Kachara Depot Land at Kothrud)”

PUNE METRO RAIL PROJECT



PUNE METRO RAIL PROJECT



- PHASE -1**
- CORRIDOR -2 VANAZ TO RAMWADI**
- REACH - 2 VANAZ TO CIVIL COURT**
- REACH - 3 CIVIL COURT TO RAMWADI**

Legend:-
(W-E) VANAZ - RAMWADI
 Elevated (Fully) ————— 14.000km
 Stations ————— 16 nos.
 Depot —————

[F.No.K-14011/16/2017-MRTS-II]
 AMBUJ BAJPAI, Under Secy.

ALOK KUMAR Digitally signed by ALOK KUMAR
 Date: 2018.01.08 12:46:15 +05'30'

पुणे
रजिस्ट्री सं० डी० एल०-33004/99

REGI -33004/99



भारत का राजपत्र The Gazette of India

असाधारण

EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (ii)

PART II—Section 3—Sub-section (ii)

प्राधिकार से प्रकाशित

PUBLISHED BY AUTHORITY

सं. 3371]

नई दिल्ली, सोमवार, अक्टूबर 14, 2019/आश्विन 22, 1941

No. 3371]

NEW DELHI, MONDAY, OCTOBER 14, 2019/ASVINA 22, 1941

आवासन और शहरी कार्य मंत्रालय

अधिसूचना

नई दिल्ली, 14 अक्टूबर, 2019

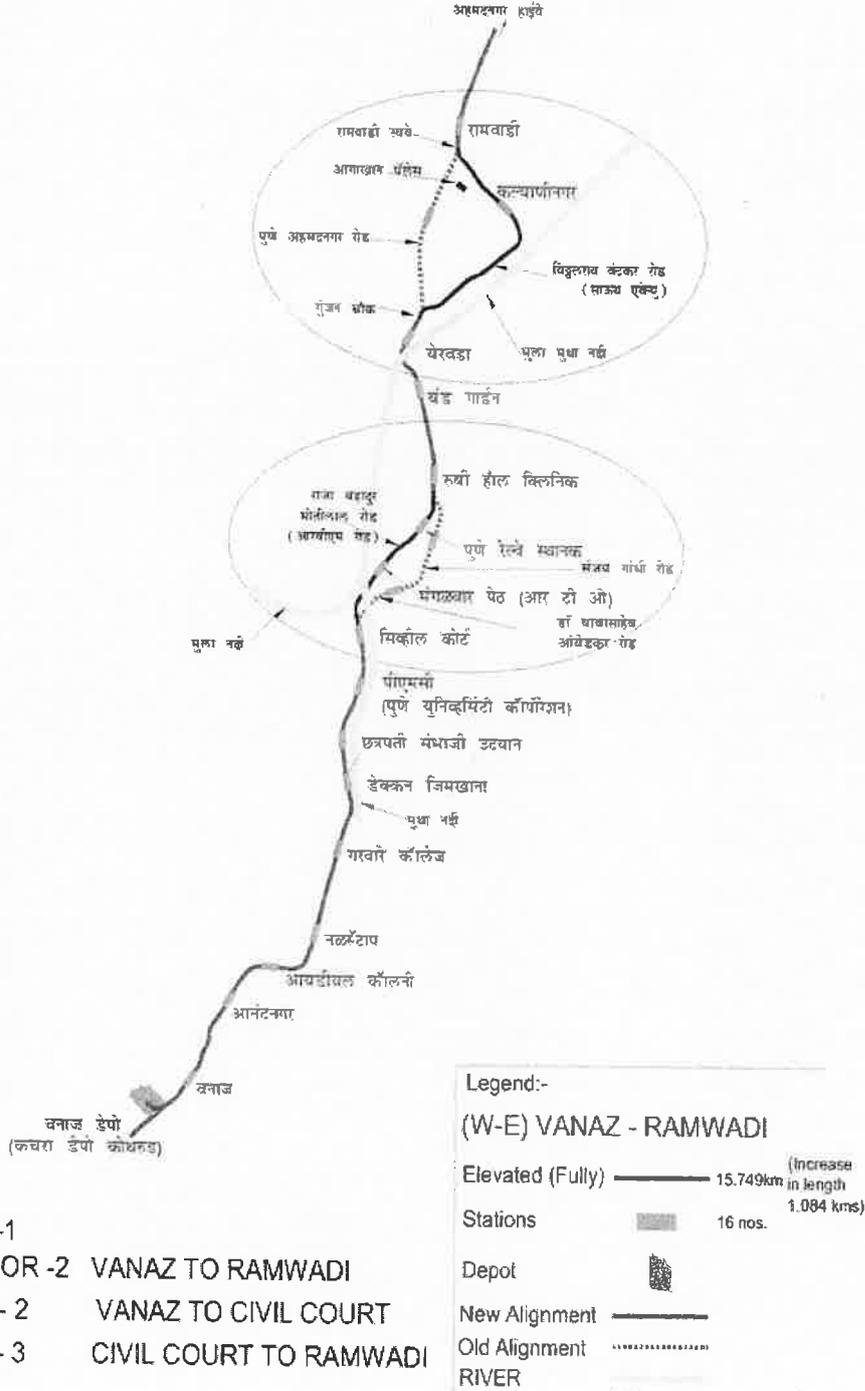
का.आ. 3706(अ).—केन्द्रीय सरकार ने, भूमिगत रेल (संकर्म सन्निर्माण) अधिनियम, 1978 (1978 का 33) (जिसे इसमें इसके पश्चात् उक्त अधिनियम कहा गया है) की धारा 1 की उपधारा (3) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, उक्त अधिनियम के उपबंधों के लागू होने का भारत सरकार के तत्कालीन शहरी विकास मंत्रालय की अधिसूचना सं. का.आ. 2732(अ) तारीख 21 अक्टूबर, 2014 द्वारा महाराष्ट्र राज्य में पुणे महानगर क्षेत्र पर विस्तार किया था ;

और केन्द्रीय सरकार ने उक्त अधिनियम की धारा 32 की उपधारा (1) के खंड (क) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए पुणे मेट्रो रेल परियोजना के चरण-1, कारीडोर-1 (पीपरी-चिंचवाड़ से स्वरगेट) और कारीडोर-2 (वनाज से रामवाड़ी) के संरेखण को उक्त अधिनियम की अनुसूची में भारत सरकार के आवासन और शहरी कार्य मंत्रालय की अधिसूचना सं. का.आ. 95(अ) तारीख 5 जनवरी, 2018 द्वारा जोड़ा है।

अतः, अब, केन्द्रीय सरकार, उक्त अधिनियम की धारा 32 की उपधारा (1) के खंड (ख) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए उक्त अधिनियम की अनुसूची के चरण-1 - पुणे मेट्रो रेल कारीडोरों के कारीडोर-2 (वनाज से रामवाड़ी) के संरेखण का संशोधन करती है, अर्थात् :-

"कारीडोर 2: वनाज से रामवाड़ी	वनाज, आनंद नगर, आइडियल कालोनी, नल स्टॉप, गरवारे कॉलेज, दक्खन जिम्खाना, छत्रपति संभाजी उद्यान, पुणे नगर निगम, सिविल न्यायालय, मंगलवार पेठ, पुणे रेलवे स्टेशन, रूबी हॉल क्लिनिक, बुंद गार्डन, यरवाडा, कल्याणी नगर, रामवाड़ी
डिपो	वनाज डिपो (कोथरूड में कचरा डिपो भूमि)"

पुणे मेट्रो रेल परियोजना



[फा. सं. के-14011/16/2017-एमआरटीएस-II]

के. संजय मूर्ति, अपर सचिव

MINISTRY OF HOUSING AND URBAN AFFAIRS

NOTIFICATION

New Delhi, the 14th October, 2019

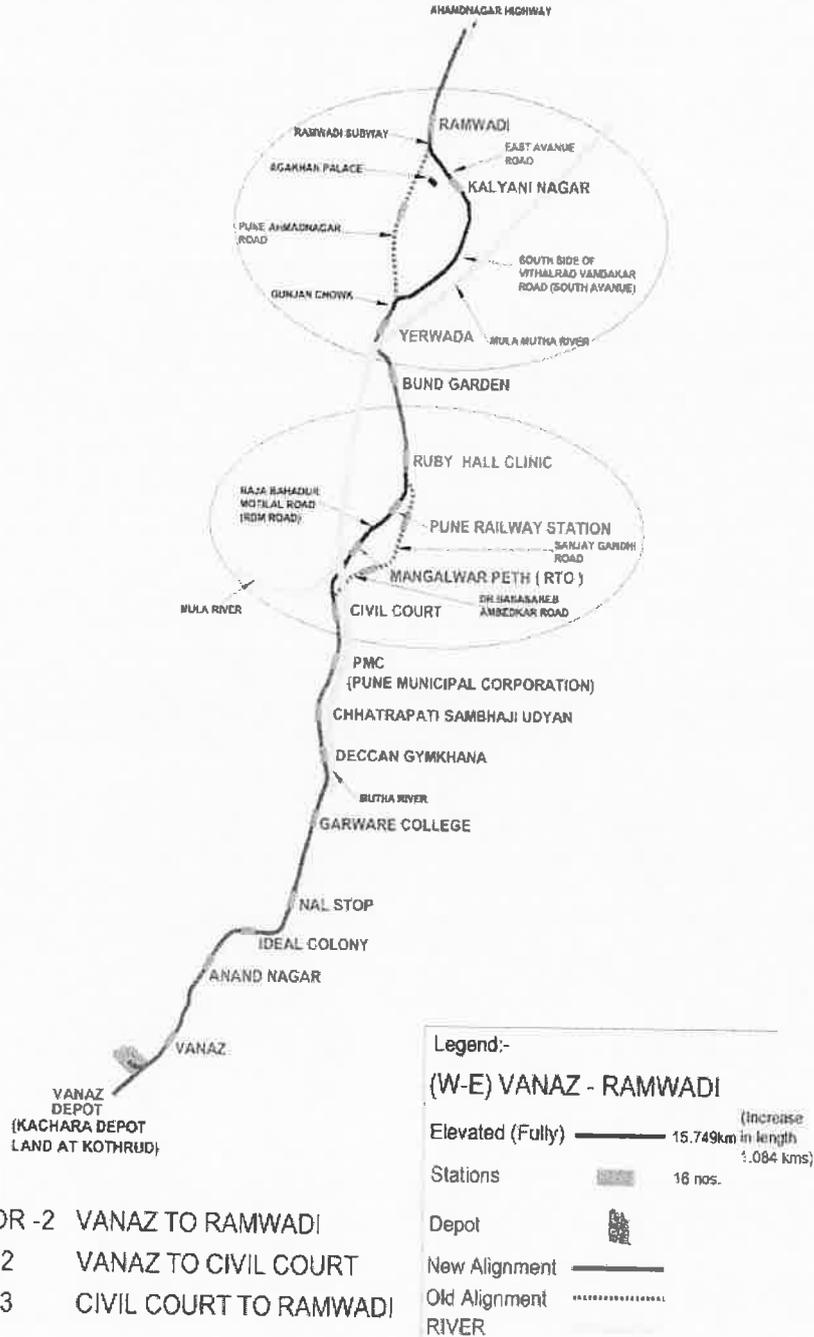
S.O. 3706(E).—Whereas, in exercise of the powers conferred by sub-section (3) of section 1 of the Metro Railways (Construction of Works) Act, 1978 (33 of 1978) (hereinafter referred to as the said Act), the Central Government had extended the application of the provisions of the said Act to the Pune Metropolitan Area in the State of Maharashtra *vide* notification of the Government of India in the erstwhile Ministry of Urban Development number S.O. 2732 (E), dated the 21st October, 2014;

And whereas, in exercise of the powers conferred by clause (a) of sub-section (1) of section 32 of the said Act, the Central Government added metro alignment of Pune Metro Rail Project, Phase-1, corridor 1 (Pimpri-Chinchwad to Swargate) and corridor 2 (Vanaz to Ramwadi) to the Schedule of the said Act *vide* notification of the Government of India in the Ministry of Housing and Urban Affairs Number S.O.95(E), dated the 5th January, 2018.

Now, therefore, in exercise of the powers conferred by clause (b) of sub-section (1) of section 32 of the said Act, the Central Government hereby alters the said metro alignment in respect of Corridor 2 (Vanaz to Ramwadi) of the Pune Metro Rail Corridors – Phase – 1 in the Schedule of the said Act, namely :—

“Corridor 2: Vanaz to Ramwadi	Vanaz, Anand Nagar, Ideal Colony, Nal Stop, Garware College, Deccan Gymkhana, Chhatrapati Sambhaji Udyan, Pune Municipal Corporation, Civil Court, Mangalwar Peth, Pune Railway Station, Ruby Hall Clinic, Bund Garden, Yerwada, Kalyani Nagar, Ramwadi.
Depot	Vanaz Depot (Kachara Depot Land at Kothrud).”

PUNE METRO RAIL PROJECT



- PHASE -1
- CORRIDOR -2 VANAZ TO RAMWADI
- REACH - 2 VANAZ TO CIVIL COURT
- REACH - 3 CIVIL COURT TO RAMWADI

[F. No. K-14011/16/2017-MRTS-II]
 K. SANJAY MURTY, Addl. Secy.

Subject -National Green Tribunal Principal Bench, New Delhi

Sarang Yadvadkar and others

Against

Pune Municipal Corporation and others.

Minutes of the meeting Date- 20/11/2019 at Divisional Commissioners Office, Pune under the chairmanship of Dr.Deepak Mhaisekar,Divisional Commissioner,Pune

The Following were present: -

1. Dr. Ritesh Vijay -Principal Scientist, NEERI and Convenor Expert Committee.
2. Dr A. Benniamin -Scientist, State Bio Diversity Board Member of Expert Committee.
3. Mrs Jadhav, Maharashtra Pollution Control Board, Pune
4. Mr. Ramnath Subramaniam-Executive Director Strategic Planning -Maha Metro
5. Mr. Santosh Patil -Manager, Maha Metro
6. Mr. Ratnakar Pandey -DGM, Environment -Maha-Metro
7. Mr. Mangesh Dighe -Environment Officer, PMC
8. Dr Sandeep Jadhav -Vice President, MITCON Consultants
9. Prateek Deshpande- MITCON Consultants
10. Sanjay D.Sati- Dy. Engineer, PCMC
11. Mr. Rajendra G. Dhopkar- Executive Engineer, Irrigation.
12. P.O. Shinde-Sectional Engineer, Irrigation
13. P.K.Shelar -S.D.O. Mutha Irrigation Substation
14. Chandrakant Khose -Distt Admin Officer, Collectors office
15. Mrs. Renu Gera-Sr Environmental Expert (General Consultants)

Purpose: In compliance with NGT court order dated 3rd August,2018 para 17 "We also direct the Divisional commissioner of Pune to associate with the committee and supervise the project specially the environmental aspects. It will be open to the applicant or any stakeholders to continue to give their suggestions to the committee so that any damage to the environment can be prevented or minimized. In case it is found that project proponent is not complying with the directions of the expert committee, the committee will be at liberty to bring the same to the notice of this tribunal by moving an appropriate application.

Proceedings – This was the fourth meeting with the Expert Committee members. The first being on 30.11.2018 followed by meeting on 13.03.2019 and 4.09.2019 on issues related to environmental compliance for construction at the river front.

The meeting commenced with a presentation capturing the directives of the Expert Committee and the compliances achieved. The need for the 2D Hydrological model was reiterated and suggestions for further detailing were provided by the Expert Committee.

S.No.	Recommendations of Expert Committee	Compliance	Further Suggestions
1.	As per the initial layout 32 trees being affected of which 23 to be transplanted and 9 to be cut.	Out of 32 trees only 7 trees have been transplanted, of which four trees have survived. No further transplants are expected. Coordinates of survived trees and	Coordinates of survived trees, location of new planted trees and their photographs shall be presented in the final report.

		locations has been provided. 36 new trees have been planted at Kharadi forest Survey No. 74 in lieu of 7 transplants (7x3=21) and 3 dead trees (3x5=15).	
2.	Reason for displacement of Metro alignment from original location and change in design foundation at some locations bringing the pile caps above the River bed.	<p>Initially the foundations were proposed below riverbed. But during detailing it was found that a large length of this alignment was falling within the main river bed and closer to channelized stream of the river. The construction along this would have caused a much higher obstruction to the river flow due to higher water velocity in the central zone of the river hence to keep the flow obstruction minimum a logical decision to move alignment towards left bank was taken. While working into this area it was noticed that there are two large diameter sewerage pipe lines are embedded which could not be disturbed considering the serious pollution consequences. thus, a structural scheme/ modified design having a pile and pile caps became necessary to save these sewer pipelines.</p> <p>Mathematical modelling studies for a discharge of 60,000 and 100,000 Cusec was carried out for both the scenarios i.e. without pile cap and with pile cap and it was concluded that water afflux and submergence caused due to Metro Pier is insignificant. This was presented to the NGT Expert Committee on 30.11.2018.</p>	<p>In lieu of fresh petition in NGT, the Expert Committee has asked for below additional information:</p> <ul style="list-style-type: none"> - 1. Additional data on afflux and submergence to be provided in suggested format. 2. As the piers at the stations are in a line hence the area of obstruction would increase. This has to be considered while calculating afflux and submergence. 3. Water levels at pier locations for discharges of 45,474 cusecs, 60,000 cusecs and 100,000 cusecs to be presented in graphical format considering both the scenarios i.e. without Metro Piers and Metro piers with pile caps. 4. Submergence also needs to be depicted in a similar manner, In case if it is found to be very meagre then an enlarged section of the same to be presented. 5. Verify the river dimensions with the irrigation Department and provide appropriate computations in case of discrepancy. Validation/ Endorsement from Irrigation Department is to done. 6. Impact on ground water recharge due Metro pier construction. 7. Issues to be recorded in chronological order and

			<p>replies to be submitted.</p> <p>Maha-Metro agreed to abide above and will make the submissions to the Divisional Commissioners office at the earliest so that Expert Committee is able to provide decision for the same.</p>
3.	Hydrodynamic 2-D stimulation modelling including temporary ramp	<p>As directed by the NGT Expert committee Hydrodynamic modelling studies considering 0.5 Km upstream and downstream of the Mutha River including ramp has been undertaken by using the HECRAS 4.0 Beta Software and same were presented to Expert Committee. Further, Committee wanted that report to be reviewed and vetted by CWPRS.</p> <p>Maha-Metro officially approached the CWPRS for vetting of the report but the CWPRS clarified that they do not review the study conducted by other agency and only willing to take-up fresh numerical model study. accordingly, it was decided to proceed for numerical model study with CWPRS.</p>	<p>Numerical Model study from CWPRS to be conducted at an earliest and report to be submitted.</p> <p>Maha-Metro informed that as per the CWPRS proposal, Numerical Modelling study would take 4 months' time but it was agreed by CWPRS officials that they will try to expedite the study within 2 months' time.</p>

The meeting concluded subsequent to vote of thanks

909
No/NP-4/ws/~~10~~/2019
Date: 16/12/2019

Sd/-
(Dr.Deepak Mhaisekar)
Divisional Commissioner,Pune

Copy :

1. P.K.Shelar -S.D.O. Mutha Irrigation Substation
2. Mr. Mangesh Dighe -Environment Officer, PMC
3. Sanjay D.Sati- Dy. Engineer, PCMC
4. Mr. Rajendra G. Dhopkar- Executive Engineer, Irrigation.
5. P.O. Shinde-Sectional Engineer, Irrigation
6. Chandrakant Khose -Distt Admin Officer, Collectors office
7. Mr. Ramnath Subramaniam-Executive Director Strategic Planning -Maha Metro
8. Dr. Ritesh Vijay -Principal Scientist, NEERI and Convenor Expert Committee.

9. Dr A. Benniamin -Scientist, State Bio Diversity Board Member of Expert Committee.
10. Mrs Jadhav, Maharashtra Pollution Control Board, Pune
11. Mr. Santosh Patil -Manager, Maha Metro
12. Mr. Ratnakar Pandey -DGM, Environment -Maha-Metro
13. Dr Sandeep Jadhav -Vice President, MITCON Consultants
14. Prateek Despande- MITCON Consultants
15. Mrs. Renu Gera-Sr Environmental Expert (General Consultants)


(Prashant Khandkekar) 16/11/2019
Regional Deputy Director[
Municipal Administration,
Pune Division,Pune

ITEM NO.69

COURT NO.6

SECTION XVII

S U P R E M E C O U R T O F I N D I A
R E C O R D O F P R O C E E D I N G S

Civil Appeal No(s). 14941/2017

MAHARASHTRA METRO RAIL CORPORATION LTD

Appellant(s)

VERSUS

PUNE MUNICIPAL CORPORATION & ORS.

Respondent(s)

(FOR PERMISSION TO FILE APPLICATION FOR DIRECTION ON IA 93744/2017
FOR EXEMPTION FROM FILING C/C OF THE IMPUGNED JUDGMENT ON IA
93745/2017
FOR EXEMPTION FROM FILING O.T. ON IA 93746/2017)

Date : 18-09-2017 This matter was called on for hearing today.

CORAM : HON'BLE MR. JUSTICE A.K. SIKRI
HON'BLE MR. JUSTICE ASHOK BHUSHAN

For Appellant(s) Mr. K.K. Venugopal, AG
Mr. Tushar Mehta, ASG
Mr. S.K. Mishra, Sr. Adv.
Mr. Mehul M. Guputa, Adv.
Mr. Pralhad Paranjape, Adv.
Mr. R. P. Gupta, AOR

For Respondent(s) Ms. Anitha Shenoy, AOR
Ms. Srishti Agnihotri, Adv.

UPON hearing the counsel the Court made the following
O R D E R

Issue notice.

Tag with Civil Appeal No. 8762/2016 and C.A. No. 9070/2016.

The National Green Tribunal by the impugned order has only decided on its jurisdiction and has not yet taken any view in the merits of the case. The Tribunal may decide the case finally as we are informed that the case is fixed finally on 21st September, 2017. However, in case the final order goes against the appellant no

effect to that shall be given without leave of this Court. At the same time, we make it clear that there is no stay on the project which is being undertaken by the appellant and it will have the right to continue with the project.

(ASHWANI KUMAR)
COURT MASTER

(MALA KUMARI SHARMA)
COURT MASTER



Exhibit "4"

महाराष्ट्र मेट्रो रेल कॉर्पोरेशन लिमिटेड

MAHARASHTRA METRO RAIL CORPORATION LIMITED

(भारत सरकार आणि महाराष्ट्र शासनाचा संयुक्त उपक्रम)
Joint Venture of Govt. of India & Govt. of Maharashtra
PUNE METRO RAIL PROJECT

Maha-Metro/Pune/ENV/02

Date: 21/11/2019

To,
The Executive Engineer,
Khadakwasla Irrigation Division
Sinchan Bhawan, Pune

Sub: Requirement of Mutha River data w.r.t NGT Expert Committee meeting held at Divisional Commissioner office, Pune dated on 20th November, 2019.

Dear Sir

Maharashtra Metro Rail Corporation Ltd. Is a joint venture company of Government of India (GOI) and Government of Maharashtra (GOM) established under the companies Act 2013 for the purpose of implementation of Pune Metro Rail Project. The total length of Pune Metro Rail Project is 31.25 km of which a stretch of 1.45 km passes along the left bank of the Mutha River.

Reference to NGT order 3rd August, 2018 (OA no. 130/2018) and subsequent order (OA no. 70/2019) dated 5th November, 2019, a meeting along with NGT expert Committee has been convened by the Divisional Commissioner, Pune wherein the afflux and submergence due to Metro pier passing along the left bank of the Mutha River (1.45 Km) were discussed and some points were raised by the Committee, to meet this requirement below mentioned data is required from your good office.

1. Water level at a discharge of 45,474, 60,000 and 100,000 Cusec.
2. Topographical data of both banks starting from Khadakwasala to Bund Garden.
3. Details of the Superstructure in between Khadakwasala to Bund Garden.
4. Zoning data w.r.t. blue line and red line.
5. CWC data at Bund Garden.
6. Contribution data of both the Rivers i.e. Mula & Mutha at Bund Garden.

I would highly appreciate, if you could please provide us the above-mentioned data at earliest to have a further study and framing the suitable reply to Committee.

Ratnakar
21/11/19

आवक लिफिक
खडकवासला पाटबंधारे विभाग
सिंचन भवन, पुणे. ११

Ratnakar
21/11/19

Ratnakar Pandey
(DGM/Environment)
Maha-Metro Rail Corporation Limited, Pune

CORPORATE OFFICE: PUNE

... MUTHA RIVER ...

KHADAKWASLA TO KHARADI

CROSS SECTION

CH. 8/040 TO 10/020

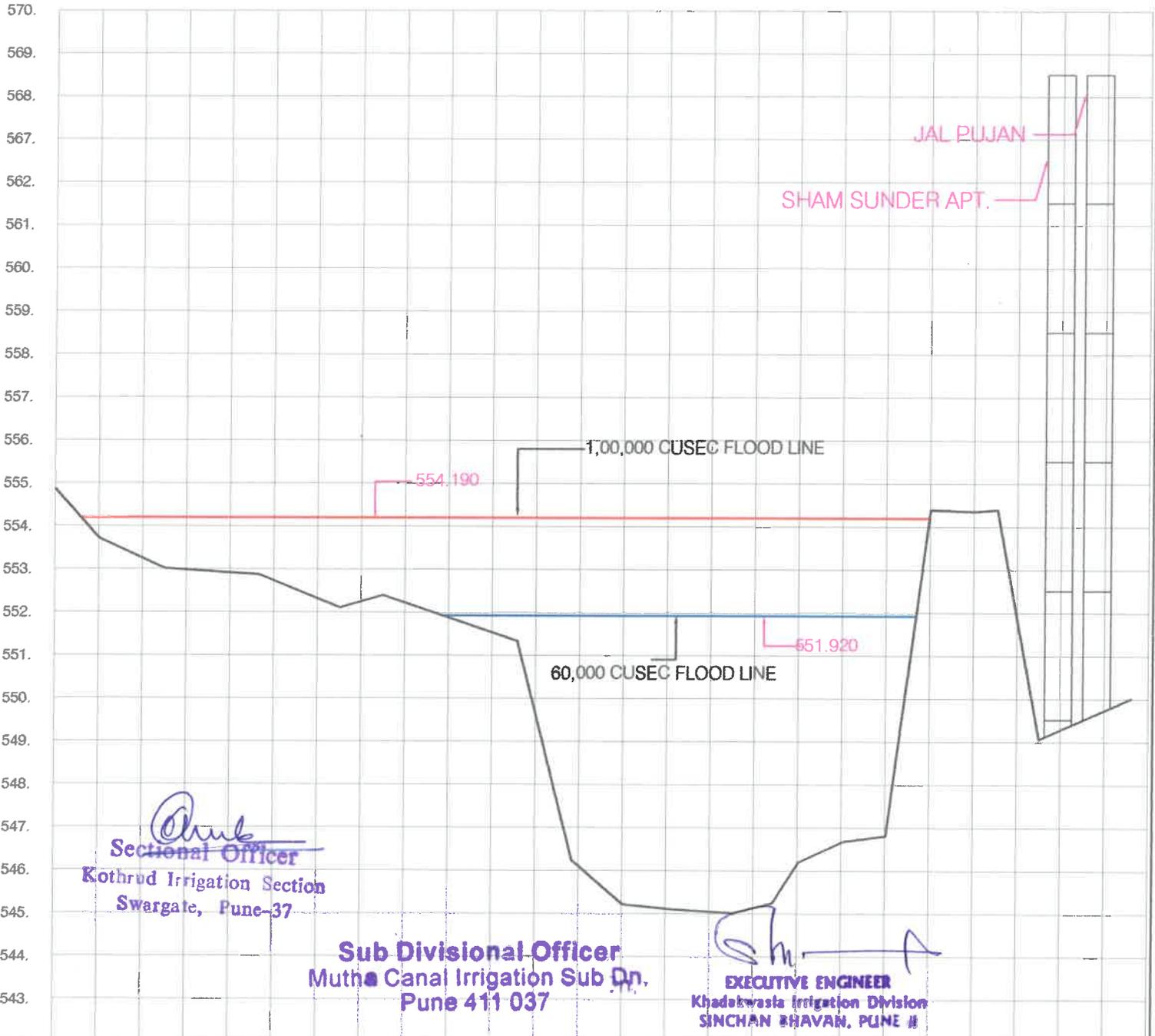
मंडळ कार्यालय, पुरा - २

CH. 8/040 TO 9/000

DISCHARGE	LINE	COLOUR	पूररेषा
1,00,000 CUSEC	RED LINE		नियंत्रक पूररेषा
60,000 CUSEC	BLUE LINE		निषेधक पूररेषा

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+040



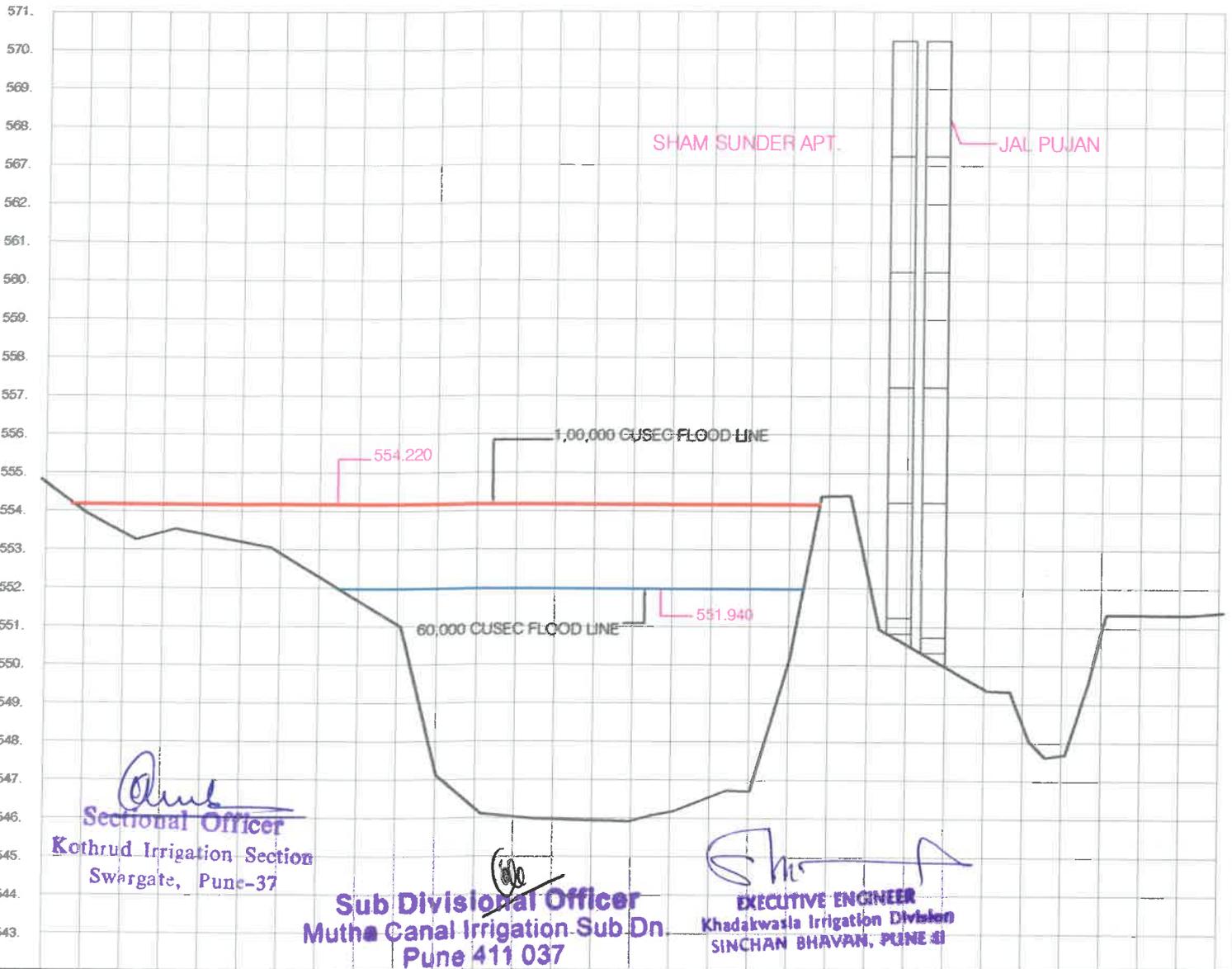
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	554.838	553.700	553.233	553.000	552.968	552.903	552.860	552.718	552.299	552.090	552.206	552.380	552.204	551.860	551.516	551.320	549.591	546.230	546.066	546.200	545.101	545.035	545.000	545.125	545.240	546.158	546.661	546.798	554.406	554.906	551.913	554.954	553.874	549.050	549.275	549.725	550.000
CHAINAGE	0.00	10.00	20.00	25.000	30.00	40.00	46.600	50.00	60.00	66.000	70.00	74.900	80.00	90.00	100.00	106.700	110.00	118.360	120.00	130.05	140.00	150.00	155.250	160.00	164.350	170.00	180.00	190.10	200.00	206.900	210.00	218.900	220.00	225.000	230.00	240.00	246.100

**CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE
CH 8+070**



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

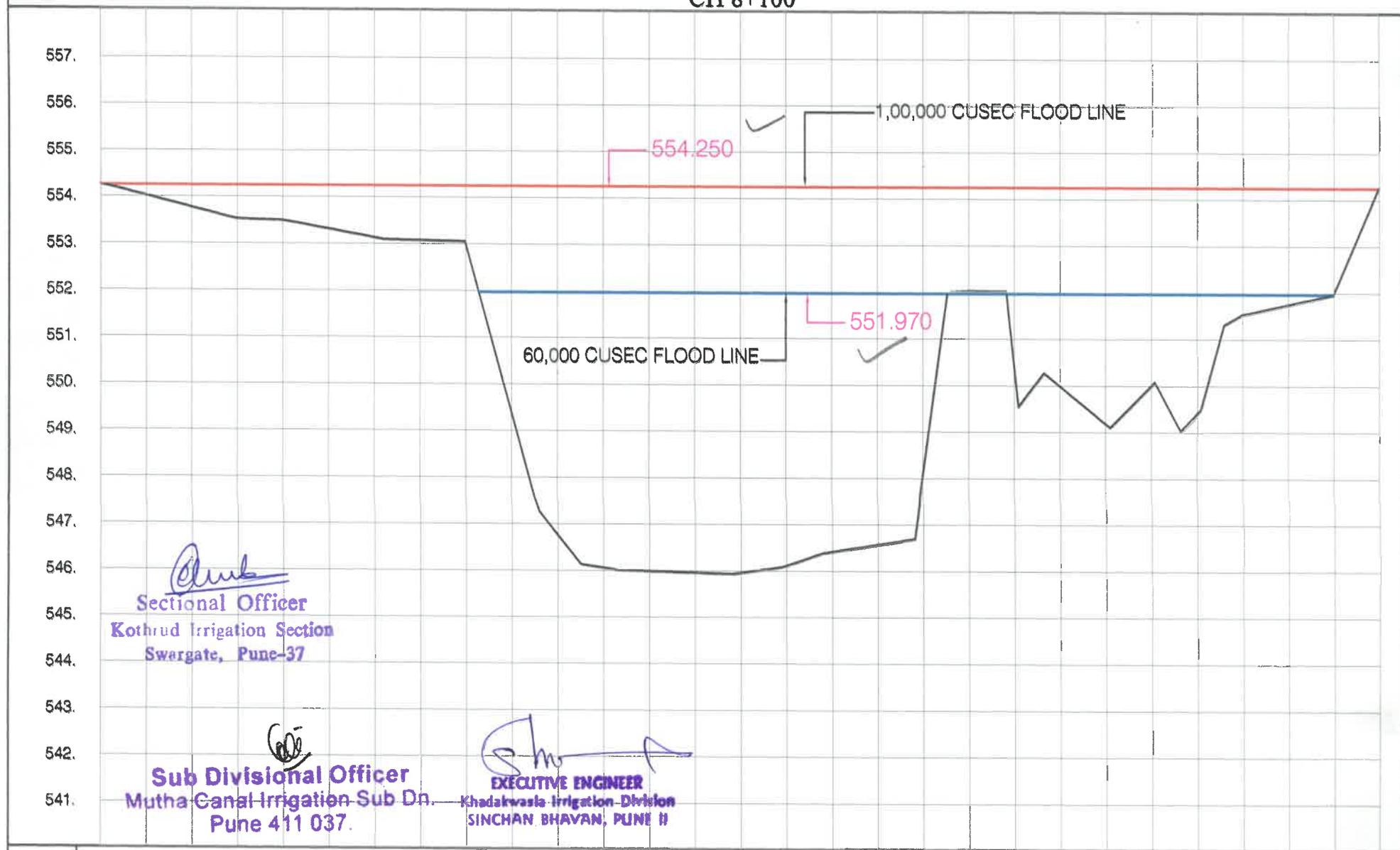
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE 41

LEVELS	554.980	553.940	553.287	553.637	553.381	553.184	553.040	552.871	552.255	551.559	551.023	550.960	547.000	546.815	546.010	545.960	545.946	545.823	545.600	545.060	545.135	545.170	546.544	546.710	546.560	550.120	554.337	554.541	554.547	553.783	553.630	550.521	546.944	546.387	546.310	546.296	546.280	547.650	547.681	546.770	546.350	550.915	551.320	551.316	551.311	551.372	
CHAINAGE	0.00	10.00	23.990	38.000	40.00	50.00	57.290	60.00	70.00	60.00	90.00	97.700	100.00	110.00	120.00	125.350	130.00	140.00	146.40	154.850	160.00	166.500	170.00	174.100	180.15	180.00	194.900	200.00	206.900	210.00	212.990	220.00	230.00	240.00	246.500	248.310	250.00	251.400	253.600	260.00	266.770	270.00	270.00	271.000	280.00	290.00	300.00

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+100



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

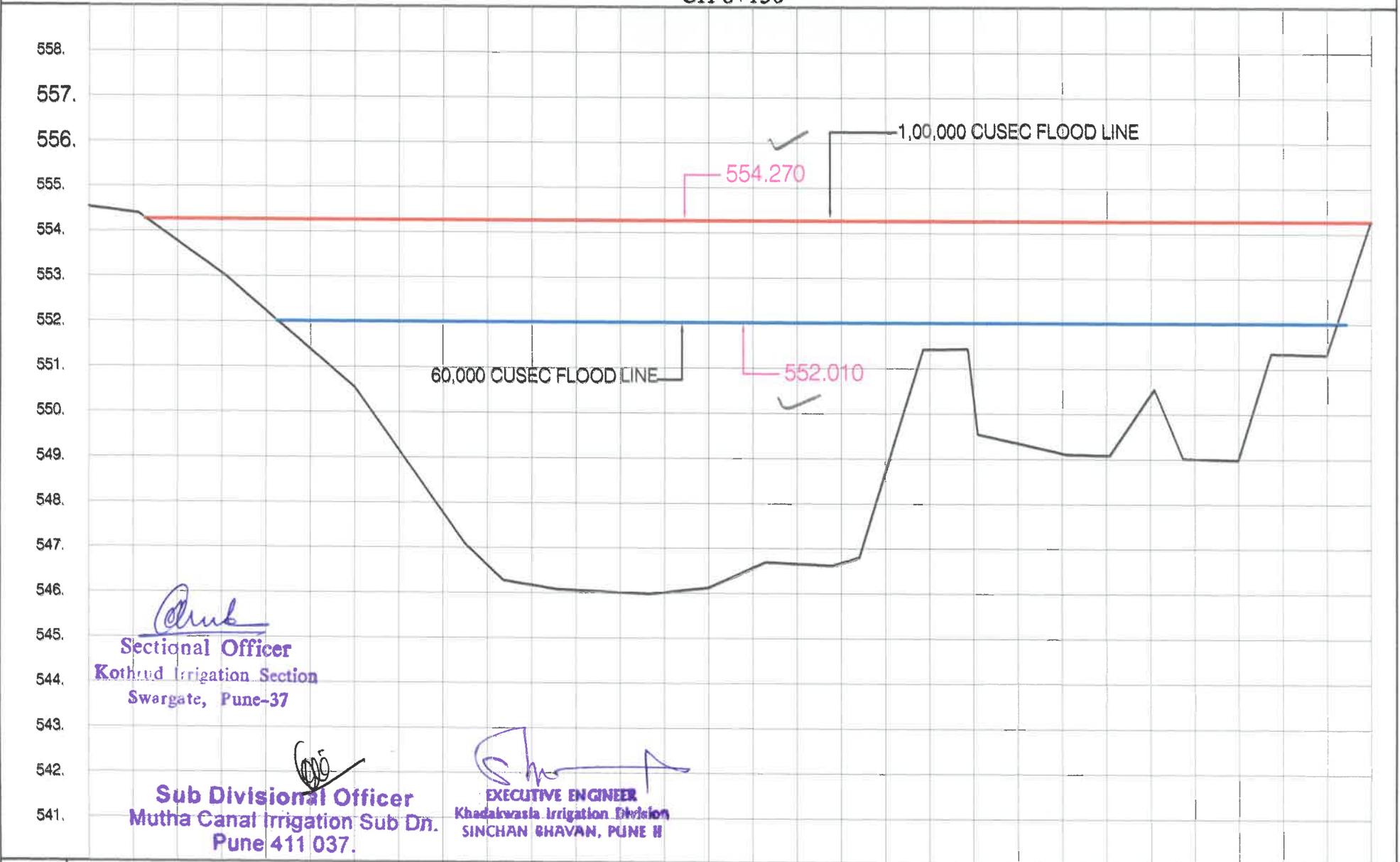
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037.

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE II

LEVELS	554.230	554.000	553.617	553.500	553.471	553.292	553.111	553.070	553.052	552.994	549.404	547.250	546.749	546.110	546.038	545.980	545.968	545.937	545.910	545.933	546.085	546.360	546.389	546.544	546.670	547.715	554.457	554.477	545.474	550.057	549.520	550.250	549.976	549.169	549.080	549.970	550.060	549.000	549.363	549.470	551.290	551.510	551.725	551.940	552.156	554.250
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	62.250	70.00	80.00	90.00	96.000	100.00	105.100	110.00	113.250	120.00	130.00	138.300	140.00	148.250	158.100	160.00	170.00	178.200	180.00	185.450	190.20	198.300	200.00	201.000	208.600	210.00	220.00	221.100	230.00	230.900	236.600	240.000	241.000	246.000	250.00	260.00	270.00	280.00	281.600

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

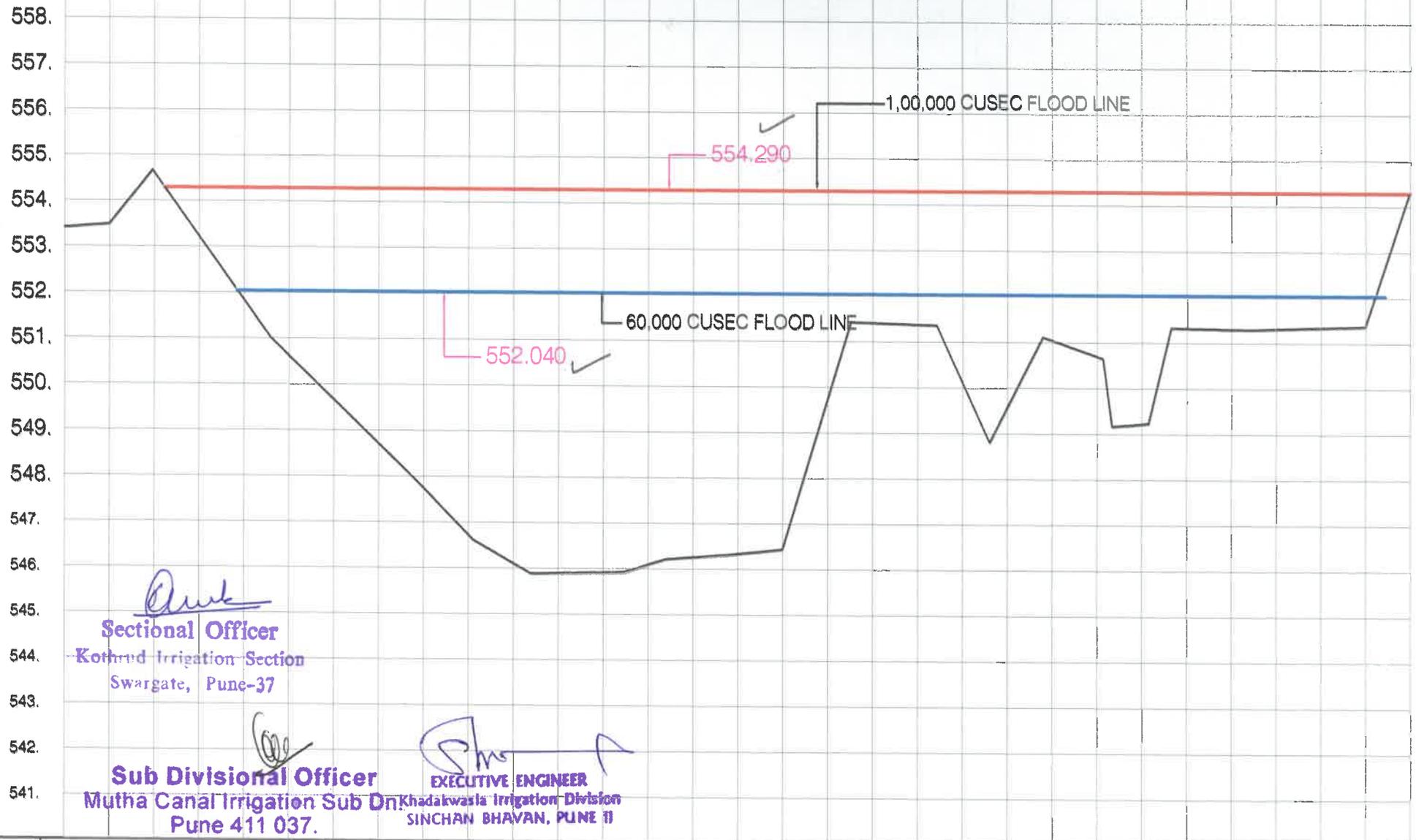
CH 8+130



LEVELS	554.510	554.365	554.370	553.732	553.050	552.950	552.217	551.373	550.520	549.151	547.763	547.050	546.588	546.250	546.148	546.050	546.033	545.990	545.960	545.982	546.089	546.541	546.670	546.637	546.600	546.656	546.780	549.738	554.100	554.150	550.520	549.324	549.106	549.080	549.062	550.384	550.330	549.500	548.982	548.960	551.320	551.314	551.293	554.270
CHAINAGE	0.00	10.00	11.200	20.00	30.00	30.850	40.00	50.00	60.10	70.00	80.00	86.200	90.00	93.700	100.00	106.000	110.00	120.00	126.950	130.00	140.00	150.00	152.800	160.00	168.100	170.00	174.200	180.00	190.00	200.00	201.000	210.00	220.00	221.200	230.00	240.00	241.000	247.500	250.00	260.00	267.400	270.00	280.00	291.000

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+160



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

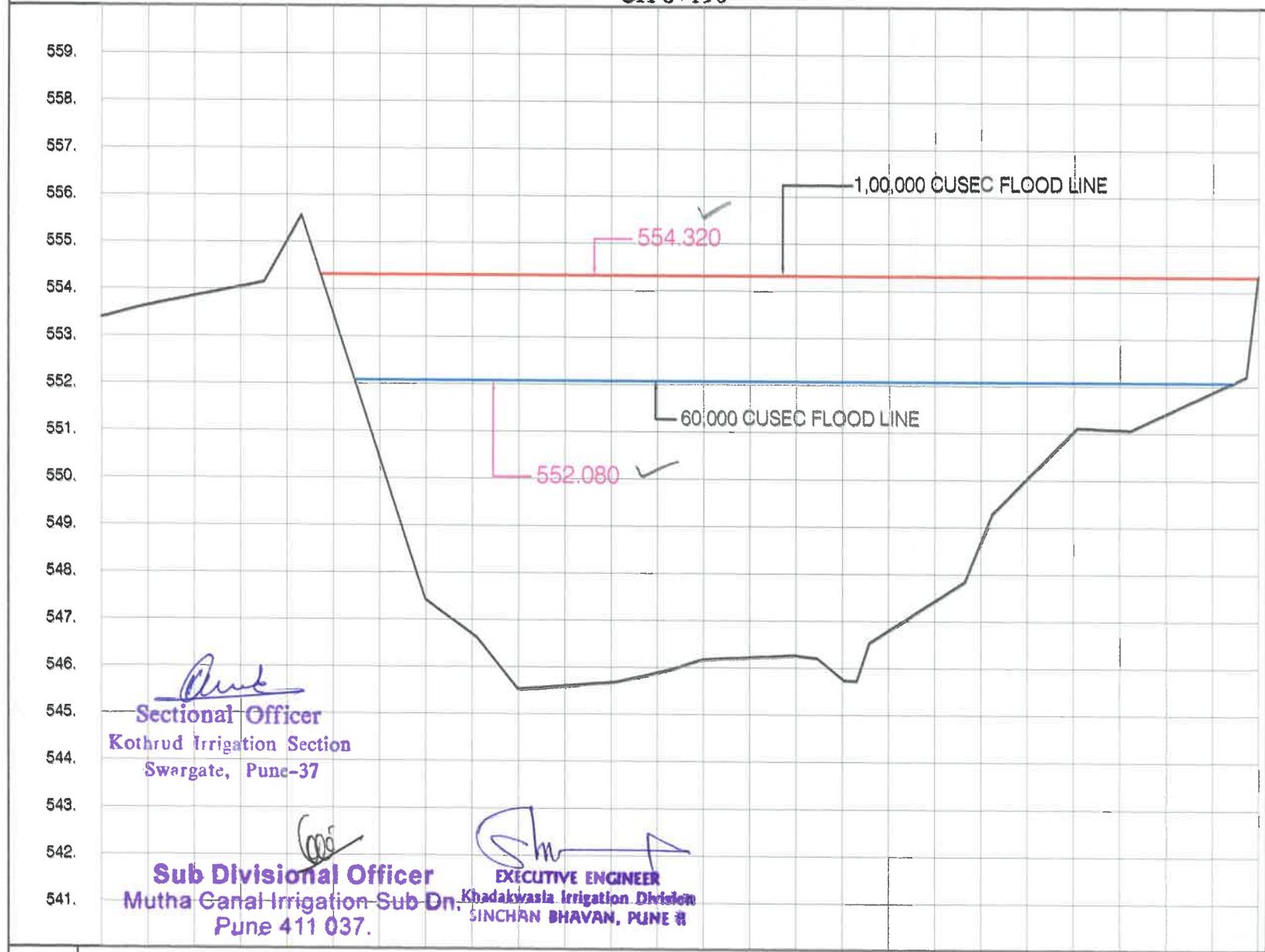
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Division
 Pune 411 037.

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	553.380	553.460	554.640 554.598	553.212	551.826	550.980	550.608	549.655	548.701	547.900 547.736	546.713 546.600	546.087 545.860	545.872	545.881	545.900	546.067 546.190	546.233	546.280	546.311	546.410	549.252	550.730	550.715	550.684	550.670	549.765	548.780	549.524	551.080	551.021	550.678	548.140	548.196	548.210	551.300	551.294	551.277	551.270	551.288	551.319	551.360	554.290
CHAINAGE	0.00	10.00	19.700 20.00	30.00	40.00	46.100	50.00	60.00	70.00	78.400 80.00	90.00 91.100	100.00 103.950	110.00	120.00	124.650	130.00 133.950	140.00	147.900	150.00	160.00	170.00	175.200	180.00	190.00	194.300	200.00	206.200	210.00	218.000	220.00	230.00	233.500	240.00	241.800	246.600	250.00	260.00	263.800	270.00	280.00	290.00	300.00

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+190



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

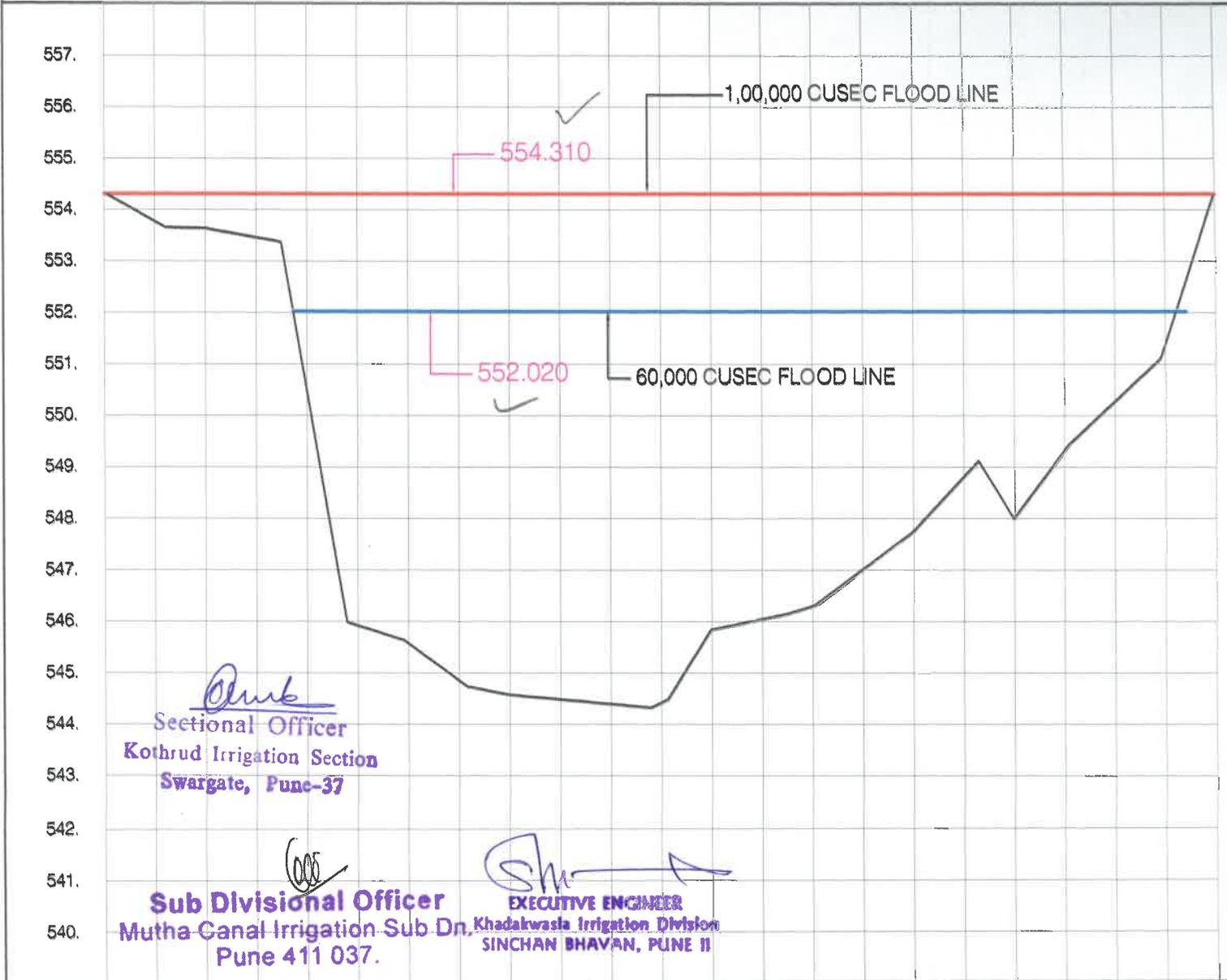
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub-Dn.
 Pune 411 037.

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE 411 007

LEVELS	CHAINAGE
553.360	0.00
553.600	8.000
553.620	10.00
553.819	20.00
554.018	30.00
554.120	35.100
554.979	40.00
555.540	43.200
553.475	50.00
550.437	60.00
547.400	70.00
546.679	80.00
546.600	81.100
545.500	90.00
545.575	100.00
545.650	110.00
545.856	120.00
545.910	122.400
546.150	130.00
546.195	140.00
546.239	150.00
546.180	154.700
545.758	160.00
545.700	163.250
546.510	165.950
546.765	170.00
547.395	180.00
547.810	186.600
548.632	190.00
548.260	182.600
550.000	200.00
551.000	210.00
551.080	210.900
551.050	220.00
551.040	222.400
551.388	230.00
551.846	240.00
554.320	247.500

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

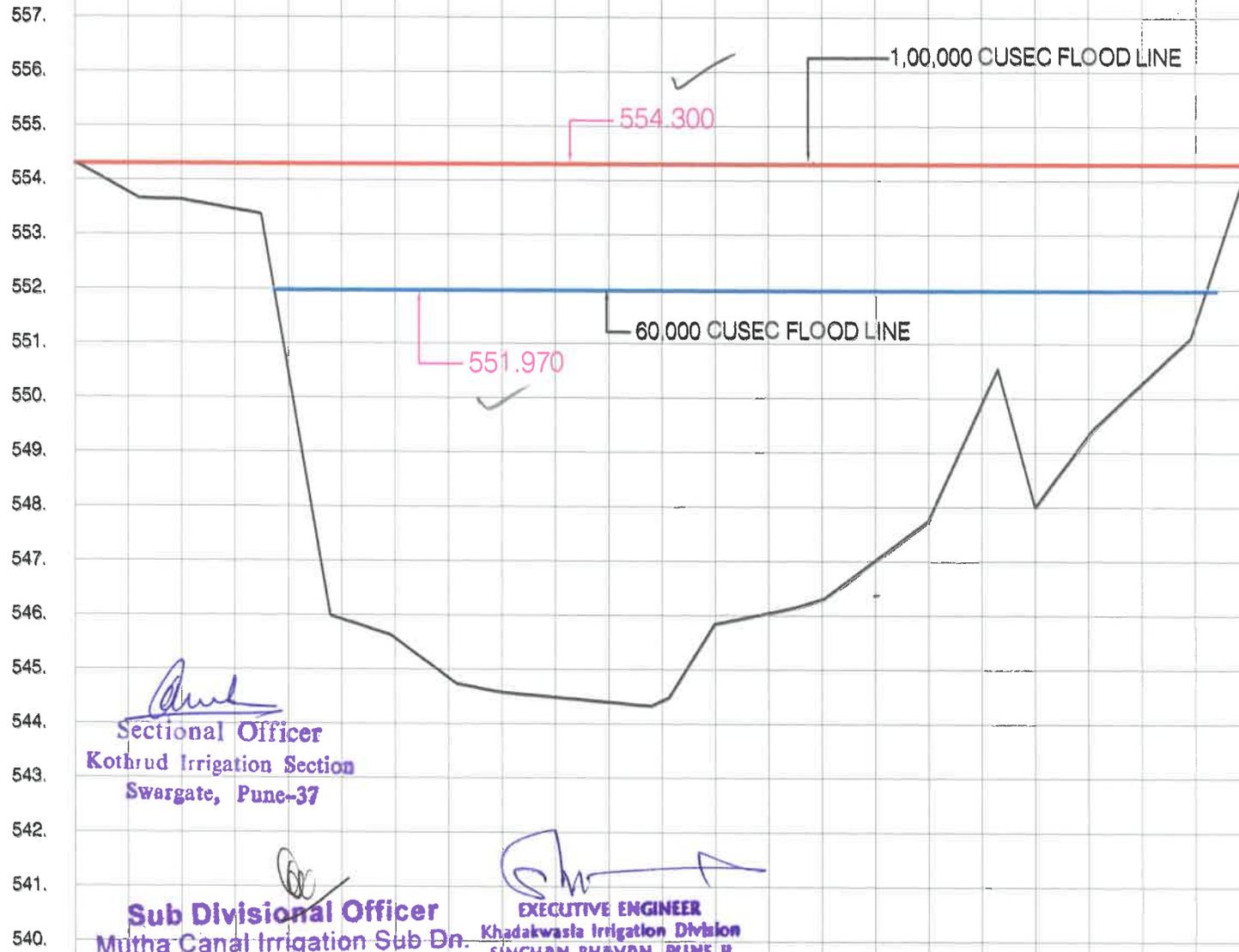
CH 8+220



LEVELS	554.310	553.626	553.610	553.437	553.350	550.508	545.990	545.888	545.610	545.552	544.831	544.710	544.551	544.461	544.372	544.300	544.392	544.460	545.812	546.016	546.120	546.271	546.250	546.978	547.710	548.855	548.100	547.970	549.278	549.410	550.241	551.090	551.067	554.310
CHAINAGE	0.00	10.00	20.10	30.00	35.000	40.00	48.000	50.00	59.200	60.00	70.00	71.670	80.00	90.00	100.00	108.100	110.00	111.400	120.00	130.00	135.100	140.00	140.600	150.00	160.00	170.00	173.100	180.10	190.00	191.000	200.00	209.200	210.00	220.700

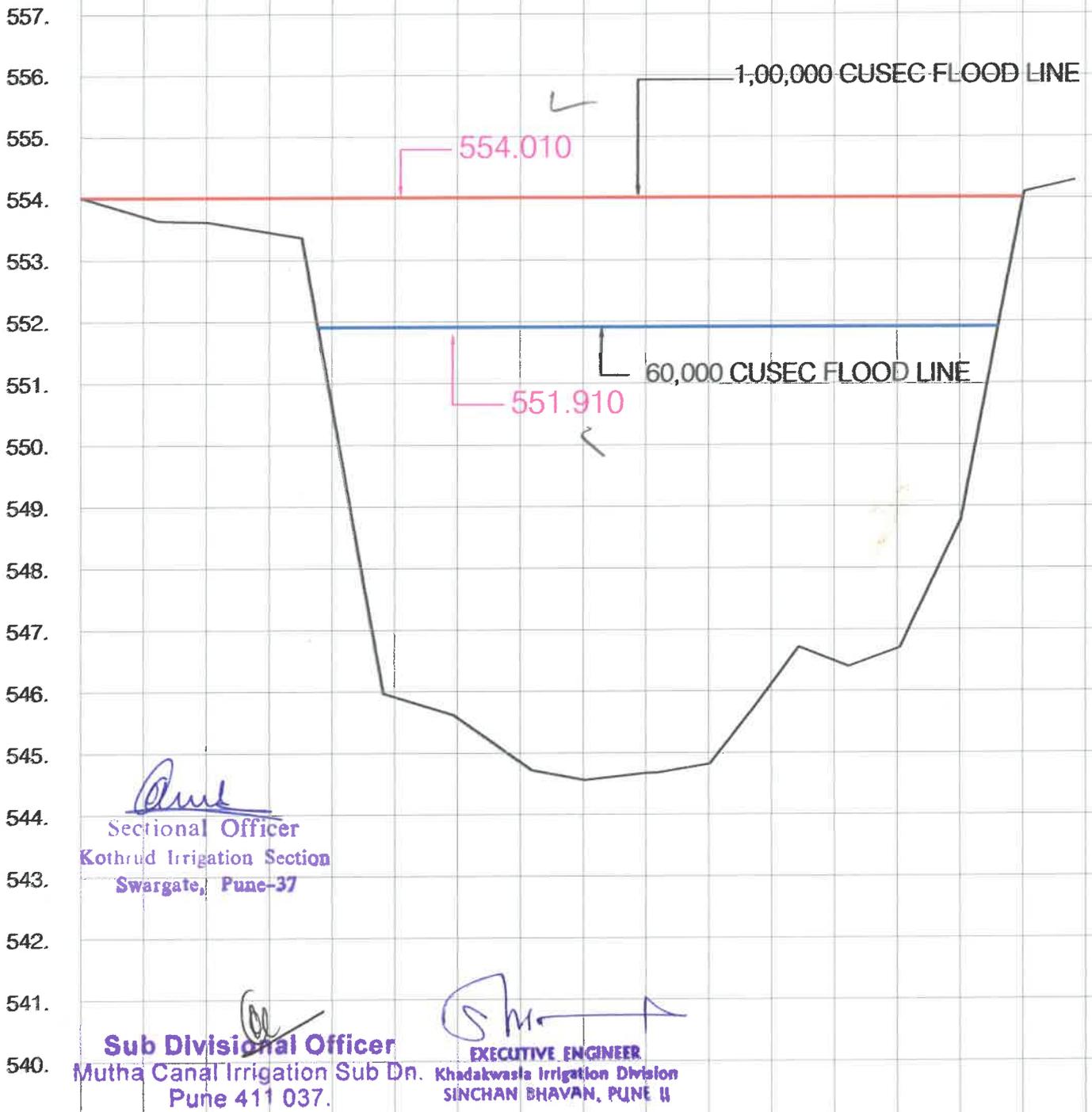
CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+250



LEVELS	554.300	553.626	553.610	553.437	553.350	550.508	545.960	545.898	545.610	545.552	544.831	544.710	544.551	544.461	544.372	544.300	544.282	544.480	545.812	546.016	546.120	546.271	546.260	546.978	547.710	549.855	550.850	547.970	549.278	549.410	550.241	551.080	551.087	554.300
CHAINAGE	0.00	10.00	20.10	30.00	35.000	40.00	48.000	50.00	59.200	60.00	70.00	71.670	80.00	90.00	100.00	108.100	110.00	111.400	120.00	130.00	135.100	140.00	140.600	150.00	160.00	170.00	173.100	180.10	190.00	191.000	200.00	209.200	210.00	220.700

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE CH 8+280



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

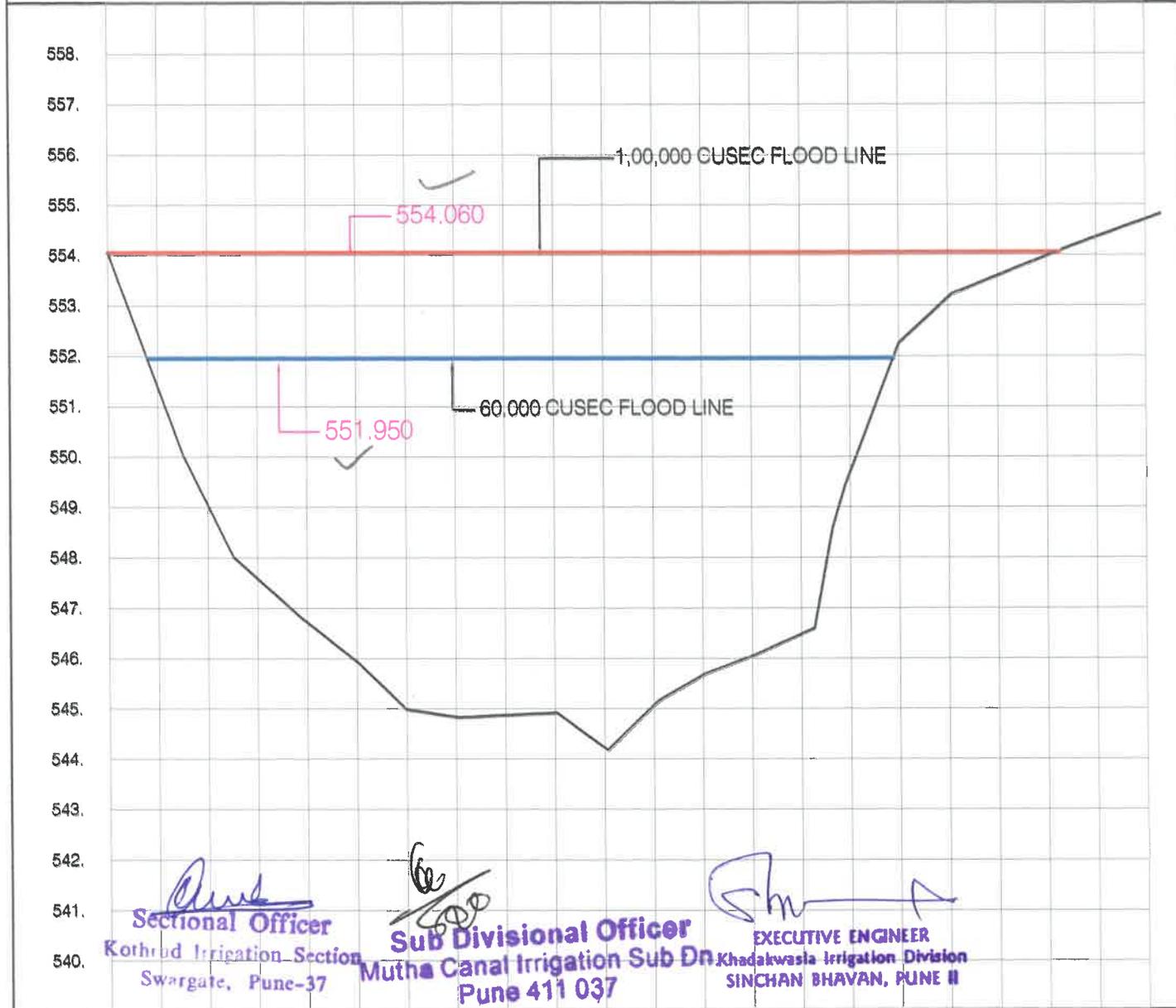
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037.

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	554.010	553.626	553.610	553.437	553.360	550.508	545.960	545.898	545.610	545.552	544.851	544.710	544.551	544.665	544.810	545.740	546.136	546.710	546.475	546.390	546.681	546.690	548.770	554.064	554.010
CHAINAGE	0.00	10.00	20.10	30.00	35.000	40.00	48.000	50.00	59.200	60.00	70.00	71.670	80.00	90.00	100.00	107.100	110.00	114.200	120.00	122.100	130.00	130.250	140.00	150.00	158.100

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+310



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn
 Pune 411 037

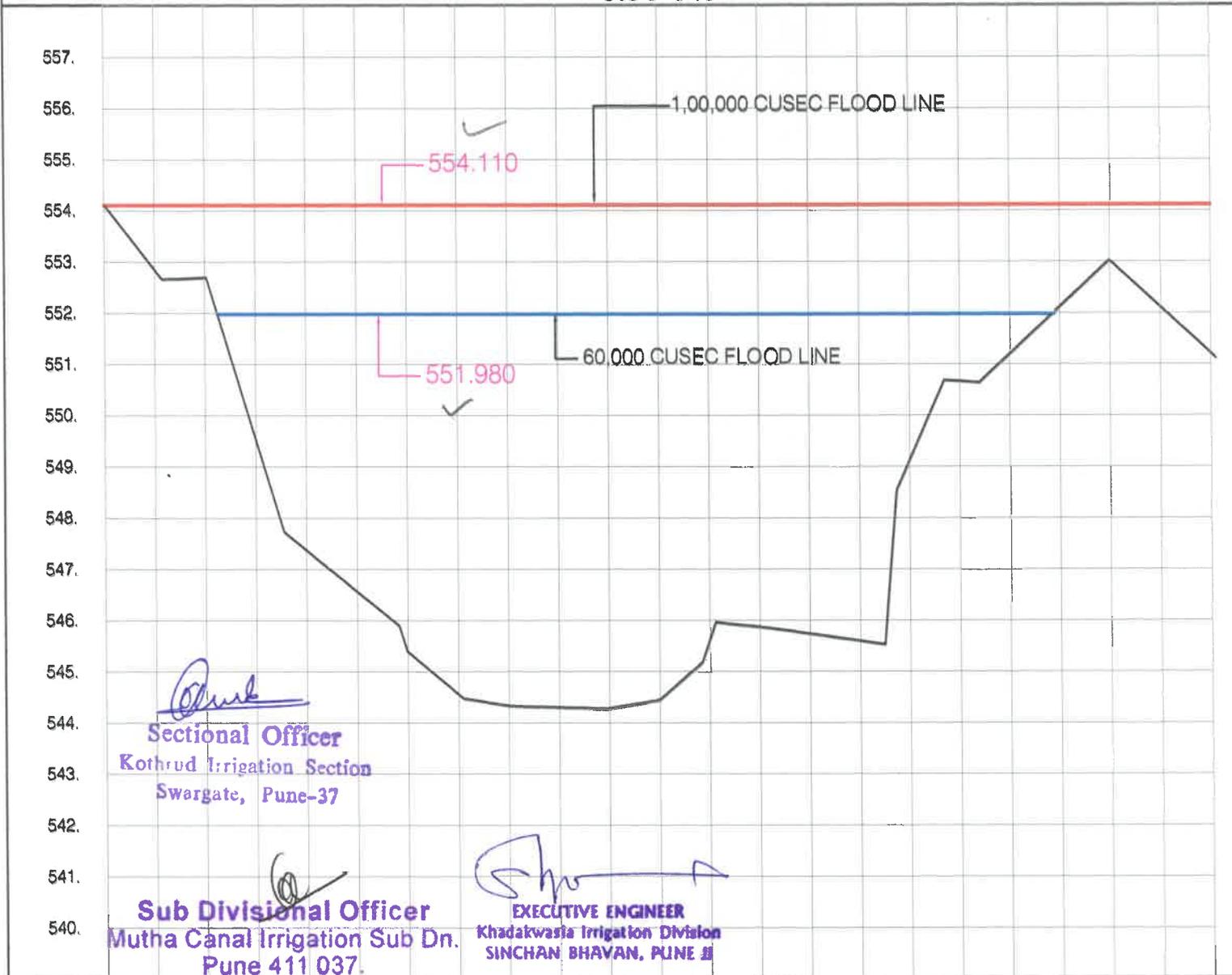
[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	554.060	550.944	550.010	549.050	547.990	547.575	546.788	546.702	545.917	545.870	544.970	544.809	544.800	544.800	544.843	544.888	544.880	544.204	544.150	545.026	545.140	545.636	545.670	546.013	546.050	546.447	546.570	548.560	548.380	548.637	552.207	552.220	553.119	553.200	553.559	553.963	554.150	554.326	554.677	554.780
CHAINAGE	0.00	10.00	15.200	20.00	25.300	30.00	38.000	40.00	50.00	50.600	60.00	70.00	70.600	80.00	90.00	90.500	100.00	100.750	110.00	111.200	120.00	120.600	130.00	131.000	140.00	142.800	146.500	148.000	150.00	160.00	160.060	170.00	170.900	180.00	190.00	195.000	200.00	210.00	213.200	

Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037.

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+340



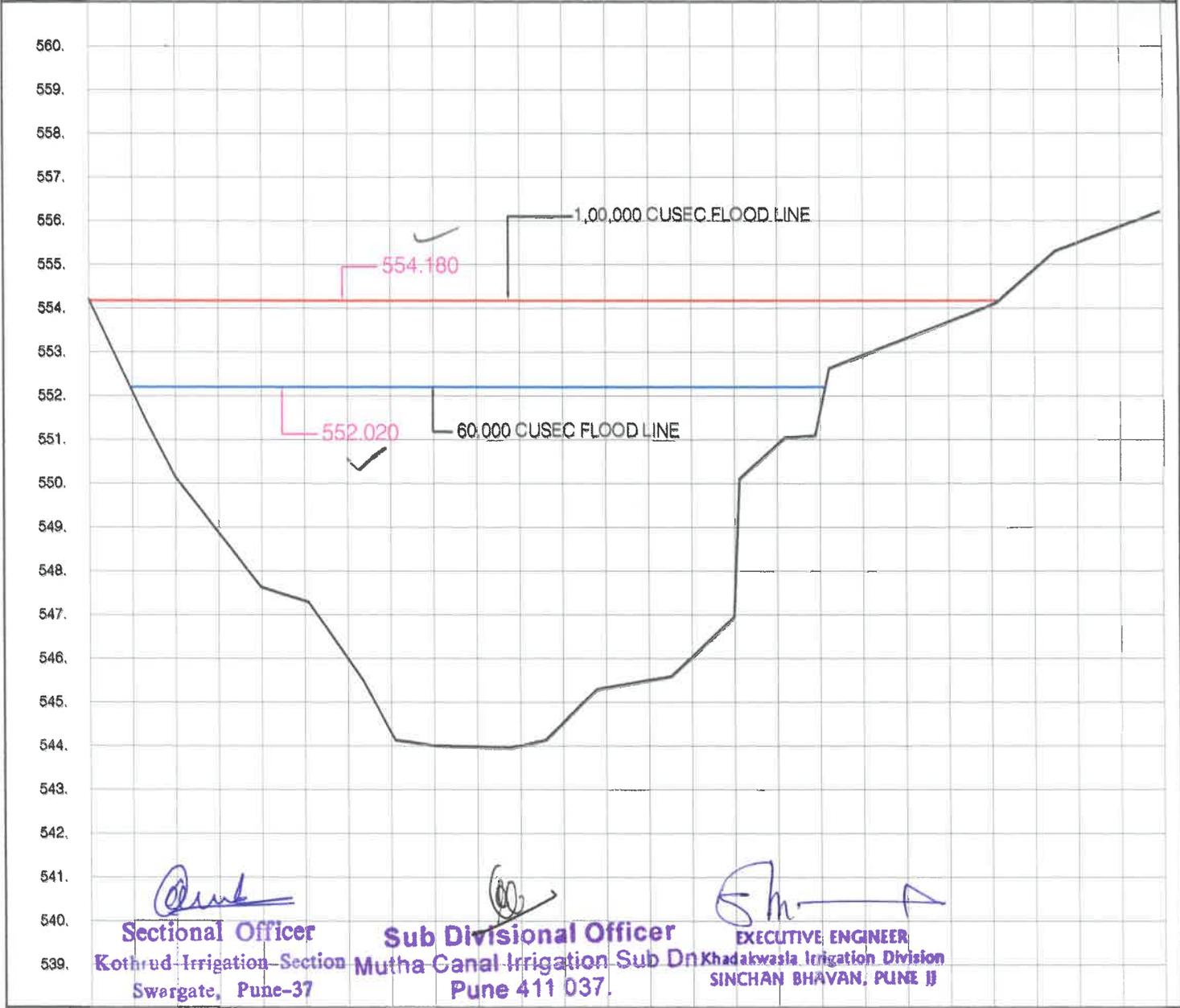
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037.

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE II

LEVELS	554.110	552.648	552.669	549.552	547.700	547.353	546.547	545.870	545.370	544.545	544.450	544.306	544.275	544.255	544.410	545.150	545.554	545.890	545.843	545.820	545.711	545.570	545.500	548.510	549.076	550.660	550.639	550.610	551.162	552.081	553.000	552.100	551.198	551.100
CHAINAGE	0.00	10.00	20.00	30.00	35.700	40.00	50.00	58.400	60.00	70.00	71.150	80.00	90.00	100.00	110.00	118.600	120.00	121.300	130.00	132.300	140.00	150.00	155.000	157.500	160.00	167.000	170.00	174.000	180.00	190.00	200.00	210.00	220.00	221.00

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE
CH 8+370



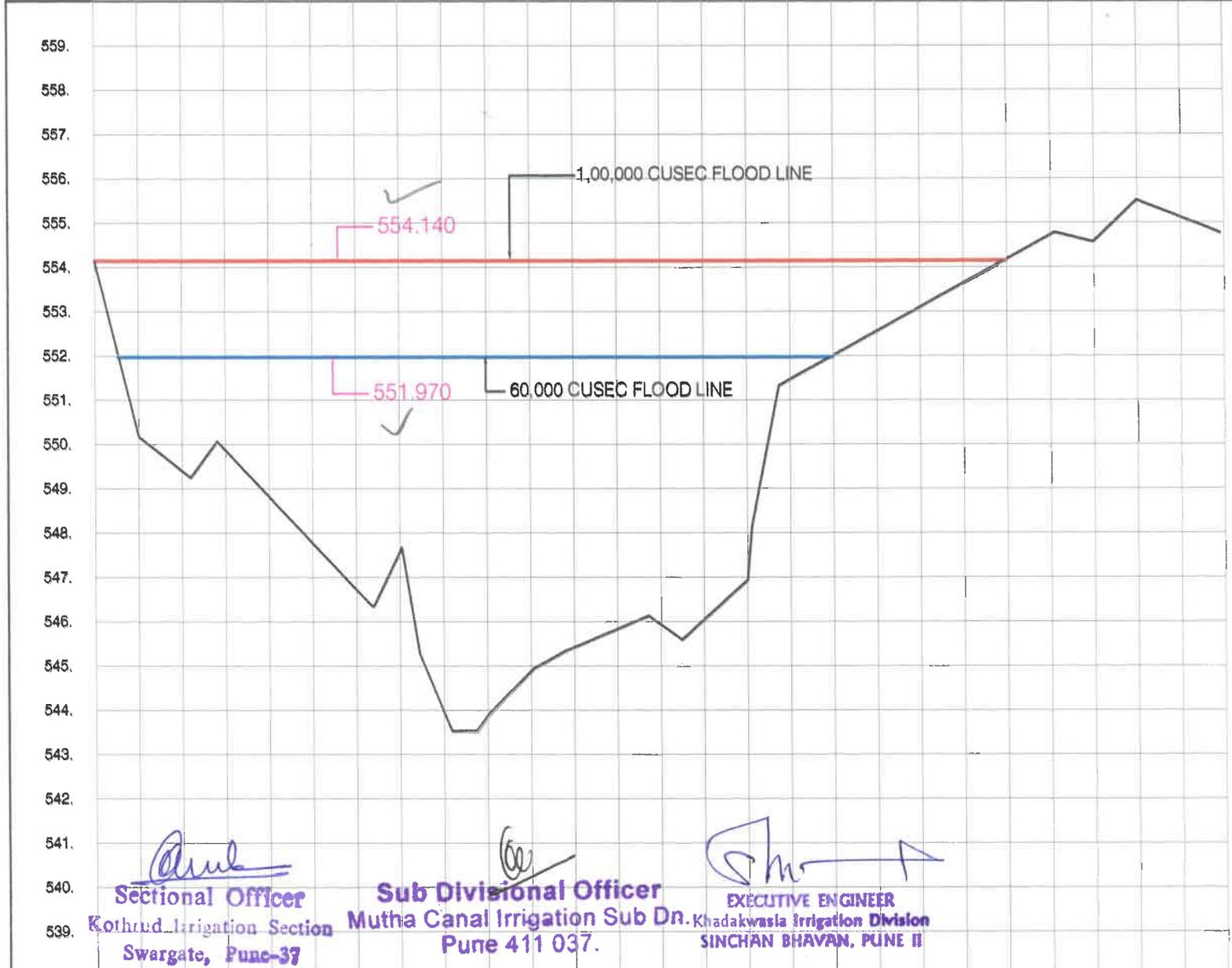
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn
 Pune 411 037.

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

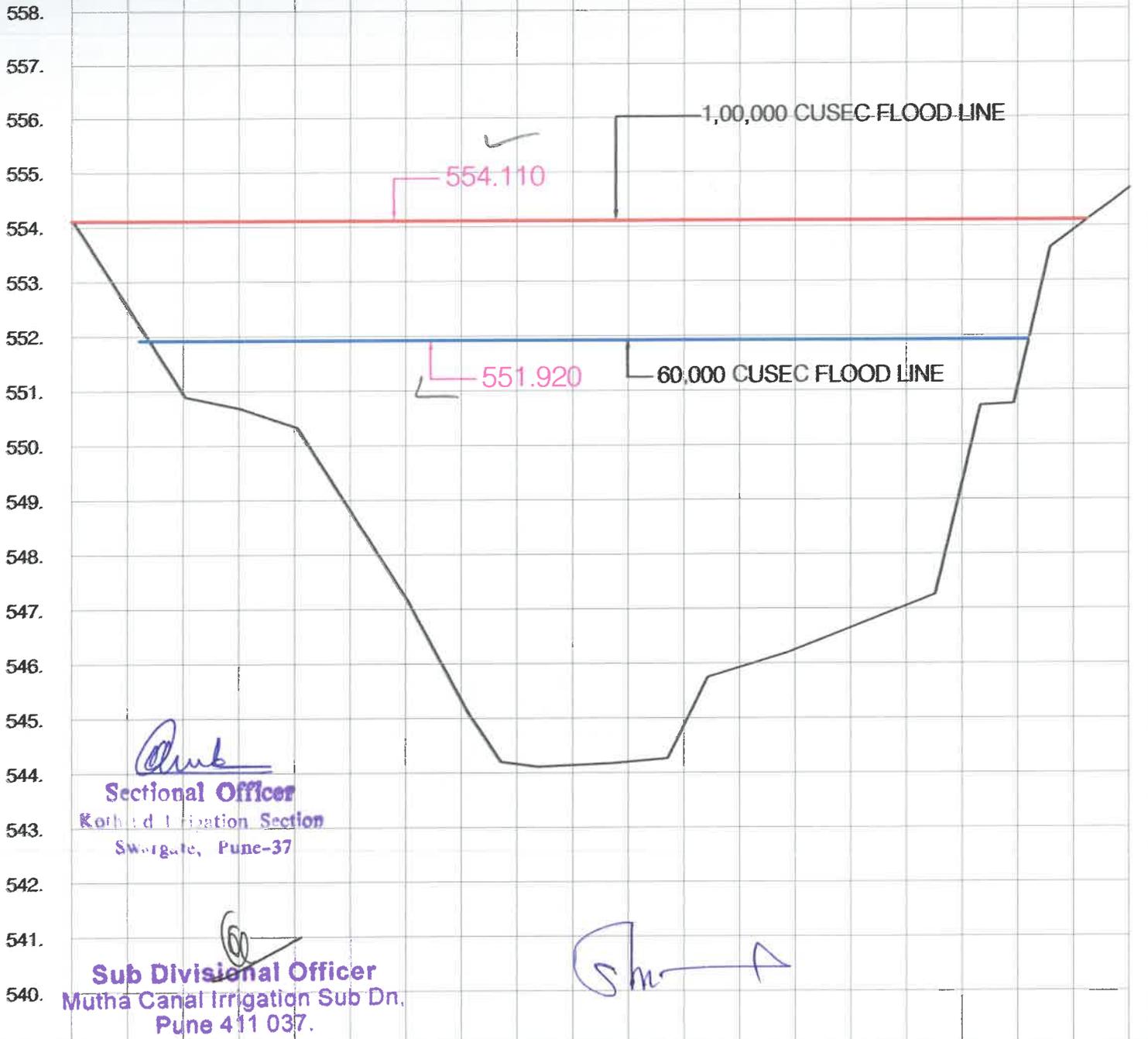
LEVELS	554.180	551.804	551.400	550.130	548.865	547.600	547.291	547.281	545.981	545.470	544.283	544.100	543.982	543.970	543.943	543.920	543.972	544.100	544.488	544.980	545.270	545.304	545.471	545.560	545.985	546.920	550.070	550.842	551.020	551.897	552.600	552.894	553.277	553.659	554.042	554.080	554.851	555.280	555.465	555.835	556.180
CHAINAGE	0.00	10.00	13.300	20.00	30.00	40.00	50.00	51.000	60.00	63.600	70.00	71.050	80.00	80.900	90.00	97.600	100.00	105.950	110.00	115.000	118.000	120.00	130.00	135.300	140.00	150.00	151.300	160.00	162.000	168.000	172.300	180.00	190.00	200.00	210.00	211.000	220.00	225.000	230.00	240.00	249.300

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE
CH 8+400



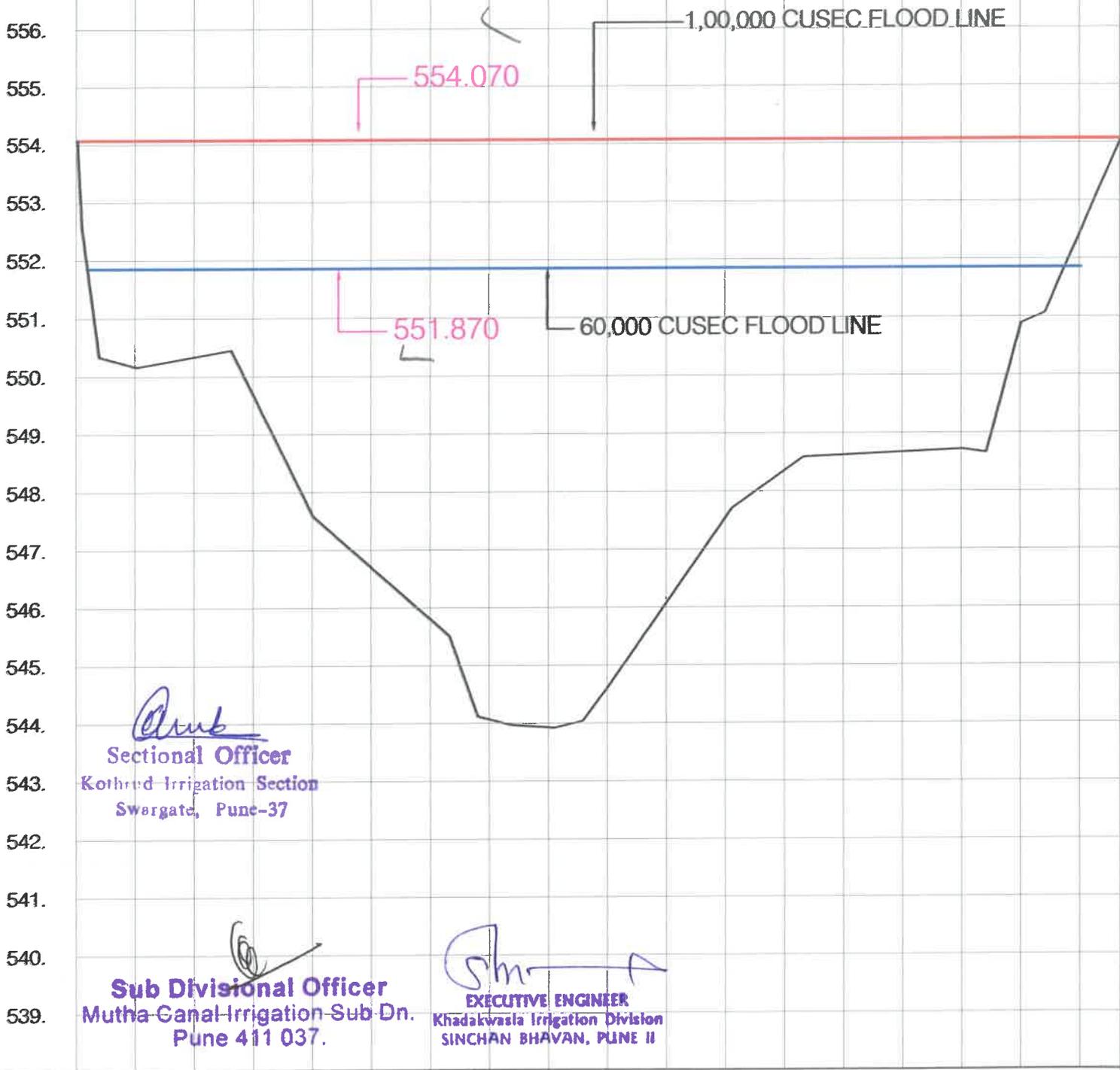
LEVELS	554.140	550.173	549.384	549.220	550.040	549.851	548.803	547.756	546.708	546.323	547.511	547.540	546.230	543.955	543.500	543.500	543.500	543.850	543.850	544.831	544.920	545.300	545.363	546.004	546.797	546.100	545.911	545.960	546.004	546.910	548.120	551.300	551.436	551.978	552.521	553.063	553.605	554.148	554.690	554.750	554.540	555.480	555.087	554.740
CHAINAGE	0.00	10.00	20.00	22.100	28.200	30.00	40.00	50.00	60.00	64.100	70.00	70.640	74.600	80.00	81.900	87.600	88.000	88.000	100.00	100.900	108.000	110.00	120.00	127.300	130.00	135.000	140.00	150.20	151.200	157.500	160.00	170.00	180.00	190.00	200.00	210.00	220.00	221.100	230.00	240.00	250.00	259.300		

**CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE
CH 8+430**



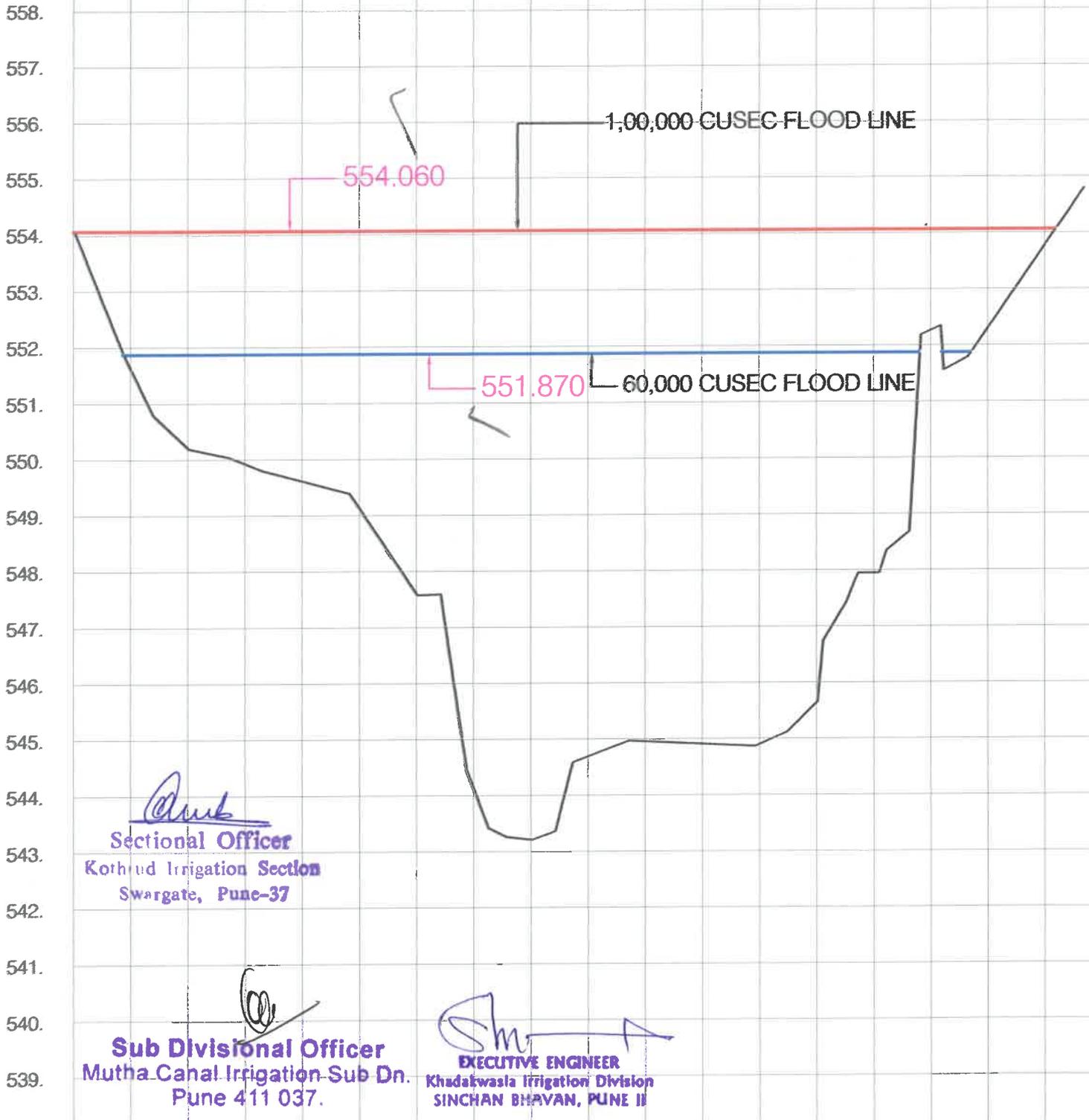
LEVELS	554.110	552.195	550.879	550.670	550.330	548.770	547.173	547.146	545.283	545.150	544.190	544.148	544.100	544.129	544.160	544.189	544.250	544.892	545.740	545.923	546.180	546.248	546.649	547.050	547.250	549.386	550.710	550.748	551.130	553.600	553.925	554.680
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	60.200	70.00	70.700	76.950	80.00	83.550	90.00	96.800	100.00	106.900	110.00	114.100	120.00	128.300	130.00	140.00	150.00	155.000	160.00	163.100	169.100	170.00	175.700	180.00	190.00

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE CH 8+460



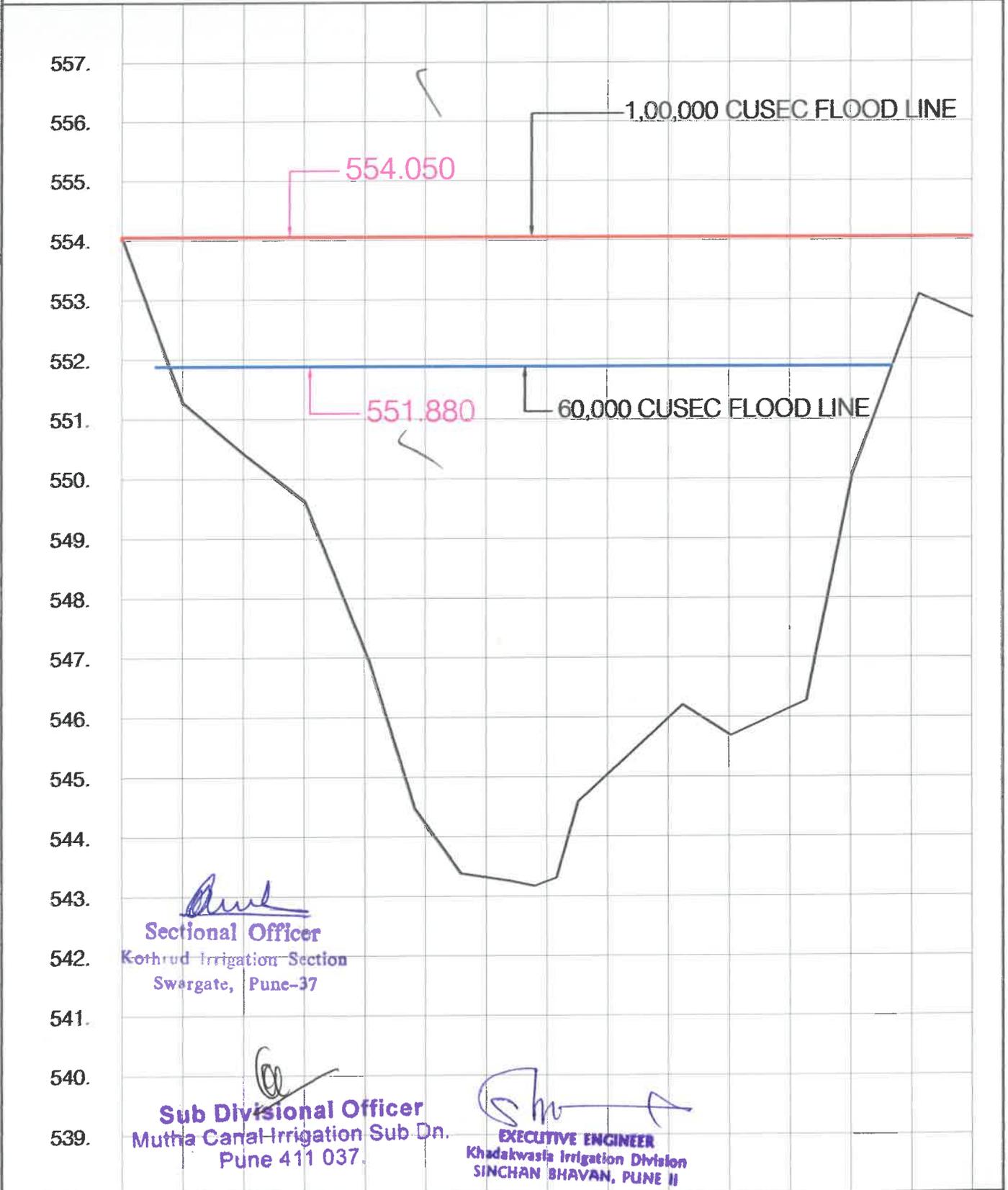
LEVELS	554.070	550.152	550.329	550.440	549.635	547.570	546.674	545.778	545.500	544.110	544.055	543.960	543.916	544.030	544.620	546.087	547.553	547.700	548.355	548.580	548.613	548.661	548.710	548.650	550.880	551.060	551.788	554.070
CHAINAGE	0.00	10.00	20.00	26.100	30.00	40.00	50.00	60.00	63.100	67.900	70.00	73.600	80.00	85.650	90.00	100.00	110.00	111.000	120.00	123.100	130.00	140.00	150.00	154.100	160.00	164.000	170.00	172.900

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE CH 8+490



LEVELS	554.060	551.575	550.180	550.030	549.910	549.790	549.598	549.380	549.091	547.570	547.580	544.460	544.073	543.410	543.250	543.200	543.350	544.580	544.689	544.960	544.946	544.901	544.860	544.900	545.110	545.650	546.720	547.420	547.940	547.940	548.340	548.680	552.180	552.267	551.550	551.780	552.318	553.792	554.780
CHAINAGE	0.00	10.00	20.00	27.100	30.00	32.900	40.00	48.100	50.00	60.00	64.100	68.600	70.00	72.400	75.600	80.00	84.100	87.200	90.00	97.000	100.00	110.00	119.100	120.00	104.700	130.00	131.000	135.000	137.100	140.00	142.100	146.100	148.100	150.00	152.100	156.350	160.00	160.00	156.700

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE CH 8+520



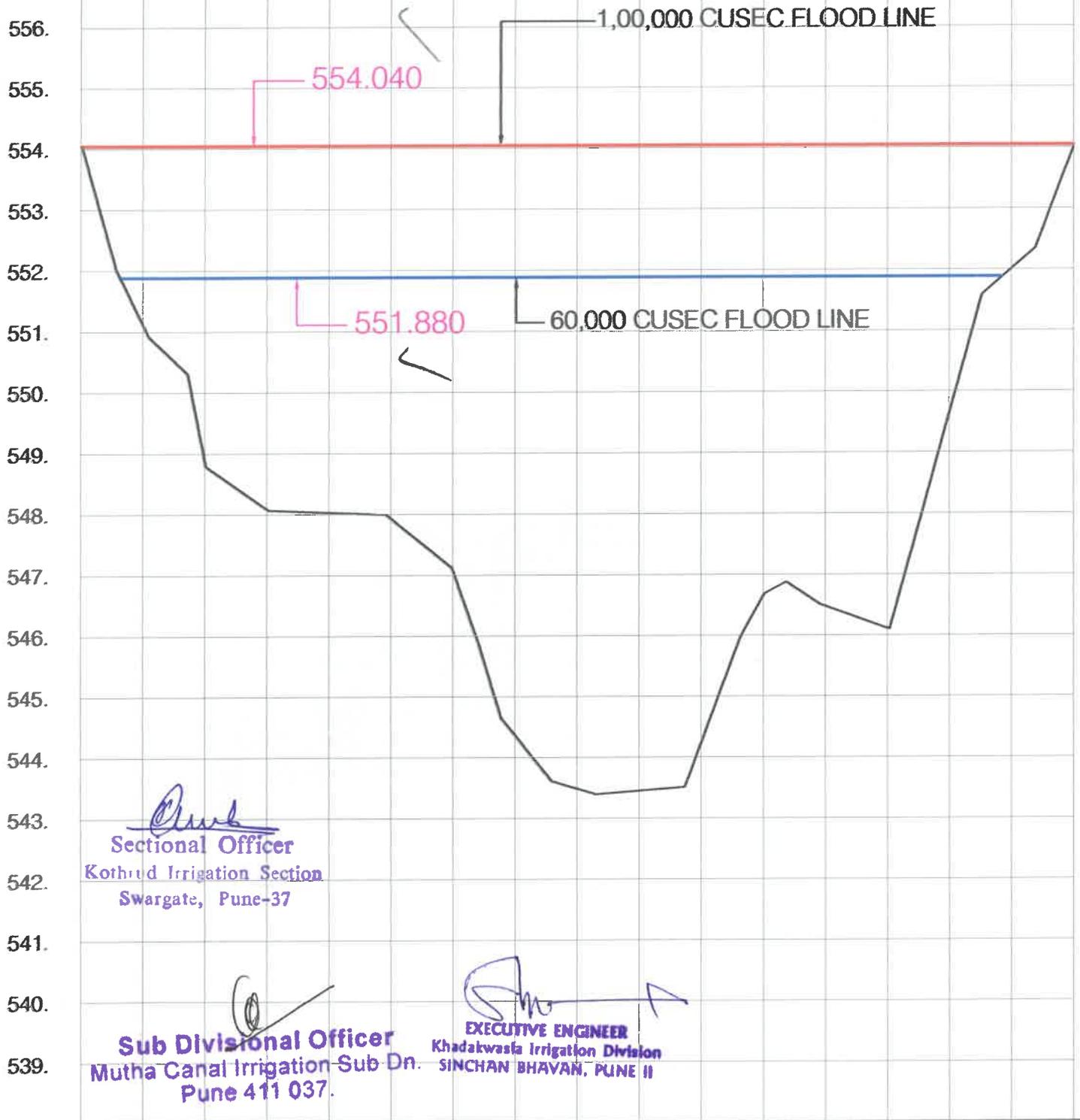
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037.

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

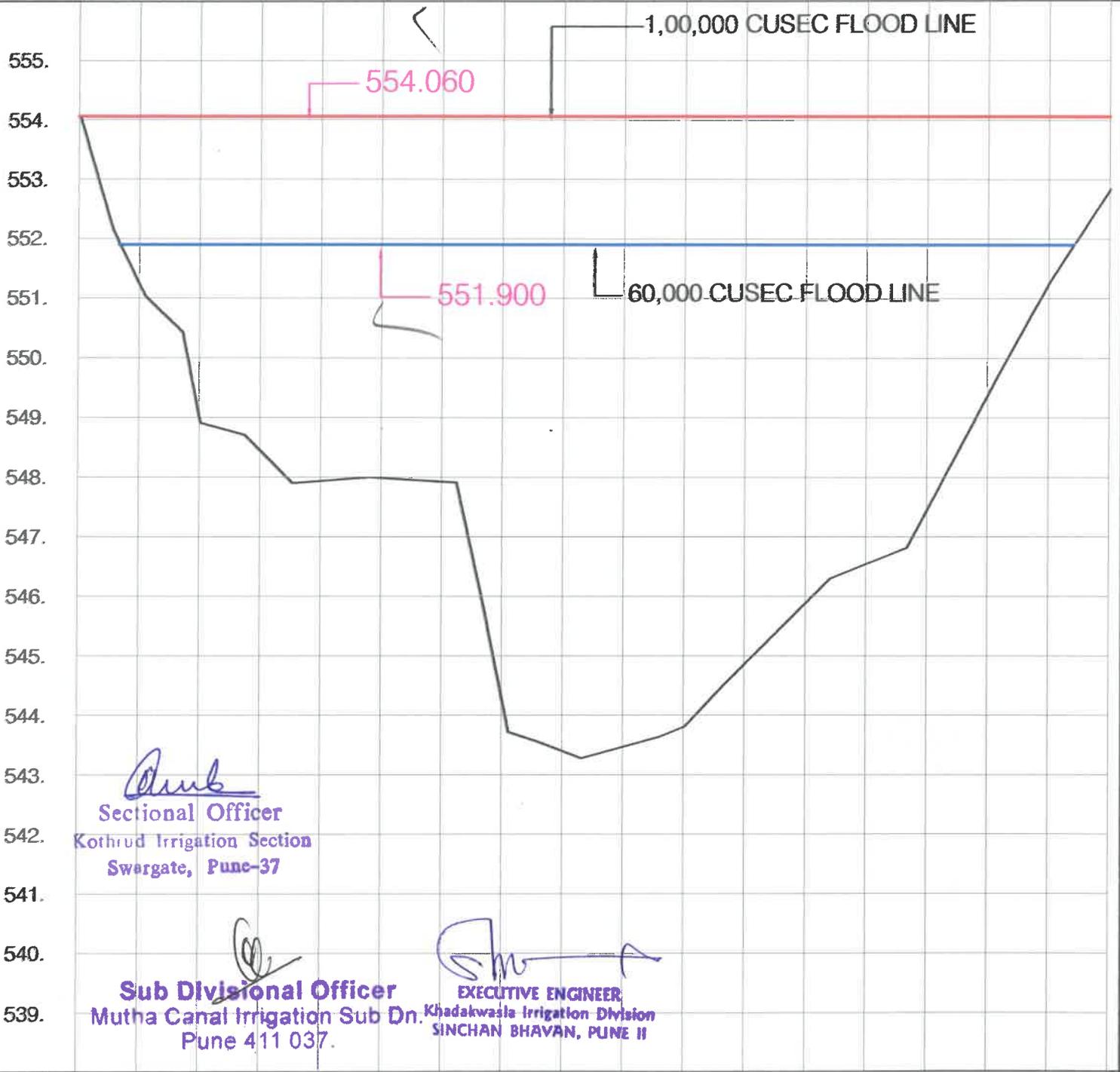
LEVELS	554.050	551.260	549.090	549.070	550.400	549.620	547.092	546.946	544.460	544.188	543.370	543.305	543.250	543.160	543.246	543.300	544.580	545.046	545.530	545.989	546.200	545.687	546.147	546.270	550.040	552.776	553.080	552.680
CHAINAGE	0.00	10.00	16.100	18.200	20.00	30.00	40.00	40.600	48.100	50.00	55.700	60.00	63.600	67.800	70.00	71.400	75.000	80.00	85.200	90.00	92.200	100.00	110.00	112.600	120.10	130.00	131.100	140.00

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE CH 8+550



LEVELS	554.040	551.080	548.780	548.067	548.023	547.990	547.908	547.110	547.022	545.820	544.640	544.332	543.600	543.470	543.380	543.440	543.500	544.271	545.950	546.676	547.980	546.588	546.463	546.097	549.701	551.580	552.013	552.340	554.040
CHAINAGE	0.00	10.00	20.00	30.00	40.00	49.000	50.000	59.700	60.000	64.100	67.600	70.00	75.700	80.00	83.000	90.00	97.200	100.00	106.100	110.00	117.000	116.800	120.00	130.00	140.00	145.100	150.00	133.700	160.00

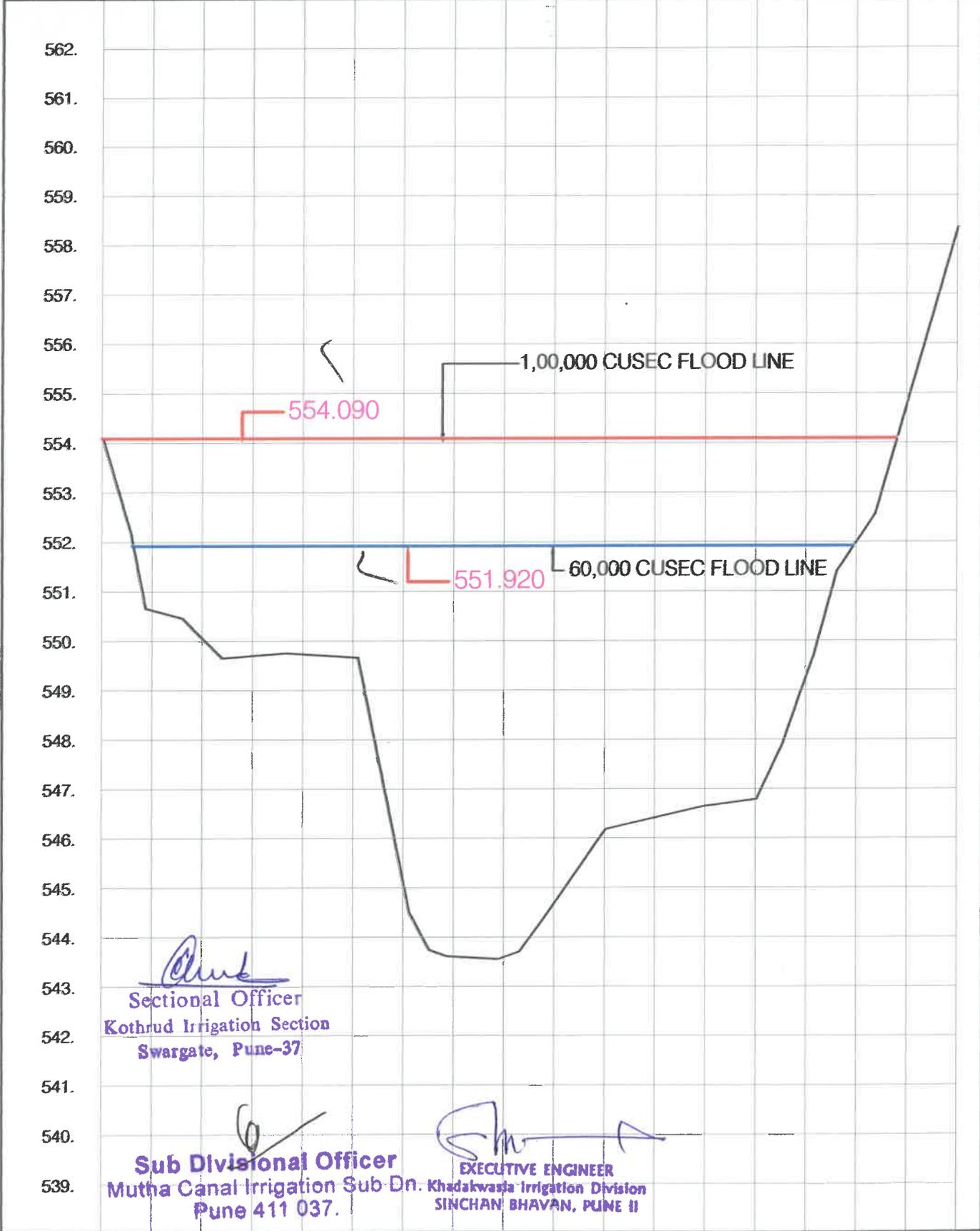
CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE CH 8+580



LEVELS	554.060	551.200	548.900	548.700	548.423	547.890	547.928	547.990	547.977	547.914	547.900	545.820	544.193	543.710	543.560	543.380	543.260	543.460	543.630	543.800	544.520	544.866	545.070	545.890	546.290	546.540	546.810	547.466	549.396	549.840	551.260	552.830
CHAINAGE	0.00	10.00	20.00	27.300	30.00	35.200	40.00	47.950	50.00	60.90	62.300	66.800	70.00	70.950	75.550	80.00	83.300	90.00	95.900	100.00	106.600	112.000	120.00	123.900	130.00	136.600	140.00	150.00	152.300	160.00	167.600	

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

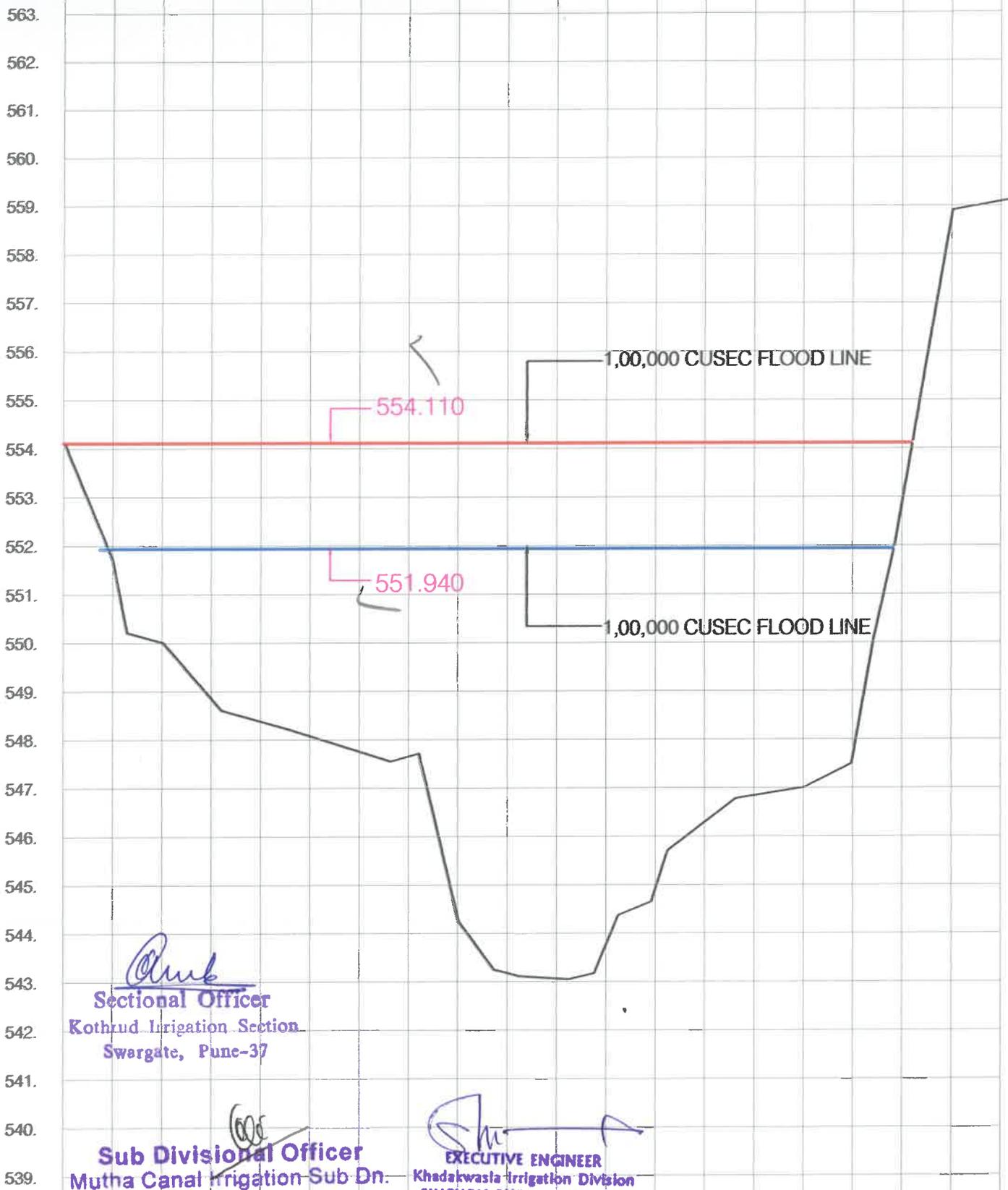
CH 8+610



LEVELS	554.090	550.610	550.480	550.000	549.670	547.920	547.780	549.480	554.520	544.997	544.866	543.730	543.600	543.591	543.540	543.586	543.696	544.490	544.696	546.170	546.408	546.640	546.780	547.860	549.297	549.670	551.400	552.011	552.560	554.820	558.360
CHAINAGE	0.00	10.00	17.300	20.00	30.00	40.00	42.600	50.00	51.400	80.00	81.000	84.960	88.450	70.00	78.700	80.00	82.900	88.600	90.00	100.00	110.00	120.00	130.00	135.000	140.00	141.300	146.000	150.00	153.600	160.00	170.00

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+640



Ans
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

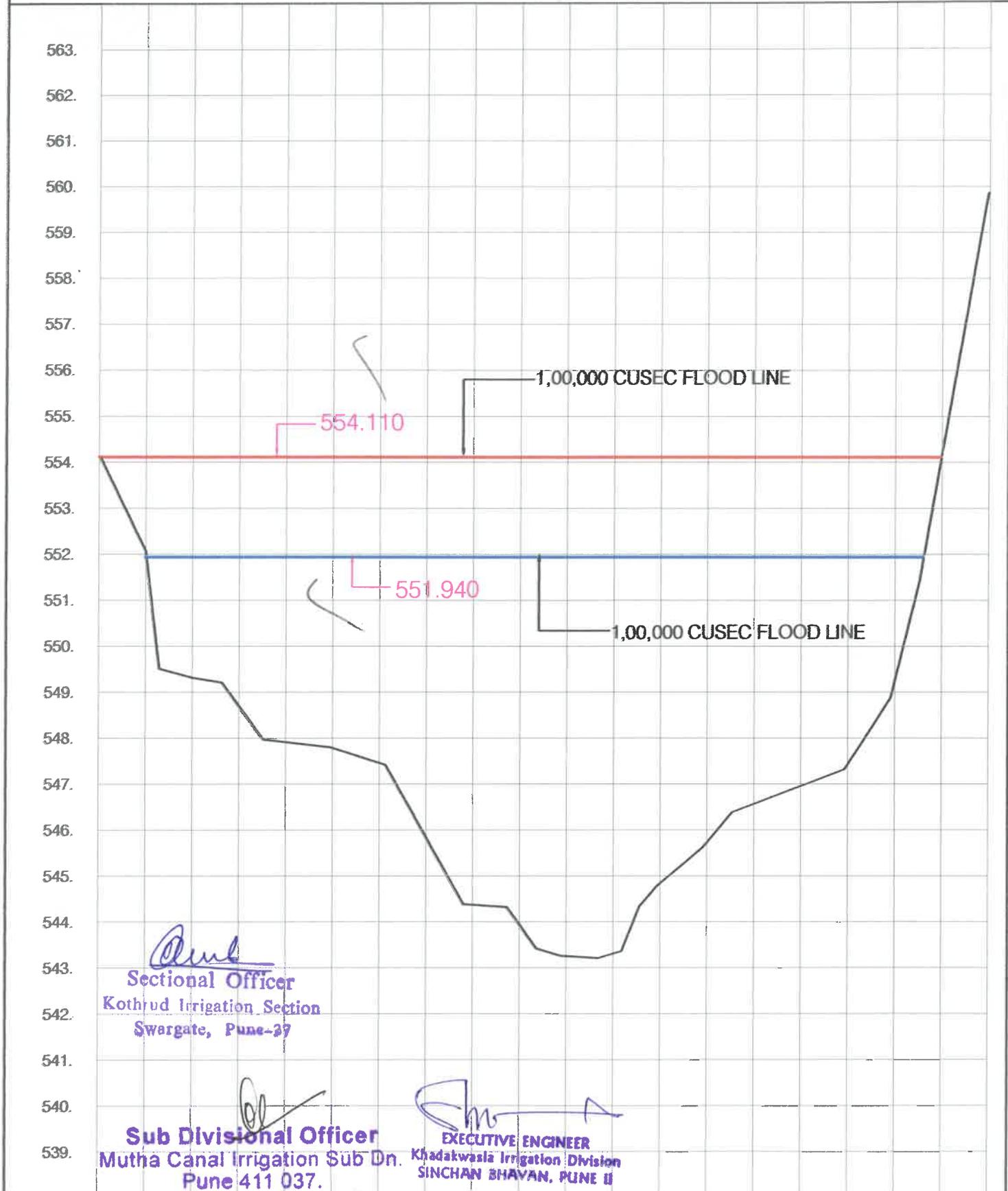
CC
Sub Divisional Officer
 Mutha Canal Irrigation Sub-Dn.
 Pune 411 037.

Sh
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	554.110	551.600	550.000	548.824	548.660	548.365	548.200	548.062	547.740	547.540	547.617	547.900	544.230	543.240	543.180	543.054	543.040	543.160	543.797	544.360	544.640	544.961	545.700	546.297	546.770	546.855	547.000	547.490	547.722	550.100	552.000	553.003	558.900	559.084	559.110	
CHAINAGE	0.00	10.00	20.00	30.00	31.900	40.00	45.700	50.00	60.00	66.200	70.00	71.900	80.00	87.100	90.00	92.200	100.00	102.300	107.400	110.00	112.300	118.000	120.00	122.300	130.00	136.100	140.00	150.00	158.600	160.00	164.100	168.300	170.00	180.00	190.00	191.400

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+670



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

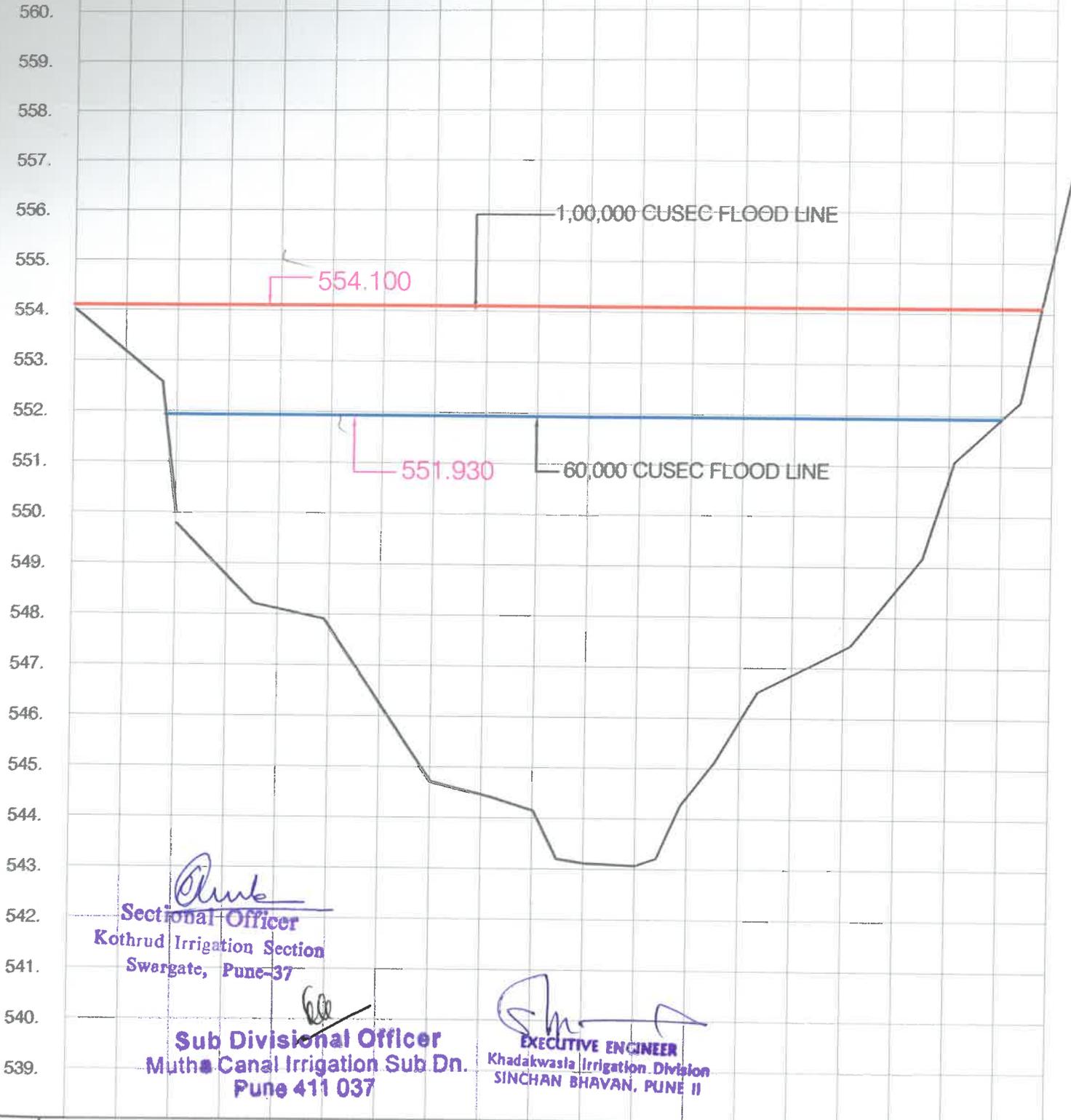
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037.

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE II

LEVELS	564.110	551.845	549.300	549.200	548.657	547.960	547.901	547.790	547.787	547.445	547.410	545.790	544.370	544.356	544.310	543.896	543.410	543.250	543.241	543.200	543.303	543.350	544.330	544.760	545.610	545.746	546.380	546.568	546.957	547.310	547.452	548.690	549.313	551.370	554.294	559.850	
CHAINAGE	0.00	10.00	20.00	26.100	30.00	35.000	40.00	48.300	50.00	60.00	61.100	70.00	77.800	80.00	87.100	90.00	93.400	98.500	100.00	106.600	110.00	111.500	116.400	128.000	128.000	138.000	138.000	135.150	140.00	150.00	159.100	160.00	168.900	170.00	155.000	160.00	169.500

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+700



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swergate, Pune-37

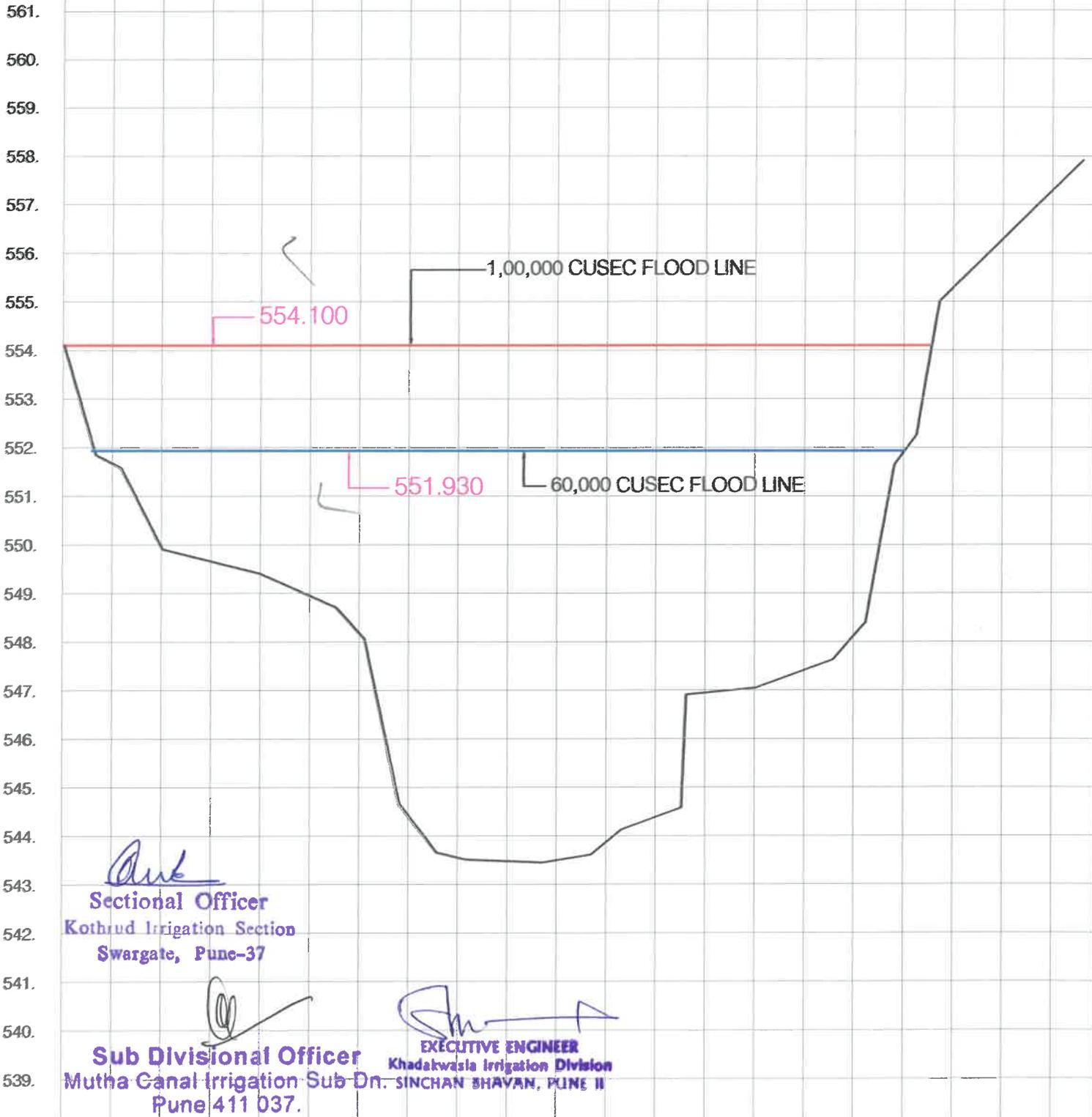
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	554.010	552.905	549.780	548.741	548.200	548.095	547.900	547.783	546.217	544.700	544.448	544.410	544.140	543.190	543.101	543.063	543.200	544.260	544.444	545.100	545.954	546.500	546.850	547.368	547.480	548.540	549.170	550.780	551.070	551.916	552.250	555.190	556.680
CHAINAGE	0.00	10.00	20.00	30.00	25.200	40.00	48.900	50.00	60.00	70.00	80.00	81.500	90.00	94.600	100.00	110.00	113.950	118.600	120.00	125.000	130.00	133.200	140.00	150.00	151.200	160.00	165.000	170.00	150.800	180.00	183.600	190.00	193.200

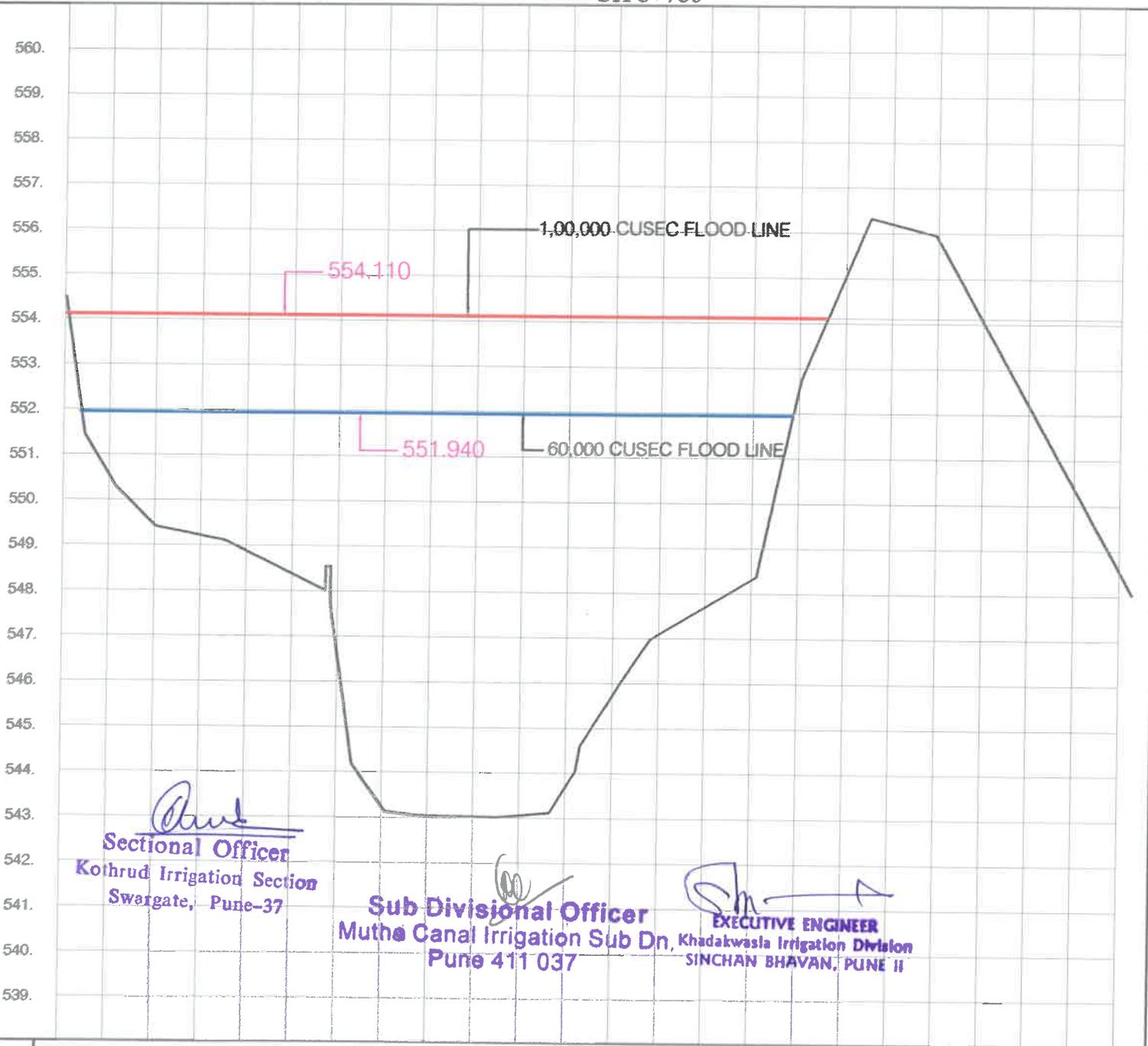
CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE

CH 8+730



LEVELS	554.100	551.850	549.900	549.645	549.400	548.930	548.700	548.151	548.050	544.850	544.383	543.650	543.536	543.500	543.467	543.440	543.490	543.600	543.873	544.120	544.384	544.570	546.900	546.940	547.040	547.412	547.620	548.133	548.350	551.850	551.923	552.250	555.000	555.901	556.904	557.908	557.910	
CHAINAGE	0.00	10.00	20.00	30.00	39.600	40.00	50.00	55.100	60.00	60.900	68.000	70.00	75.600	80.00	81.400	90.00	96.960	100.00	106.800	110.00	112.900	120.00	125.000	126.000	130.00	140.00	150.00	155.600	160.00	162.200	168.000	170.00	172.400	177.000	180.00	190.00	200.00	206.000

**CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE
CH 8+760**



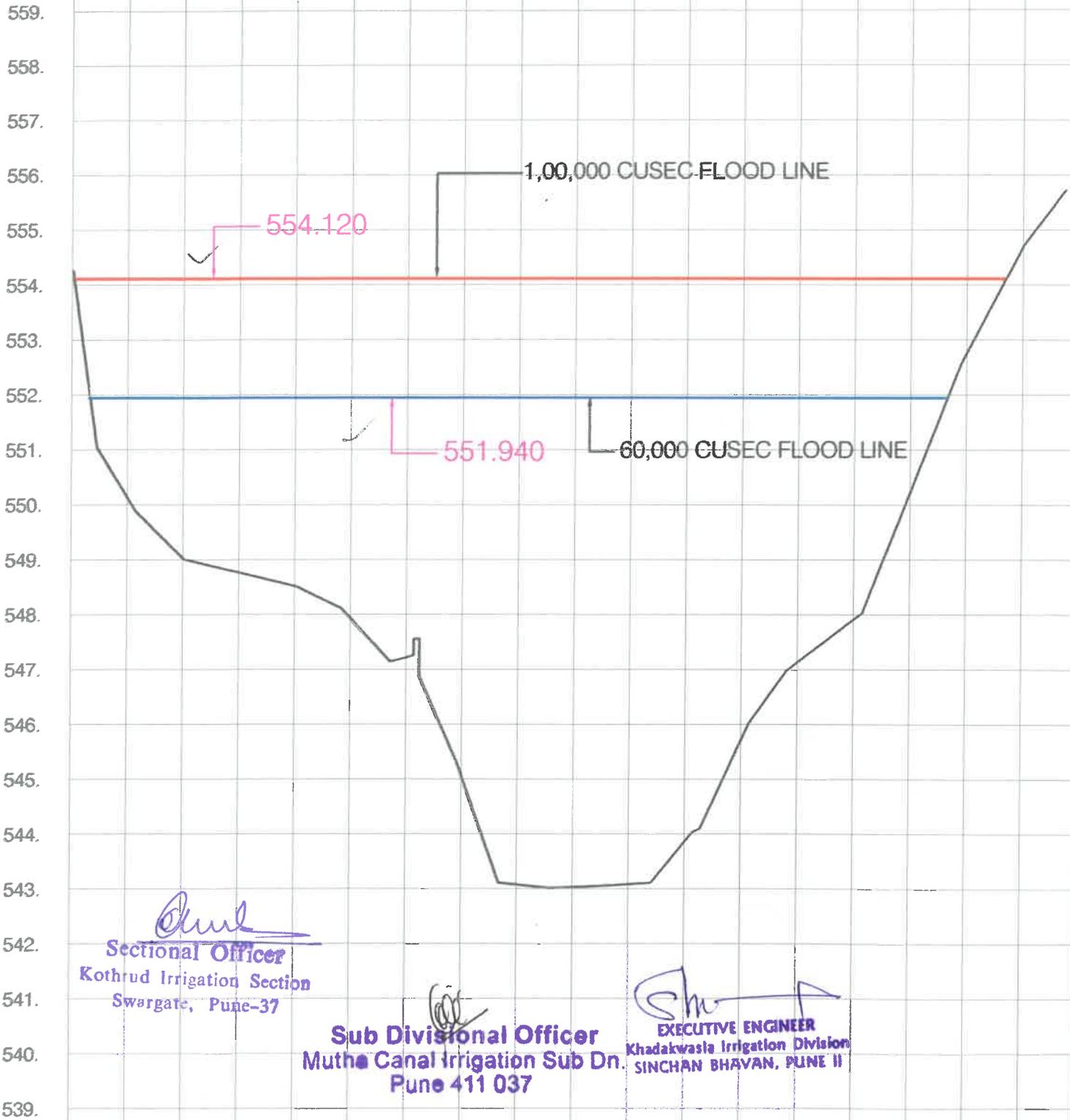
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn,
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	553.920	550.495	549.400	549.203	549.100	548.859	548.357	548.530	546.434	544.110	543.116	543.030	543.026	543.008	543.000	543.044	543.100	543.708	544.080	544.390	545.734	546.010	546.970	547.091	547.698	548.365	548.365	552.636	552.730	555.101	556.310	556.181	555.940	555.812	553.987	552.162	550.338	548.513	548.020
CHAINAGE	0.00	10.00	20.00	30.00	35.200	40.00	50.00	58.200	80.00	83.200	70.800	77.800	80.00	90.00	94.000	100.00	106.400	110.00	112.800	121.00	128.000	130.00	140.00	150.00	150.00	158.00	160.00	160.200	170.00	175.000	180.00	188.300	188.00	200.00	210.00	220.00	230.00	212.700	

CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE CH 8+790



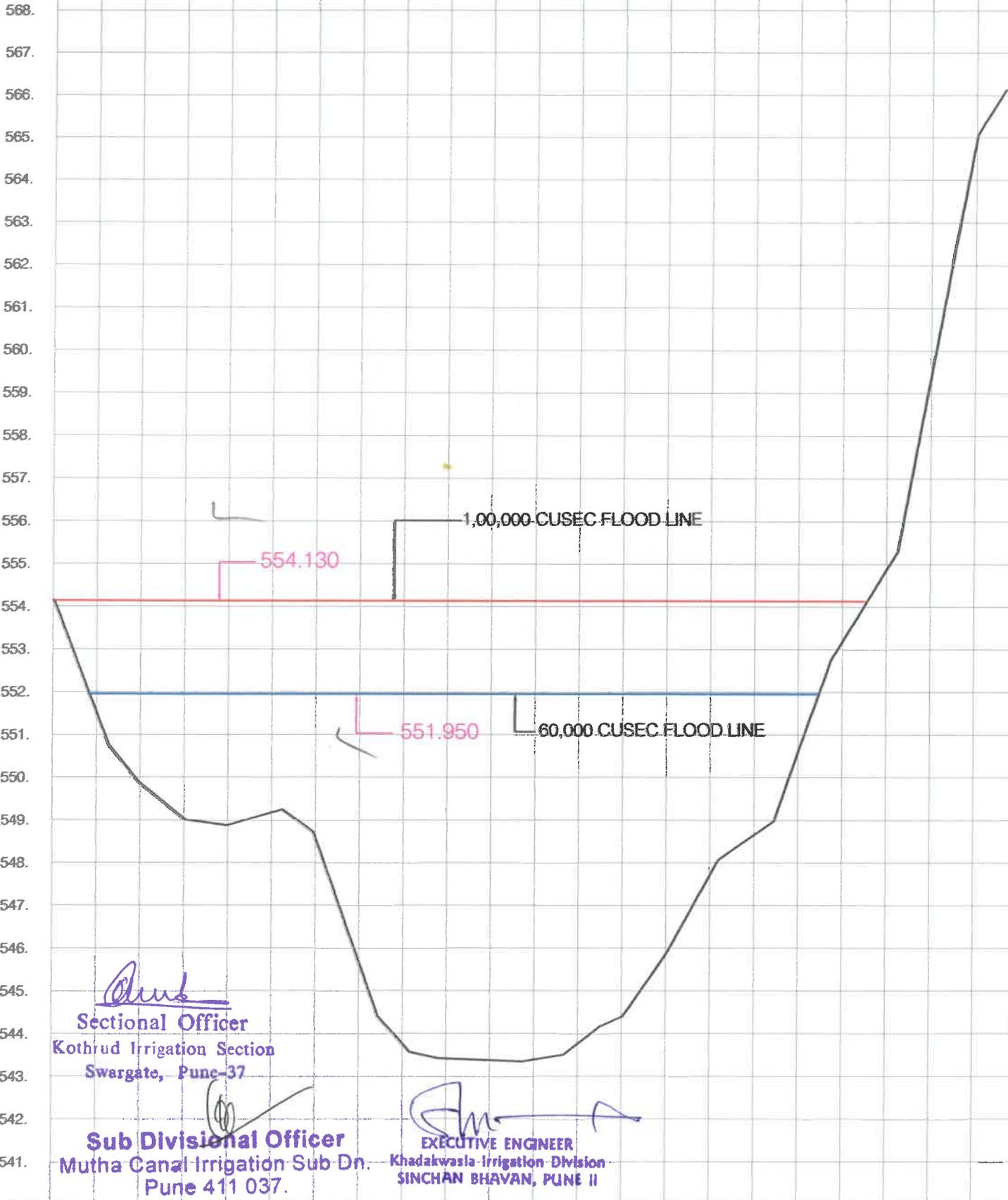
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE II

LEVELS	553.740	550.100	549.000	548.752	548.506	548.100	547.902	547.130	547.209	547.540	546.870	546.300	545.011	543.100	543.063	543.000	543.019	543.040	543.075	543.100	543.867	544.090	545.742	546.010	546.970	547.133	547.911	548.020	550.251	552.569	552.773	554.710	555.710
CHAINAGE	0.00	10.00	20.00	30.00	40.00	48.200	50.00	57.000	60.00	62.210	66.000	70.00	76.600	80.00	85.700	90.00	94.700	100.00	103.900	110.00	112.600	120.00	121.200	127.900	130.00	140.00	141.400	150.00	158.900	160.00	170.00	177.400	

CH 8+820



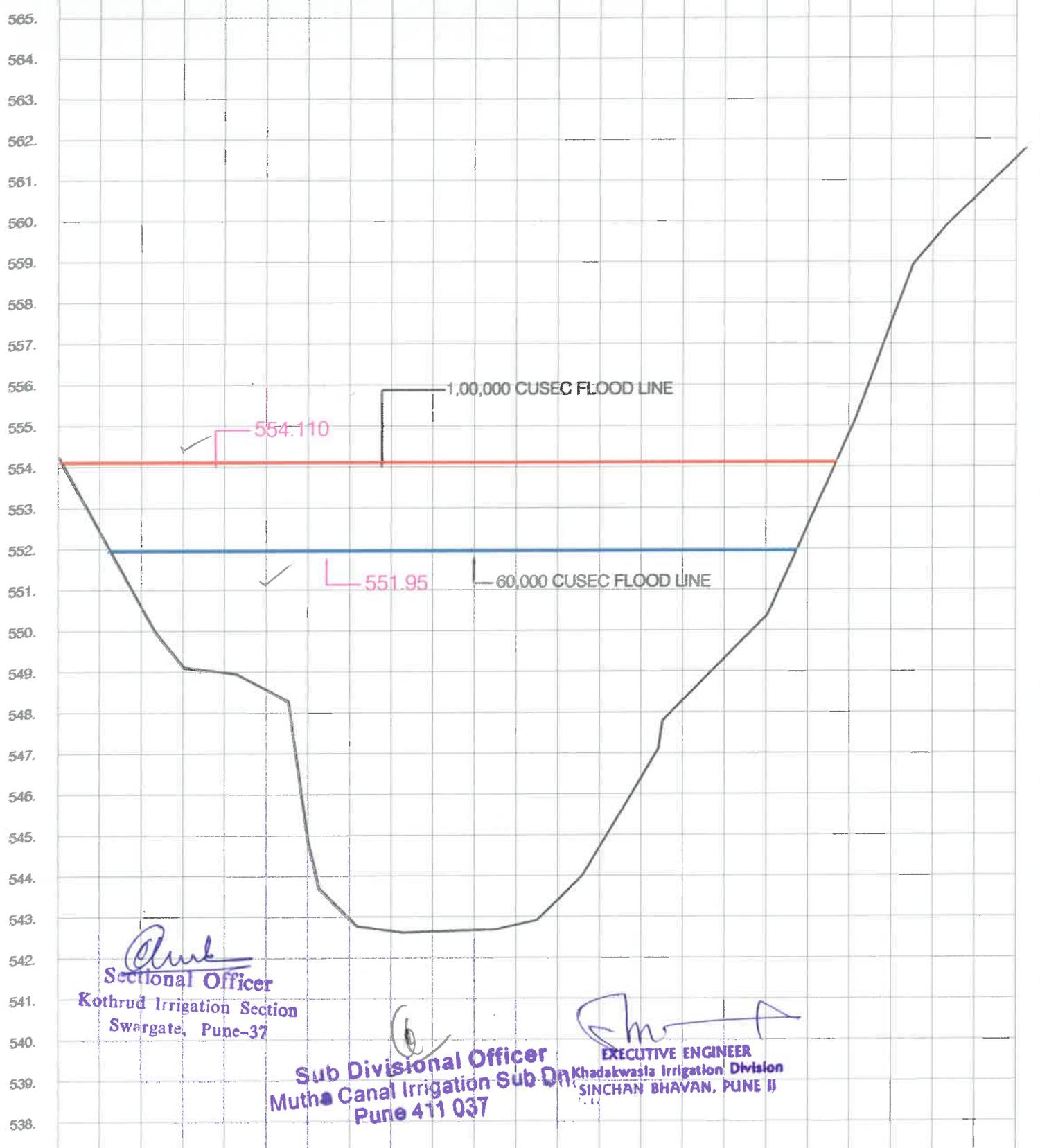
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037.

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	554.130	551.070	549.830	549.000	548.860	548.872	548.165	548.230	548.136	545.564	544.930	543.711	543.550	543.400	543.392	543.356	543.330	543.378	543.490	543.764	544.150	544.390	545.879	547.743	548.060	548.655	548.970	548.760	550.651	552.740	553.212	554.836	555.900	559.506	565.040	566.120
CHAINAGE	0.00	10.00	20.00	30.00	38.600	40.00	50.00	52.200	58.300	70.00	74.100	80.00	81.400	87.900	90.00	100.00	107.200	110.00	106.600	120.00	124.800	130.00	140.00	150.00	151.700	160.00	164.400	167.000	170.00	177.200	180.00	190.00	192.300	200.00	210.00	216.400

**CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE
CH 8+850**



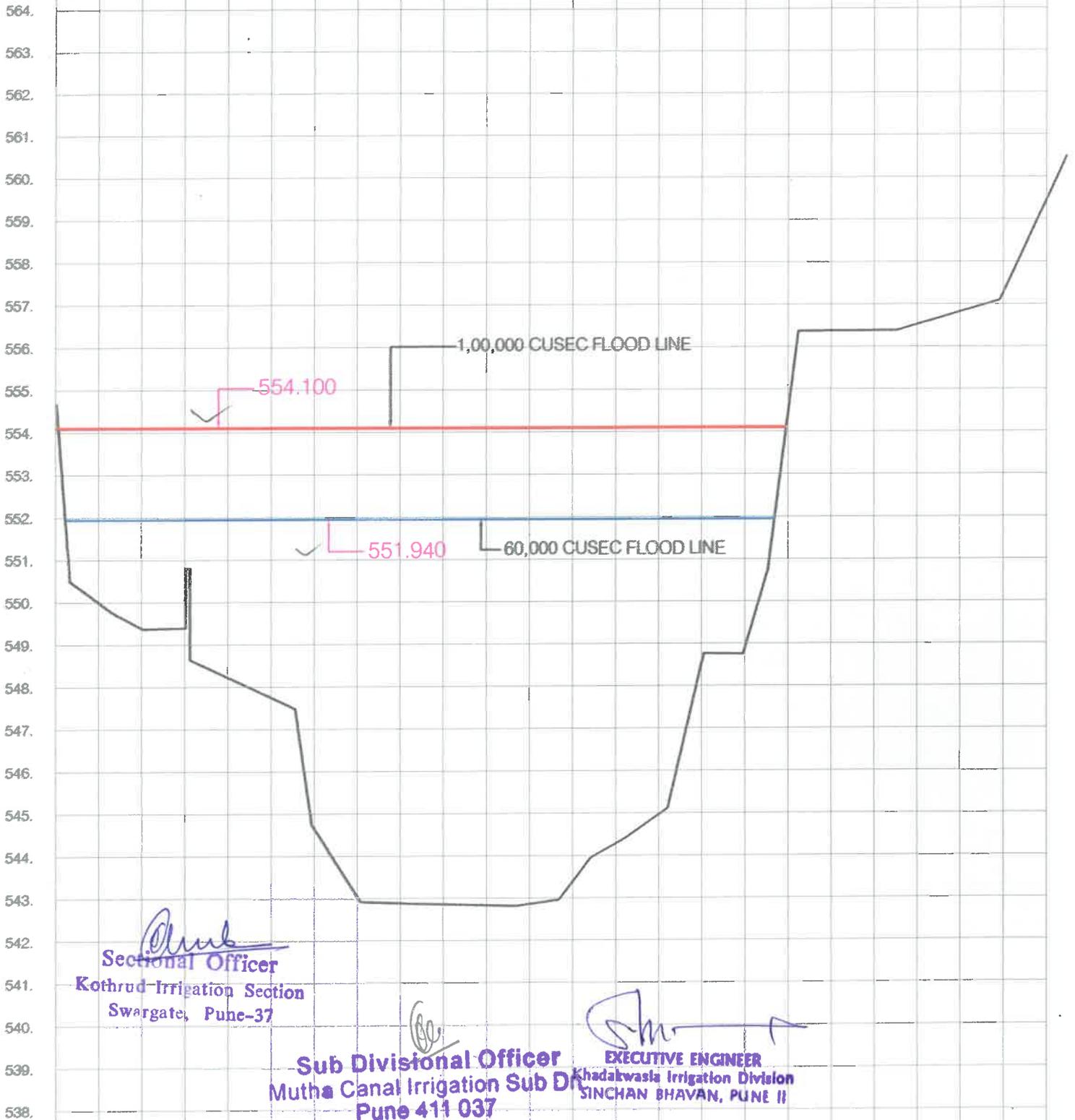
[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

[Signature]
Sub Divisional Officer
Mutha Canal Irrigation Sub Division
Pune 411 037

[Signature]
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

LEVELS	553.930	551.615	550.365	549.100	548.966	548.860	548.539	548.260	544.840	543.660	542.915	542.750	542.636	542.600	542.623	542.655	542.670	542.788	542.900	543.410	543.970	544.713	546.200	546.305	546.380	547.780	548.294	549.322	550.349	550.370	552.569	554.853	555.170	557.535	558.910	559.508	559.860	560.566	561.956	
CHAINAGE	0.00	10.00	20.00	30.00	40.00	42.700	50.00	55.200	60.00	62.800	70.000	71.800	80.00	82.700	90.00	100.00	104.800	110.00	114.900	120.00	125.600	130.00	138.800	140.00	142.000	143.000	150.00	180.00	170.00	170.200	180.00	190.00	191.400	200.00	205.000	210.00	213.200	220.00	230.00	202.00

**CROSS SECTION OF MUTHA RIVER U/S OF RAJARAM BRIDGE
CH 8+880**



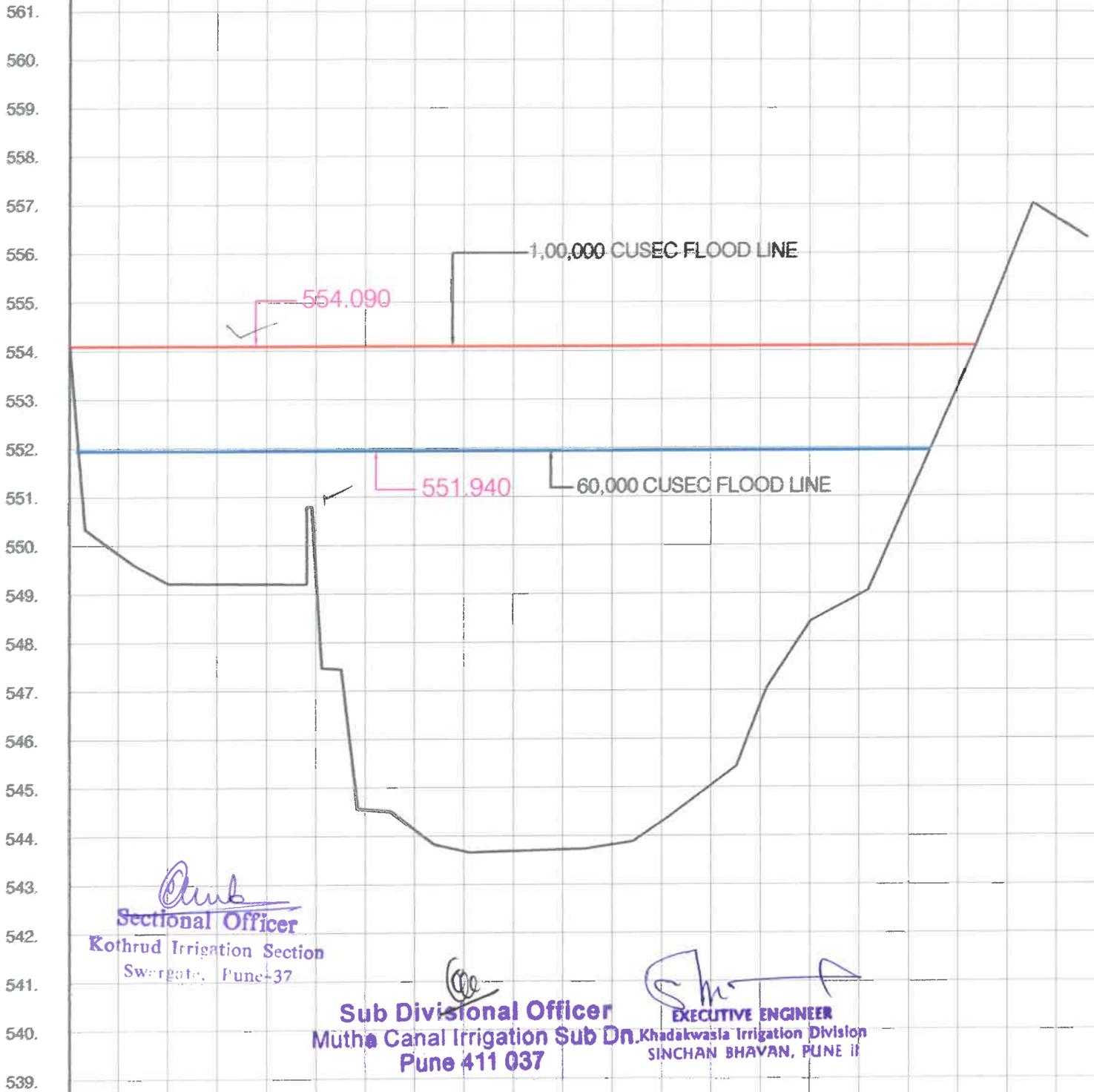
[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

[Signature]
Sub Divisional Officer
Mutha Canal Irrigation Sub Div
Pune 411 037

[Signature]
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

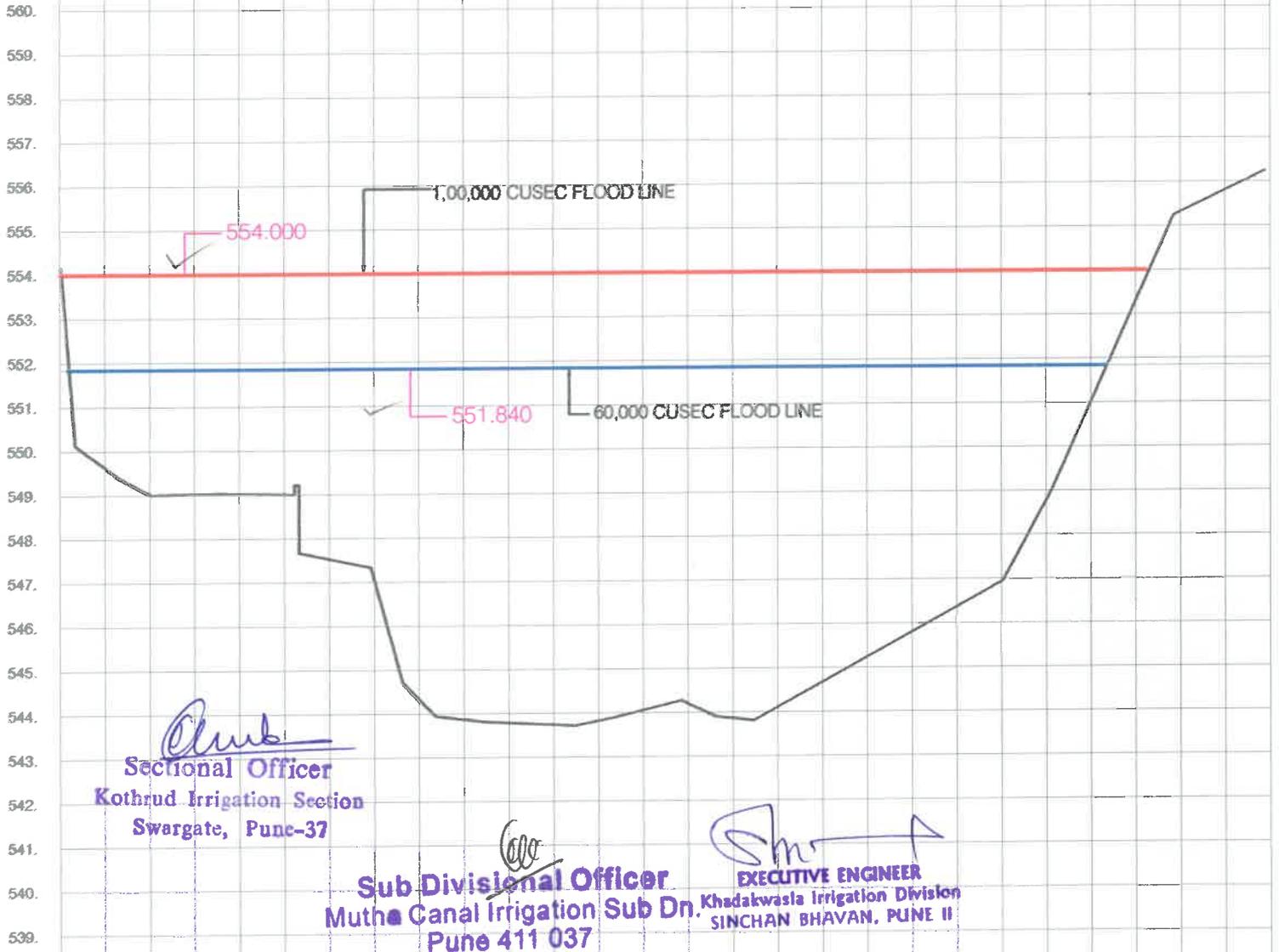
LEVELS	553.720	549.970	549.360	550.780	548.203	547.727	547.470	544.730	544.601	542.988	542.988	542.871	542.860	542.843	542.817	542.800	542.849	542.840	543.401	543.830	544.289	544.410	544.965	543.100	548.750	548.749	548.847	550.740	553.584	553.584	556.363	556.368	556.370	556.519	556.616	557.080	557.080	557.288	559.485	560.470
CHAINAGE	0.00	10.01	20.00	30.00	40.00	50.00	55.400	59.200	60.00	70.850	70.850	80.00	83.400	90.00	100.00	106.500	110.00	116.600	120.00	123.900	132.200	132.200	140.00	141.900	150.00	159.400	160.00	166.200	172.800	172.800	180.00	190.00	195.000	200.00	210.00	218.200	218.200	220.00	230.00	214.500

CROSS SECTION OF MUTHA RIVER D/S OF RAJARAM BRIDGE CH 8+910



LEVELS	554.090	549.000	549.132	549.200	549.198	549.194	549.190	550.190	549.123	549.123	547.430	544.560	544.545	544.500	544.108	543.810	543.670	543.708	543.720	543.808	543.870	544.292	544.396	544.440	545.040	545.420	546.740	547.030	548.410	548.957	549.050	550.965	553.272	553.016	555.739	557.010	556.690	556.300	
CHAINAGE	0.00	10.00	20.00	25.200	30.00	40.00	48.000	48.010	50.000	51.000	55.000	58.300	60.00	65.000	70.00	73.800	80.00	80.900	90.00	100.00	104.150	110.00	114.000	120.00	122.100	130.00	135.000	140.00	141.100	150.00	160.00	161.700	170.00	180.00	183.200	190.00	195.000	200.00	196.100

**CROSS SECTION OF MUTHA RIVER D/S OF RAJARAM BRIDGE
CH 8+940**



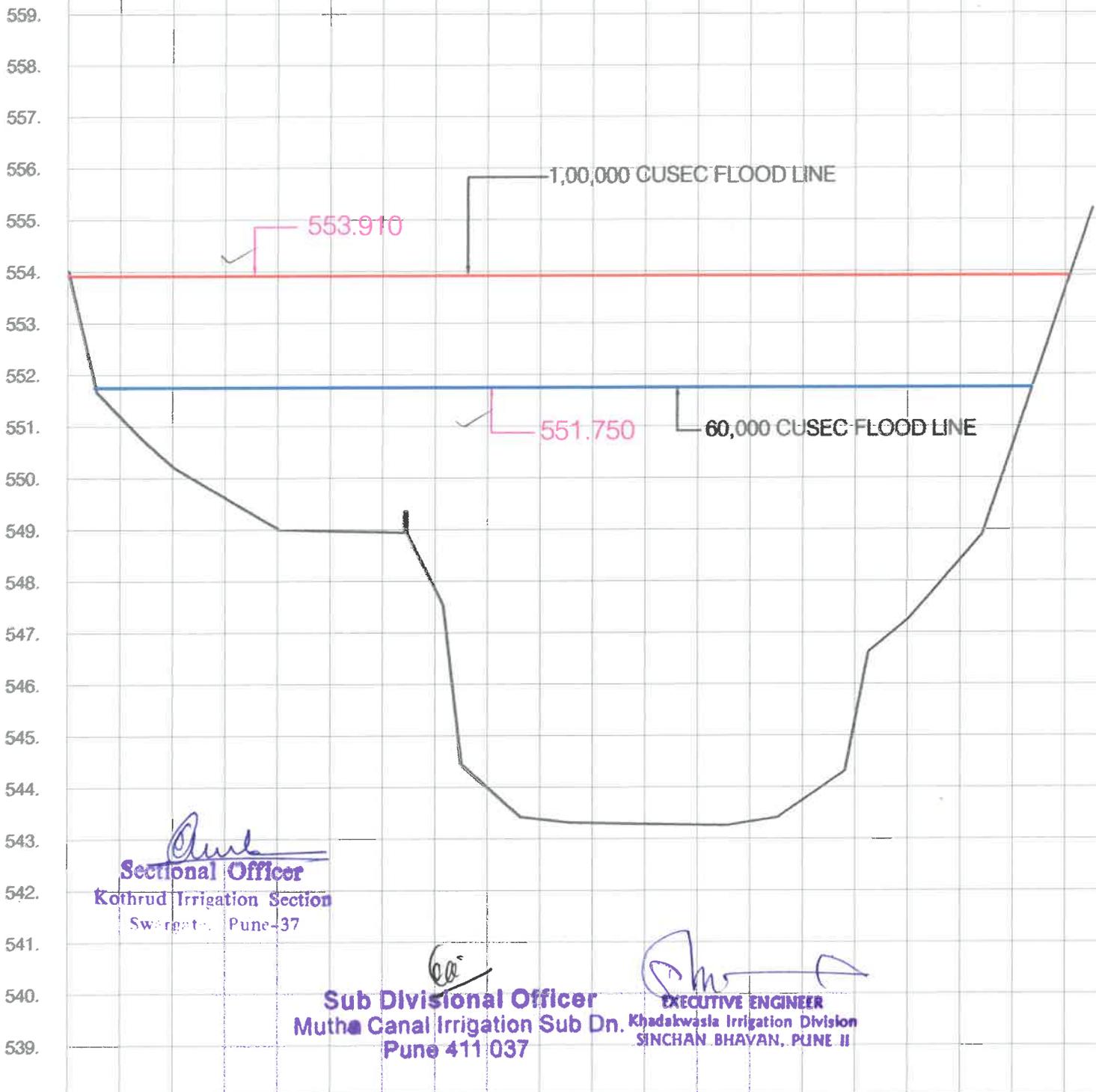
Chub
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

Cell
Sub Divisional Officer
Mutha Canal Irrigation Sub Dn.
Pune 411 037

Sm
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

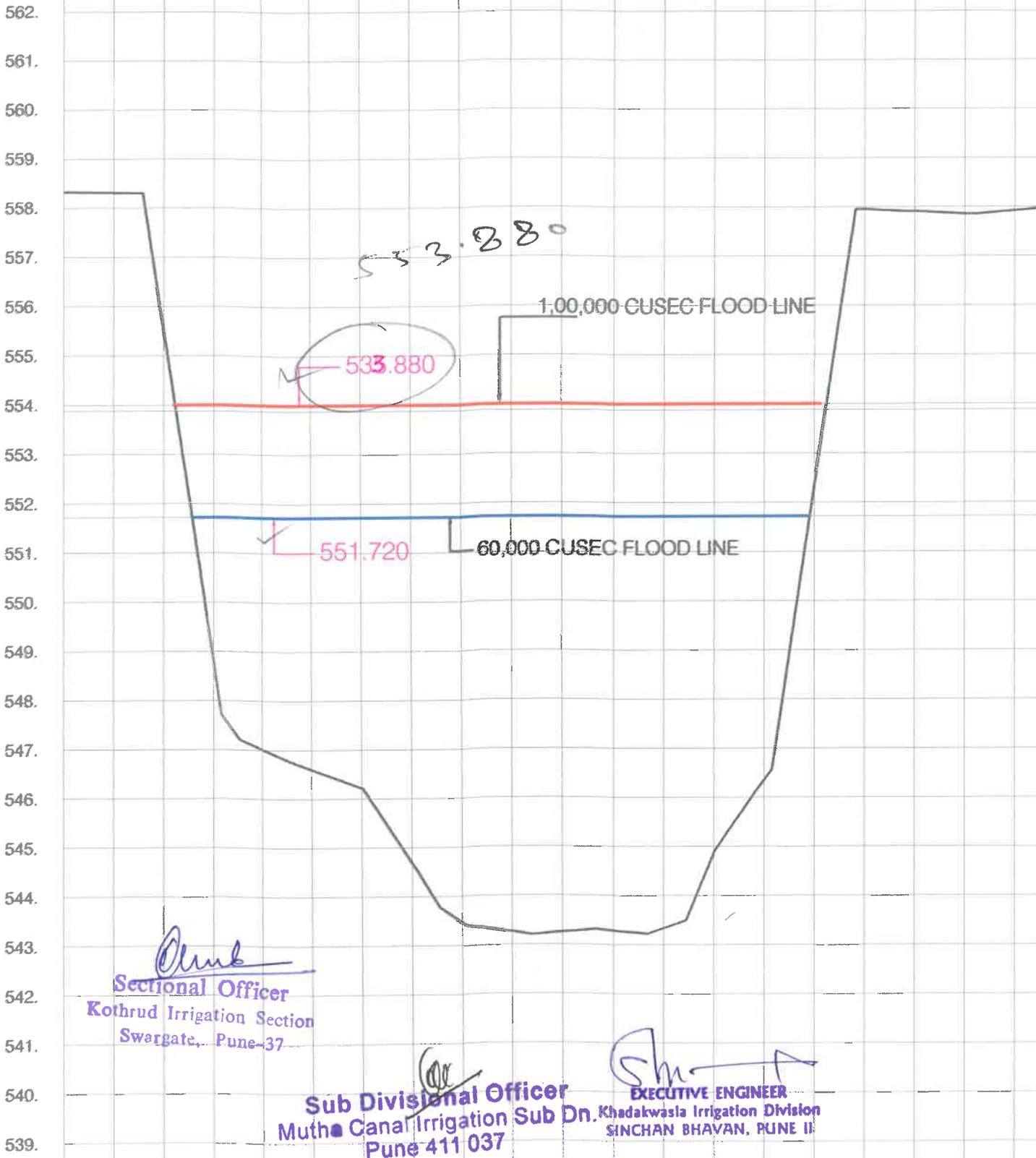
LEVELS	0.00	10.00	20.00	30.00	36.300	40.00	50.00	51.00	52.00	53.00	54.00	55.00	56.00	57.00	58.00	59.00	60.00	61.00	62.00	63.00	64.00	65.00	66.00	67.00	68.00	69.00	70.00	71.00	72.00	73.00	74.00	75.00	76.00	77.00	78.00	79.00	80.00	81.00	82.00	83.00	84.00	85.00	86.00	87.00	88.00	89.00	90.00	91.00	92.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00	109.00	110.00	111.00	112.00	113.00	114.00	115.00	116.00	117.00	118.00	119.00	120.00	121.00	122.00	123.00	124.00	125.00	126.00	127.00	128.00	129.00	130.00	131.00	132.00	133.00	134.00	135.00	136.00	137.00	138.00	139.00	140.00	141.00	142.00	143.00	144.00	145.00	146.00	147.00	148.00	149.00	150.00	151.00	152.00	153.00	154.00	155.00	156.00	157.00	158.00	159.00	160.00	161.00	162.00	163.00	164.00	165.00	166.00	167.00	168.00	169.00	170.00	171.00	172.00	173.00	174.00	175.00	176.00	177.00	178.00	179.00	180.00	181.00	182.00	183.00	184.00	185.00	186.00	187.00	188.00	189.00	190.00	191.00	192.00	193.00	194.00	195.00	196.00	197.00	198.00	199.00	200.00	201.00	202.00	203.00	204.00	205.00	206.00	207.00	208.00	209.00	210.00	211.00	212.00	213.00	214.00	215.00	216.00	217.00	218.00	219.00	220.00	221.00	222.00	223.00	224.00	225.00	226.00	227.00	228.00	229.00	230.00	231.00	232.00	233.00	234.00	235.00	236.00	237.00	238.00	239.00	240.00	241.00	242.00	243.00	244.00	245.00	246.00	247.00	248.00	249.00	250.00	251.00	252.00	253.00	254.00	255.00	256.00	257.00	258.00	259.00	260.00	261.00	262.00	263.00	264.00	265.00	266.00	267.00	268.00	269.00	270.00	271.00	272.00	273.00	274.00	275.00	276.00	277.00	278.00	279.00	280.00	281.00	282.00	283.00	284.00	285.00	286.00	287.00	288.00	289.00	290.00	291.00	292.00	293.00	294.00	295.00	296.00	297.00	298.00	299.00	300.00
--------	------	-------	-------	-------	--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

CROSS SECTION OF MUTHA RIVER D/S OF RAJARAM BRIDGE CH 8+970



LEVELS	553.650	551.165	550.200	549.598	548.990	548.964	548.980	548.940	548.900	548.410	547.804	547.520	544.440	543.971	543.410	543.365	543.300	543.293	543.276	543.259	543.250	543.323	543.400	543.747	544.300	545.378	546.610	547.250	547.246	548.416	548.690	550.678	551.400	553.692	555.200
CHAINAGE	0.00	10.00	20.10	30.00	40.00	50.00	51.400	60.00	64.500	64.510	70.00	71.200	74.900	80.00	86.100	90.00	95.700	100.00	110.00	120.00	125.250	130.00	135.050	140.00	147.900	150.00	152.400	150.050	160.00	170.00	174.050	180.00	182.400	190.00	195.000

CROSS SECTION OF MUTHA RIVER D/S OF RAJARAM BRIDGE
CH 9+000



[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

[Signature]
Sub Divisional Officer
Mutha Canal Irrigation Sub Dn.
Pune 411 037

[Signature]
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

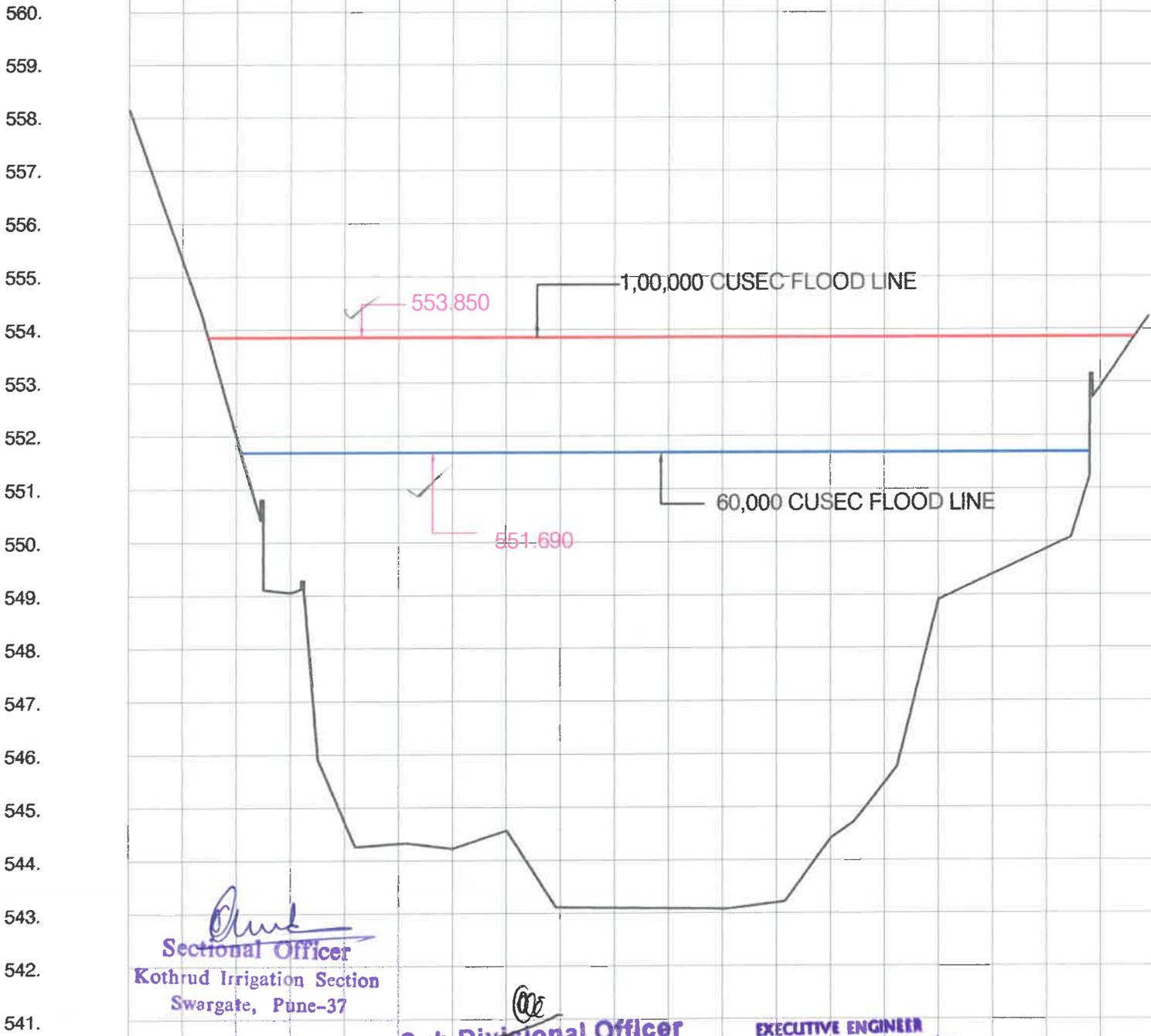
LEVELS	558.310	558.297	558.290	555.369	552.050	548.659	547.710	547.200	547.000	546.580	546.200	544.651	544.510	544.200	544.314	543.390	543.250	543.180	543.240	543.300	543.269	543.210	543.330	558.080	544.910	546.120	546.988	546.560	552.456	557.940	557.900	557.851	557.915
CHAINAGE	0.00	10.00	15.600	20.00	25.000	30.000	31.200	35.100	40.00	50.00	60.00	70.00	70.900	75.600	80.00	80.750	90.00	95.600	100.00	106.550	110.00	116.600	120.00	125.900	130.00	138.200	140.00	141.400	150.00	160.00	170.10	180.00	190.00

CH. 9/030 TO 10/020

DISCHARGE	LINE	COLOUR	पूररेषा
1,00,000 CUSEC	RED LINE		नियंत्रक पूररेषा
60,000 CUSEC	BLUE LINE		निषेधक पूररेषा

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE

CH 9+030



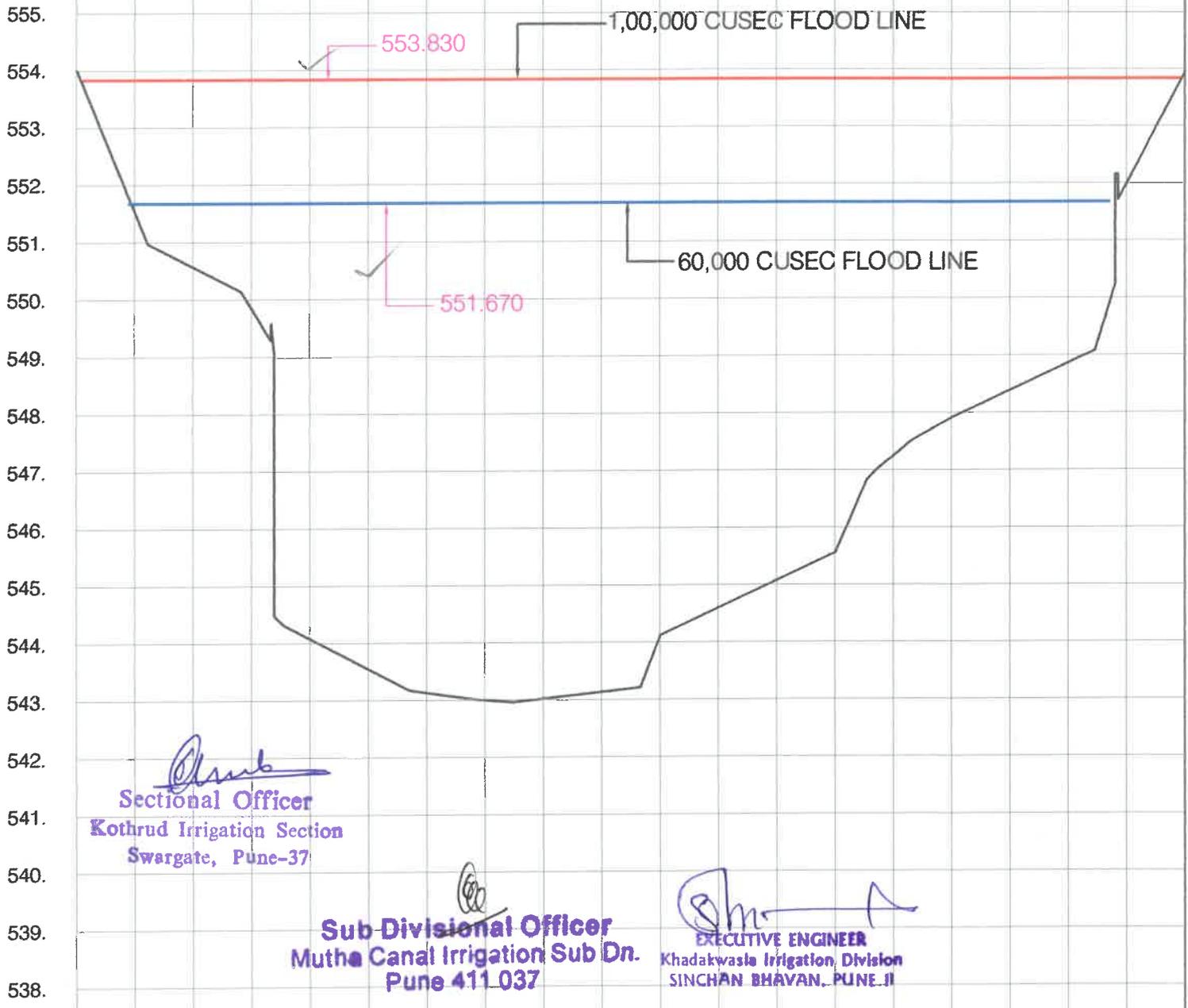
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	558.140	555.274	554.300	551.960	550.400	548.700	549.040	548.700	549.100	545.900	544.250	544.310	544.210	544.550	543.099	543.090	543.080	543.071	543.182	544.400	544.710	545.451	545.750	548.330	549.375	549.825	549.845	552.710	552.720	
CHAINAGE	0.00	10.00	13.400	20.00	24.400	24.910	30.00	32.410	33.420	35.000	40.00	41.900	50.00	59.90	70.00	80.00	90.00	100.00	110.00	120.00	130.00	134.300	140.00	142.300	150.00	160.00	168.400	170.00	180.00	185.000

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE
CH 9+060**



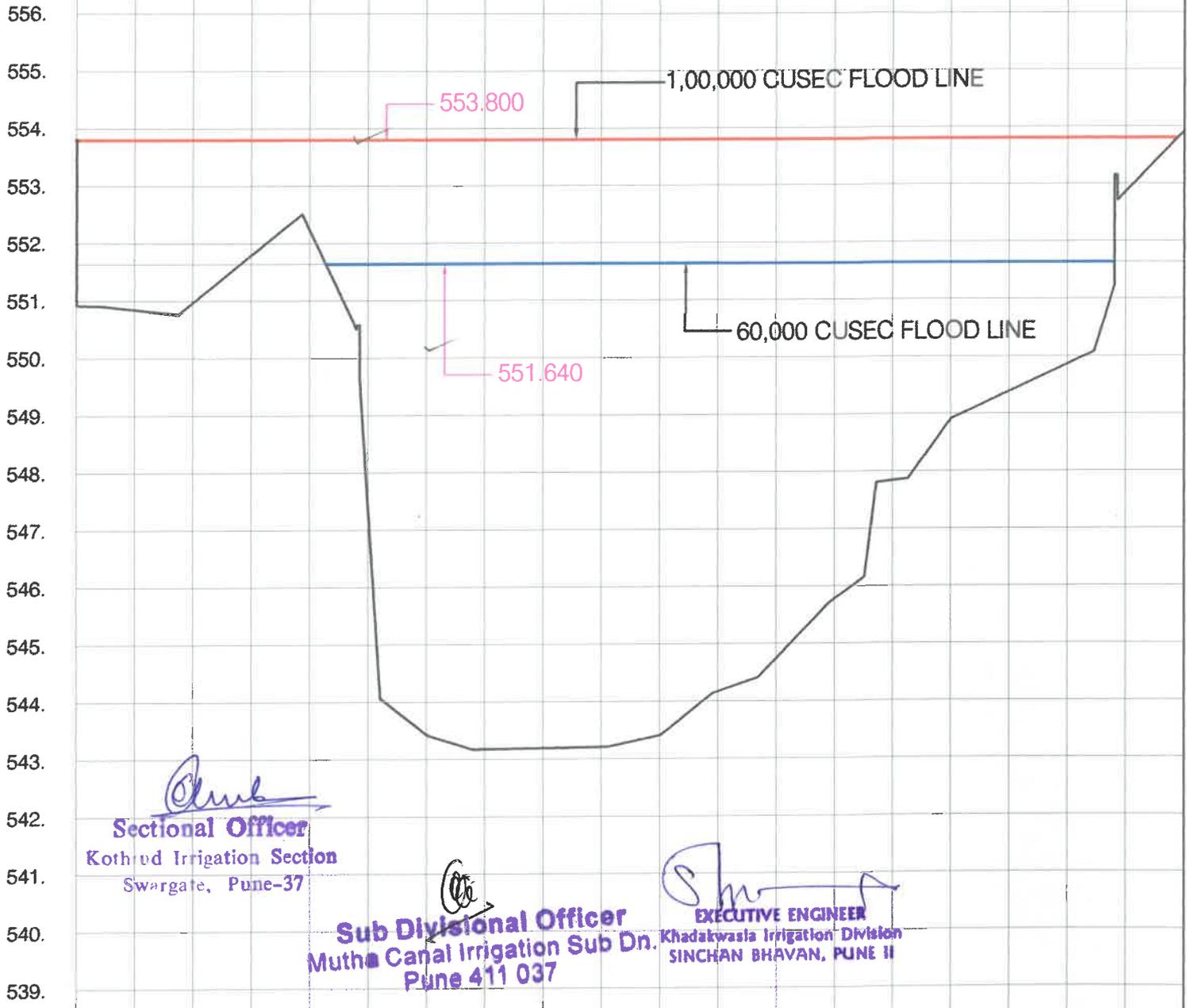
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub-Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE. II

LEVELS	553.590	550.982 550.960	550.555	550.130 549.826	549.050 544.310 544.065	543.533	543.160	543.117	543.000 542.986	542.950	543.010	543.124	543.200	544.110	544.590	545.070	545.550	546.810 546.590	547.456 547.860	547.400	548.310 548.370	548.825 548.845	551.710 551.722
CHAINAGE	0.00	10.00 12.200	20.00	28.200 30.00	33.820 35.400 40.00	50.00	57.000	60.00	68.100 70.00	74.800	80.00	90.00	96.600	100.00	110.00	120.00	130.00	135.400 137.000	140.00 143.110	150.000	158.600 160.00	168.400 170.00	180.00 185.000

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE
CH 9+090**



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

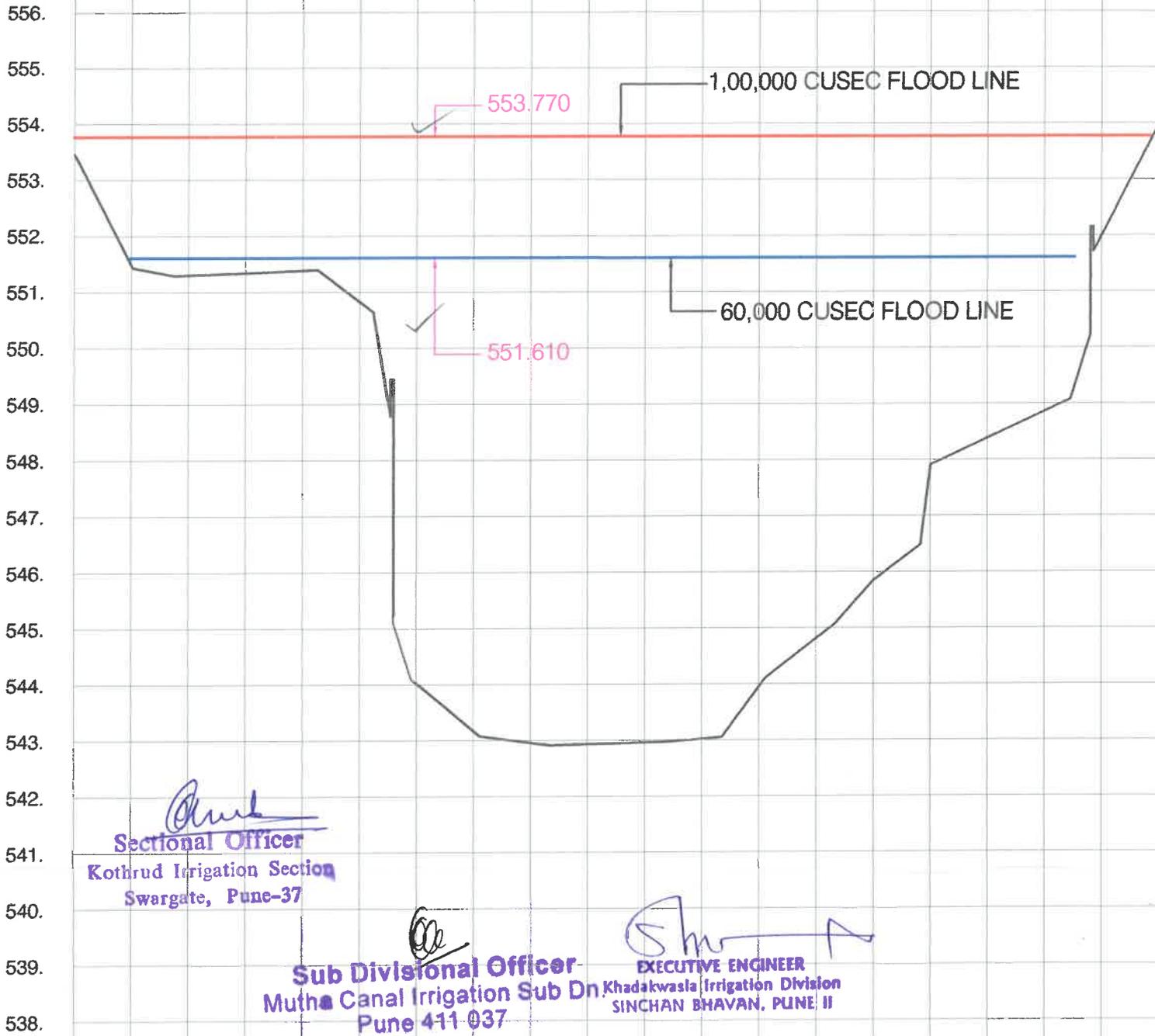
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	CHAINAGE
550.910	0.00
550.890	4.900
550.833	10.00
550.750	17.400
550.965	20.00
551.790	30.00
552.500	38.600
552.201	40.00
550.560	48.010
549.620	48.520
547.255	50.00
544.060	52.000
543.410	60.05
543.160	67.900
543.164	70.00
543.181	80.00
543.198	90.00
543.400	100.08
544.165	108.000
544.165	110.000
544.400	116.800
544.741	120.00
545.710	129.100
545.776	130.00
546.150	137.200
547.790	137.200
547.826	140.00
547.860	142.600
548.470	148.200
548.900	150.00
548.310	158.600
549.375	160.00
549.822	168.400
549.650	170.00
552.705	180.00
552.725	185.000

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE

CH 9+120



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

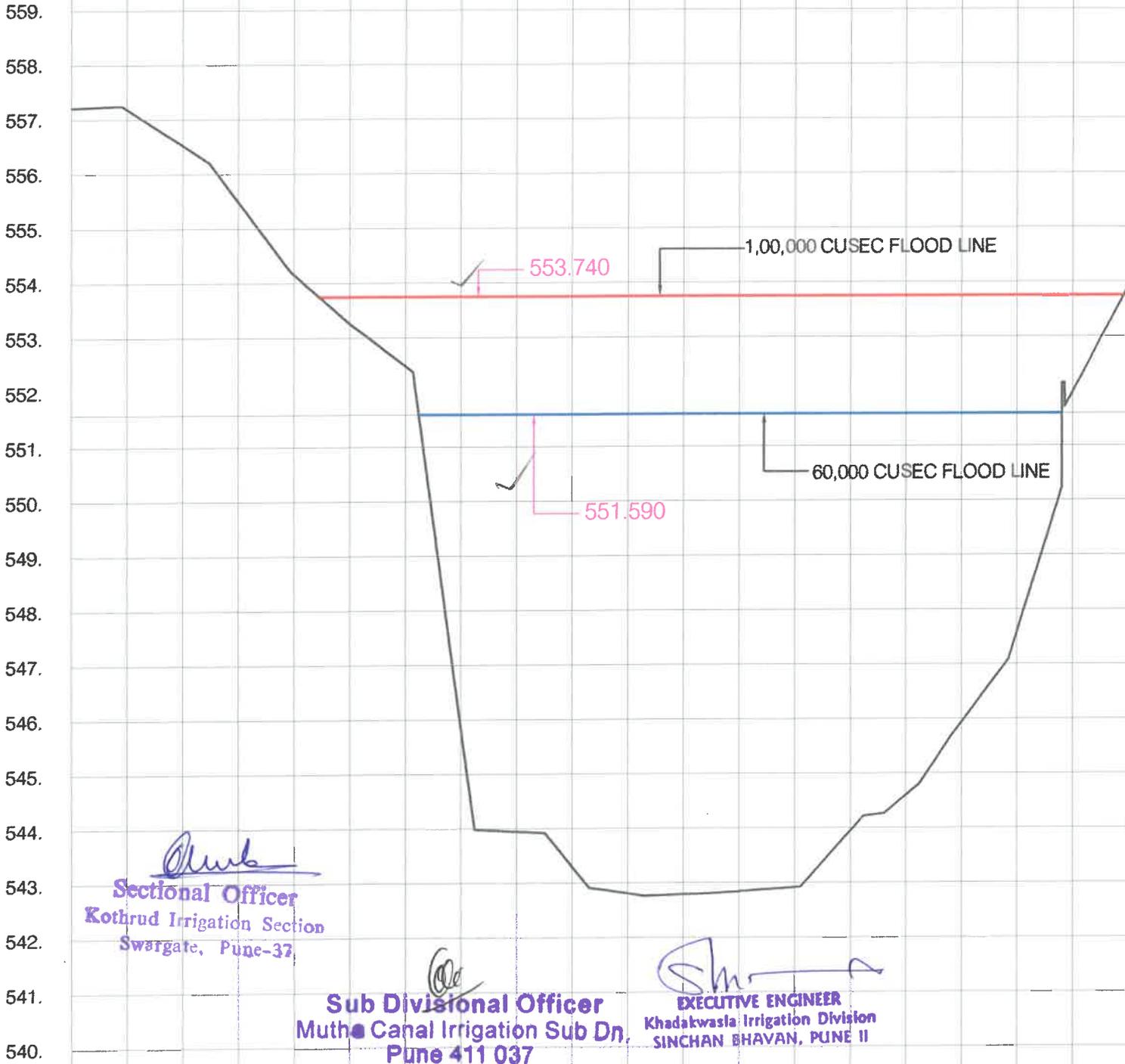
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	553.440	551.420	551.280	551.290	551.320	551.328	551.368	551.380	550.808	550.638	549.440	548.770	544.090	544.005	543.150	543.060	542.944	542.900	542.919	542.948	542.960	543.011	543.040	543.949	544.100	544.808	545.070	545.840	546.470	547.900	548.310	545.933	547.080	547.505	551.705	551.725
CHAINAGE	0.00	10.20	17.400	20.00	28.100	30.00	40.00	42.600	50.00	52.300	55.400	58.410	59.000	60.00	70.00	71.050	80.00	83.400	90.00	100.00	104.050	110.00	113.400	120.00	121.100	130.00	133.300	140.00	148.200	150.00	158.600	160.00	168.400	170.00	180.00	185.000

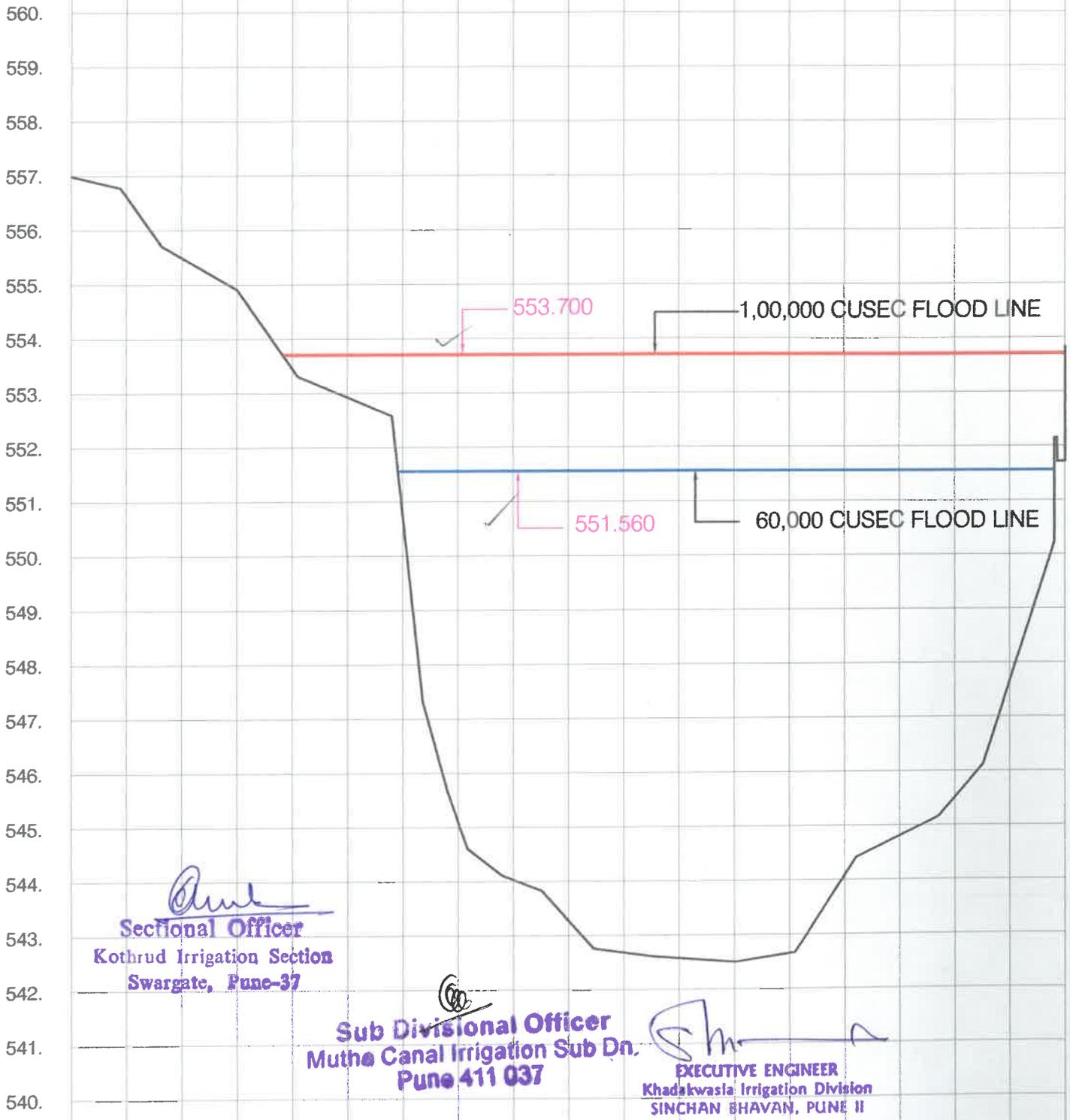
CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE

CH 9+150



LEVELS	557.200	557.240	557.173	556.507	556.200	555.465	554.200	554.137	553.250	553.242	552.461	552.360	548.784	548.370	543.934	543.910	543.279	542.900	542.794	542.750	542.779	542.800	542.833	542.903	542.910	543.947	544.210	544.250	544.593	544.790	545.660	545.933	547.080	547.605	551.705	551.725
CHAINAGE	0.00	9.000	10.00	20.00	24.600	30.00	39.300	40.00	48.900	50.00	60.00	61.300	70.00	72.400	80.00	85.000	90.00	93.000	100.00	102.900	110.00	115.350	120.00	130.00	130.950	140.00	142.300	146.000	150.00	152.300	158.000	160.00	168.400	170.00	180.00	185.000

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE
CH 9+180**



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

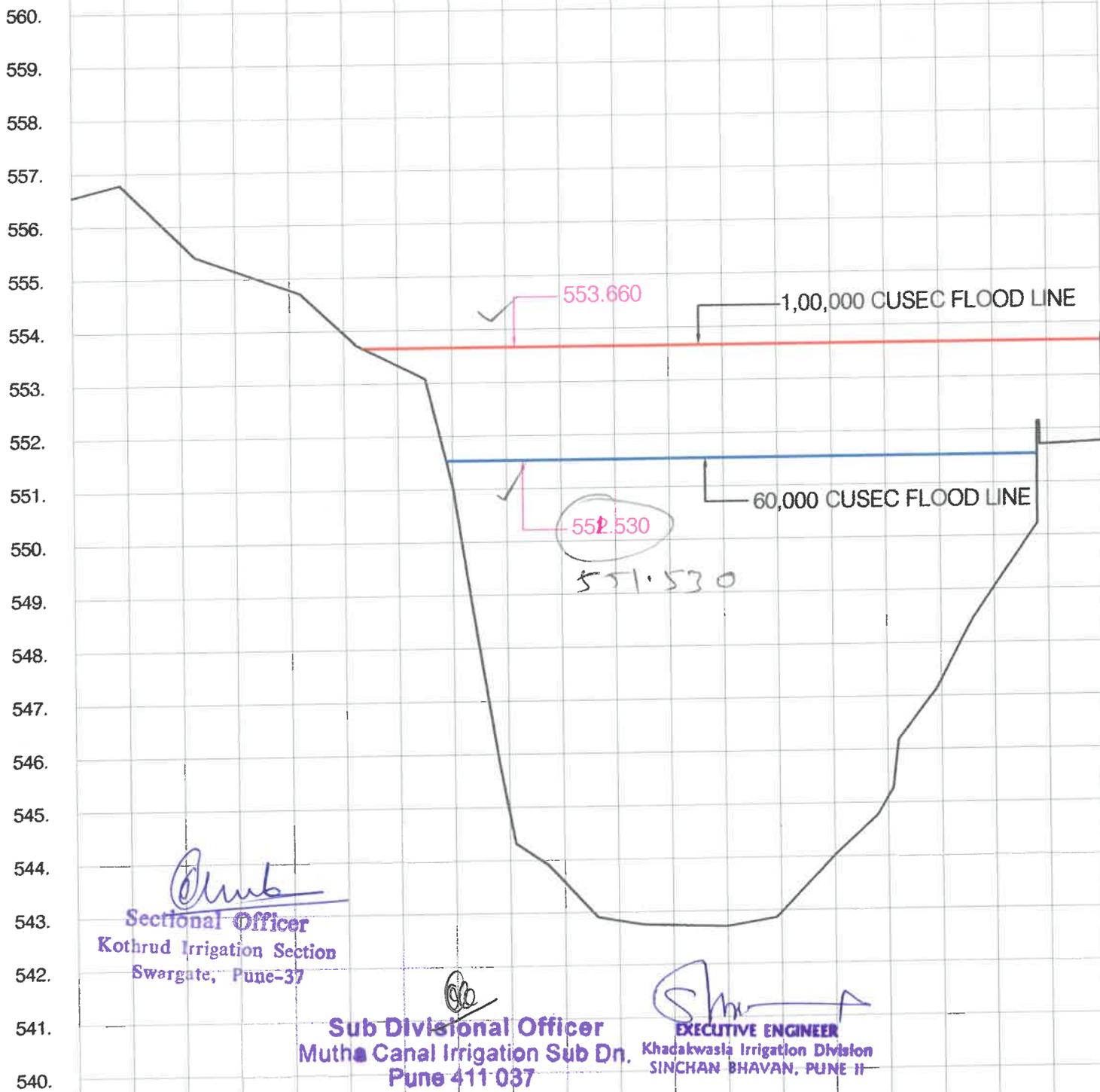
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	556.980	556.770	556.599	555.700	555.482	554.900	554.885	553.431	553.300	552.912	552.570	550.688	547.300	545.700	545.076	544.600	544.100	544.019	543.820	543.251	542.750	542.671	542.600	542.564	542.490	542.646	542.660	544.086	544.400	544.800	545.150	545.506	546.110	548.100	547.941	547.470	548.080	547.900	547.844	547.800
CHAINAGE	0.00	8.800	10.00	16.300	20.00	28.900	30.00	40.00	40.900	50.00	58.000	60.00	63.600	67.900	70.00	71.600	77.950	80.00	85.000	90.00	94.400	100.00	105.000	110.00	120.15	130.00	130.900	140.00	142.000	150.00	157.000	160.00	165.100	169.000	170.00	172.950	173.500	173.510	180.00	185.000

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE

CH 9+210



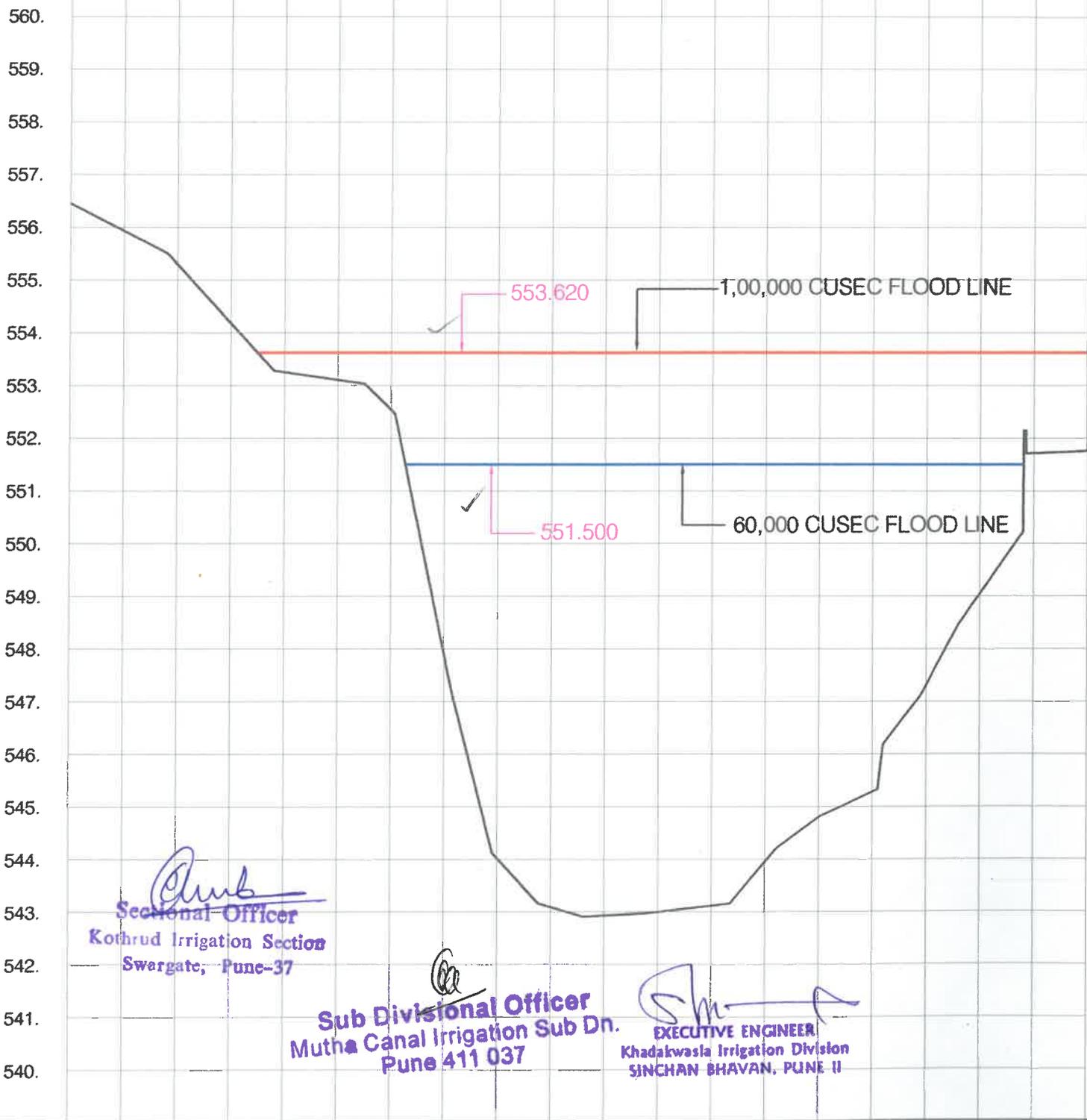
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

0.00	556.540
8.800	556.770
10.00	556.651
20.00	555.658
22.600	555.400
30.00	555.132
40.00	554.769
41.900	554.700
50.00	553.923
52.300	553.710
60.00	553.322
65.000	553.070
70.00	551.000
73.300	548.850
78.000	545.900
80.00	544.833
86.900	543.900
90.00	543.559
96.000	542.900
100.00	542.829
104.500	542.750
110.00	542.732
119.90	542.700
128.050	542.860
130.00	542.861
140.00	544.020
148.000	544.770
150.00	545.117
150.900	545.320
151.900	546.170
158.900	547.110
160.00	547.321
165.900	548.450
170.00	549.050
178.000	550.220
178.500	552.140
180.00	551.706
190.00	551.750

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE
CH 9+240**



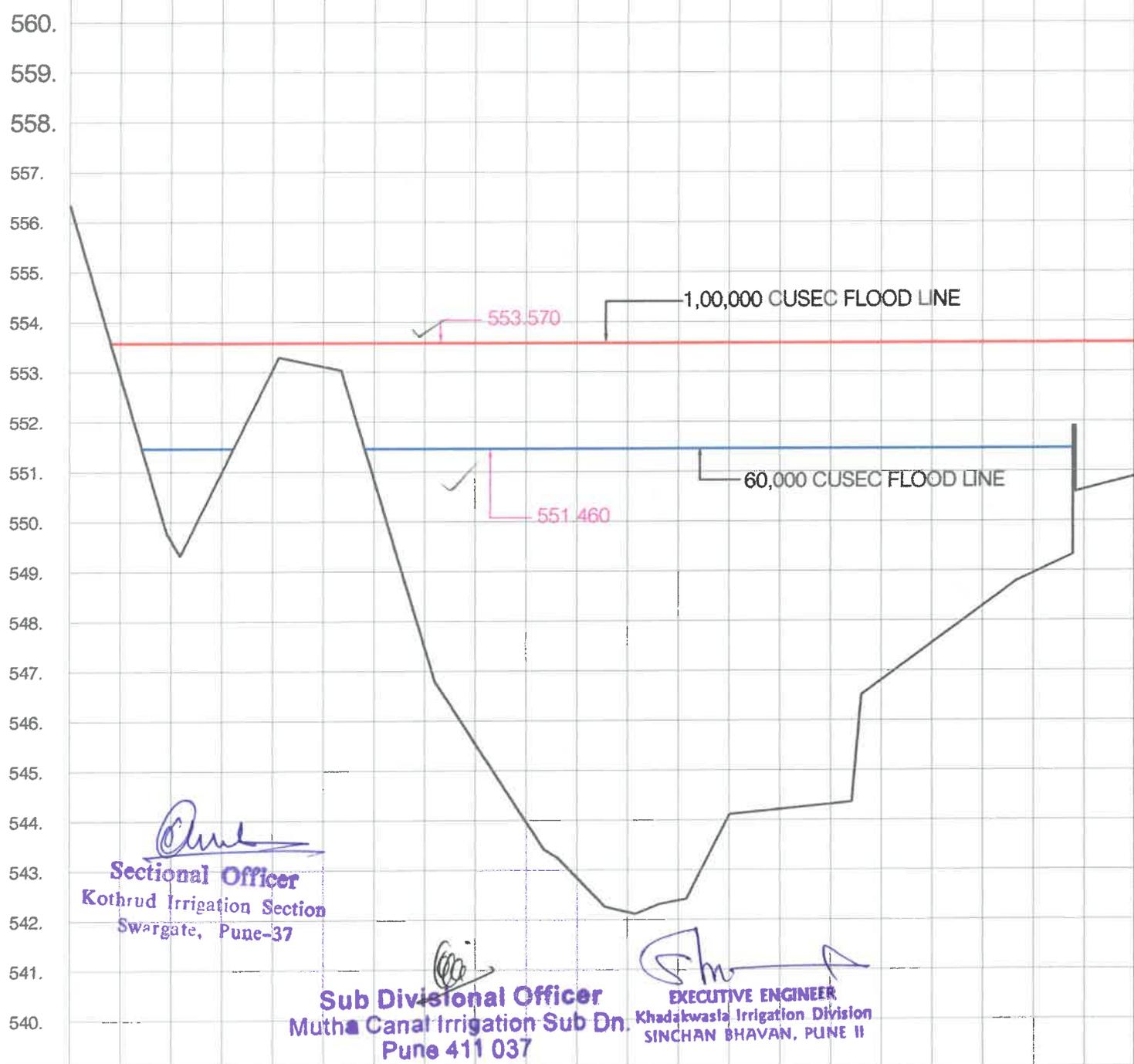
Sub
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

Sub
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

Sh
EXECUTIVE ENGINEER
 Khadakwasia Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	556.440	555.918	555.500	555.277	554.162	553.270	553.241	553.094	553.020	552.520	552.460	547.839	547.200	544.110	543.998	543.150	543.079	542.900	542.921	542.960	542.990	543.109	543.150	543.956	544.200	544.800	545.277	545.320	546.170	547.110	547.321	548.450	549.050	550.220	552.140	551.706	551.750
CHAINAGE	0.00	10.00	18.000	20.00	30.00	38.000	40.00	50.00	55.000	60.00	60.600	70.00	71.300	79.000	80.00	87.600	90.00	96.000	100.00	107.500	110.00	120.00	123.400	130.00	132.000	140.00	150.00	150.900	151.900	158.900	160.00	165.900	170.00	178.000	178.300	180.00	190.00

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE
CH 9+270**



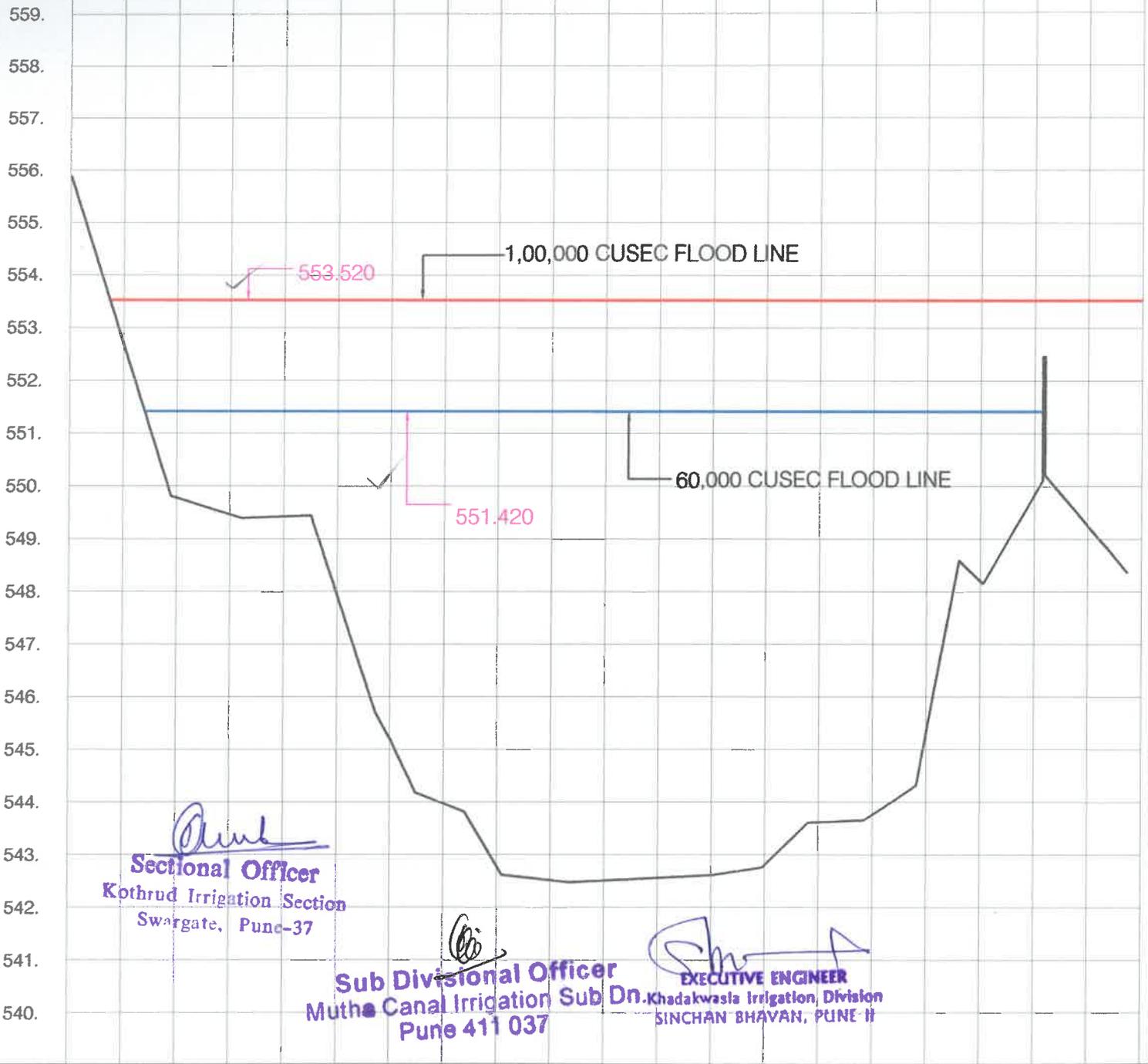
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	556.920	552.880	549.750	549.698	549.310	551.008	553.055	553.280	553.082	553.020	550.794	547.421	546.780	545.507	543.935	543.400	543.240	542.819	542.250	542.135	542.100	542.300	542.373	542.400	544.100	544.205	544.270	544.308	544.350	546.500	546.742	547.110	547.294	548.285	548.785	548.940	550.590	550.880
CHAINAGE	0.00	10.00	19.100	20.00	21.700	30.00	40.00	41.100	50.00	53.400	60.00	70.00	71.900	80.00	90.00	93.400	96.000	100.00	105.400	110.00	111.400	116.100	120.00	121.450	130.00	140.00	146.200	150.00	154.100	156.000	160.00	166.100	170.00	180.00	185.000	190.00	200.00	200.00

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE
CH 9+300**



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

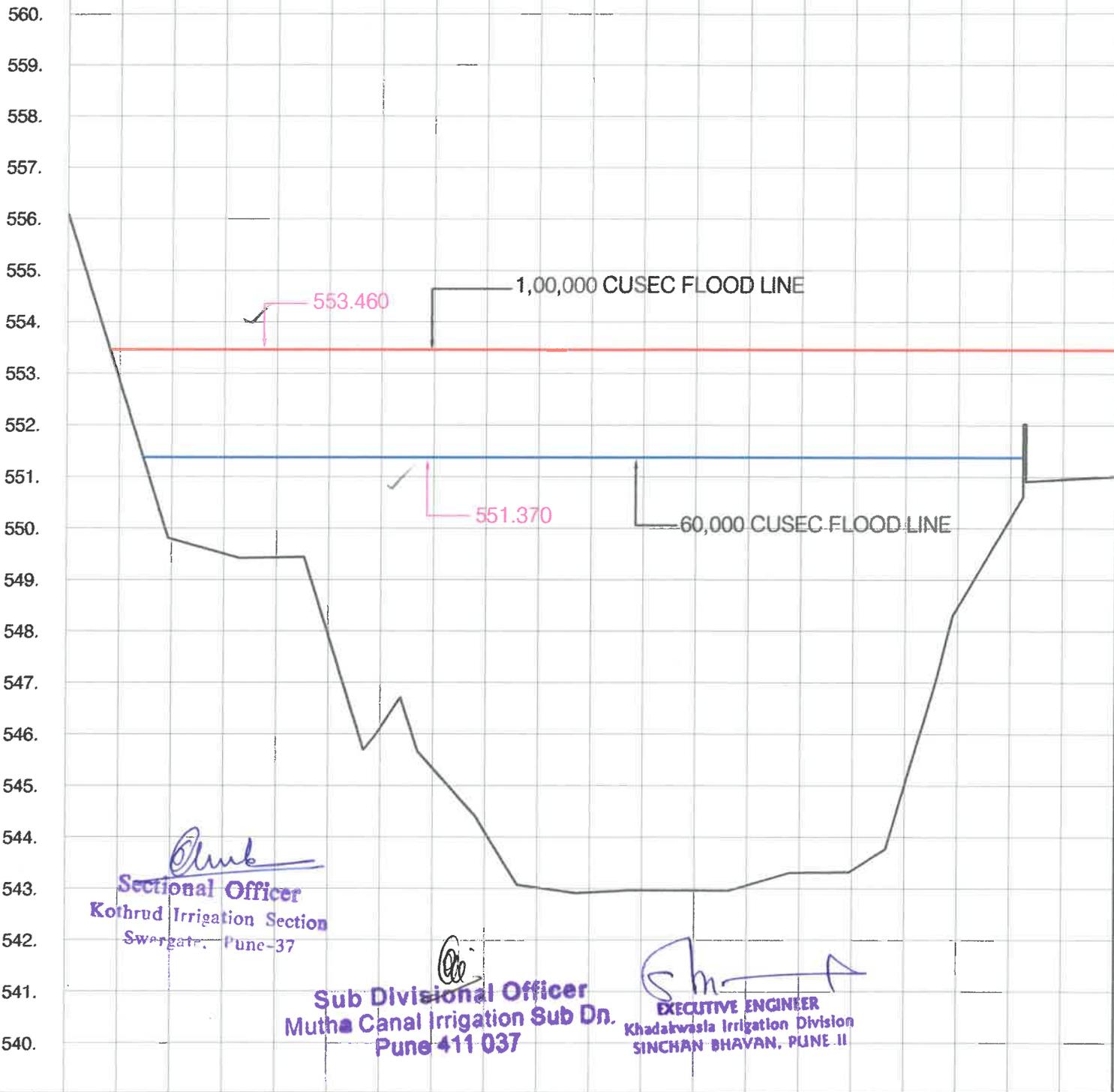
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	555.870	552.658	549.800 549.765	549.444 549.380	549.411	549.430	547.893	545.680	545.180	544.170	543.957	543.800	542.754 542.600	542.498 542.460	542.495	542.547	542.600	542.750 542.809	543.600	543.610	543.650	543.758	544.070	544.310	545.350	548.580	548.179 548.140	549.835 550.100	549.234	548.360
CHAINAGE	0.00	10.00	18.900 20.00	30.00 32.000	40.00	45.000	50.00	57.200	60.00	64.700	70.00	73.900	80.00 80.900	90.00 93.450	100.00	110.00	120.00	129.400 130.00	138.000	140.00	148.350	150.00	154.750	158.100	160.00	165.900	170.00 170.400	180.00 181.500	190.00	197.300

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE

CH 9+330



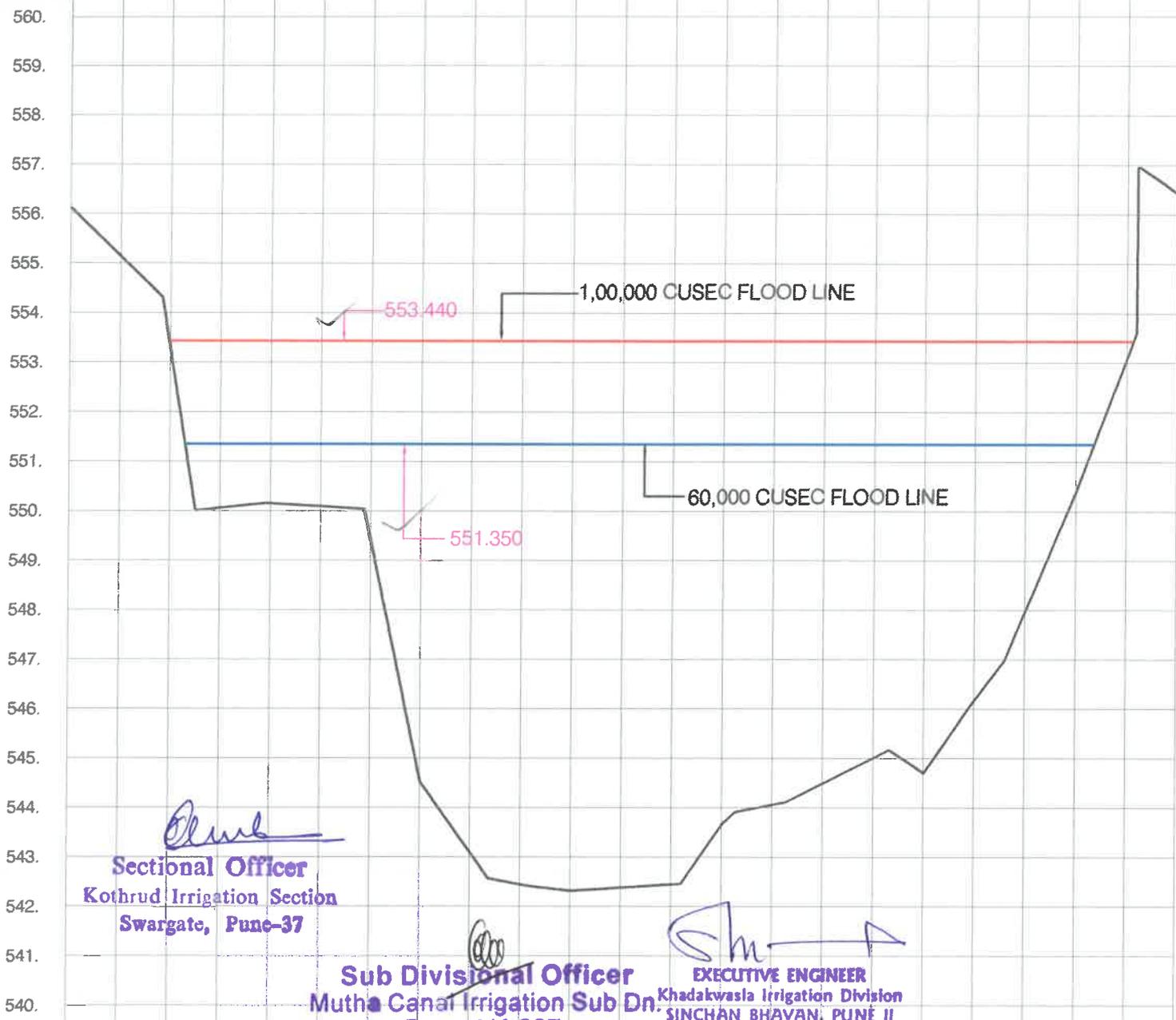
Chub
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

Ch
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

S.M.
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE. II

LEVELS	556.070	552.813	549.800	549.779	548.493	548.478	549.422	549.430	547.865	545.680	545.680	546.122	546.700	545.650	545.317	544.400	544.069	543.060	543.004	542.900	542.913	542.950	542.950	542.950	543.056	543.300	543.302	543.310	543.349	543.760	545.029	547.080	548.399	548.473	550.202	550.606	550.947	550.990	
CHAINAGE	0.00	10.00	19.250	20.00	30.00	33.906	40.00	45.200	50.00	56.700	57.000	58.000	63.700	67.100	70.00	78.000	80.00	86.100	90.00	97.300	100.00	107.400	110.00	120.00	126.500	130.00	138.100	140.00	149.400	150.00	156.320	160.00	165.950	168.000	170.00	180.00	182.300	190.00	196.700

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE
CH 9+360**



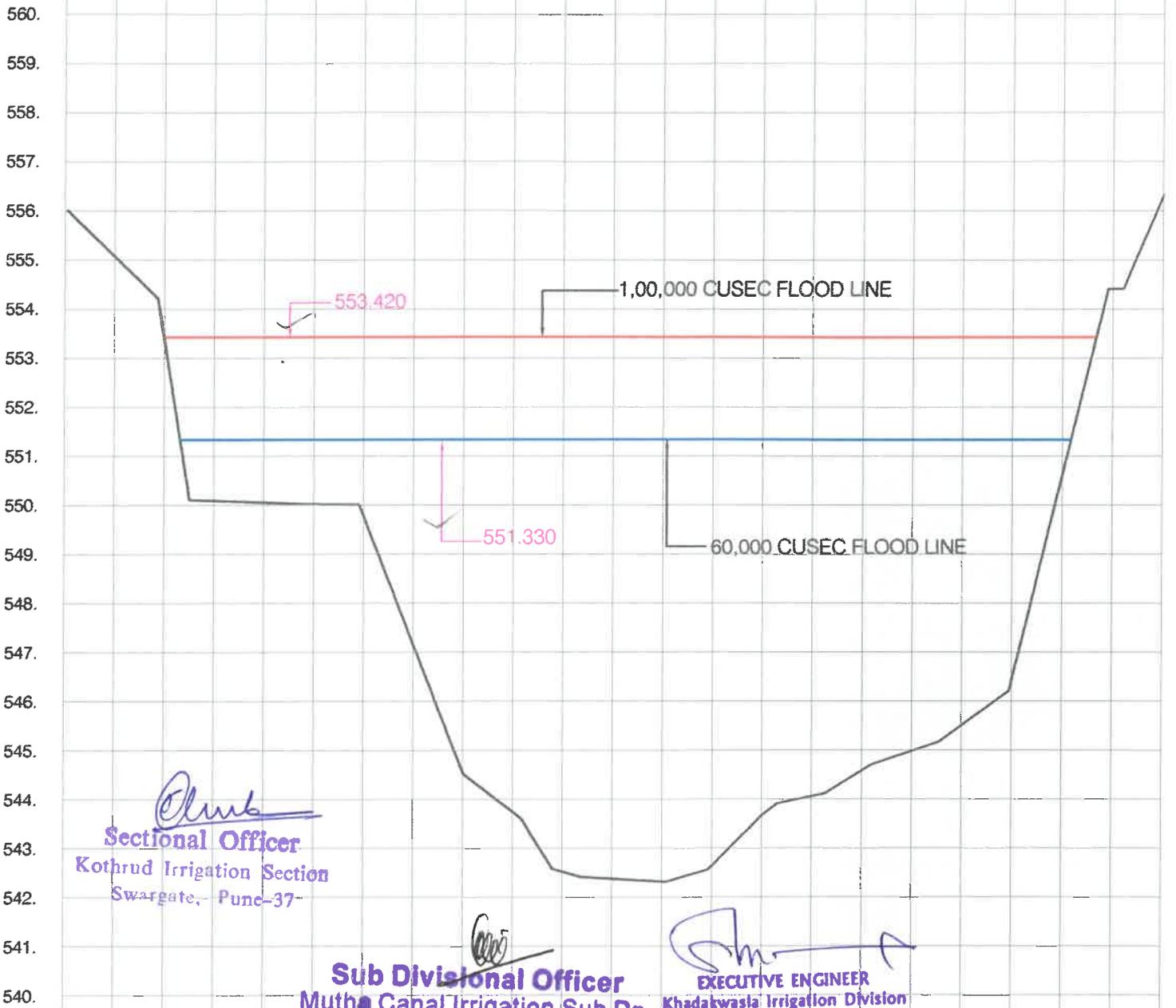
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	556.100	555.116	554.300	553.209	550.000	550.050	550.134	550.134	550.078	550.030	549.351	544.500	543.066	542.550	542.427	542.400	542.300	542.368	542.437	542.450	543.660	543.900	544.088	544.100	544.483	545.000	546.180	544.680	546.080	546.189	546.970	547.967	550.400	553.069	553.600	556.940	556.400
CHAINAGE	0.00	10.00	18.300	20.00	25.000	30.00	38.000	40.00	50.00	58.600	60.00	70.00	80.00	83.600	90.00	91.400	100.00	110.00	120.00	121.900	130.00	132.600	140.00	142.800	150.00	160.00	168.100	170.00	178.800	180.00	185.900	190.00	200.00	210.00	211.900	212.400	220.000

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE
CH 9+390**



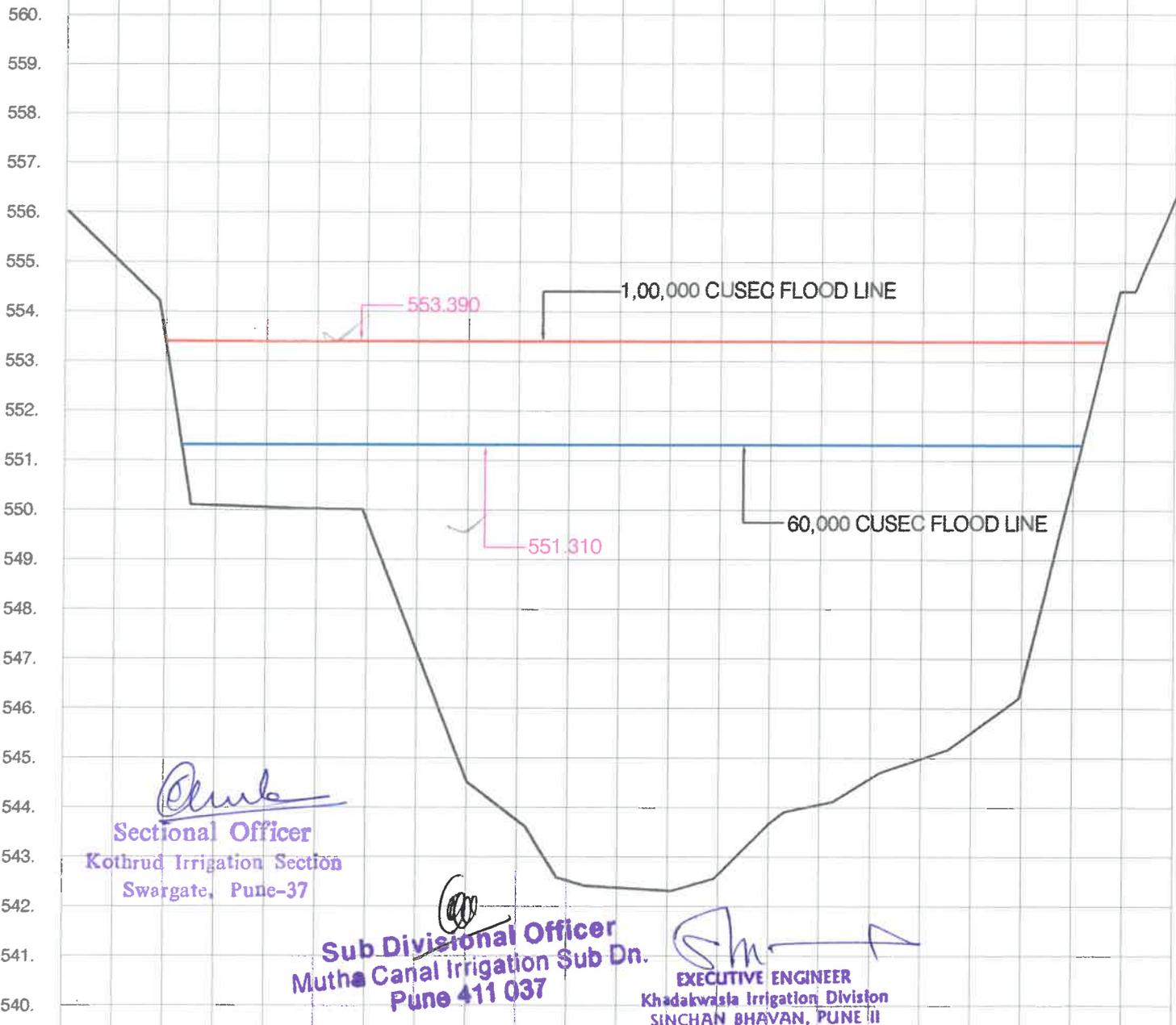
[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

[Signature]
Sub Divisional Officer
Mutha Canal Irrigation Sub Dn.
Pune 411 037

[Signature]
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

LEVELS	556.000	555.050	553.035	550.074	550.040	550.008	549.738	547.119	544.500	543.724	542.508	542.363	542.304	542.642	543.660	544.047	544.571	544.972	545.502	546.451	550.635	554.400	556.304
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE
CH 9+420**



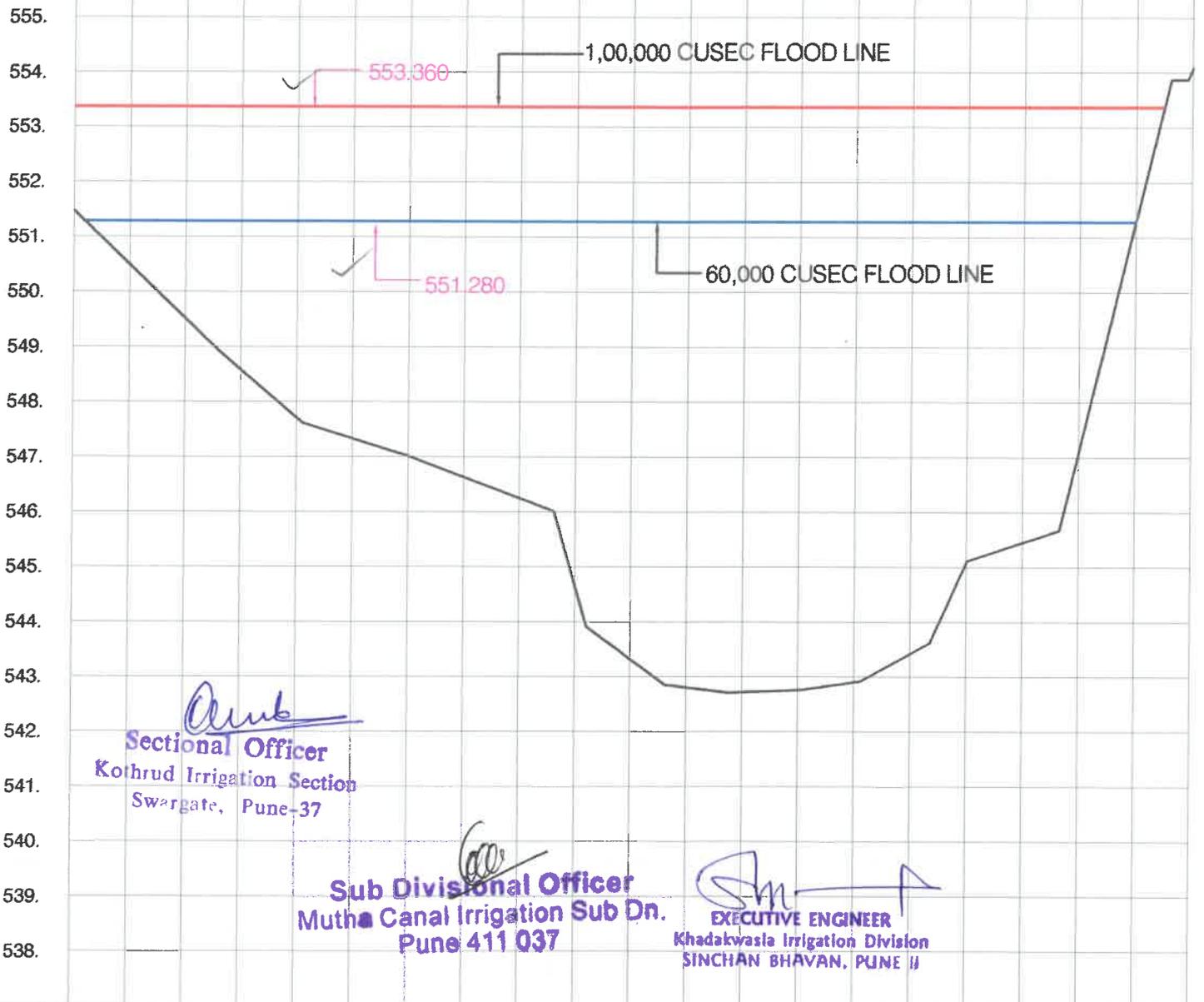
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwala Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	556.000	555.050	553.035	550.074	550.040	550.009	549.738	547.119	544.500	543.724	542.508	542.363	542.304	542.642	543.660	544.047	544.571	544.972	545.502	546.451	550.635	554.400	556.304
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE
CH 9+450



Amb
Sectional Officer
Kohrud Irrigation Section
Swargate, Pune-37

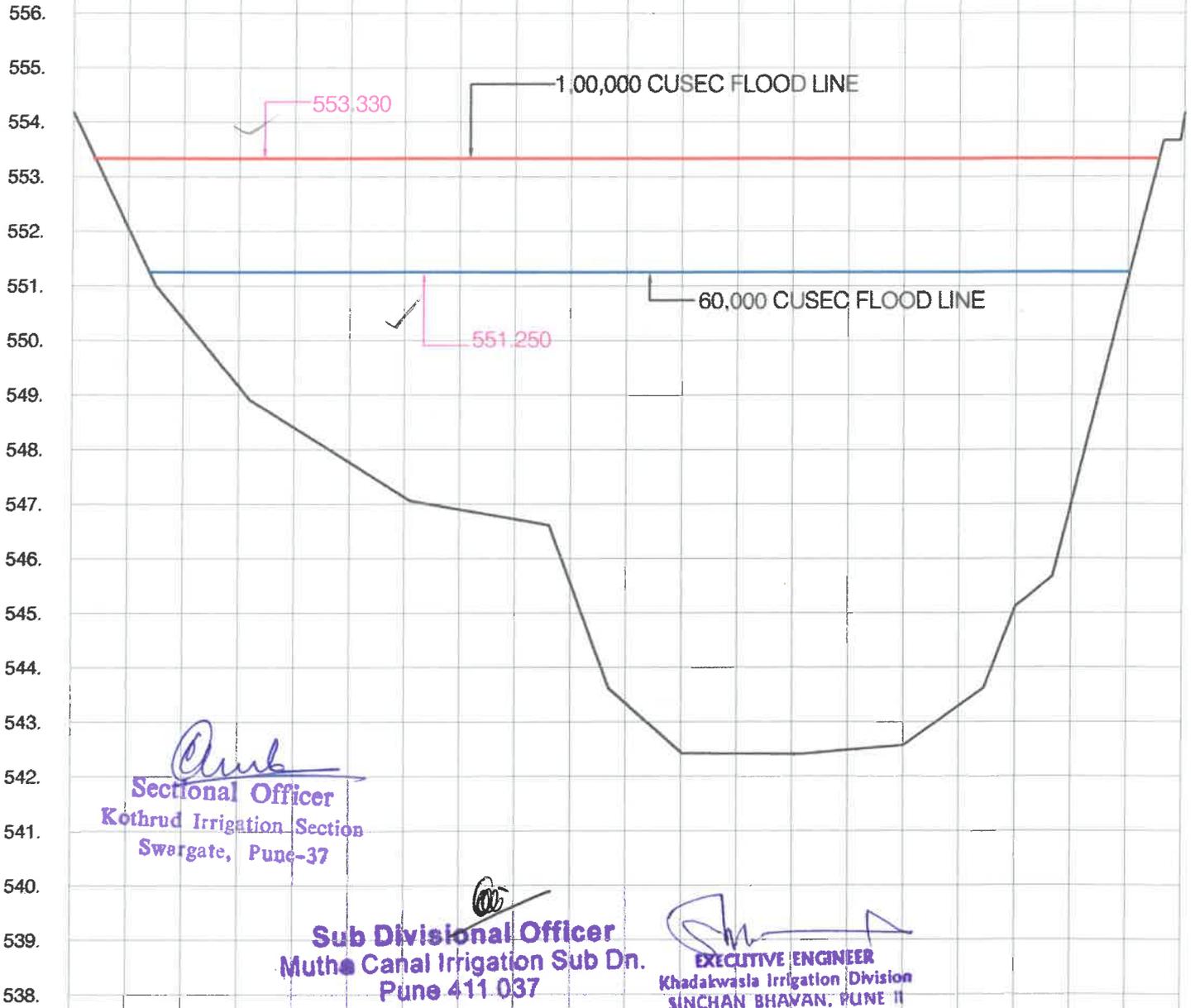
Co
Sub Divisional Officer
Mutha Canal Irrigation Sub Dn.
Pune 411 037

Sm
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

LEVELS	551.450	550.473	549.496	548.560	547.687	547.316	547.000	546.617	546.234	544.612	543.299	542.791	542.711	542.749	542.895	543.418	545.099	545.443	547.125	551.340	554.075
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE

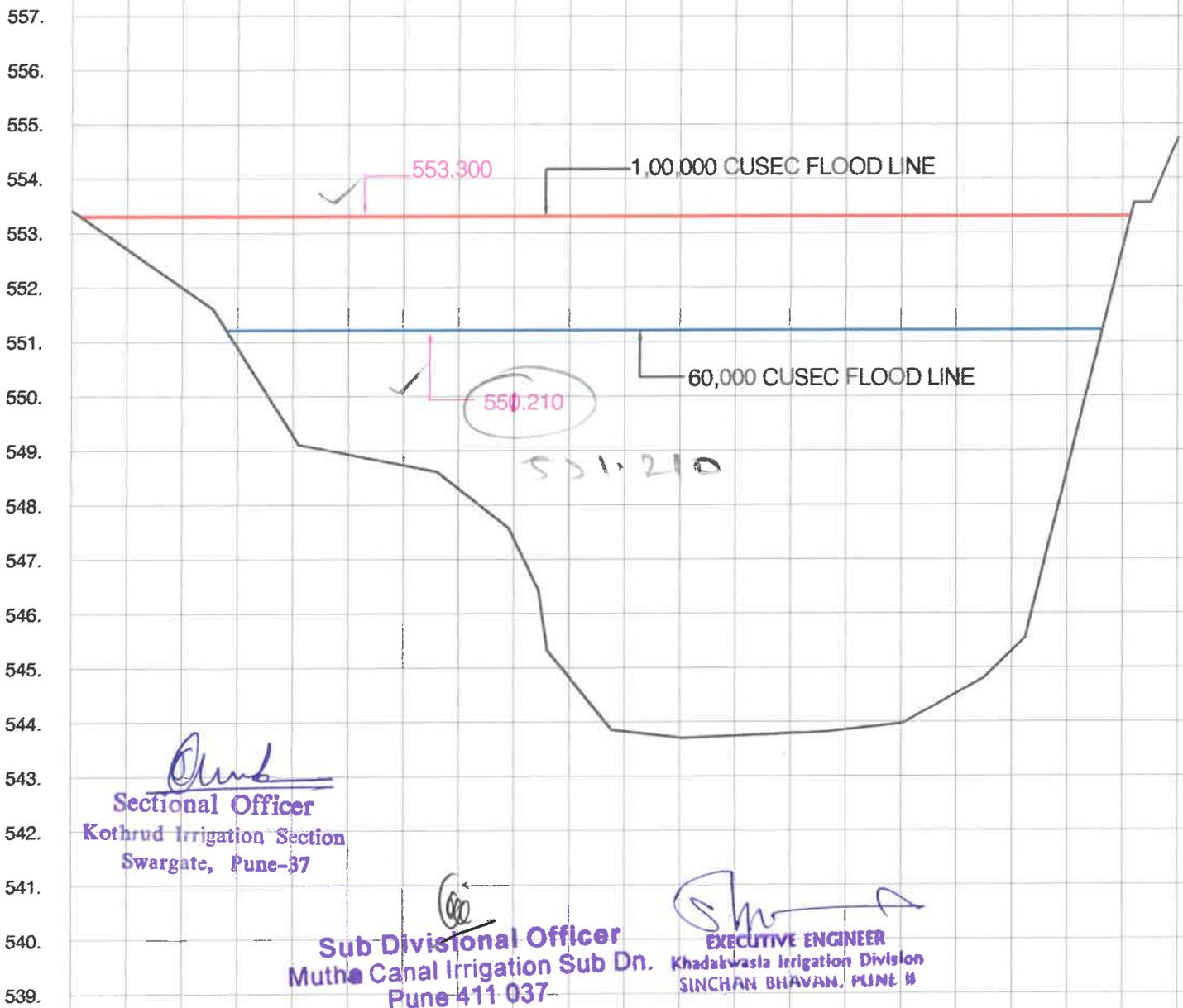
CH 9+480



LEVELS	554.160	551.460	550.370	549.135	548.385	547.749	547.114	546.889	546.709	545.517	543.322	542.410	542.405	542.401	542.474	542.560	543.289	545.110	547.070	551.125	554.160
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.15	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE

CH 9+510



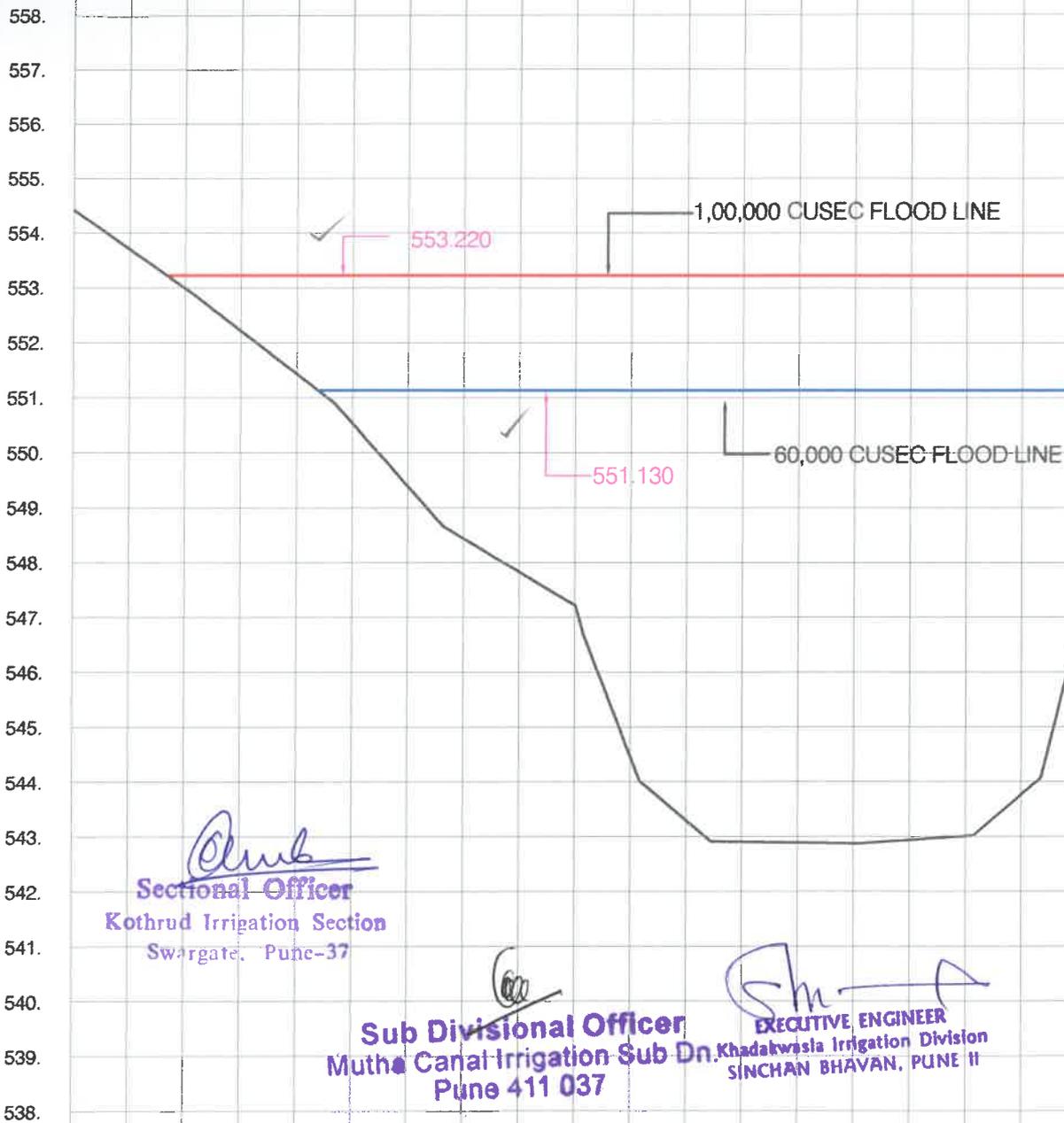
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune-411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

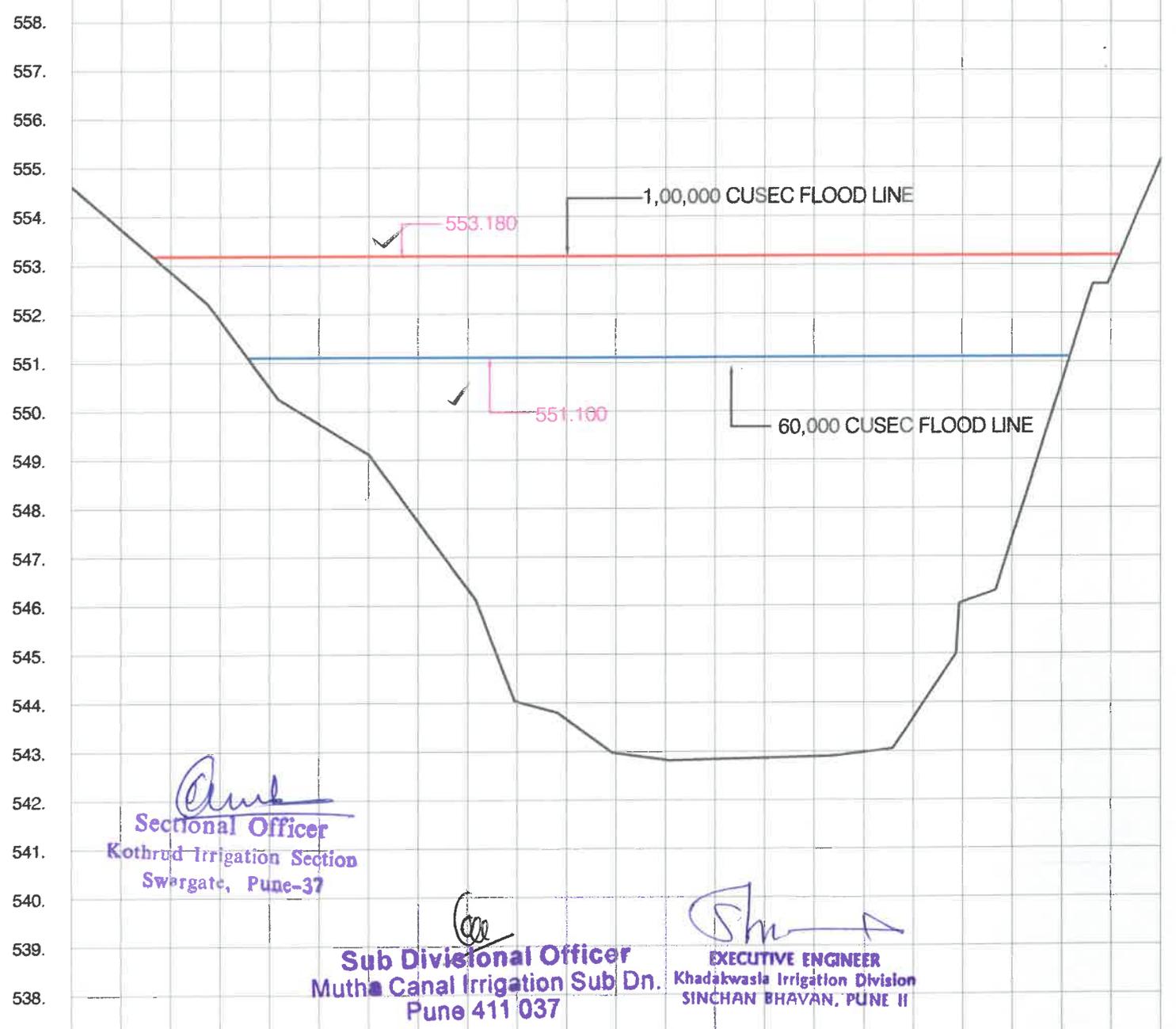
LEVELS	553.400	552.691	551.983	550.863	549.260	548.920	548.720	548.280	547.347	544.803	543.812	543.695	543.731	543.774	543.844	543.957	544.515	545.300	548.640	552.740	554.730
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE
CH 9+570**



LEVELS	554.400	553.686	552.971	552.197	551.416	550.510	549.362	548.418	547.809	547.200	544.422	543.278	542.892	542.876	542.861	542.927	543.000	543.762	546.023	546.640	550.190	546.640
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE
CH 9+600**



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

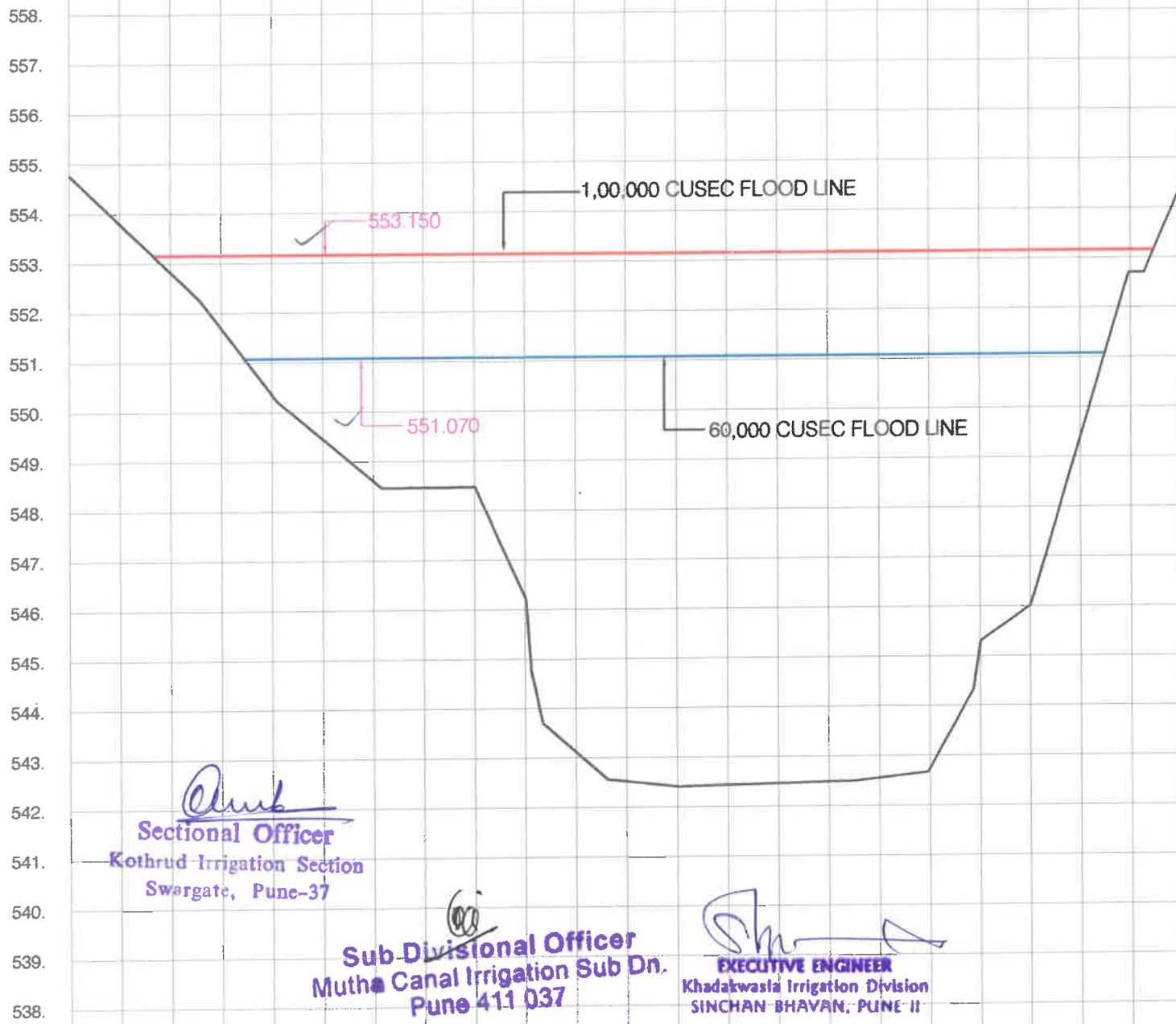
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE II

LEVELS	554.600	553.724	552.848	551.843	550.470	549.725	549.100	547.711	546.322	544.013	543.640	542.960	542.808	542.826	542.853	542.881	542.970	543.685	546.048	547.519	547.380	550.590	555.150
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	108.10	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE

CH 9+630



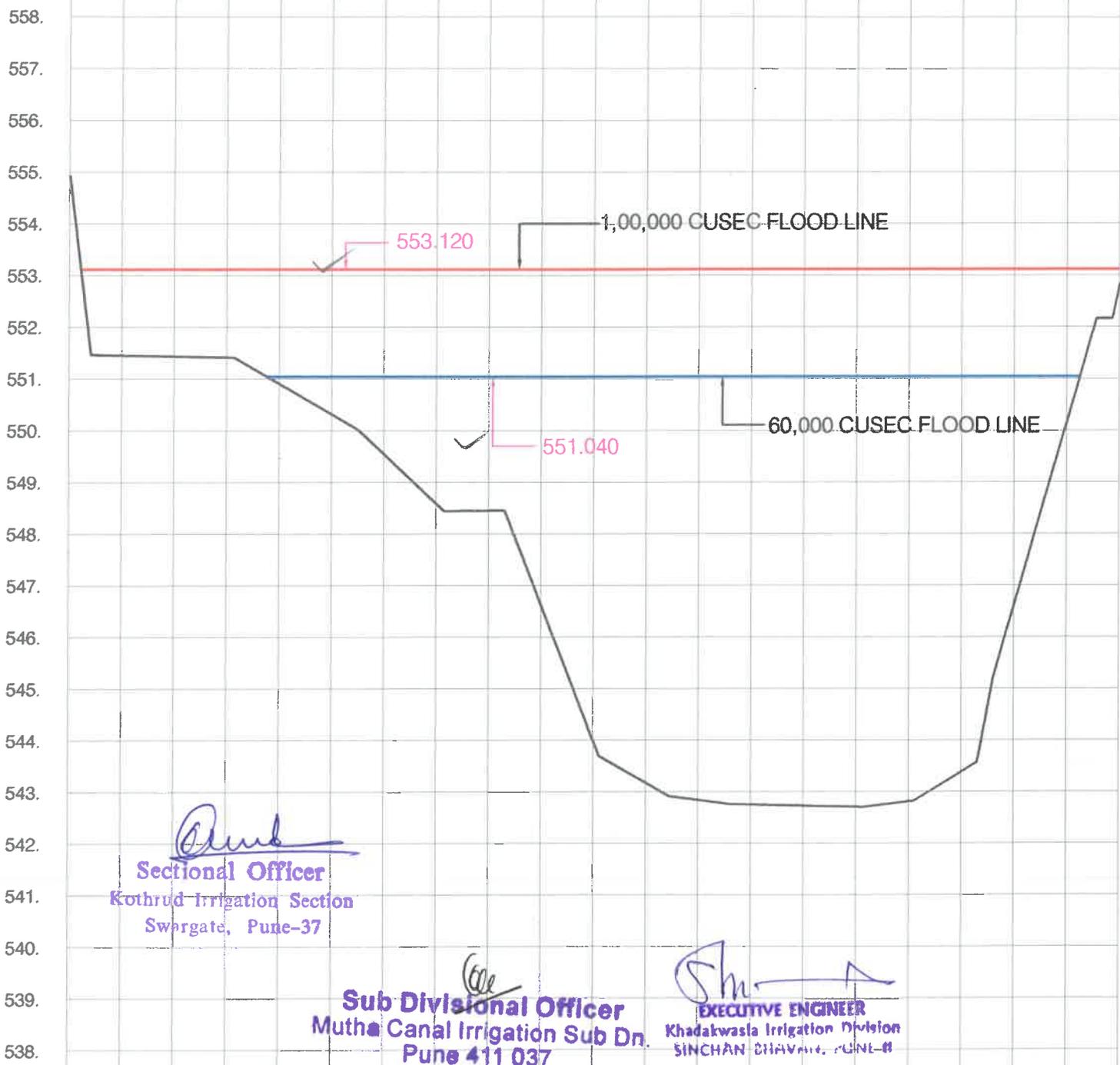
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub-Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasli Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	554.750	553.775	552.801	551.699	550.334	549.435	548.586	548.455	548.460	546.190	543.098	542.508	542.400	542.425	542.451	542.477	542.548	542.743	545.290	546.010	549.350	552.690	554.450
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.10	100.00	110.00	120.10	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE
CH 9+660**



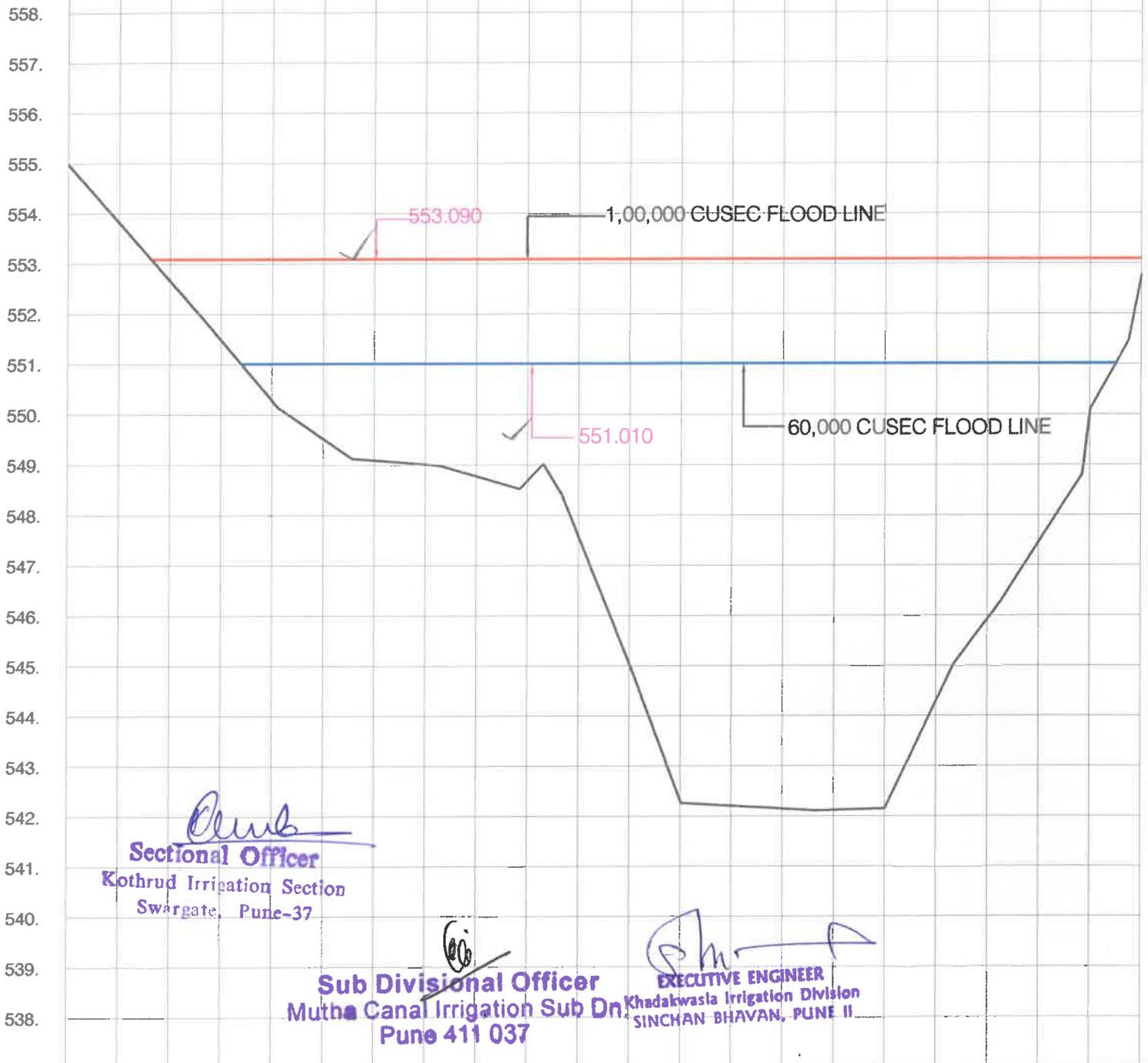
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE-11

LEVELS	554.910	547.520	549.333	551.146	550.891	550.299	549.525	548.564	548.437	546.589	543.944	543.156	542.827	542.740	542.717	542.693	542.797	543.372	546.610	550.160	552.810
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE
CH 9+690**



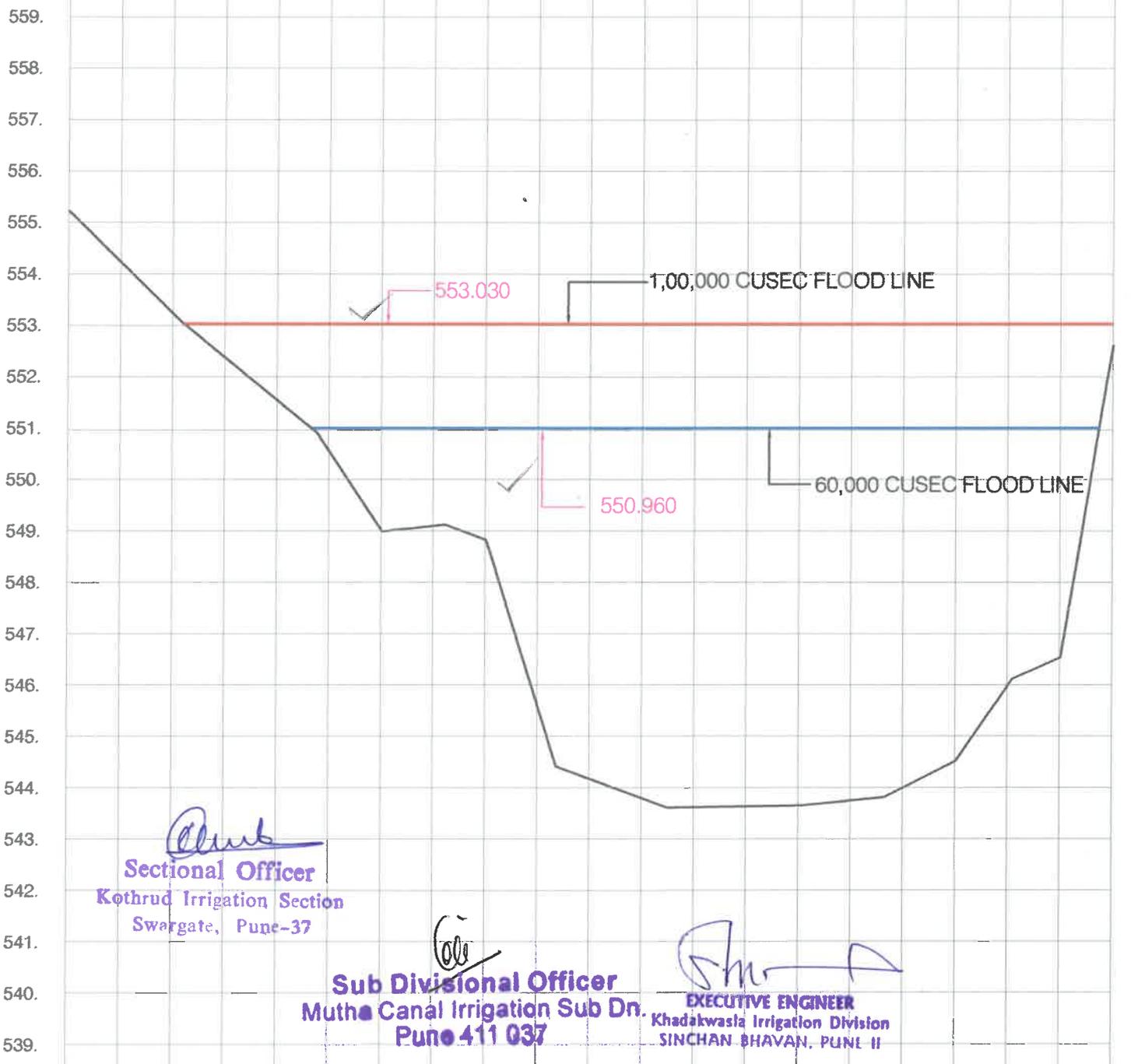
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn,
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwala Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	554.960	553.801	552.642	551.467	550.262	549.504	549.076	549.000	548.760	548.684	547.540	544.960	542.250	542.194	542.137	542.110	542.140	544.297	545.922	547.458	550.090	552.750
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.20	120.10	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE
CH 9+720**



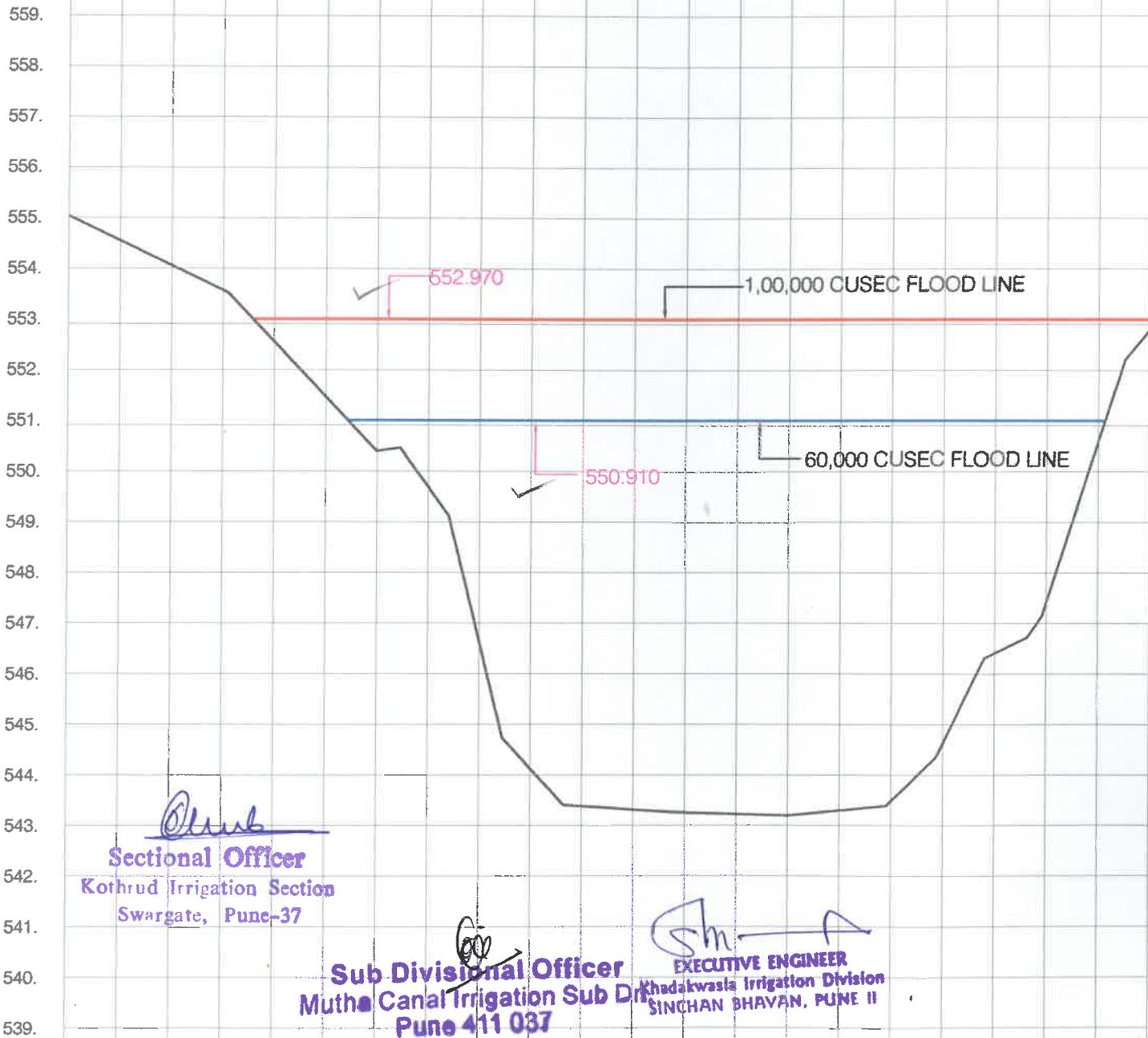
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

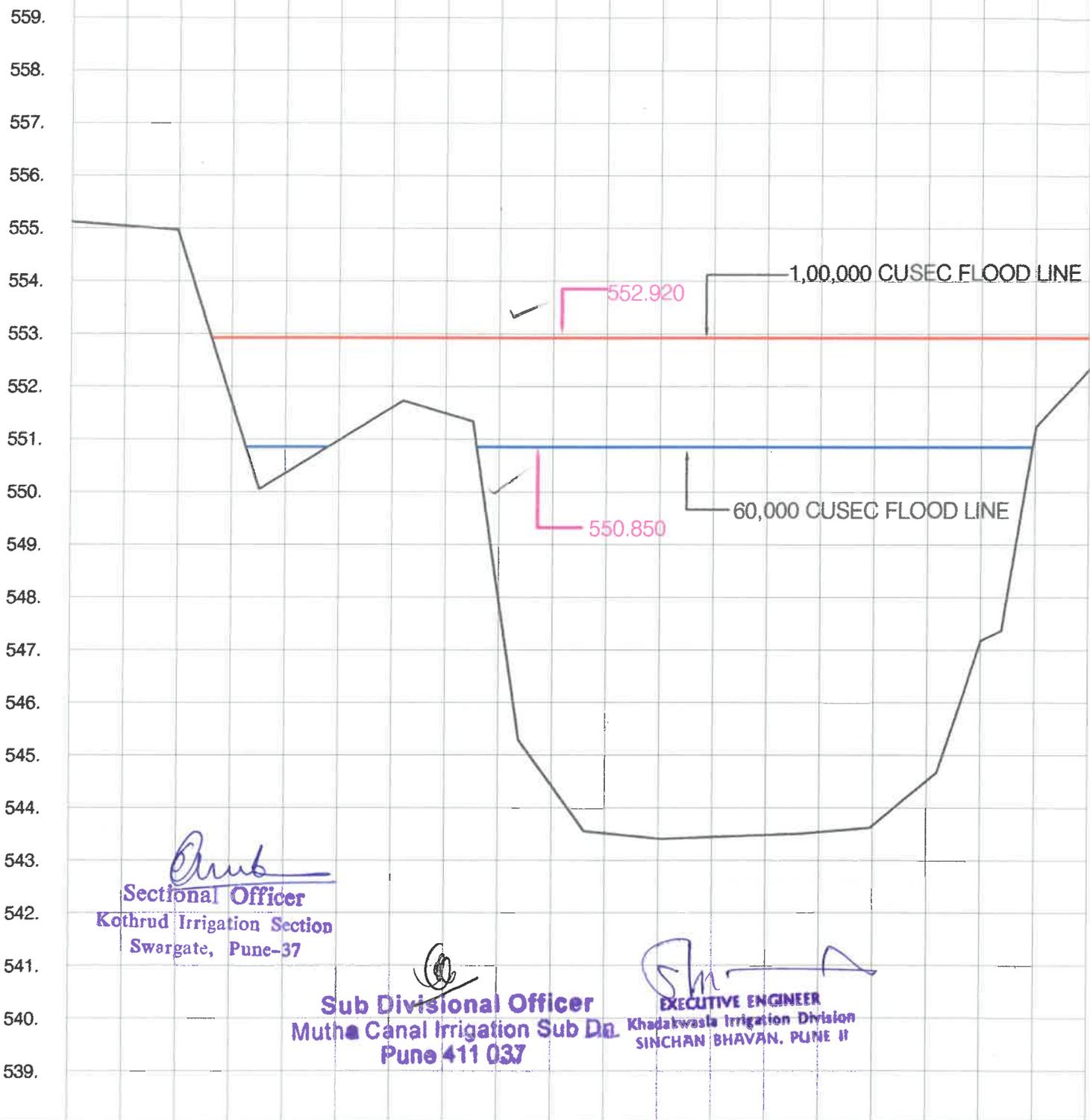
LEVELS	555.210	554.215	553.219	552.362	551.531	550.531	548.995	549.086	548.810	545.576	544.160	543.784	543.608	543.624	543.639	543.735	543.985	544.500	545.977	546.525	552.600
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.10	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE
CH 9+750



LEVELS	555.020	554.531	554.043	553.554	552.417	551.217	550.350	550.181	546.584	544.105	543.366	543.299	543.243	543.217	543.190	543.290	543.480	544.637	546.412	547.428	550.609	552.815
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	59.80	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.05	150.00	160.00	170.00	180.00	190.00	200.00	210.00

**CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE
CH 9+780**



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

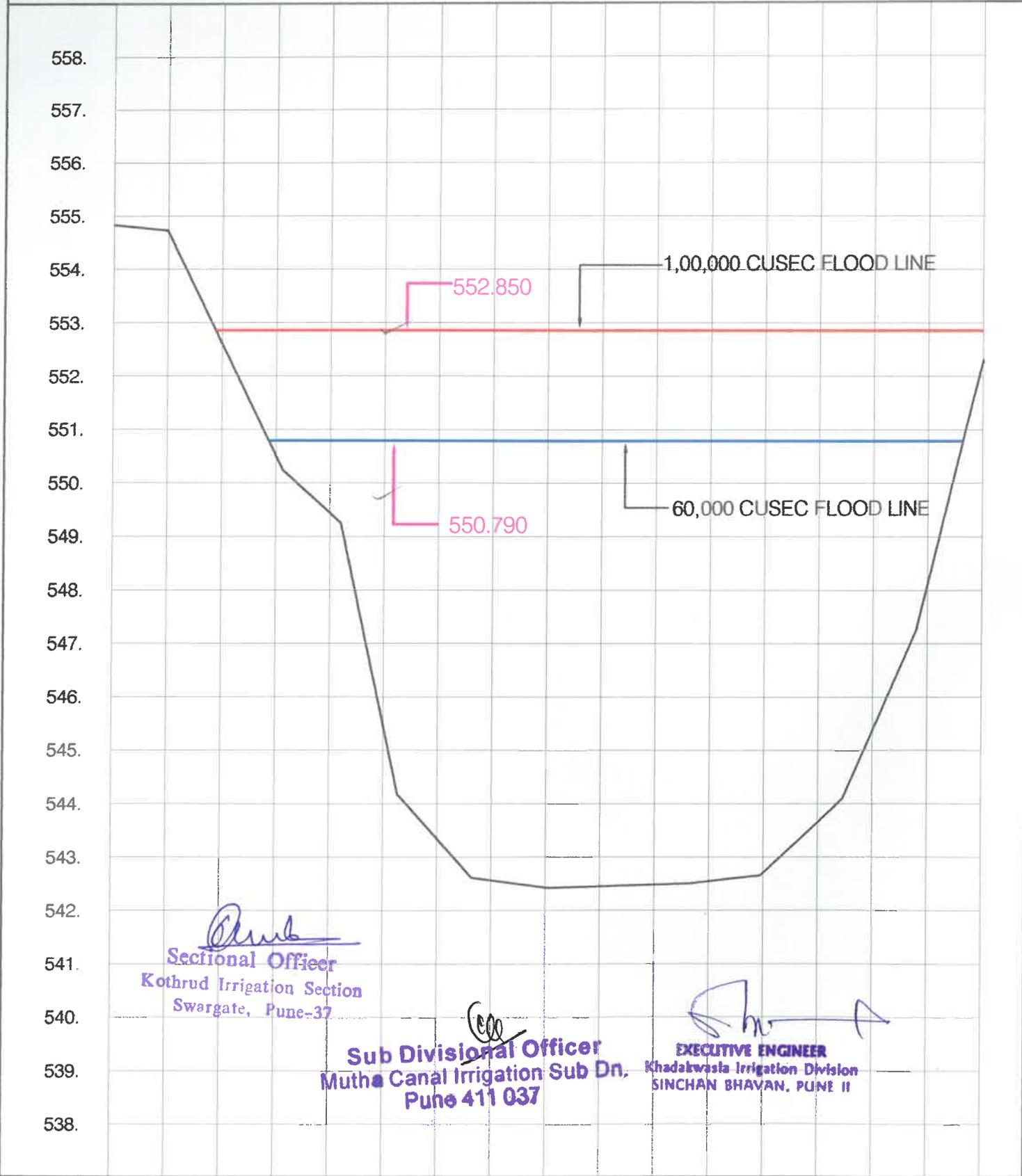
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dg.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	555.110	555.034	554.864	551.669	550.347	550.974	551.601	551.479	547.873	544.399	543.502	543.404	543.437	543.475	543.529	543.661	544.509	547.170	551.230	552.310
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.10	190.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TO MHATRE BRIDGE

CH 9+810



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

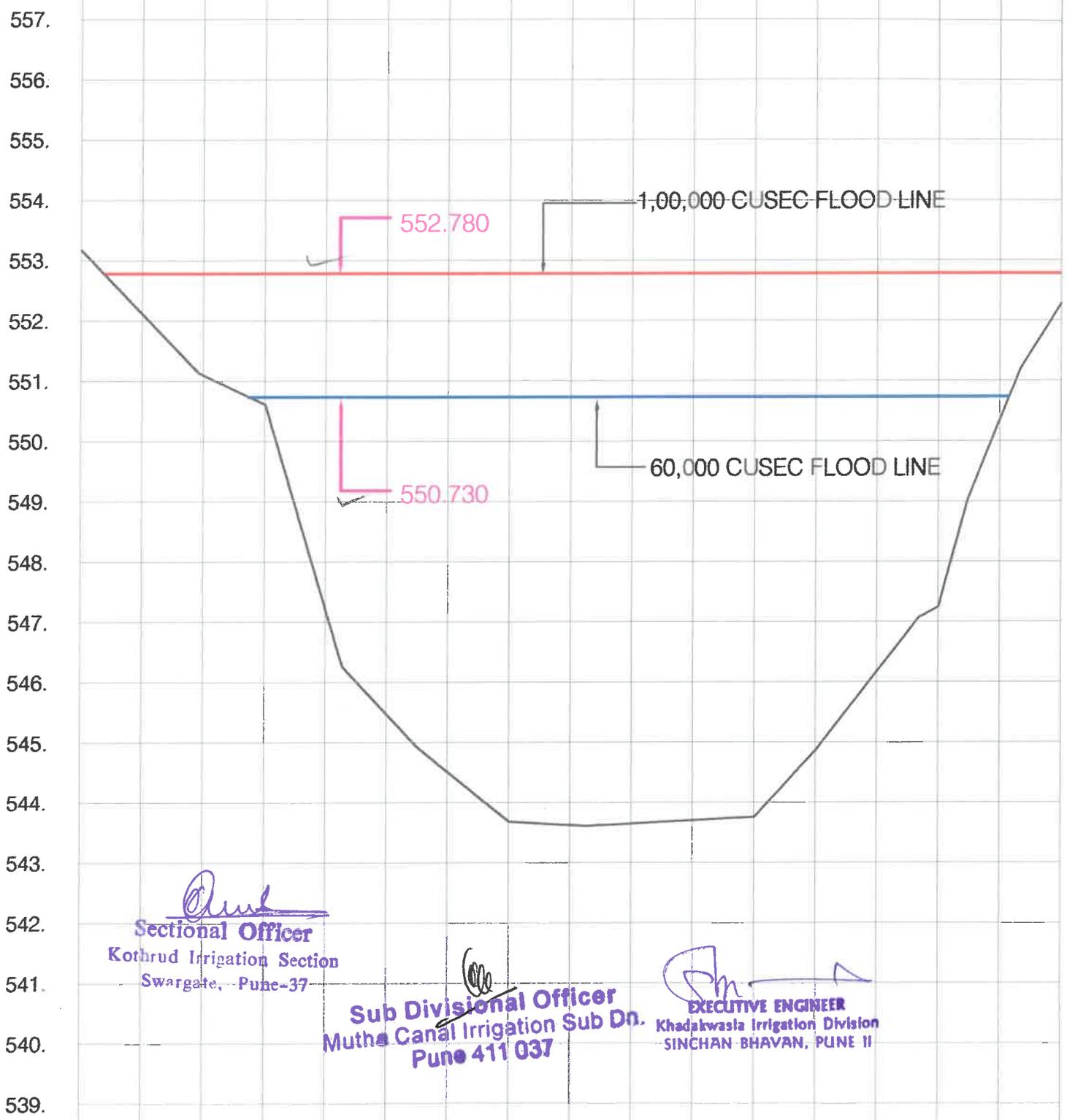
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn,
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	554.820	554.678	552.580	550.482	549.424	545.404	543.328	542.552	542.417	542.443	542.478	542.541	542.707	543.620	545.383	548.120	552.290
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	129.70	140.00	150.00	160.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE

CH 9+840



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

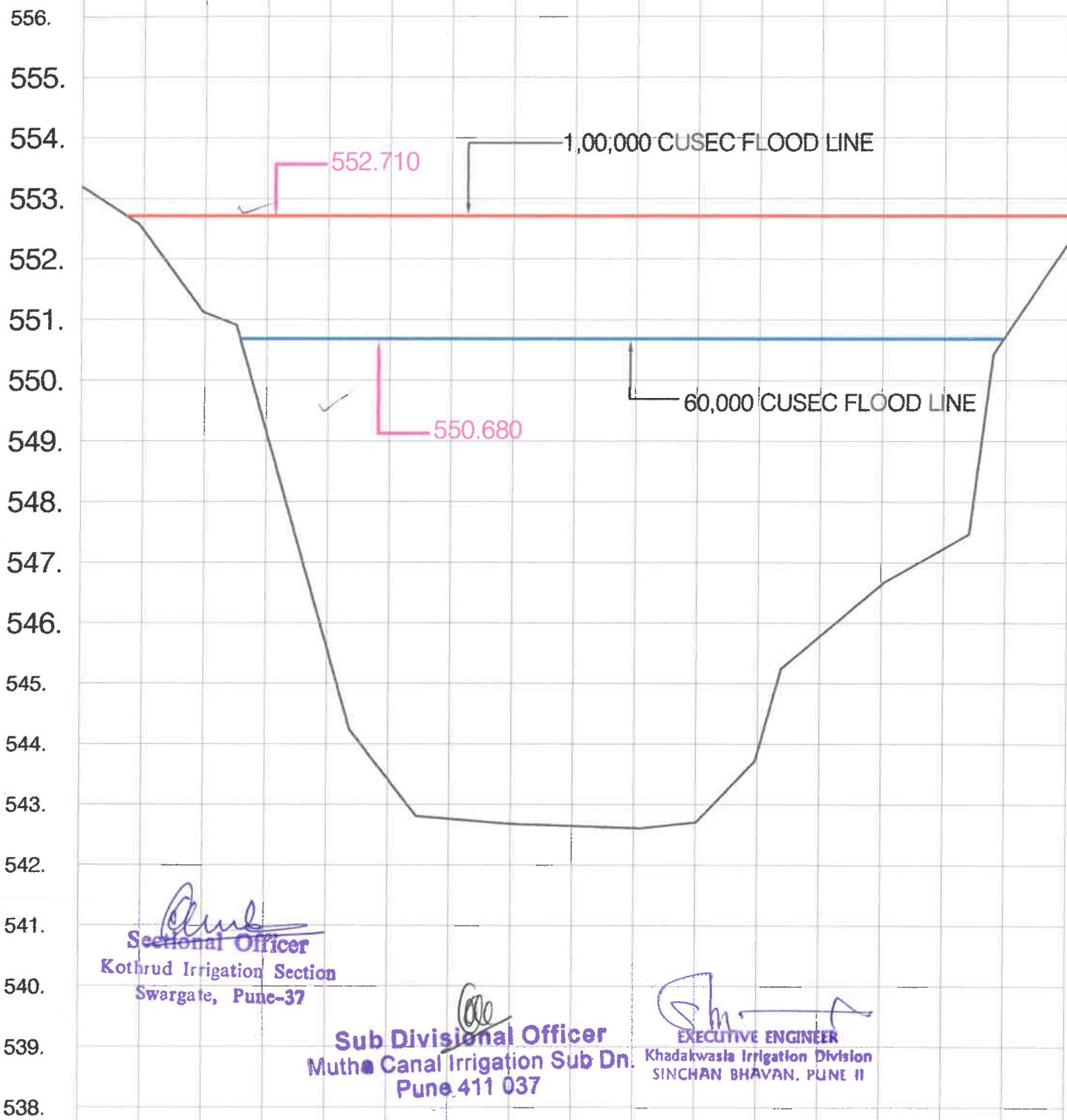
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	553.160	552.097	551.081	550.600	547.175	545.455	544.496	543.670	543.614	543.641	543.695	543.750	544.860	546.170	547.240	550.357	552.280
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	159.70

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE

CH 9+870



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

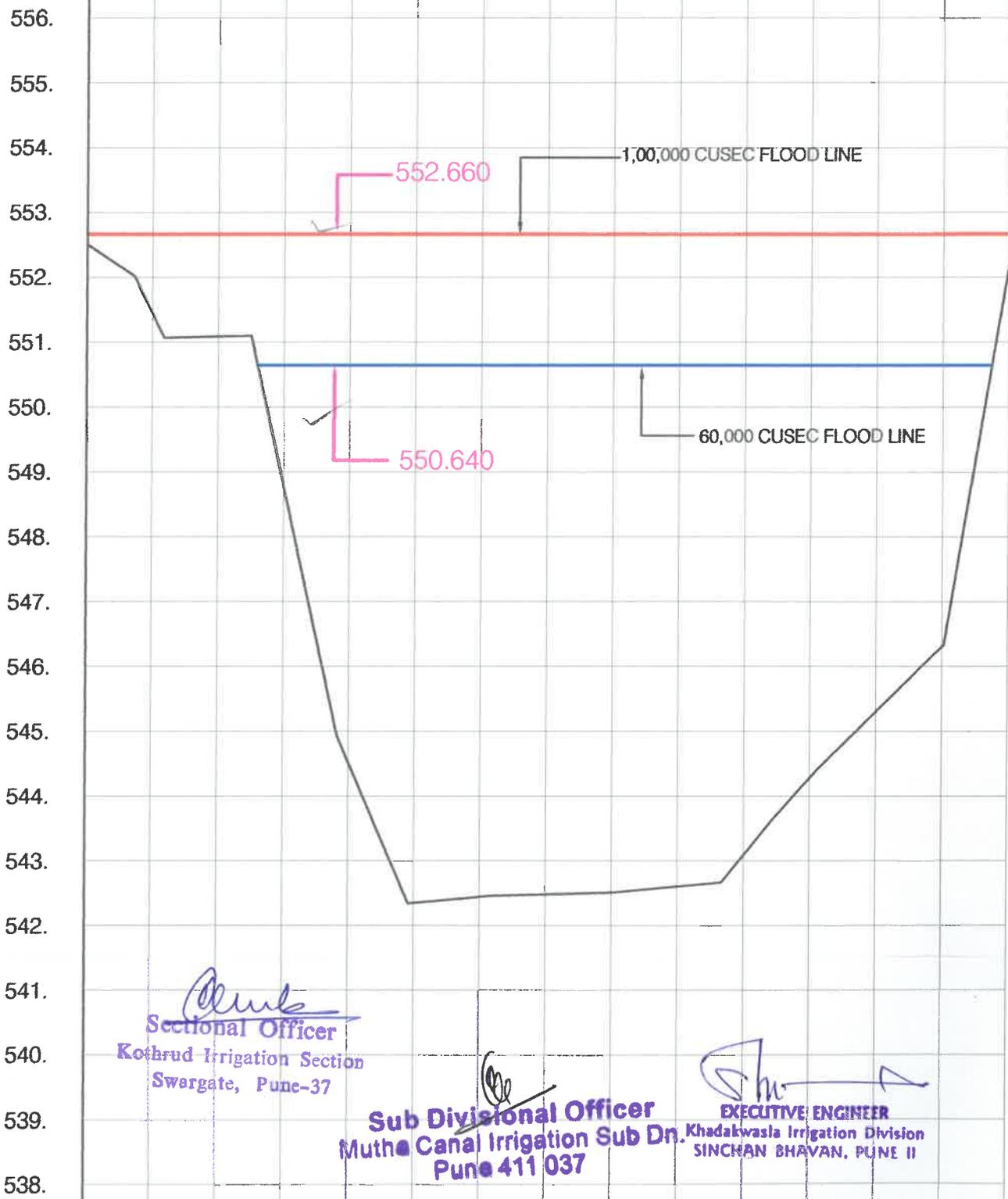
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	552.500	552.446	551.104	549.117	545.550	543.403	542.755	542.670	542.637	542.603	542.699	543.892	545.779	546.634	547.222	550.555	552.260
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.05	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRE BRIDGE

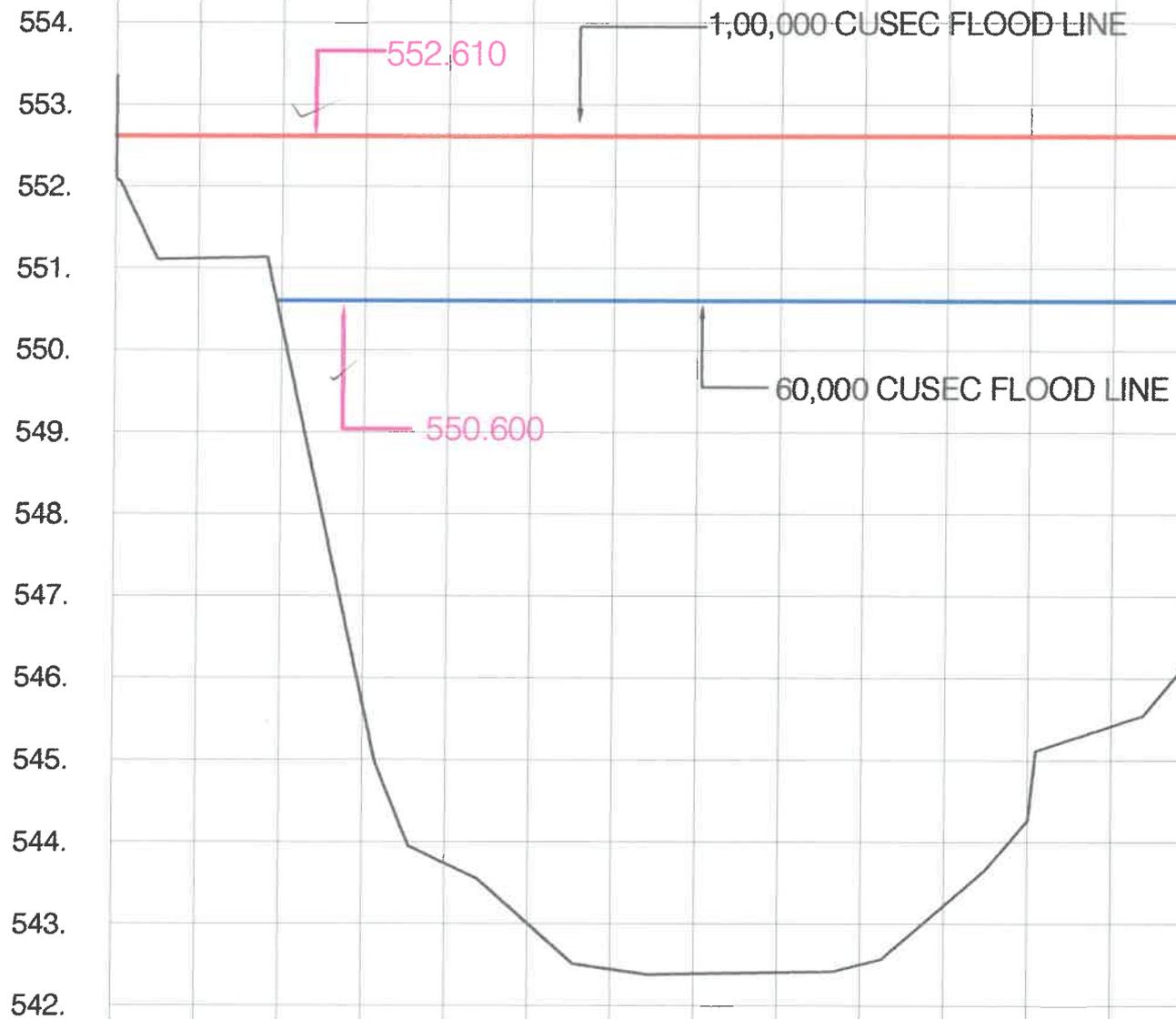
CH 9+900



LEVELS	552.500	551.419	551.079	548.724	544.492	542.339	542.435	542.473	542.500	542.596	543.088	544.285	545.305	546.310	552.220
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRA BRIDGE

CH 9+930



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

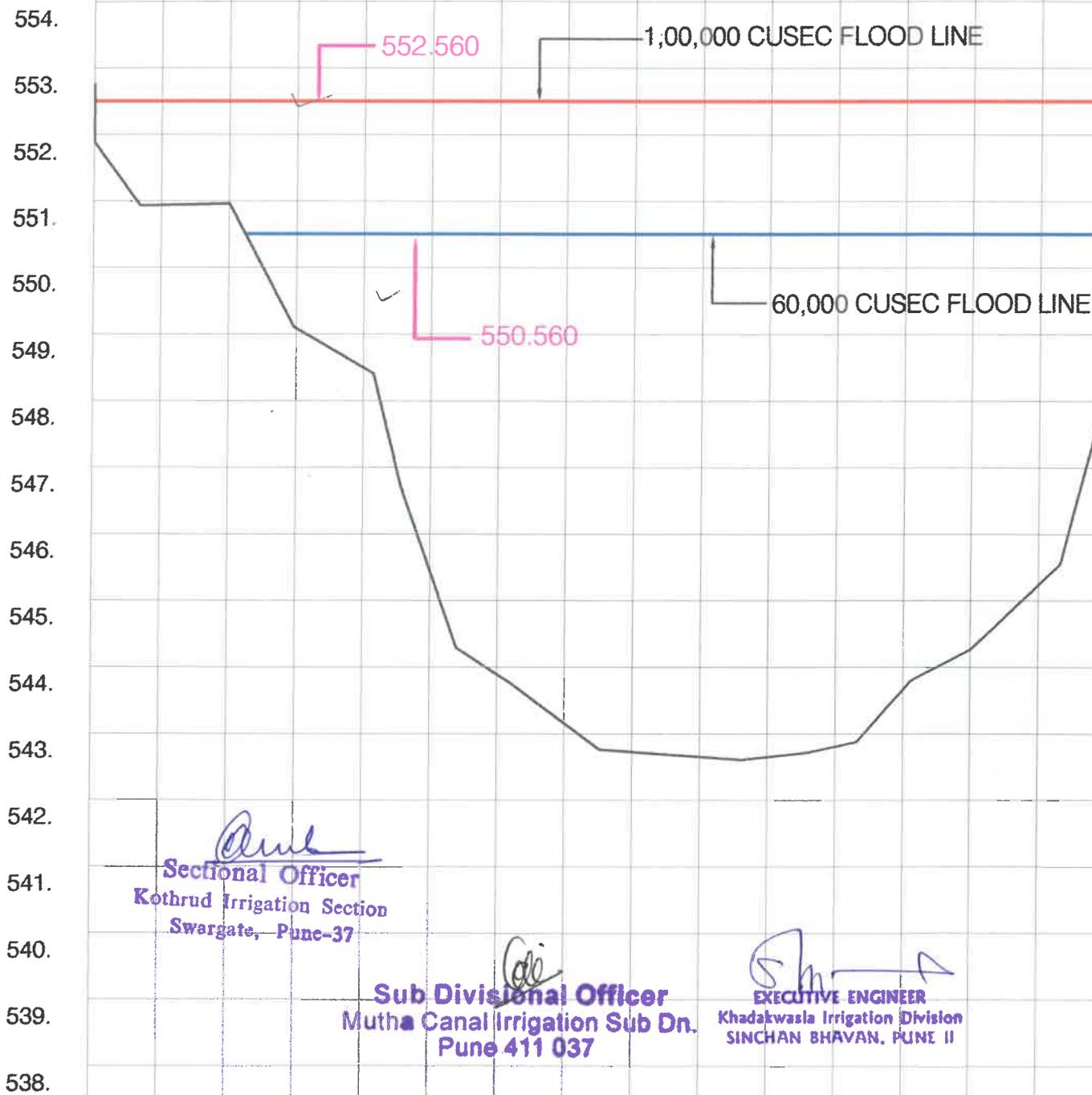
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Division
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE II

LEVELS	552.080	551.105	550.280	545.640	543.728	542.991	542.434	542.380	542.398	542.496	543.219	544.260	545.413	546.310	552.180
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.10	139.85

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRA BRIDGE

CH 9+960



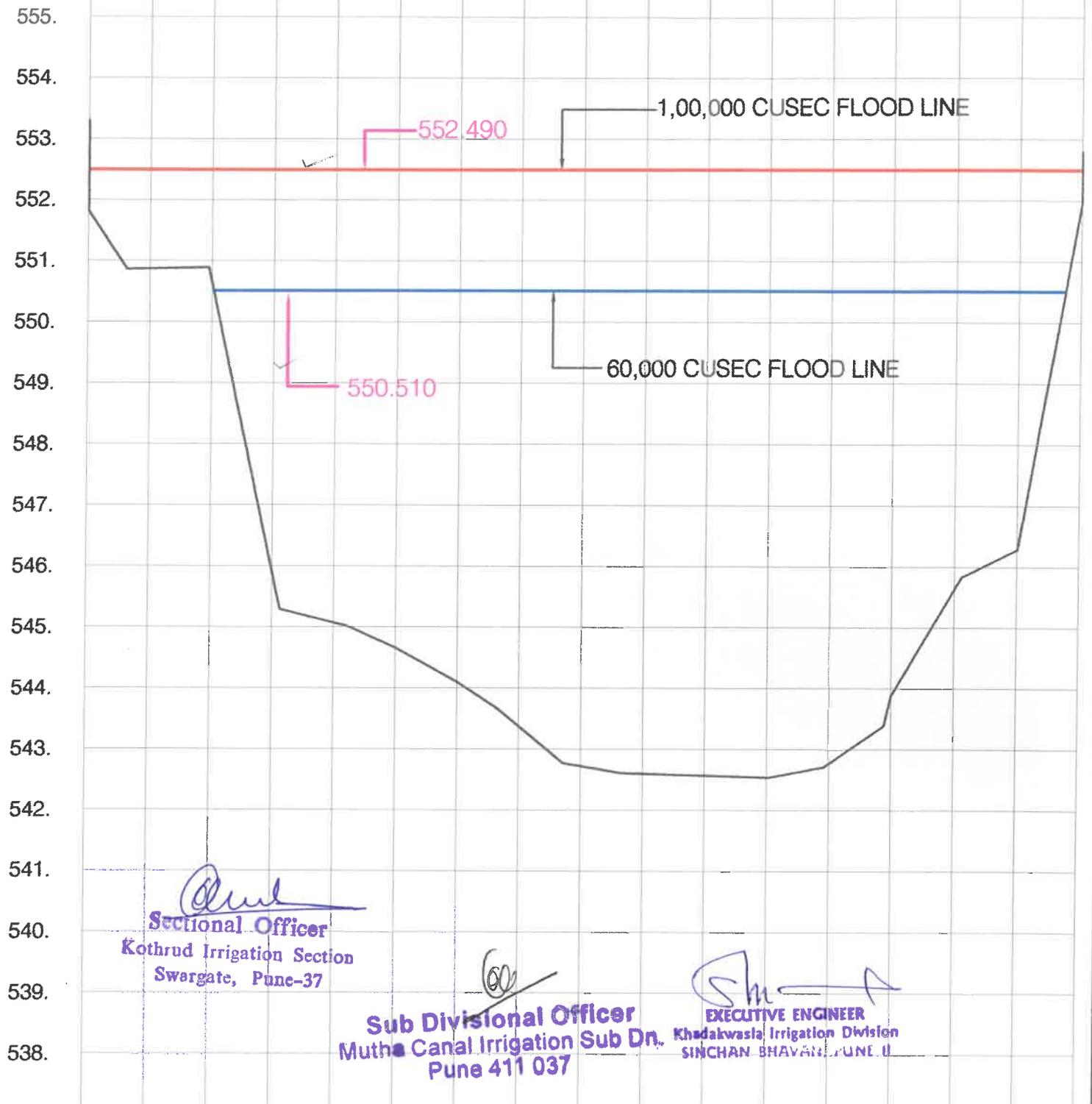
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.870	550.925	550.950	549.076	548.483	545.413	543.878	543.141	542.715	542.644	542.643	542.800	543.665	544.260	545.237	547.796	552.140
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRA BRIDGE
CH 9+990



[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

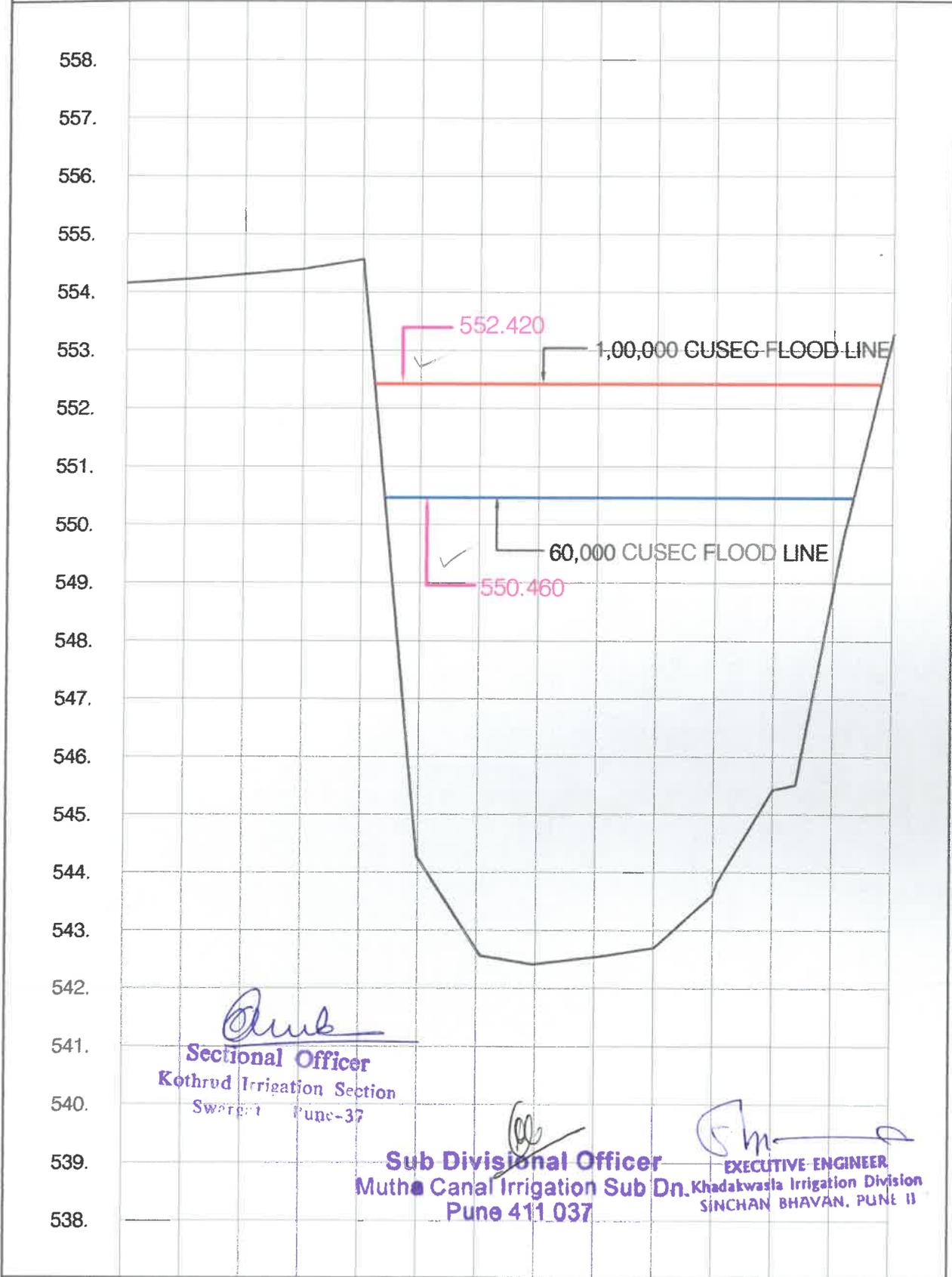
[Signature]
Sub Divisional Officer
Mutha Canal Irrigation Sub Dn.
Pune 411 037

[Signature]
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

LEVELS	551.800	550.860	550.600	545.850	545.062	544.650	544.083	543.357	542.710	542.589	542.560	542.531	542.763	543.887	545.638	546.280	551.950
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00

CROSS SECTION OF MUTHA RIVER BETWEEN RAJARAM BRIDGE TOMHATRA BRIDGE

CH 10+020



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargat Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn. Khadakwasla Irrigation Division
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 SINCHAN BHAVAN, PUNE II

LEVELS	554.140	554.211	554.300	554.390	554.560	544.270	542.645	542.407	542.530	542.690	543.600	545.420	548.854	553.270
CHAINAGE	0.00	10.00	20.00	29.90	40.00	49.70	60.00	70.00	80.00	90.05	99.90	110.00	120.00	125.90

... MUTHA RIVER ...

KHADAKWASLA TO KHARADI

CROSS SECTION

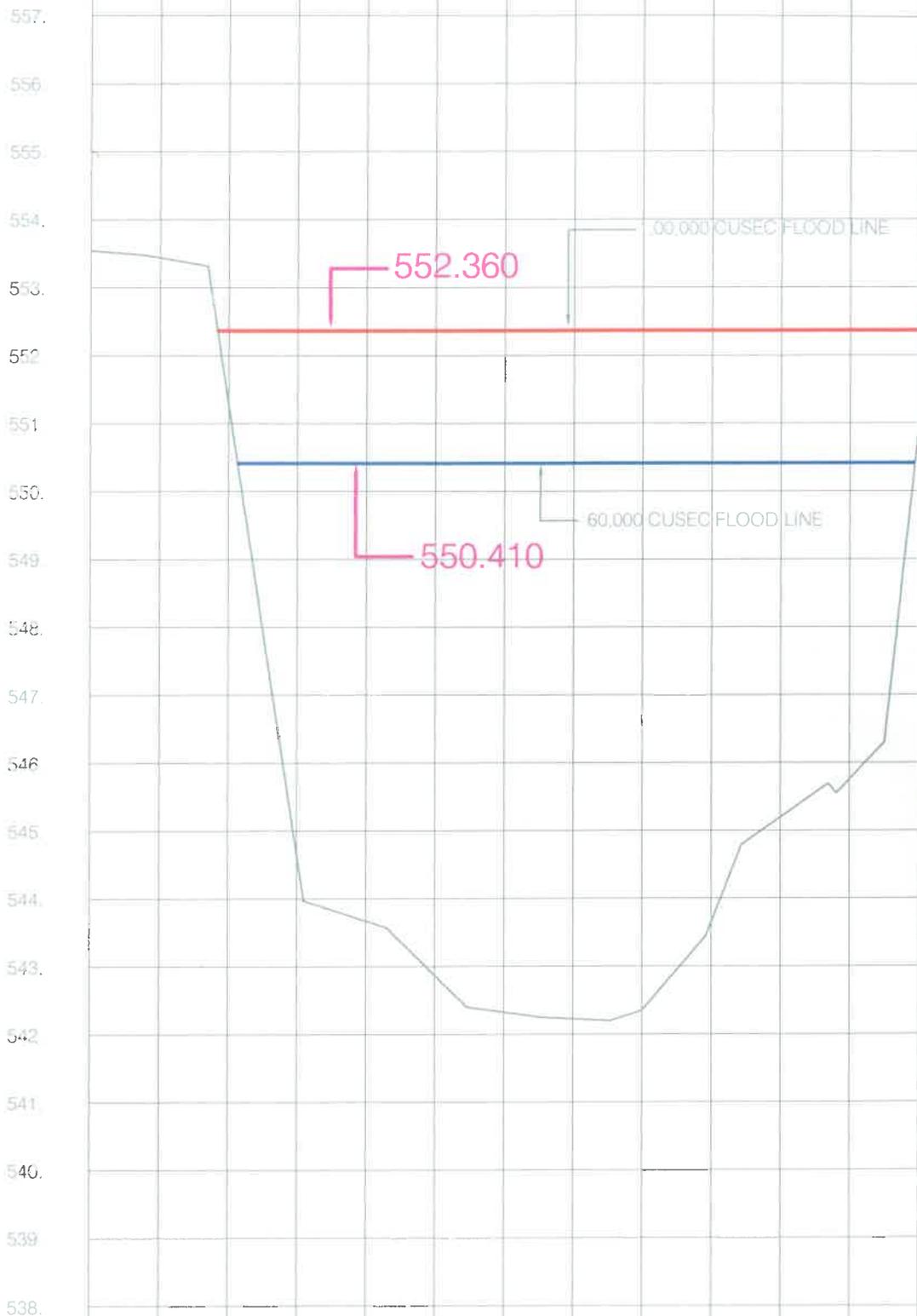
CH. 10/050 TO 12/000

CH. 10/050 TO 11/010

DISCHARGE	LINE	COLOUR	पूररेशा
1,00,000 CUSEC	RED LINE		नियंत्रक पूररेशा
60,000 CUSEC	BLUE LINE		निषेधक पूररेशा

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

CH 10+050



LEVELS	553.540	553.439	551.264	544.633	543.671	542.886	542.325	542.227	542.350	543.648	545.193	545.757	550.961
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00

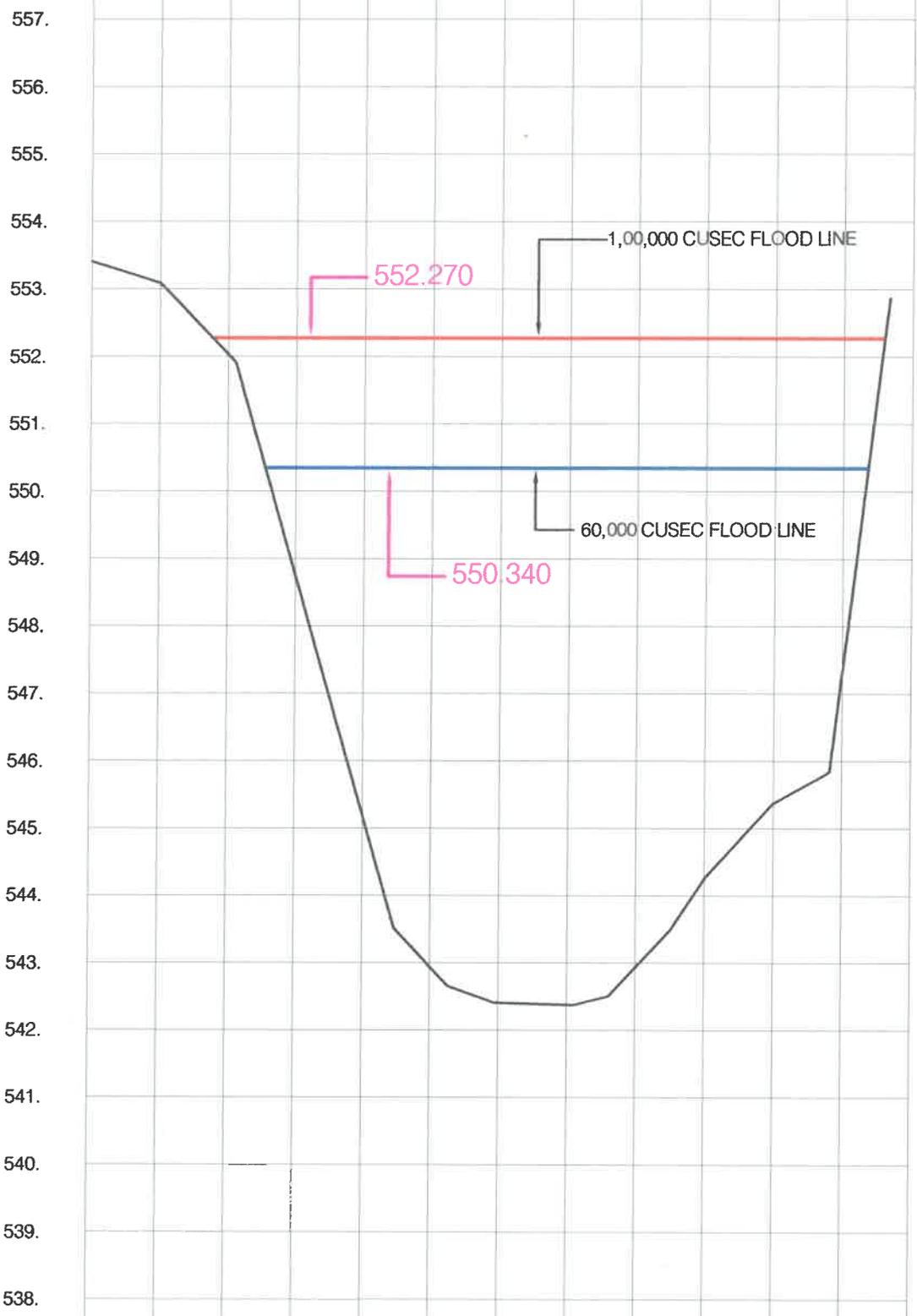
Prave
 Sectional Officer
 Kothrud Irrigation Section
 Sw. gate, Pune-37

Shri
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune-411 037

Shri
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE II

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

CH 10+080



LEVELS	553.400	553.080	552.017	548.796	545.181	542.933	542.398	542.373	542.929	544.245	545.360	547.326	551.400
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	99.90	110.00	114.90

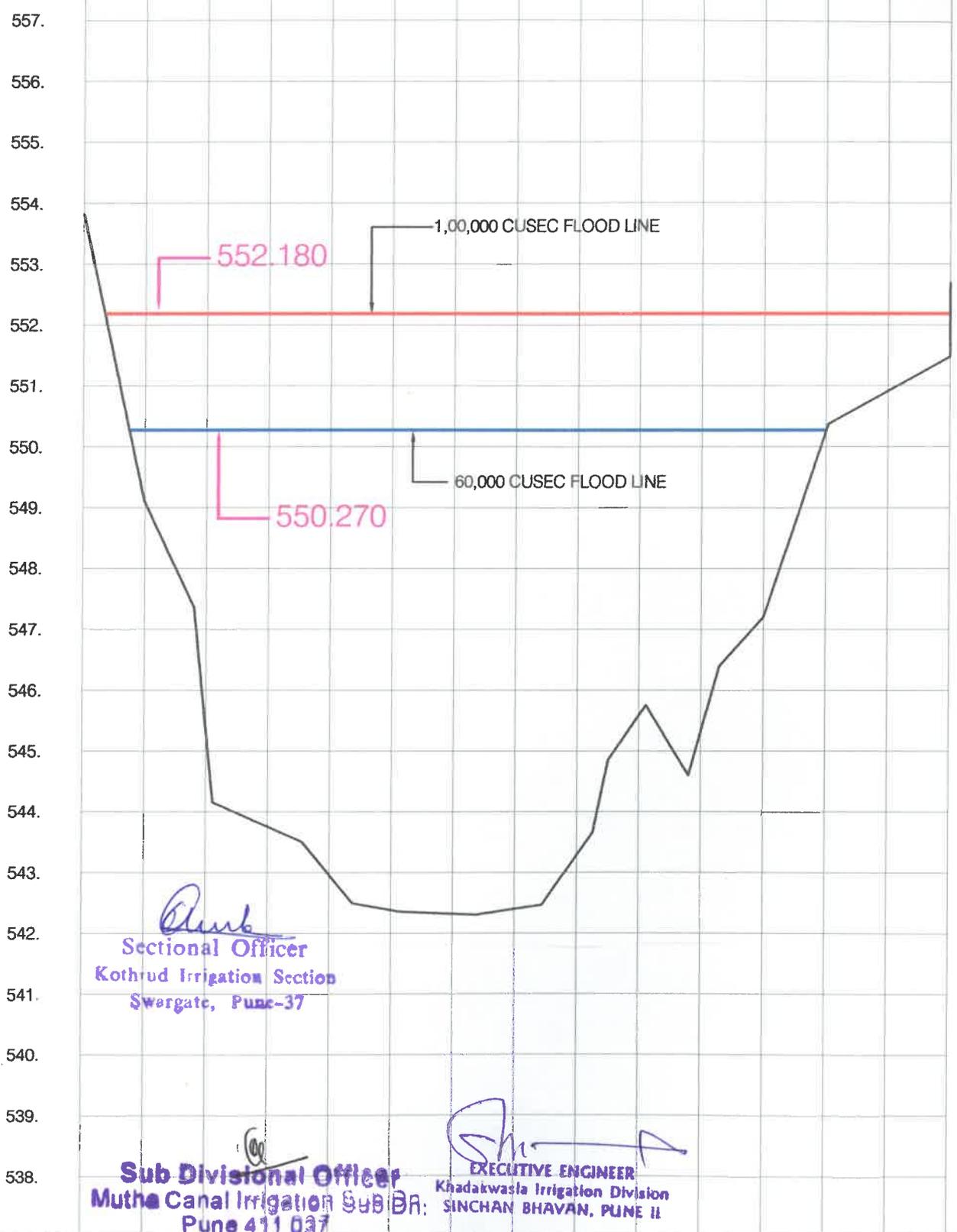
Sectional Officer
 Kothrud Irrigation Section
 Pune-37

Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINGHAN BHAVAN, PUNE II

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

CH 10+110



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

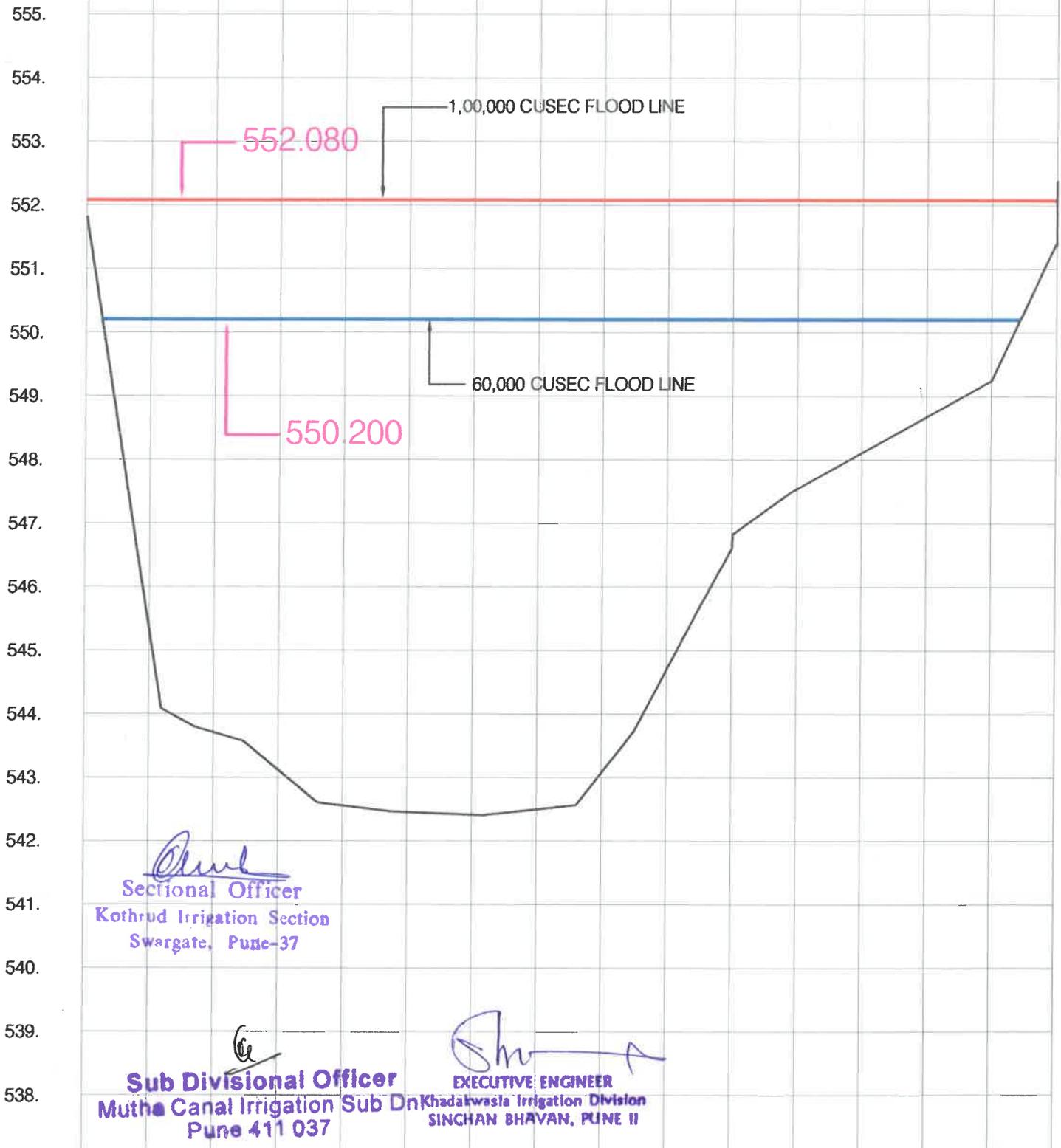
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub DA:
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	553.800	549.078	545.285	543.751	542.955	542.376	542.315	542.394	543.280	545.586	545.325	547.200	550.248	550.910	551.472
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00

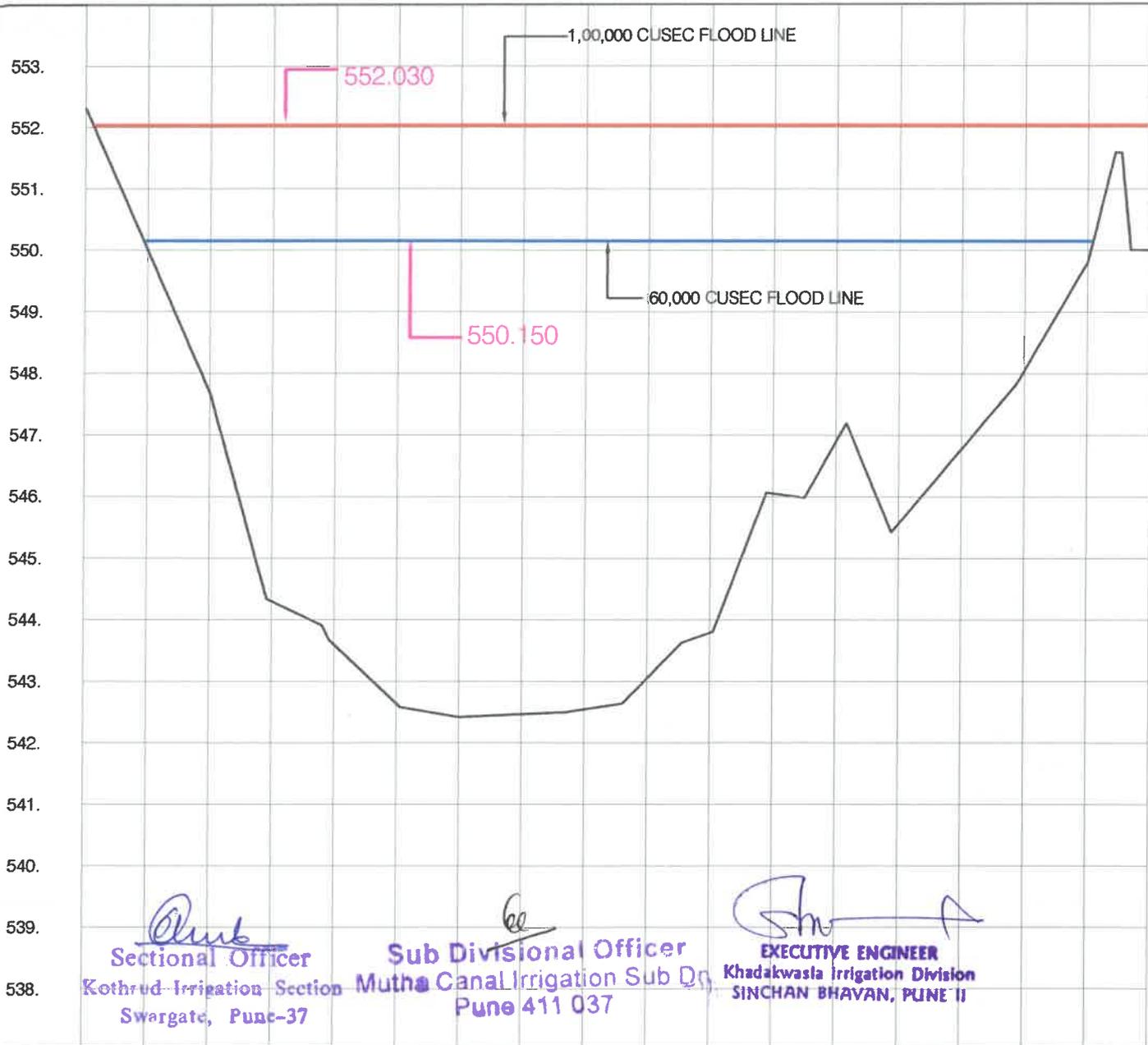
CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

CH 10+140



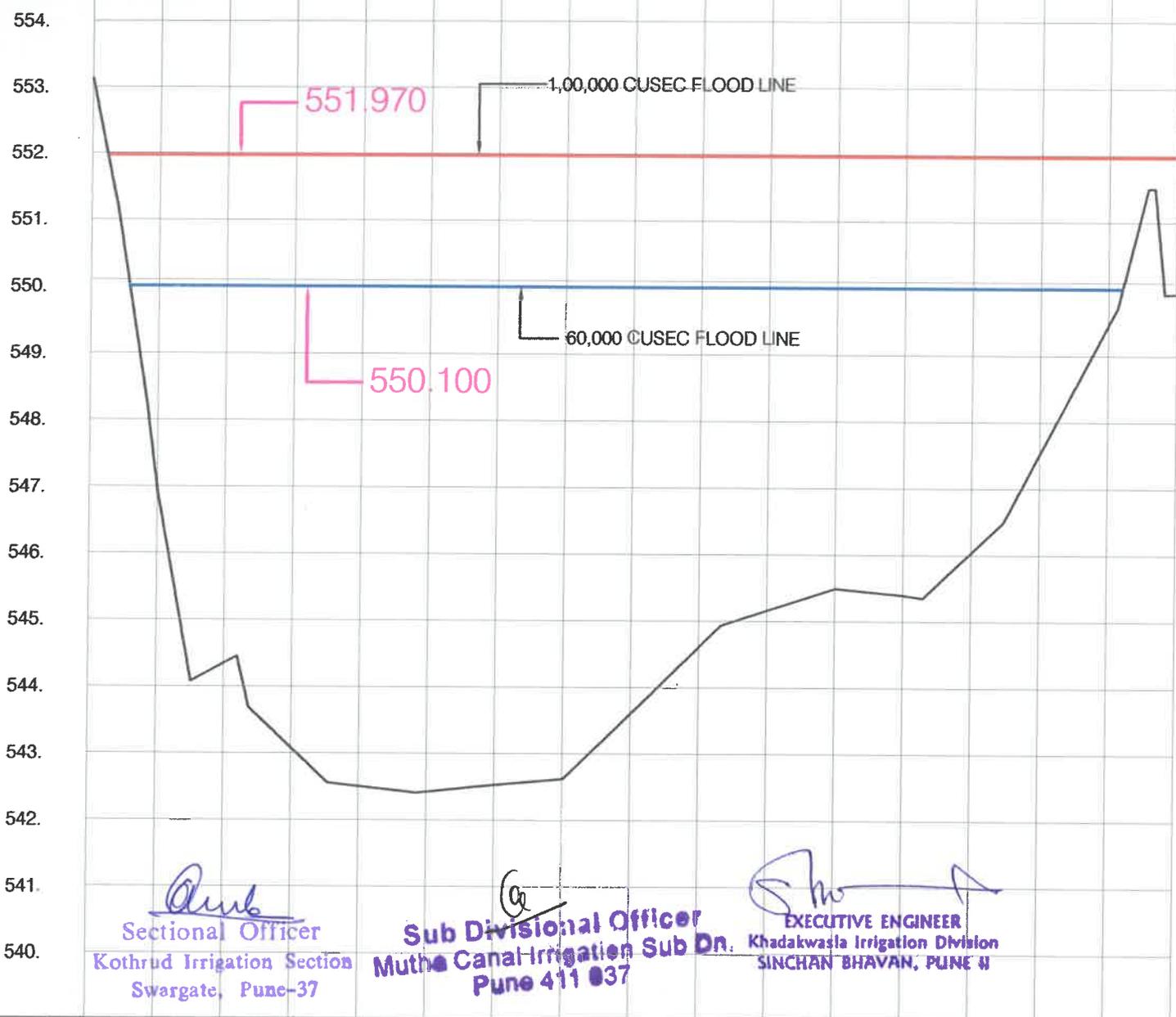
LEVELS	551.810	545.314	543.705	543.115	542.553	542.450	542.407	542.492	543.068	544.695	546.601	547.463	548.100	548.670	549.239	551.380
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+170



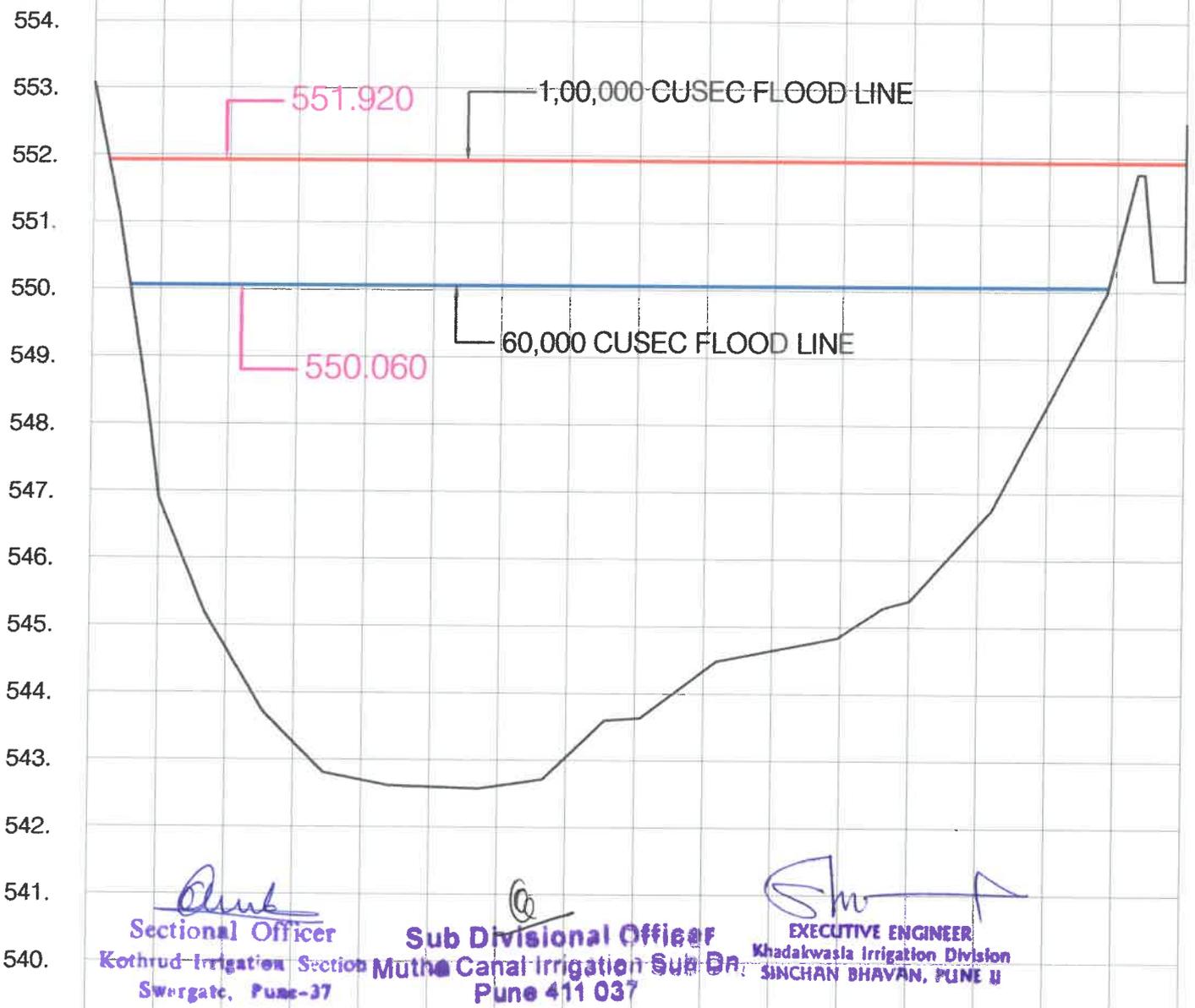
LEVELS	552.295	549.985	547.670	544.291	543.584	542.627	542.410	542.457	542.535	543.041	543.784	546.046	546.897	545.559	546.770	548.050	549.800	551.585
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	163.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+200



LEVELS	546.930	544.344	543.072	542.498	542.416	542.521	542.609	543.595	544.606	545.157	545.490	545.390	546.033	547.515	549.455	551.495
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	147.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+230



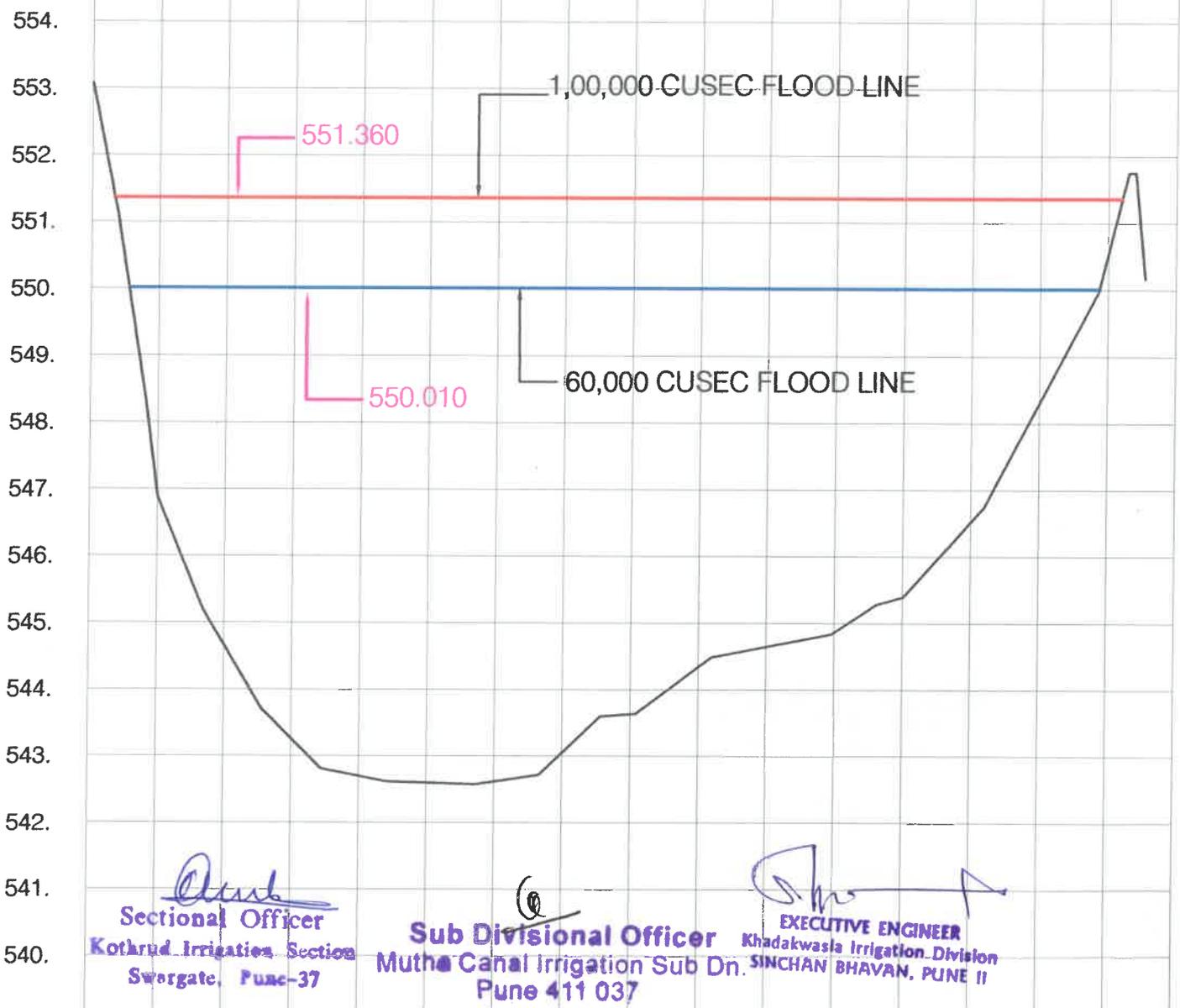
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub-Div.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

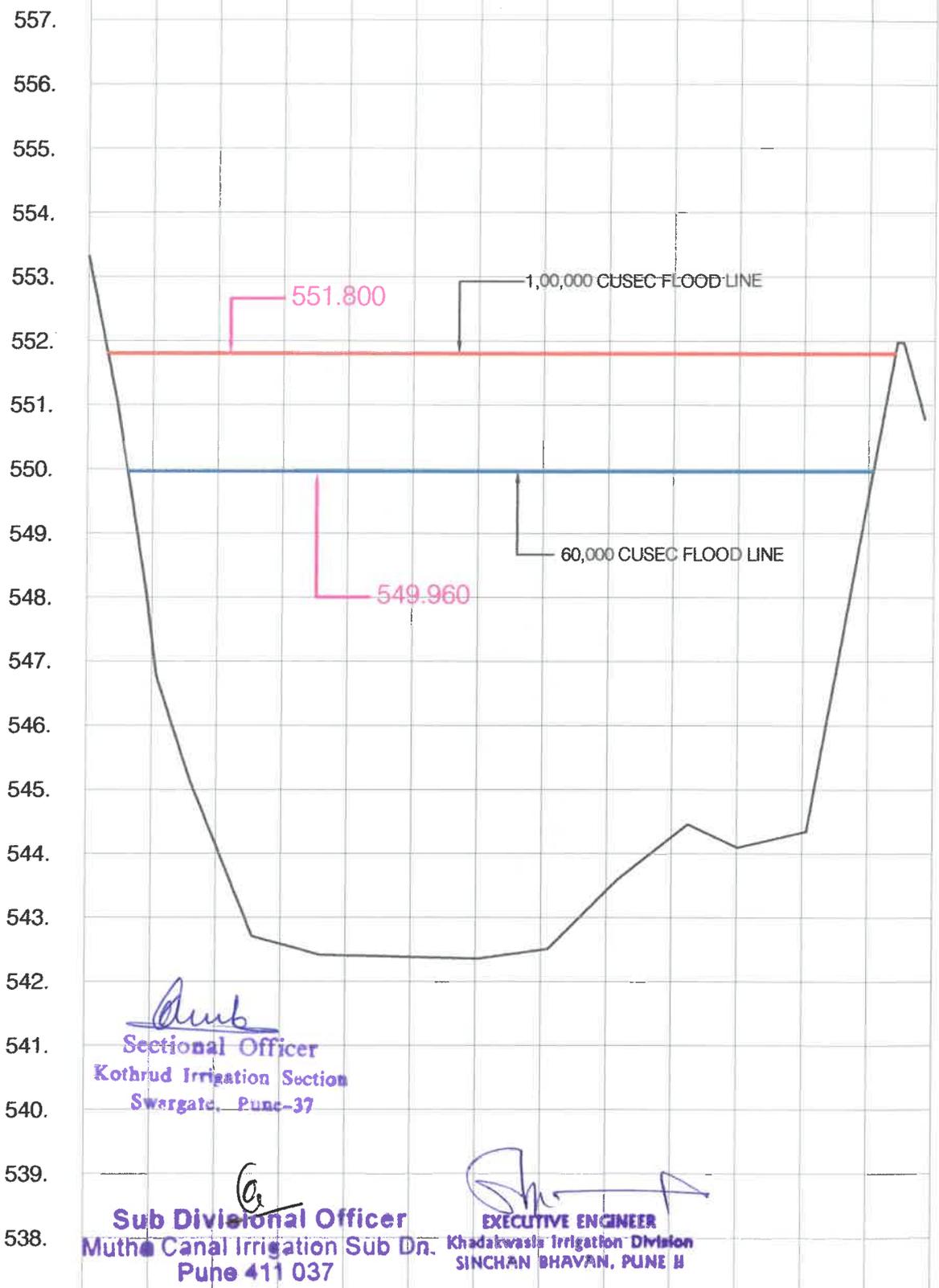
LEVELS	546.880	544.648	543.250	542.690	542.592	542.611	543.042	543.624	544.335	544.640	544.830	545.387	546.514	548.300	550.450	551.745
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	99.60	110.00	120.00	130.00	140.00	150.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+260



LEVELS	546.880	544.648	543.250	542.690	542.592	542.611	543.042	543.624	544.335	544.640	544.830	545.387	546.514	548.300	550.450	551.745
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	99.60	110.00	120.00	130.00	140.00	150.00

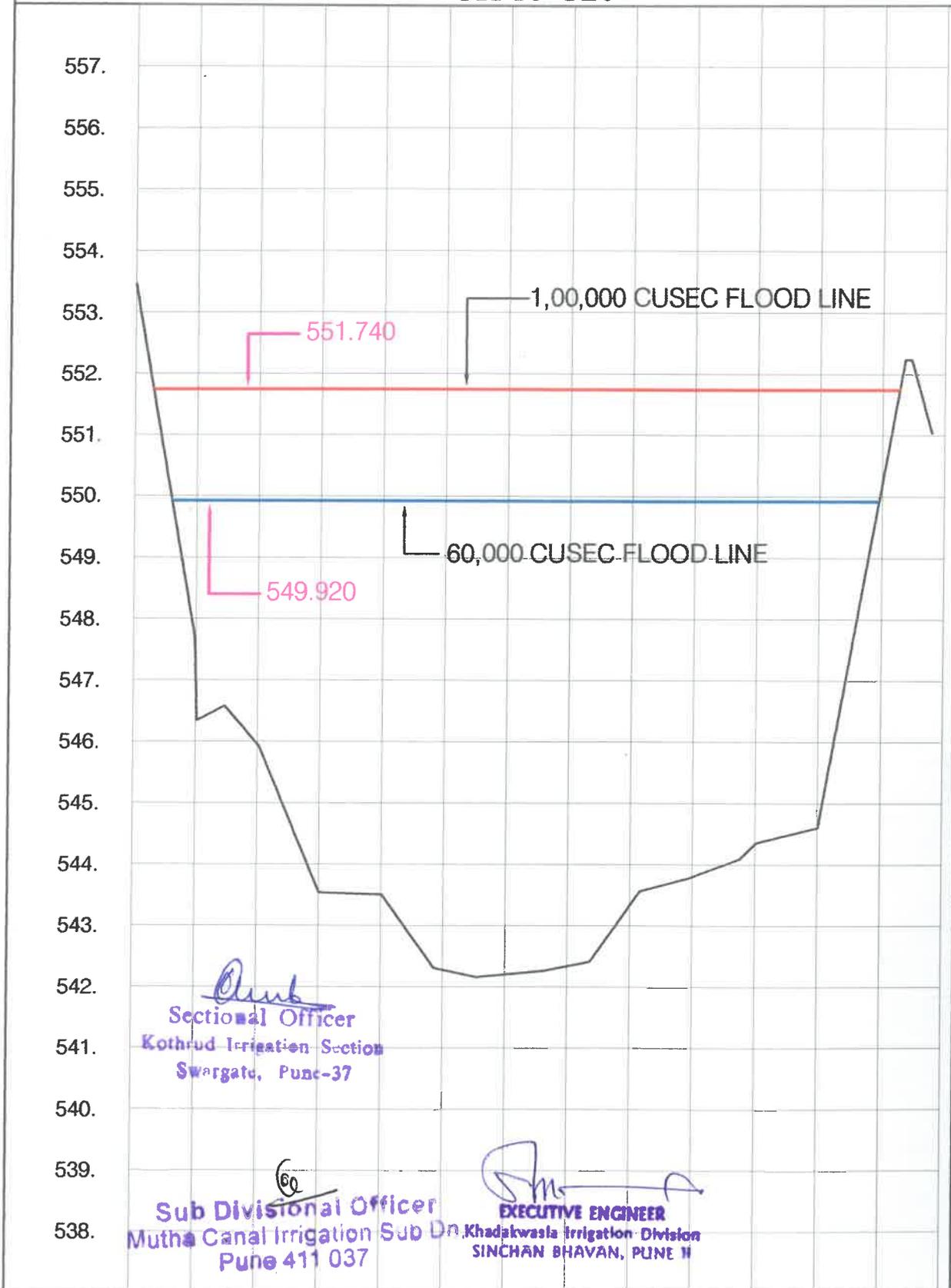
CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+290



LEVELS	553.310	547.334	544.109	542.578	542.400	542.376	542.350	542.485	543.415	544.254	544.090	544.325	549.605	550.770
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.40	70.00	80.00	90.00	100.10	110.00	120.00	130.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

CH 10+320



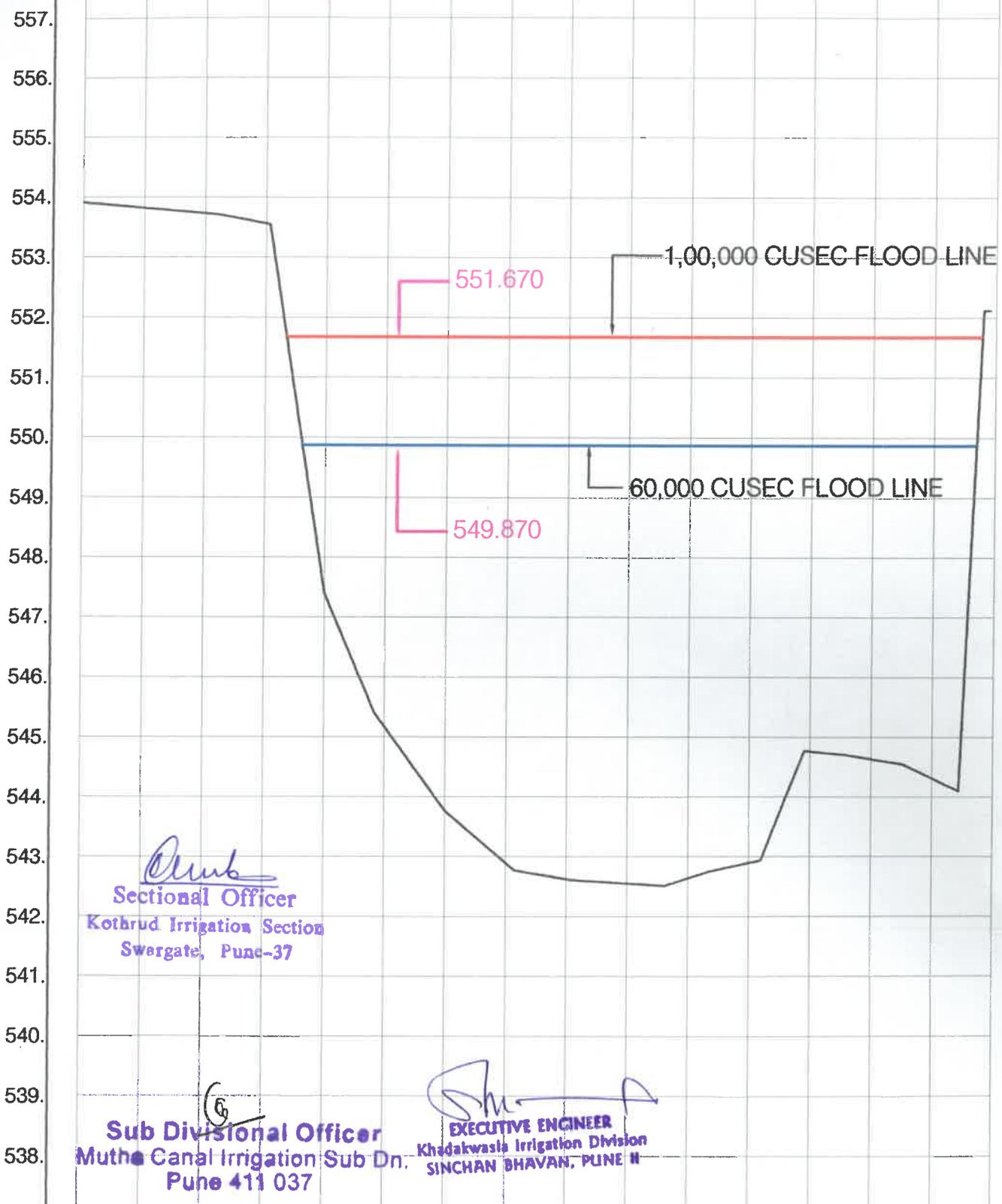
LEVELS	553.450	547.010	545.943	543.530	543.500	542.269	542.193	542.328	543.328	543.799	544.350	544.600	550.203
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.10	110.05	120.00

Sub
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

Sub
Sub Divisional Officer
 Mutha Canal Irrigation Sub Divn.
 Pune 411 037

Sm
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+350



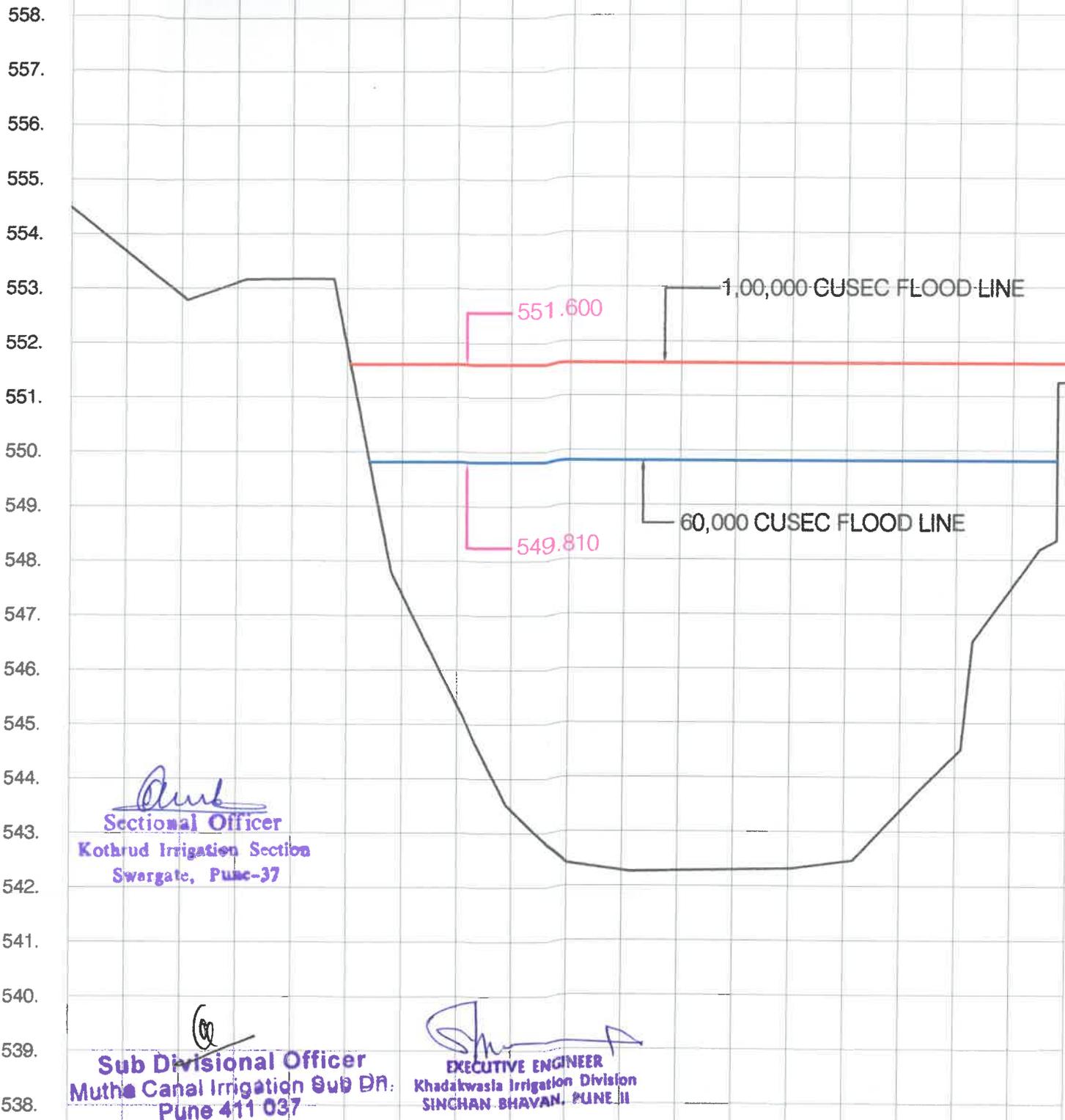
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swergate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	553.900	553.811	553.721	553.552	547.400	545.152	543.750	542.882	542.610	542.539	542.628	542.888	544.751	544.624	544.302	552.110
CHAINAGE	0.00	10.00	20.00	30.00	39.95	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	149.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+380



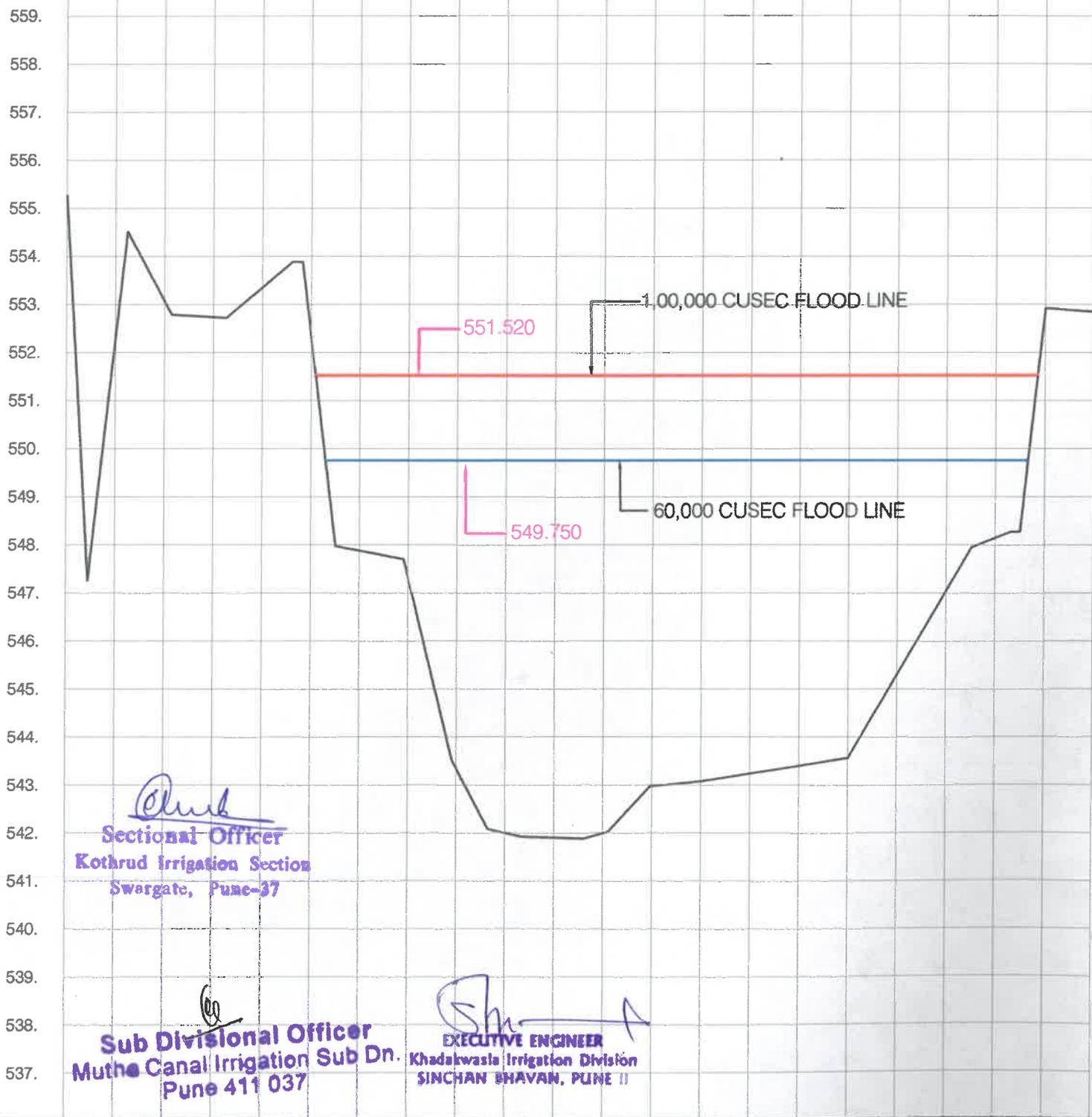
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Div.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINGHAN BHAVAN, PUNE III

LEVELS	554.470	553.660	552.851	553.093	553.155	551.881	547.372	545.396	543.411	542.410	542.270	542.268	542.288	542.309	542.438	543.363	544.399	547.476	551.240
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.10	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	179.01

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+410



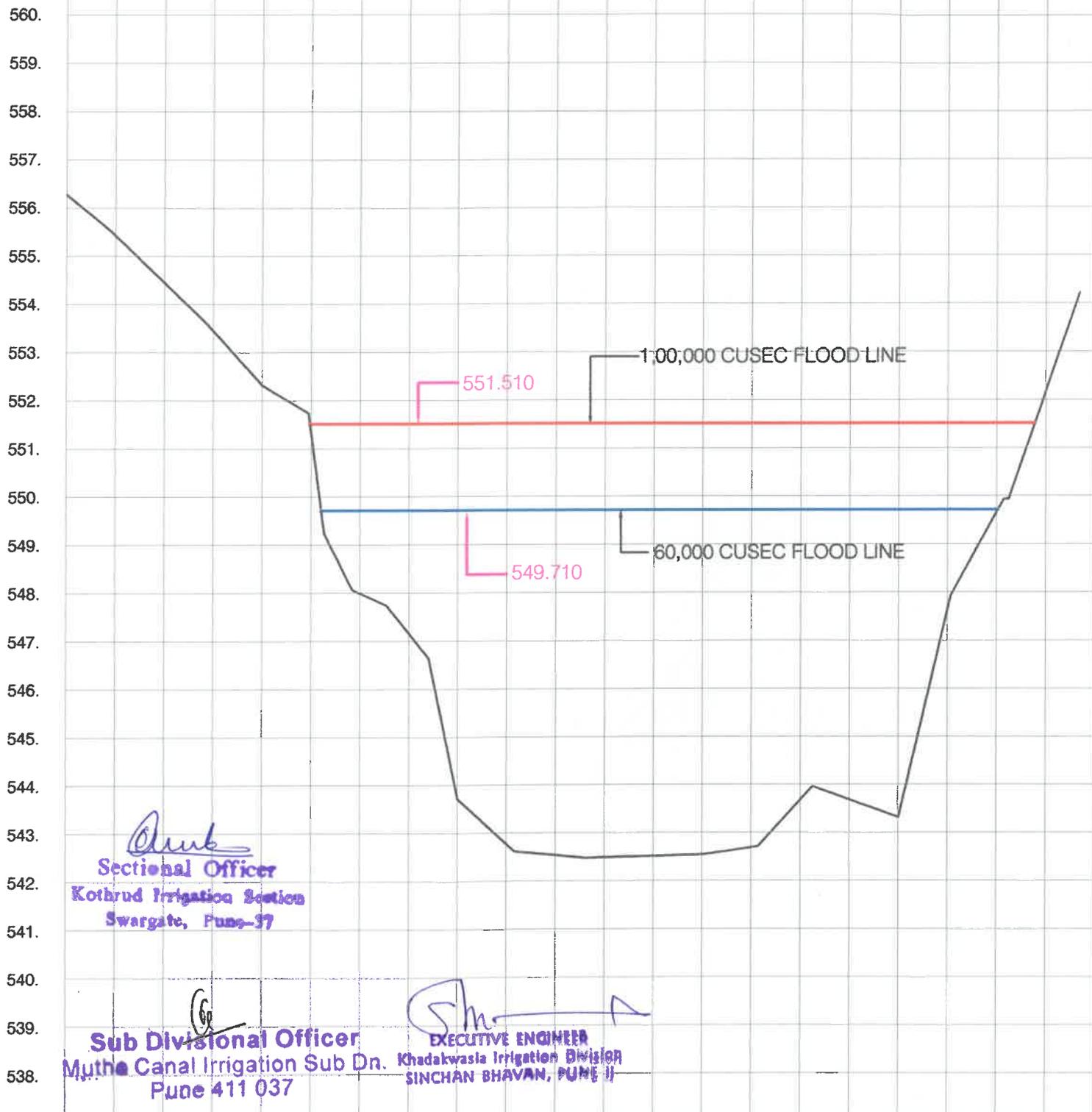
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	555.250	552.322	553.039	552.724	553.346	552.243	547.864	547.271	543.305	541.978	541.879	541.960	542.964	543.060	543.223	543.387	543.550	545.299	547.048	548.136	552.910	552.830
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+440



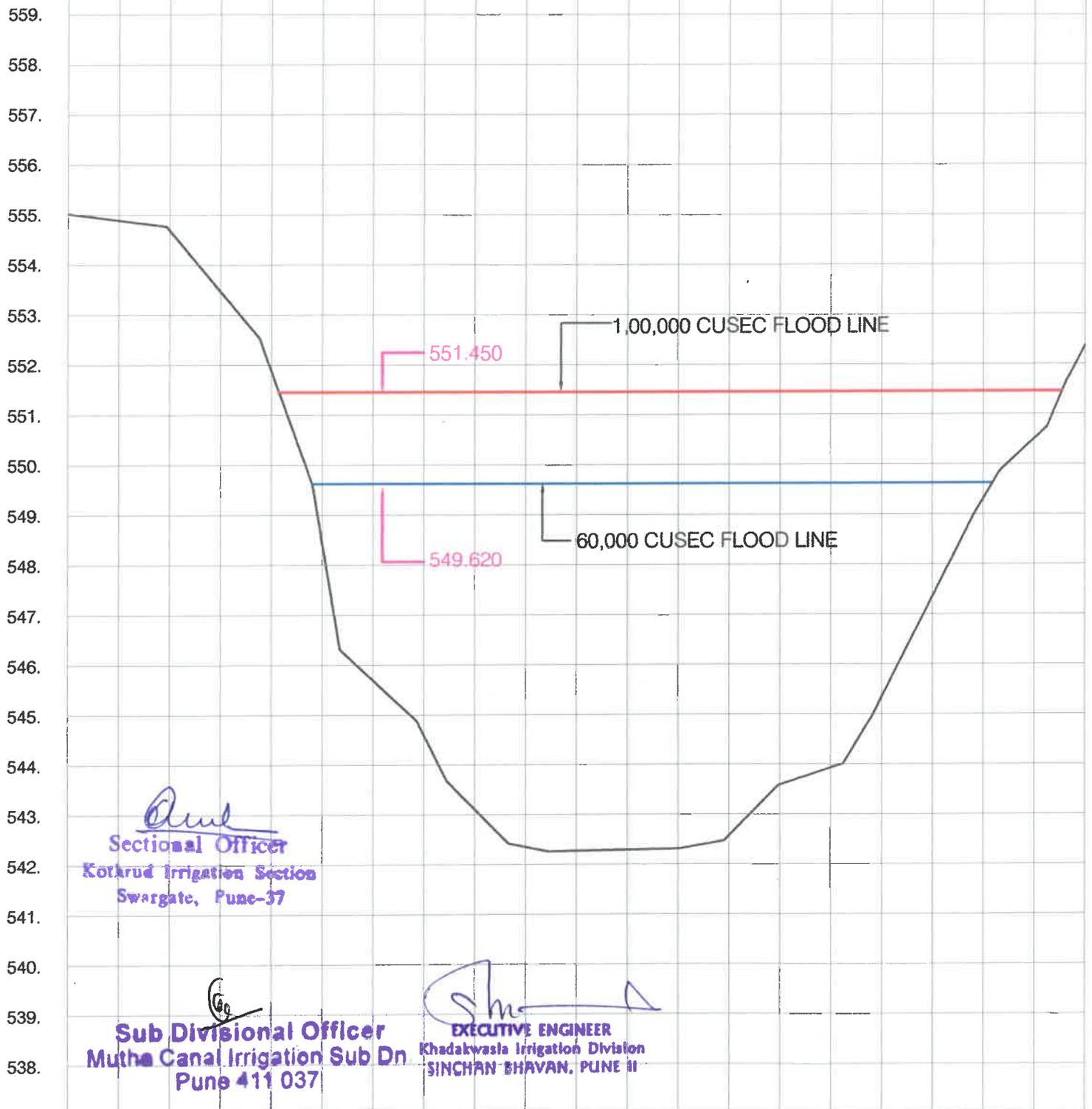
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasia Irrigation Division
 SINCHAN BHAVAN, PUNE II

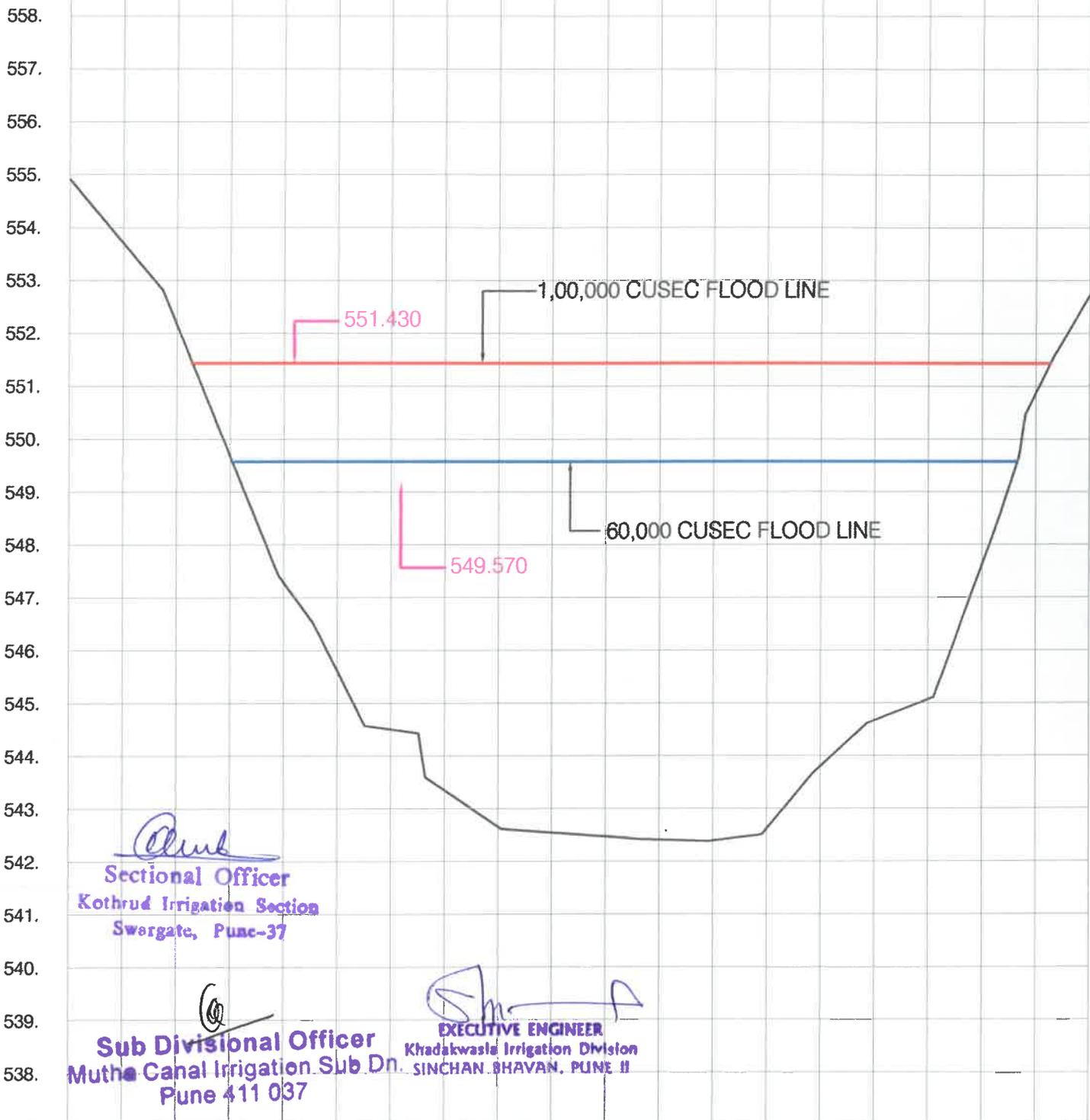
LEVELS	556.260	555.412	554.432	553.432	552.300	551.251	547.977	547.142	543.700	542.752	542.519	542.472	542.501	542.530	542.680	543.670	543.671	543.300	547.658	549.661	552.182	554.200
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.05	140.00	150.00	160.00	170.00	180.00	190.00	200.00	206.78

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+500



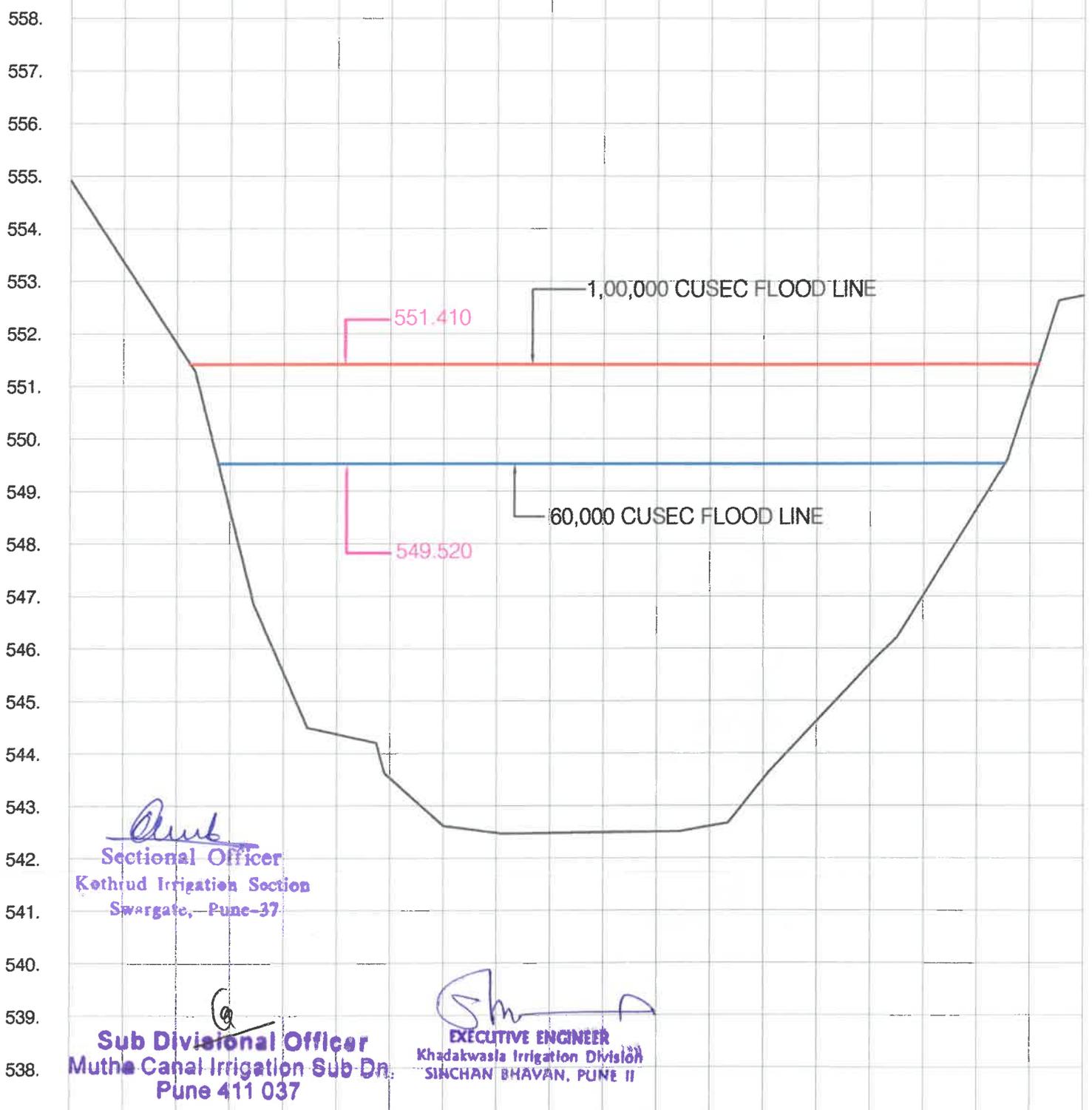
LEVELS	555.010	554.880	554.675	553.456	551.854	548.378	545.679	544.580	543.092	542.340	542.261	542.280	542.300	542.564	543.570	543.919	545.334	547.354	548.970	550.500	552.350
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	139.70	150.00	160.00	170.00	180.00	190.00	200.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+530



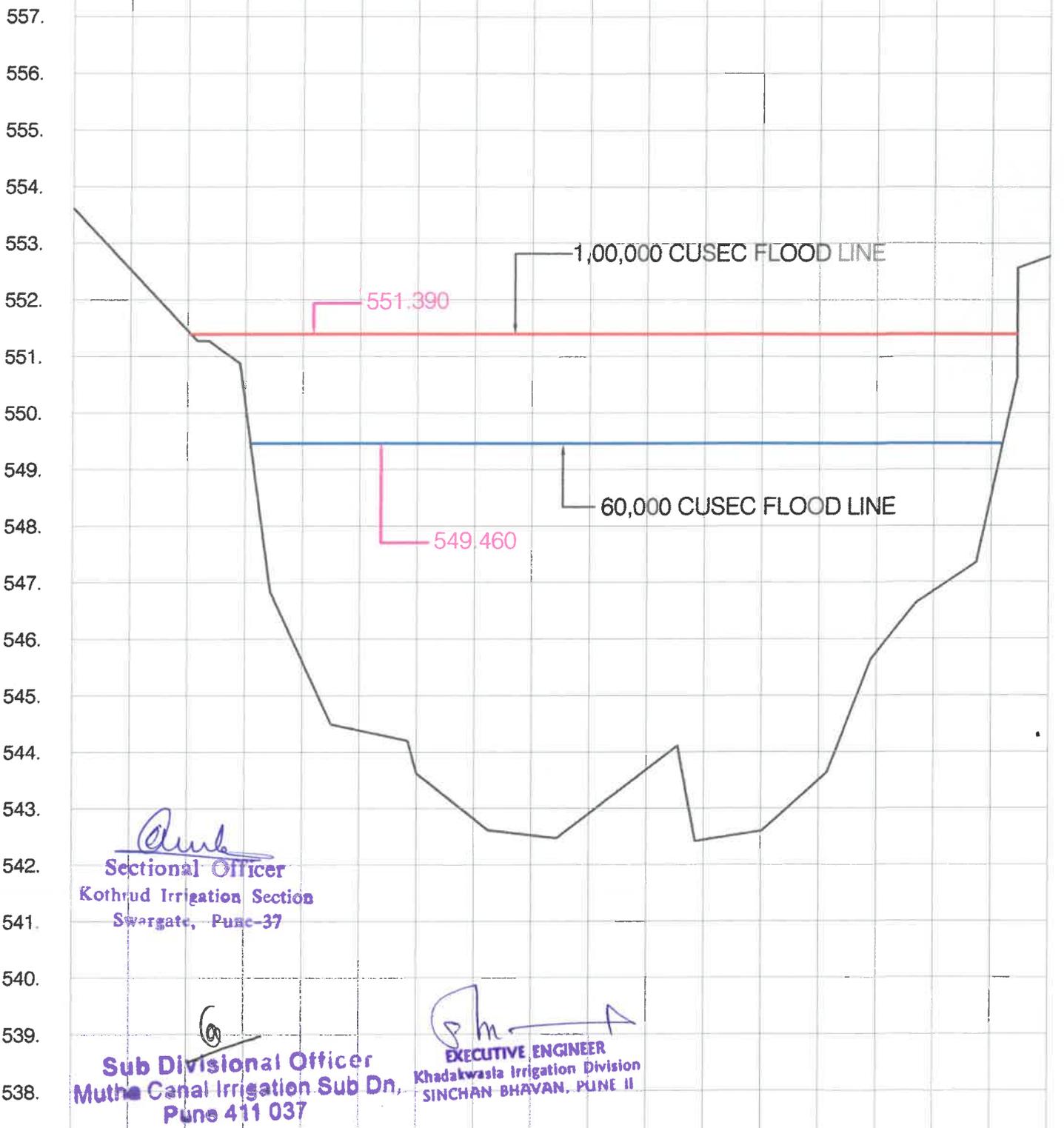
LEVELS	554.900	553.693	552.150	549.650	547.262	545.591	544.491	543.339	542.642	542.531	542.457	542.399	542.382	542.611	543.802	544.665	545.060	547.613	550.860	552.710
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+560



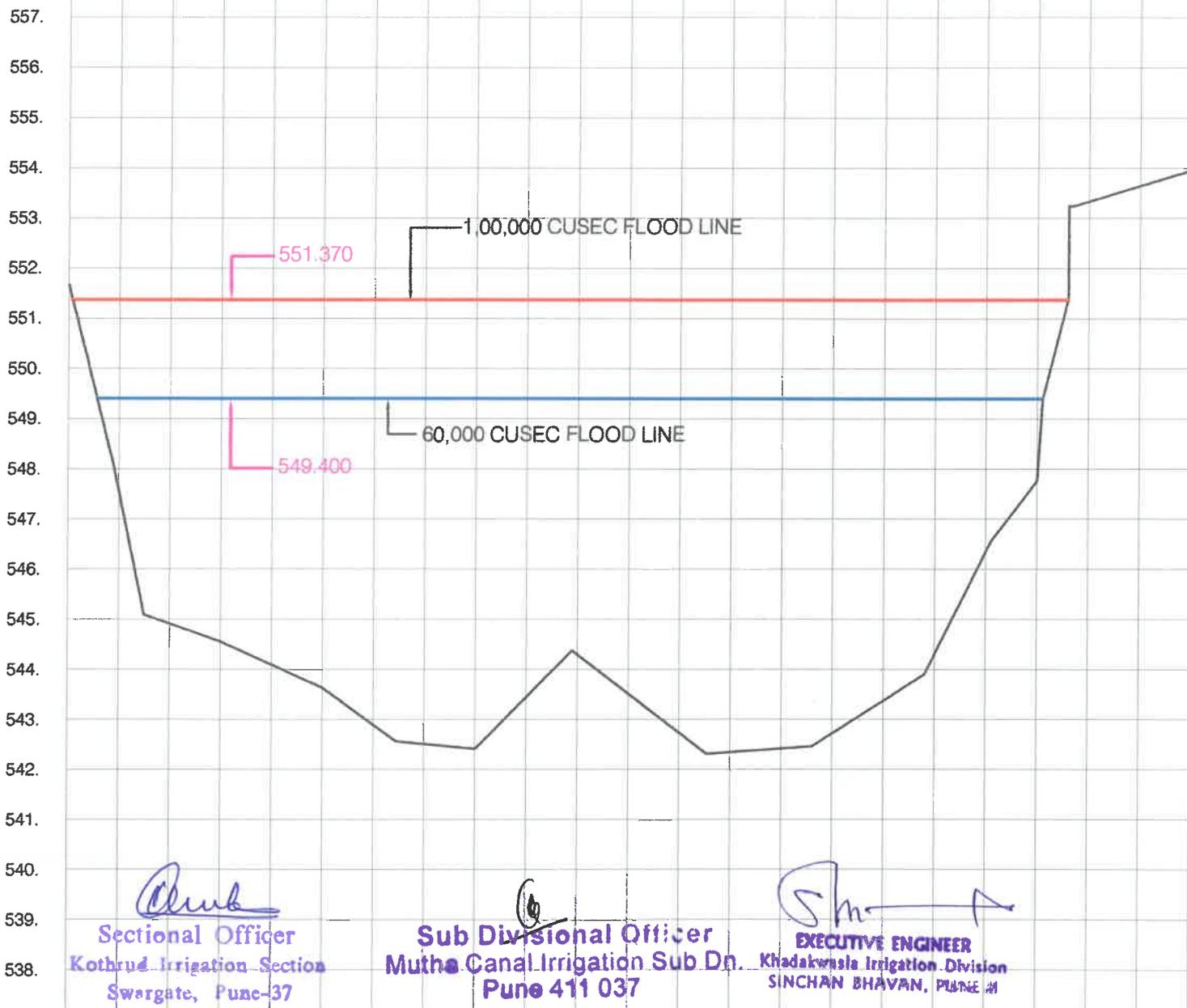
LEVELS	554.900	553.344	551.789	548.602	545.527	544.356	543.519	542.600	542.474	542.471	542.483	542.495	542.600	543.502	544.609	545.698	547.015	548.650	550.950	552.720
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.05	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+590



LEVELS	553.600	552.517	551.433	550.122	545.588	544.372	543.610	542.802	542.512	542.898	543.680	542.433	542.590	543.497	545.755	546.835	548.555	552.560	552.760
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.10	130.00	140.00	150.00	160.00	164.41	170.00

**CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE
CH 10+620**



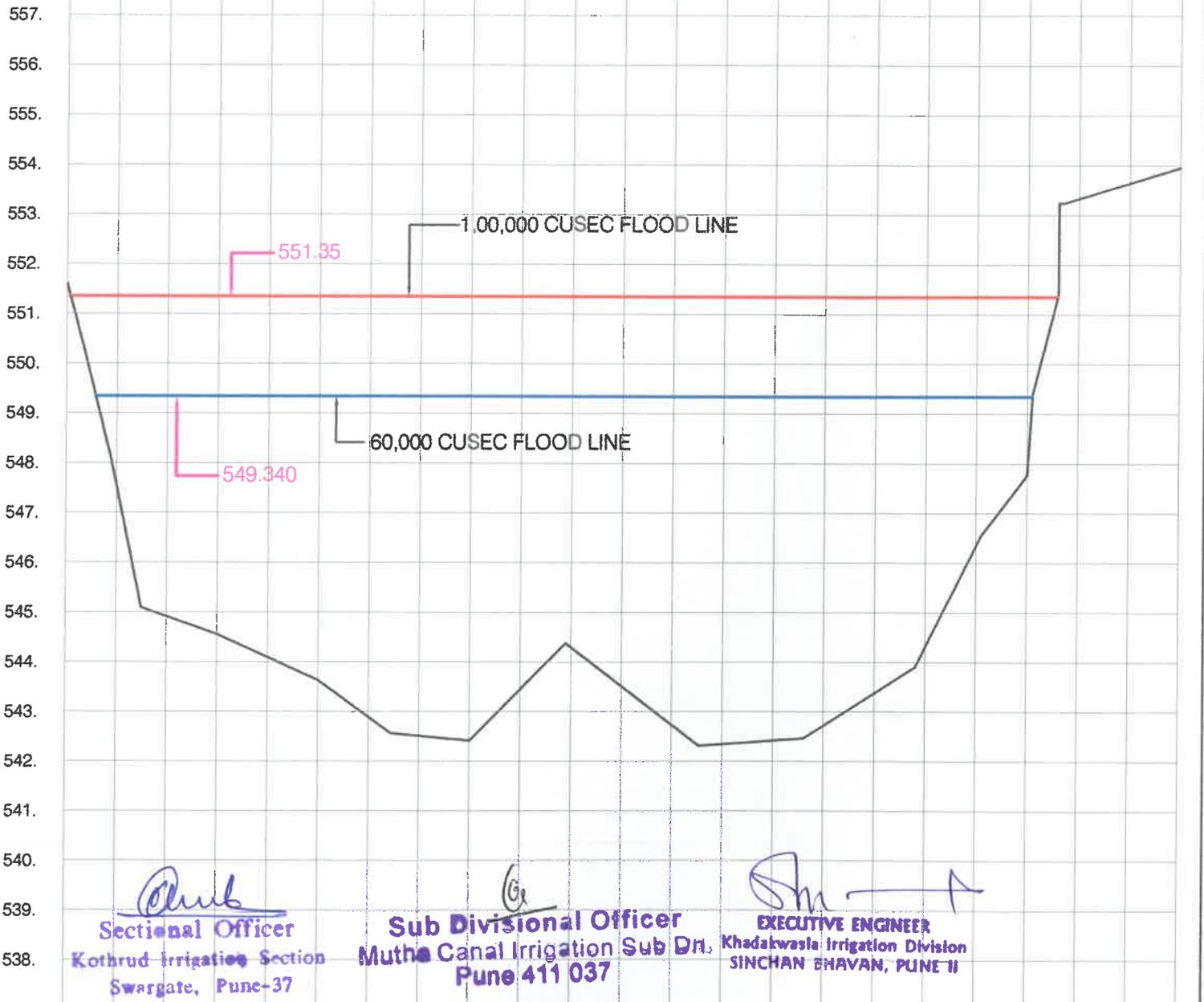
Arub
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

Q
Sub Divisional Officer
Mutha Canal Irrigation Sub Dn.
Pune 411 037

Sm
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE 41

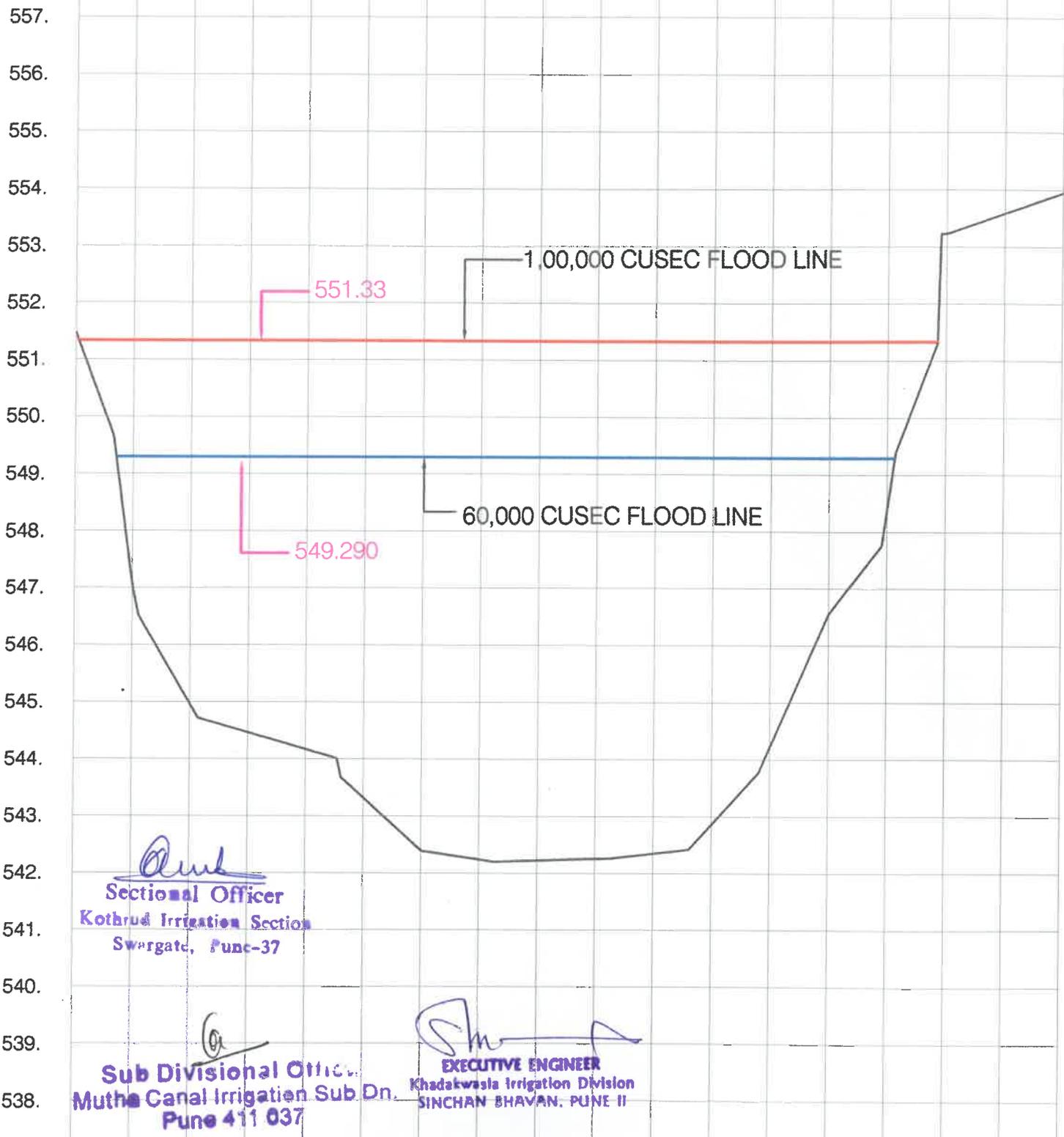
LEVELS	551.655	547.526	544.898	544.540	544.080	543.620	542.877	542.496	542.400	543.432	544.278	543.489	542.721	542.333	542.406	542.706	543.364	544.299	546.345	547.750	553.322	553.631	553.940
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00

**CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE
CH 10+650**



LEVELS	551.885	547.526	544.899	544.540	544.080	543.620	542.877	542.496	542.400	543.432	544.278	543.489	542.721	542.333	542.406	542.706	543.364	544.289	546.345	547.750	553.322	553.631	553.940
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.05	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00

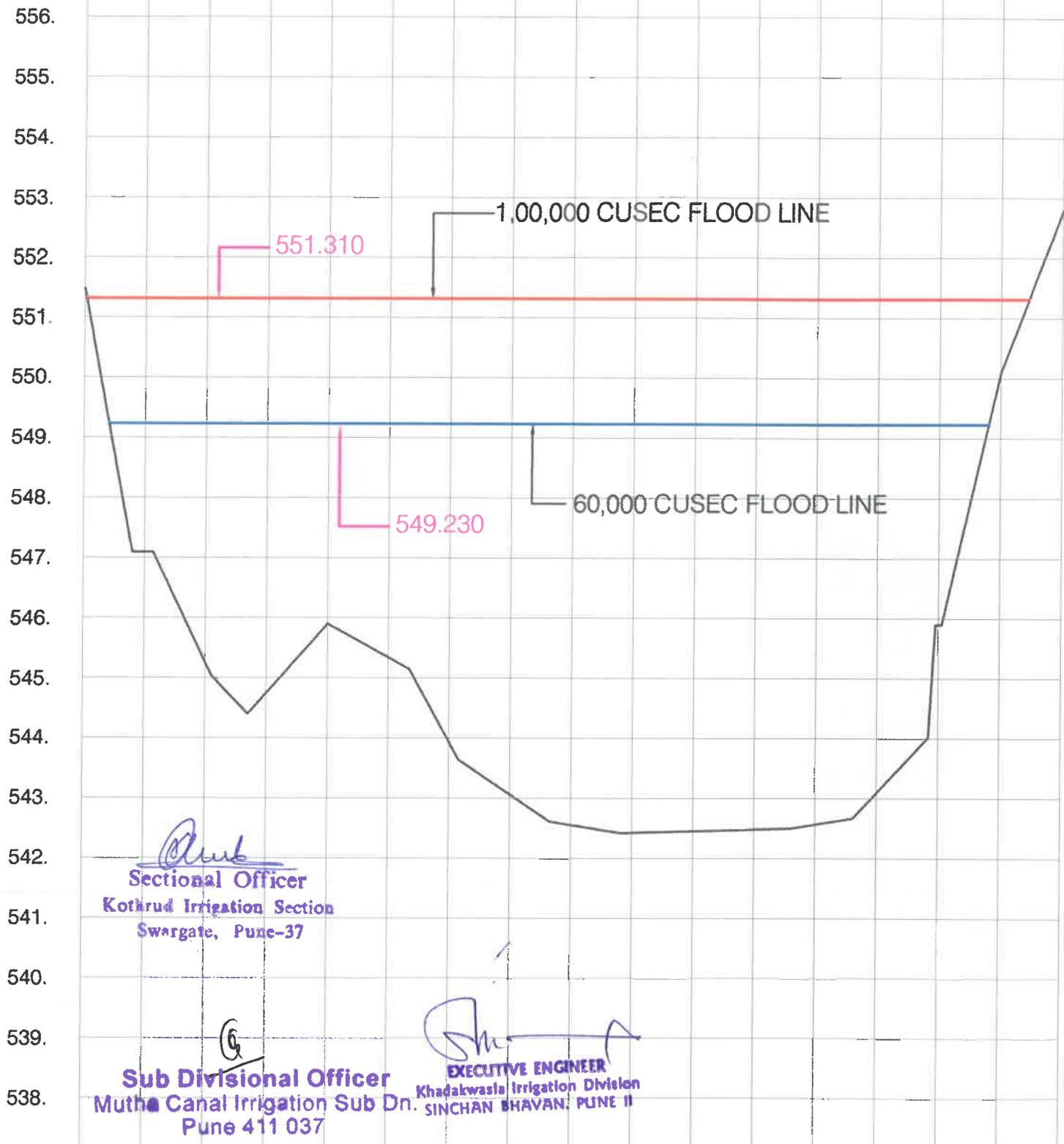
CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+680



LEVELS	551.450	547.028	544.952	544.456	544.160	543.309	542.385	542.228	542.212	542.242	542.338	542.851	544.215	546.550	548.392	553.220	553.580	553.940
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

CH 10+710



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

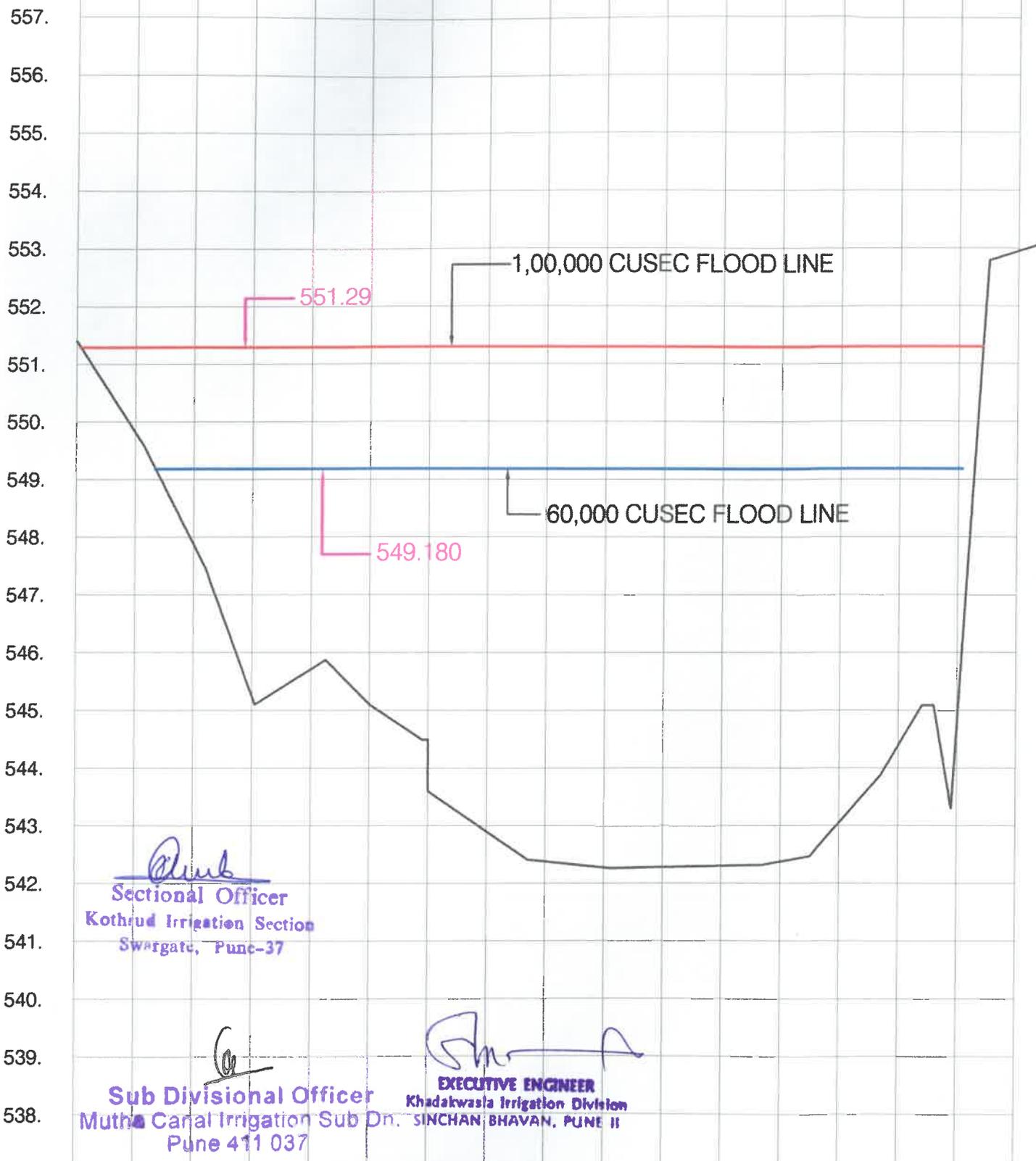
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.470	547.080	545.244	544.736	545.890	545.330	543.925	543.049	542.543	542.415	542.444	542.473	542.558	543.088	545.890	550.090	552.780
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

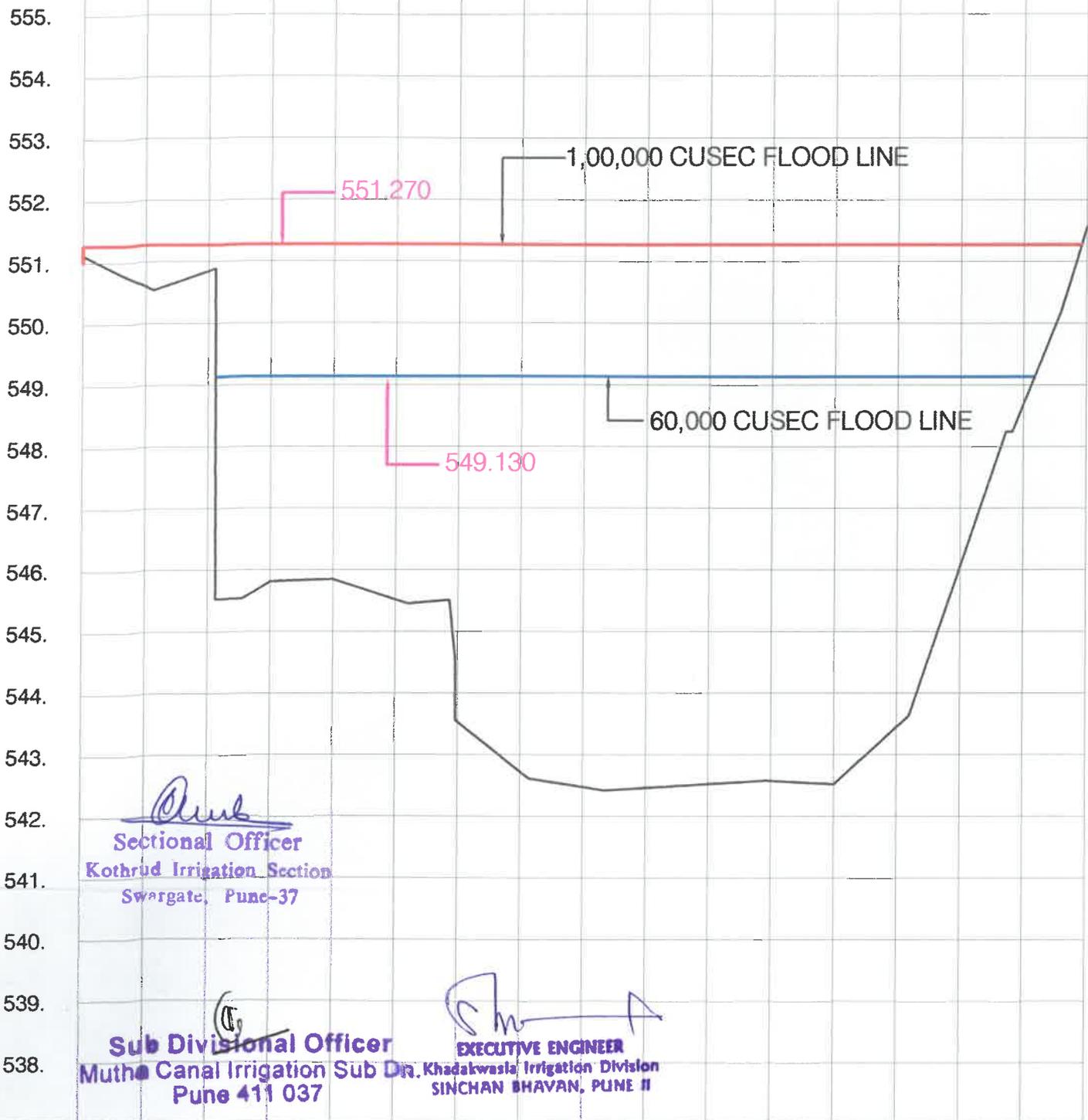
CH 10+740



LEVELS	551.390	549.767	547.860	545.229	545.700	545.090	544.480	542.890	542.368	542.262	542.271	542.294	542.367	543.043	544.383	544.805	552.942
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

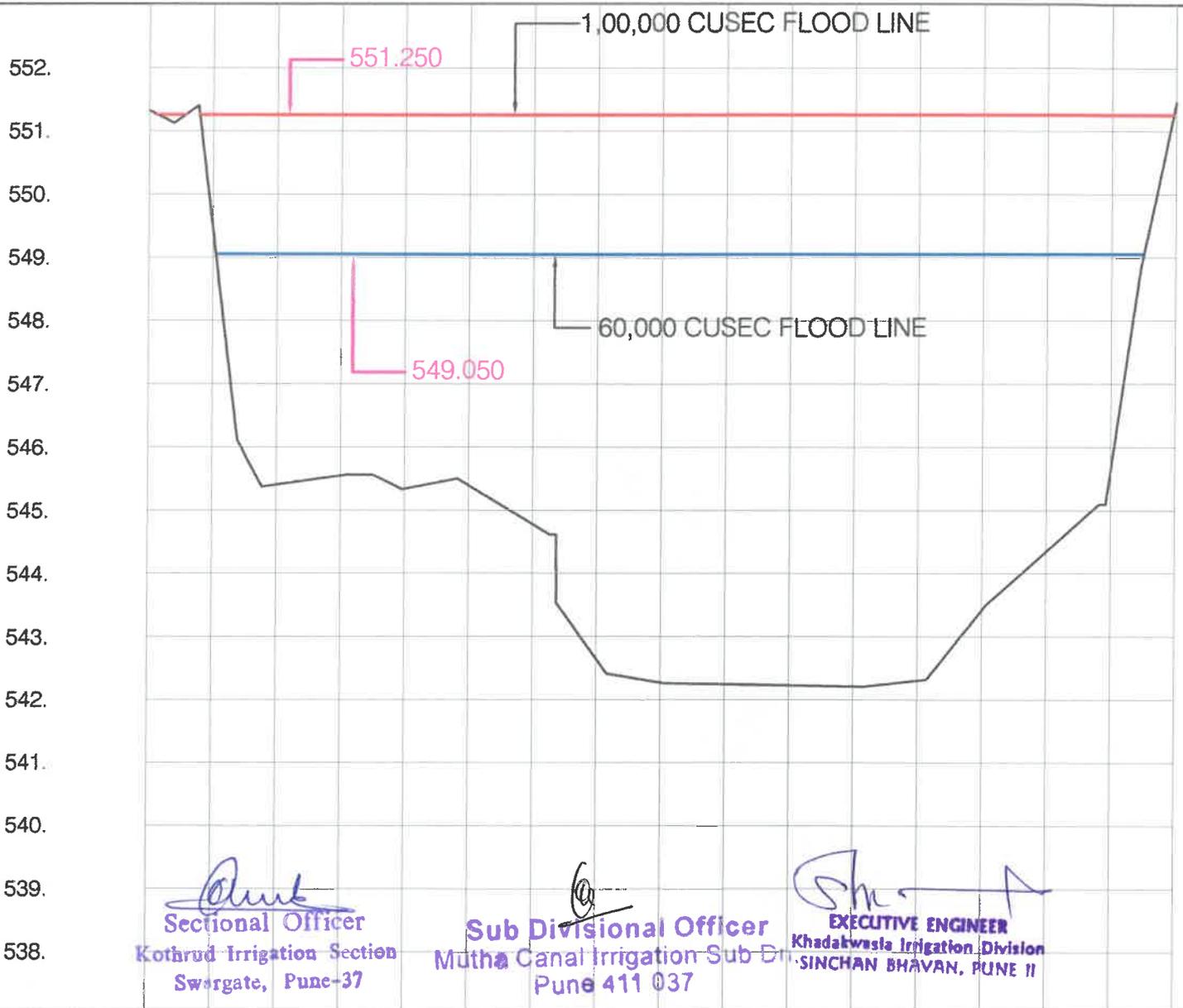
CH 10+770



LEVELS	551.110	550.592	550.841	545.800	545.840	545.506	543.519	542.713	542.464	542.451	542.513	542.565	542.510	543.443	546.061	548.688	550.190	551.550
CHAINAGE	0.00	10.00	20.00	30.00	39.90	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	155.90	160.00

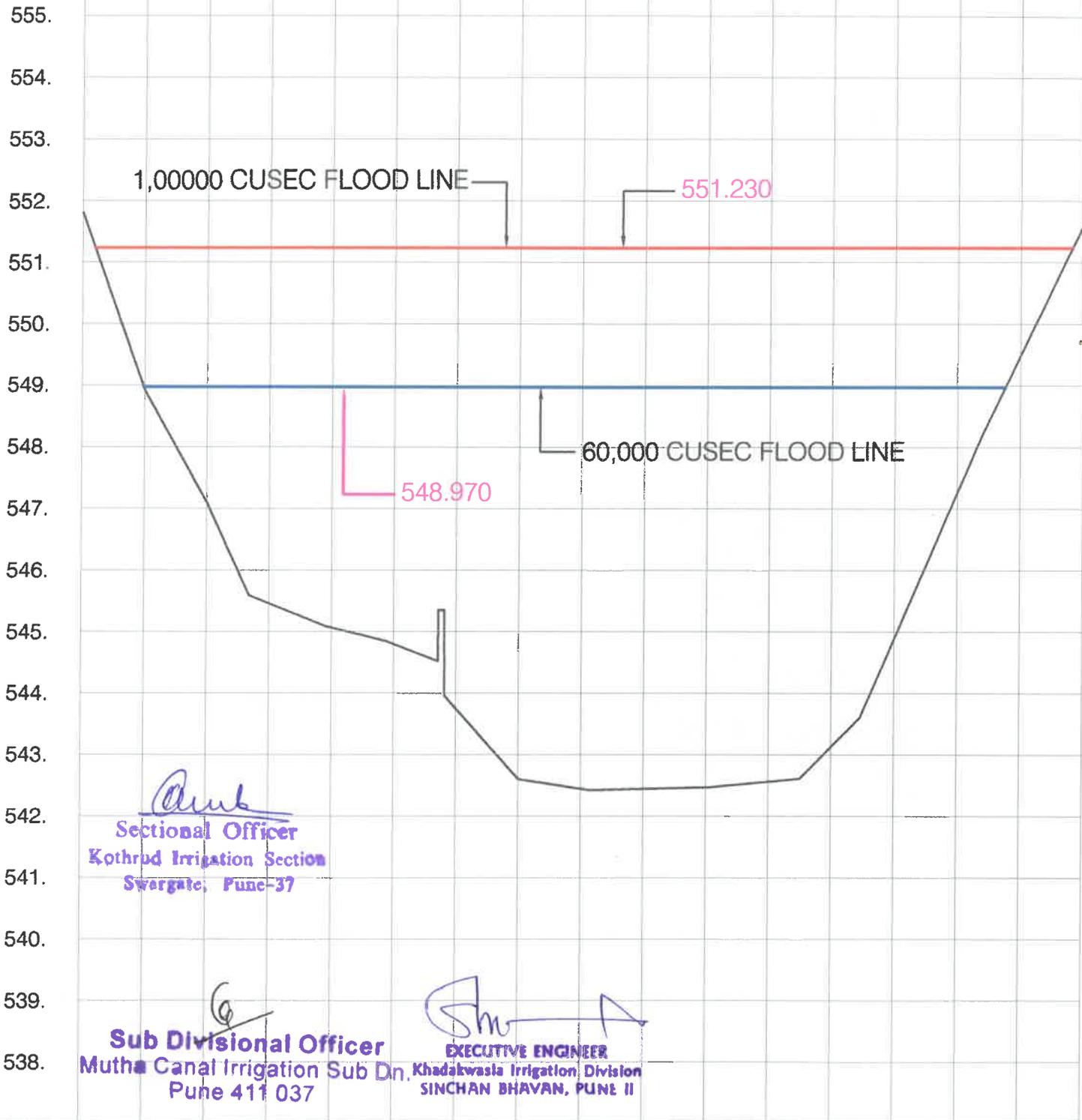
CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

CH 10+800



LEVELS	551.310	546.850	545.393	545.536	545.328	545.380	544.766	542.627	542.258	542.235	542.219	542.203	542.294	543.413	544.345	545.646	551.440
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+830



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

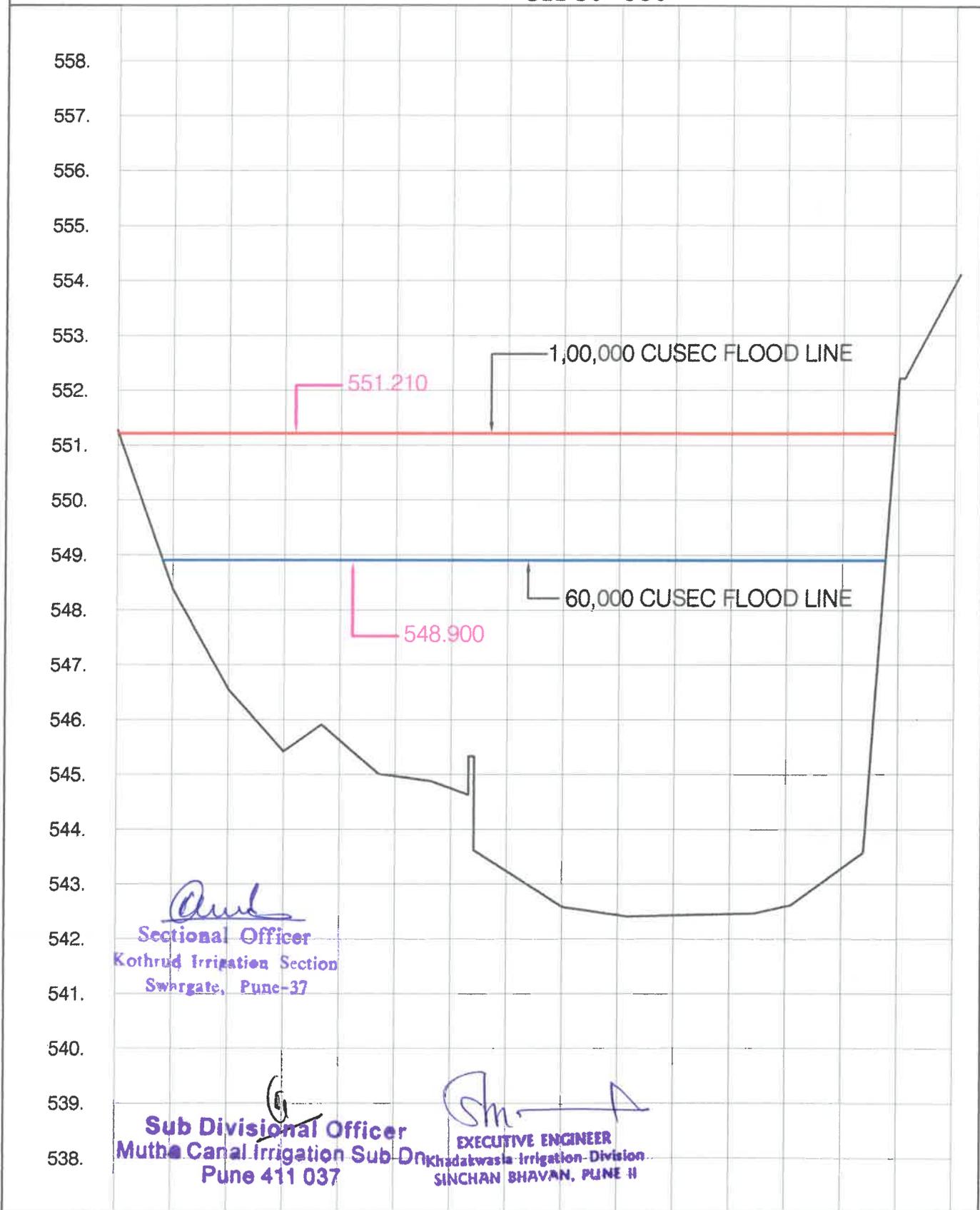
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.795	548.910	547.080	545.449	545.055	544.789	543.736	542.596	542.432	542.432	542.458	542.551	543.121	544.881	547.255	549.479	551.607
CHAINAGE	0.00	10.05	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE

CH 10+860



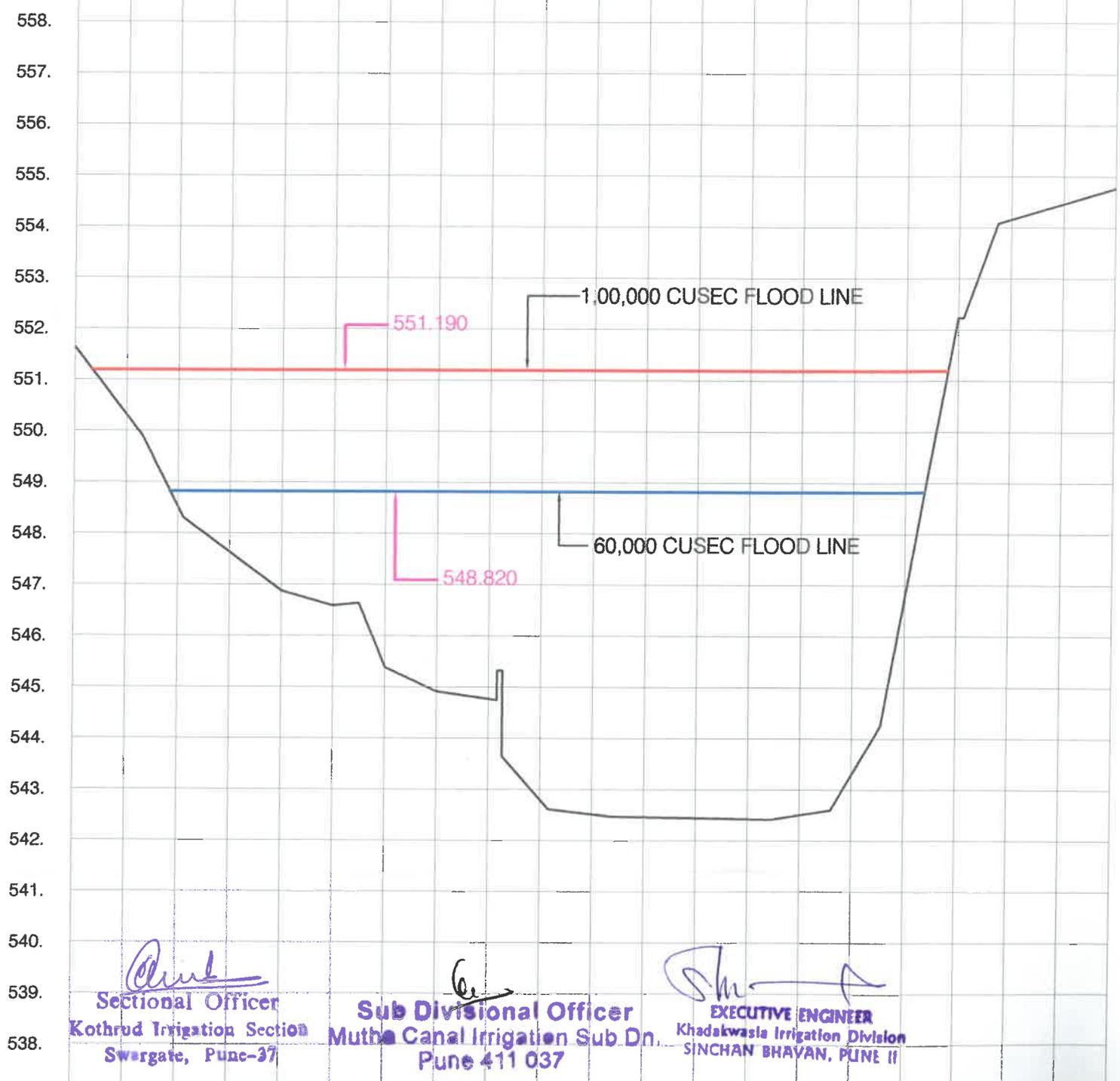
Am
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

G
Sub Divisional Officer
 Mutha Canal Irrigation Sub-Div
 Pune 411 037

Sm
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.240	546.540	546.540	545.410	545.612	544.959	544.736	543.227	542.570	542.425	542.422	542.448	542.587	543.280	552.210	553.928
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.10	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00

CROSS SECTION OF MUTHA RIVER U/S OF MHATRA BRIDGE CH 10+890



LEVELS	551.620	550.296	548.490	546.515	546.370	546.582	545.370	544.900	544.753	542.785	542.503	542.450	542.434	542.417	542.496	543.289	546.741	552.220	554.150	554.456	554.760
CHAINAGE	0.00	10.00	20.00	29.95	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	129.90	140.00	150.00	160.00	170.00	180.00	190.00	200.00

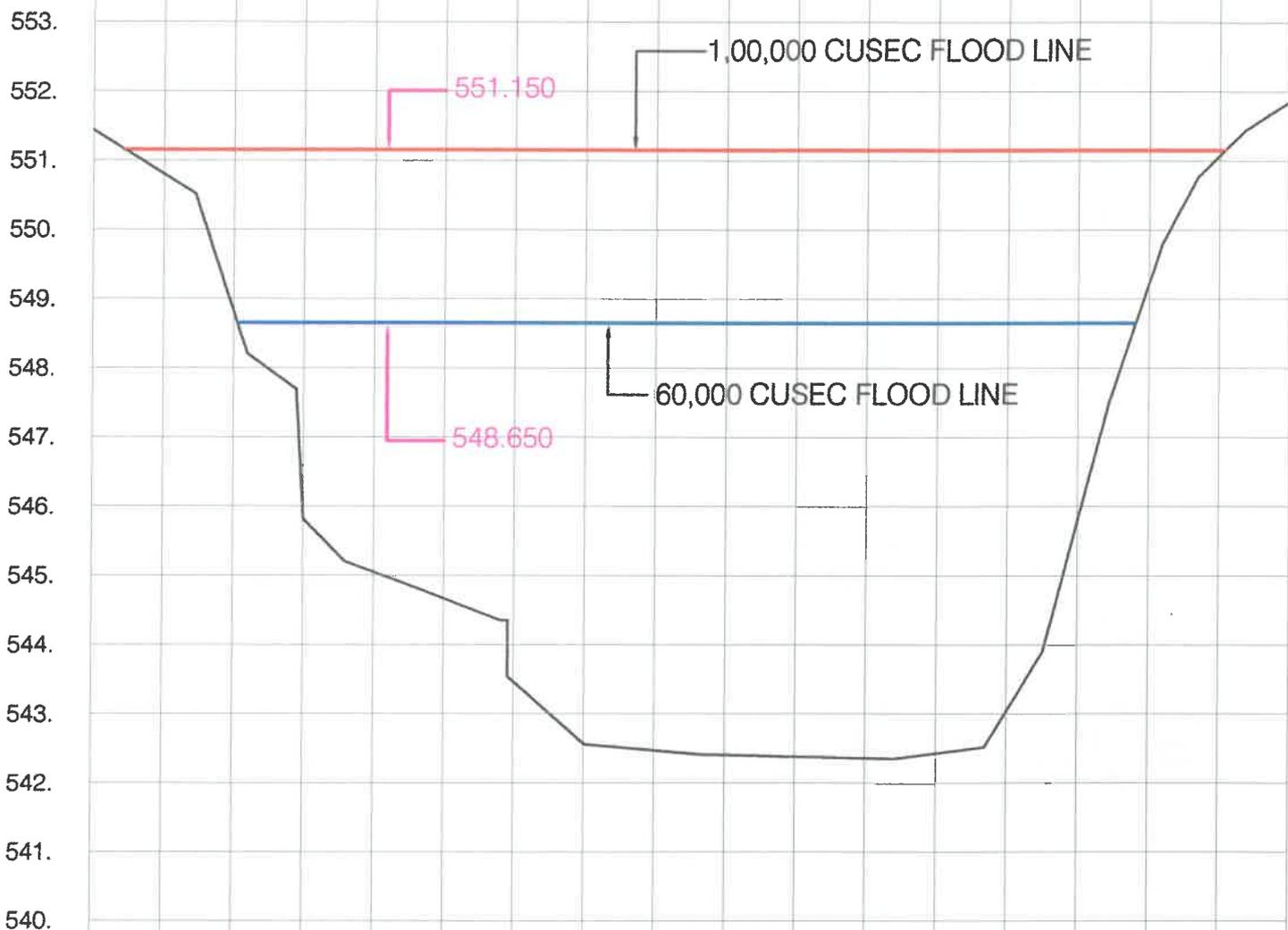
CROSS SECTION OF MUTHA RIVER D/S OF MHATRA BRIDGE

CH 10+920



LEVELS	551.650	549.940	546.590	545.966	545.413	545.116	544.414	543.247	543.066	543.003	542.987	542.972	543.002	543.846	546.913	553.841	554.390
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00

CROSS SECTION OF MUTHA RIVER D/S OF MHATRA BRIDGE CH 10+950



539. *[Signature]* Sectional Officer, Kothrud Irrigation Section, Swargate, Pune-37

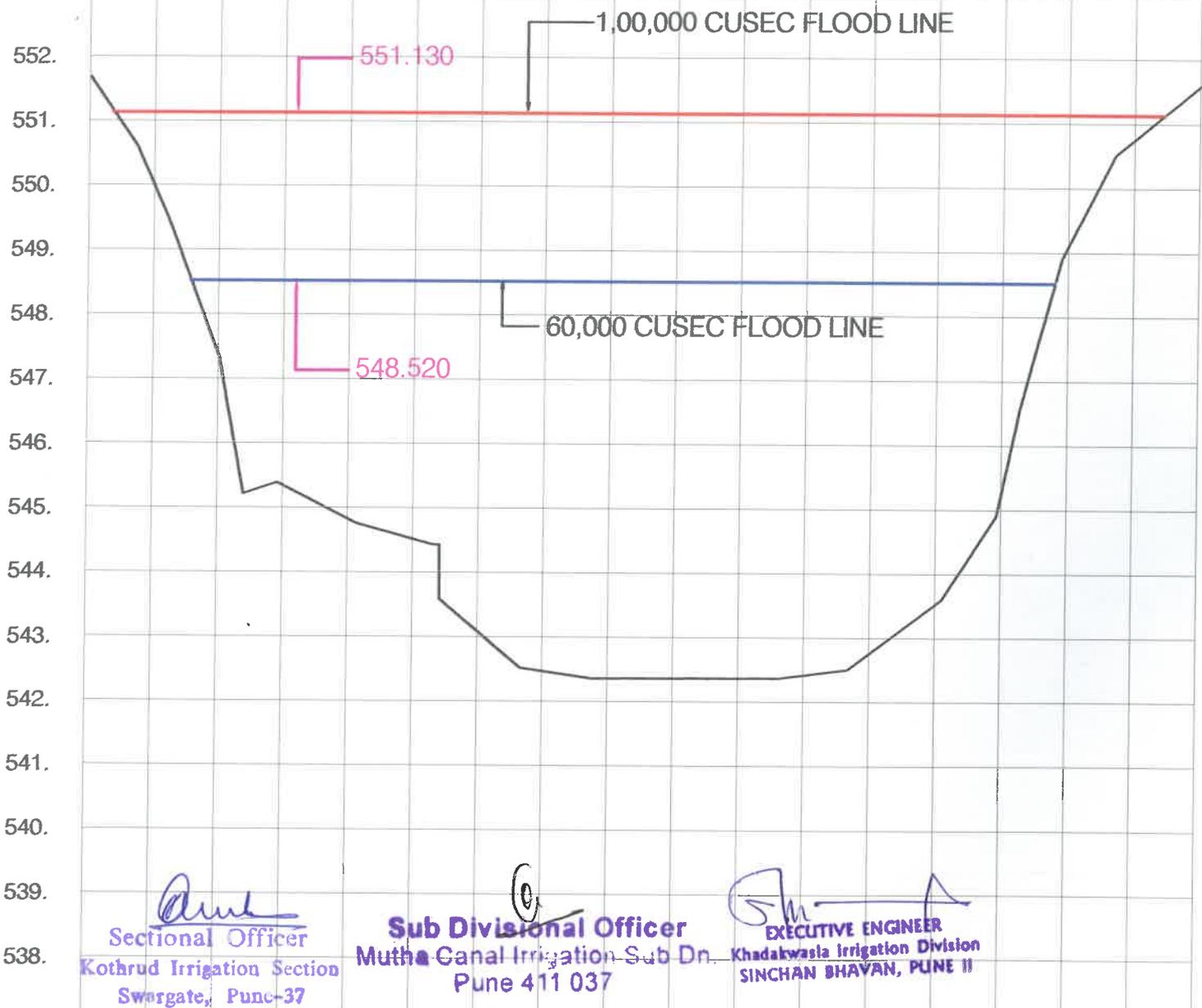
538. *[Signature]* Sub Divisional Officer, Mutha Canal Irrigation Sub Dn., Pune 411 037

[Signature] EXECUTIVE ENGINEER, Khadakwasla Irrigation Division, SINCHAN BHAYAN, PUNE II

LEVELS	547.450	545.810	545.038	544.658	543.451	542.559	542.459	542.392	542.371	542.349	542.418	543.032	545.797	549.219	551.065	551.840
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00

CROSS SECTION OF MUTHA RIVER D/S OF MHATRA BRIDGE

CH 10+980



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

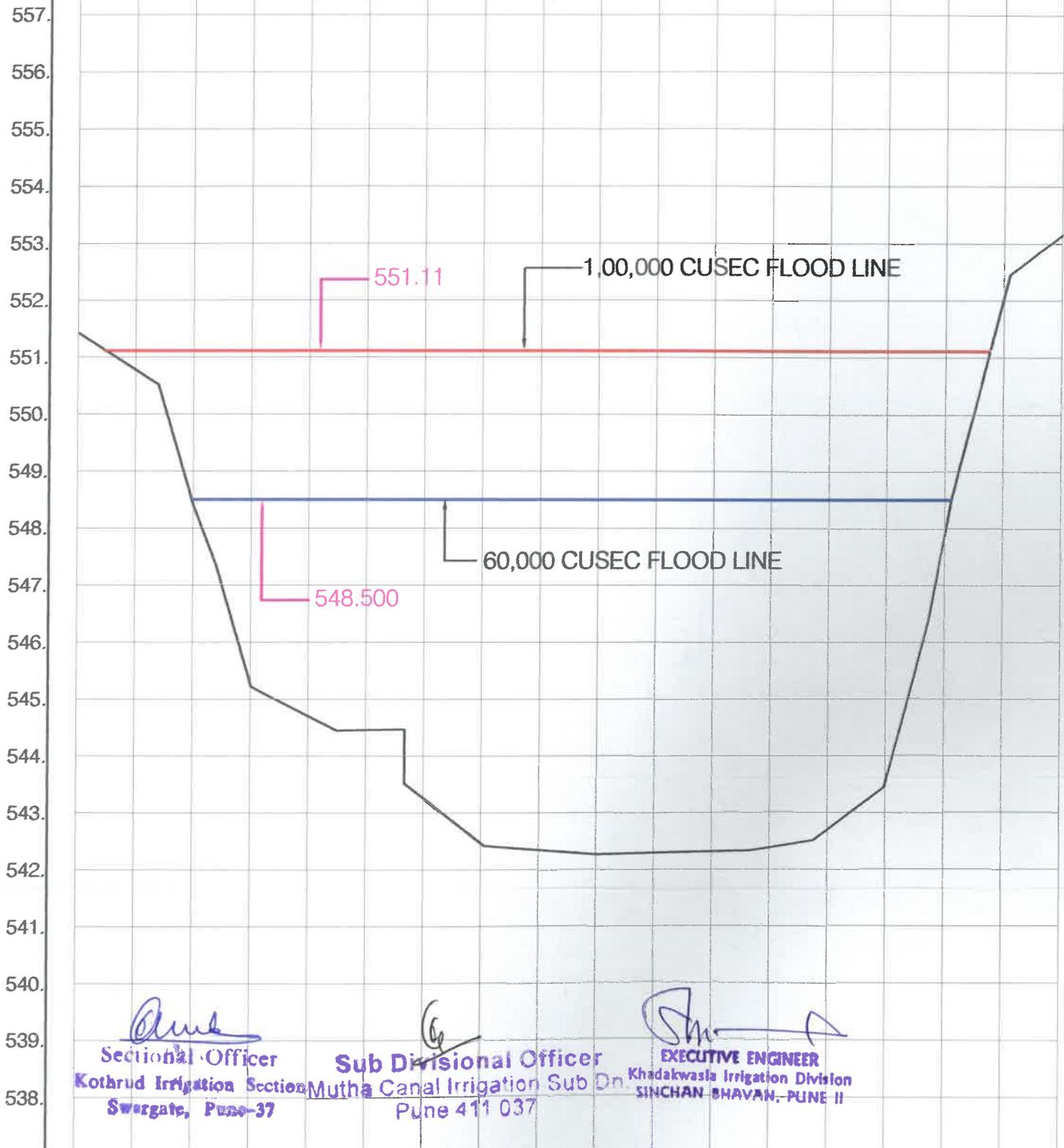
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub-Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.670	549.965	547.330	545.328	544.812	544.504	543.067	542.459	542.351	542.354	542.358	542.412	542.759	543.521	545.286	549.115	550.755	551.585
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00

CROSS SECTION OF MUTHA RIVER D/S OF MHATRA BRIDGE

CH 11+010



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

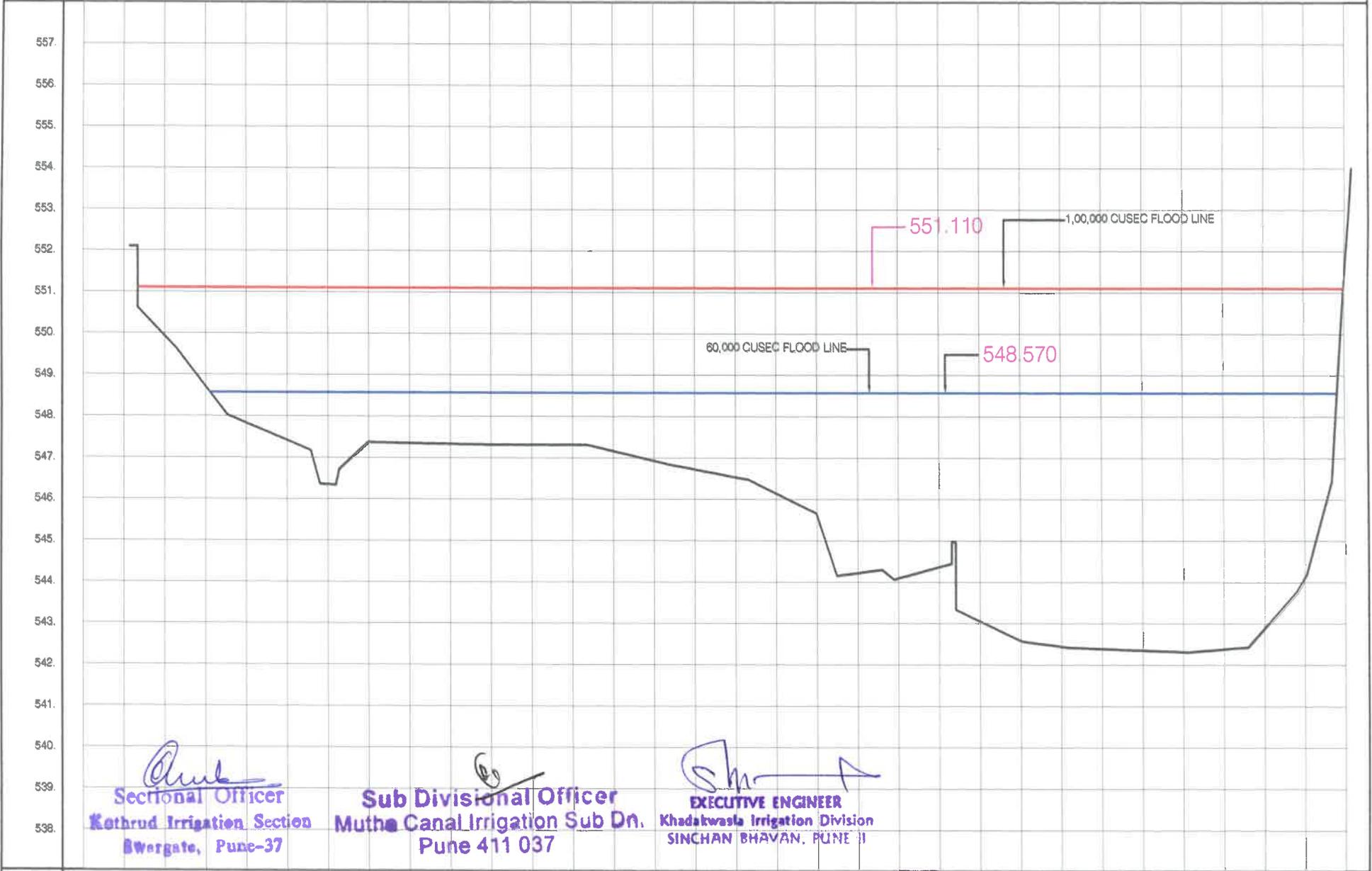
LEVELS	551.410	550.755	546.380	545.210	544.686	544.450	543.241	542.446	542.332	542.250	542.273	542.295	542.367	542.690	543.586	547.949	552.091	553.150
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00

CH. 11/040 TO 12/000

DISCHARGE	LINE	COLOUR	पूररेषा
1,00,000 CUSEC	RED LINE		नियंत्रक पूररेषा
60,000 CUSEC	BLUE LINE		निषेधक पूररेषा

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+040



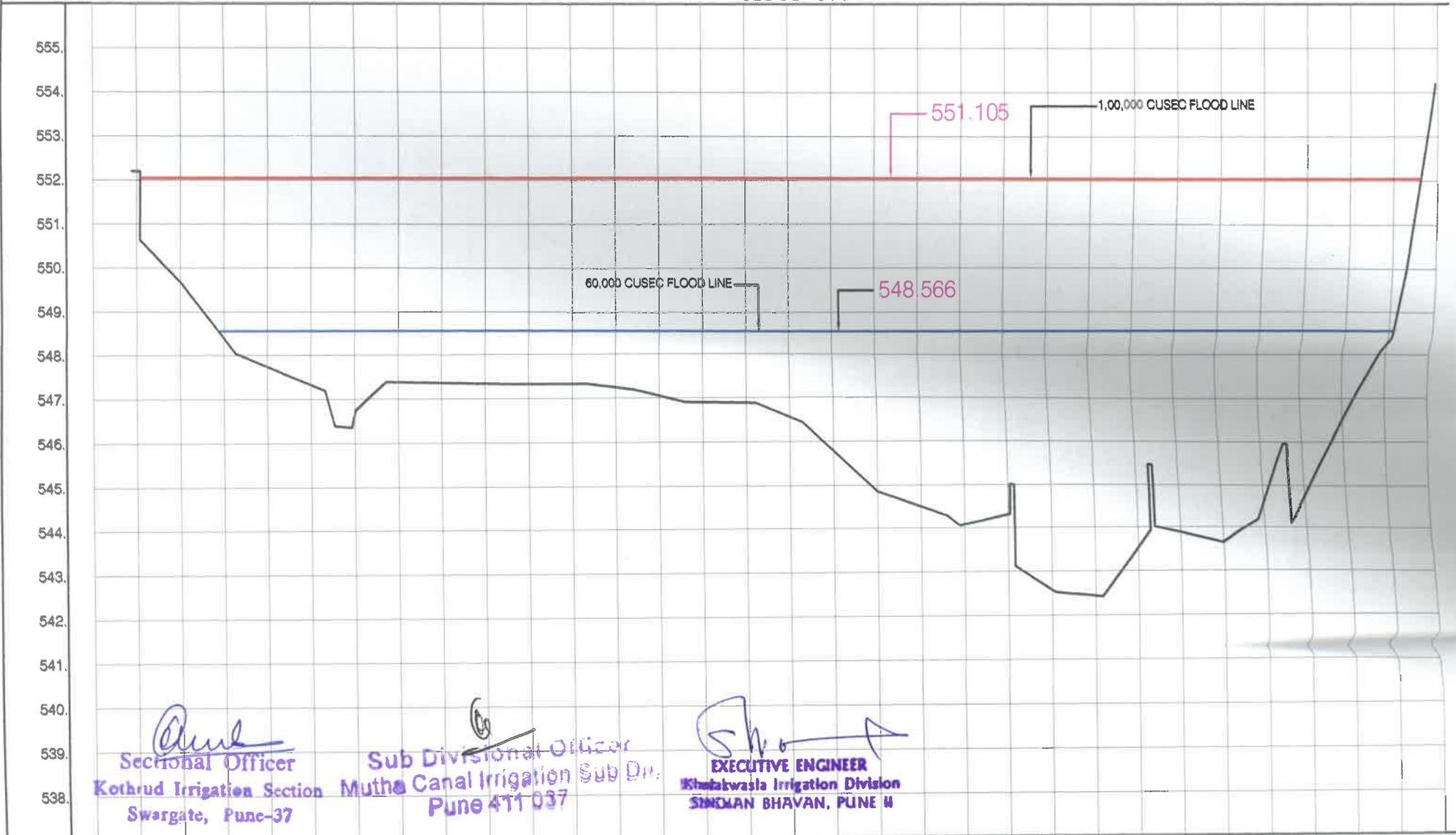
[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Bwergate, Pune-37

[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	562.073	548.916	546.708	547.814	547.400	546.317	547.347	547.328	547.309	547.290	547.290	547.290	547.144	546.912	546.704	546.513	546.127	545.640	544.188	544.067	544.342	543.039	542.568	542.425	542.370	542.333	542.295	542.360	542.844	544.067	551.203
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	230.00	240.00	250.00	260.00	270.00	280.00	290.00	300.00

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE
CH 11+070



[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

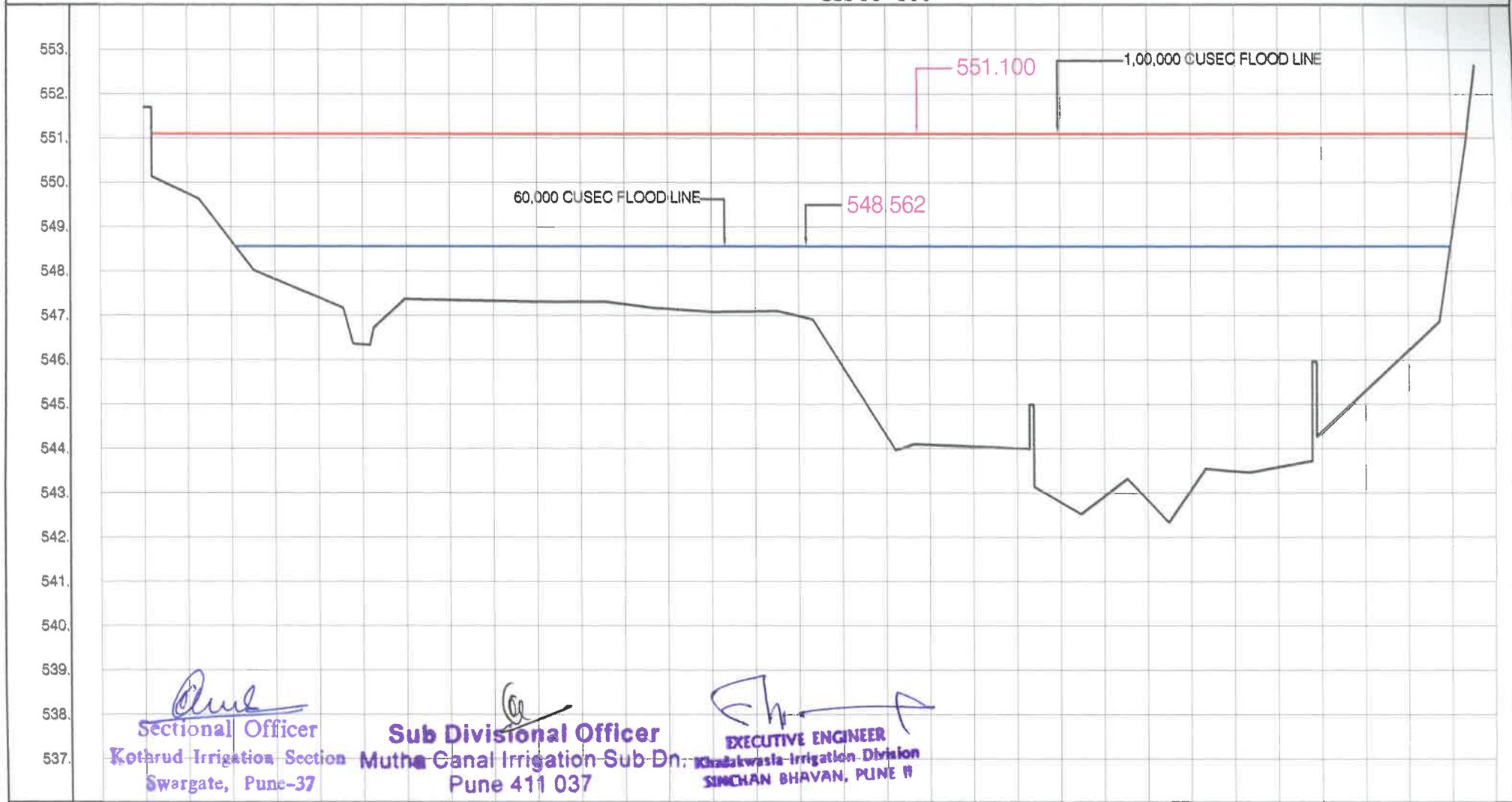
[Signature]
Sub Divisional Officer
Mutha Canal Irrigation Sub Div.
Pune 411 037

[Signature]
EXECUTIVE ENGINEER
Khatavwadi Irrigation Division
SINDHAN BHAVAN, PUNE 41

LEVELS	552.178	549.633	548.384	547.727	547.313	546.593	547.263	547.344	547.325	547.311	547.311	547.230	547.036	546.882	546.866	546.545	545.774	544.849	544.496	544.064	544.306	542.558	542.417	543.488	543.853	543.620	544.540	544.705	546.468	548.231	554.180
CHAINAGE	0.00	10.35	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	230.00	240.00	250.00	260.00	270.00	280.00	290.00	298.00

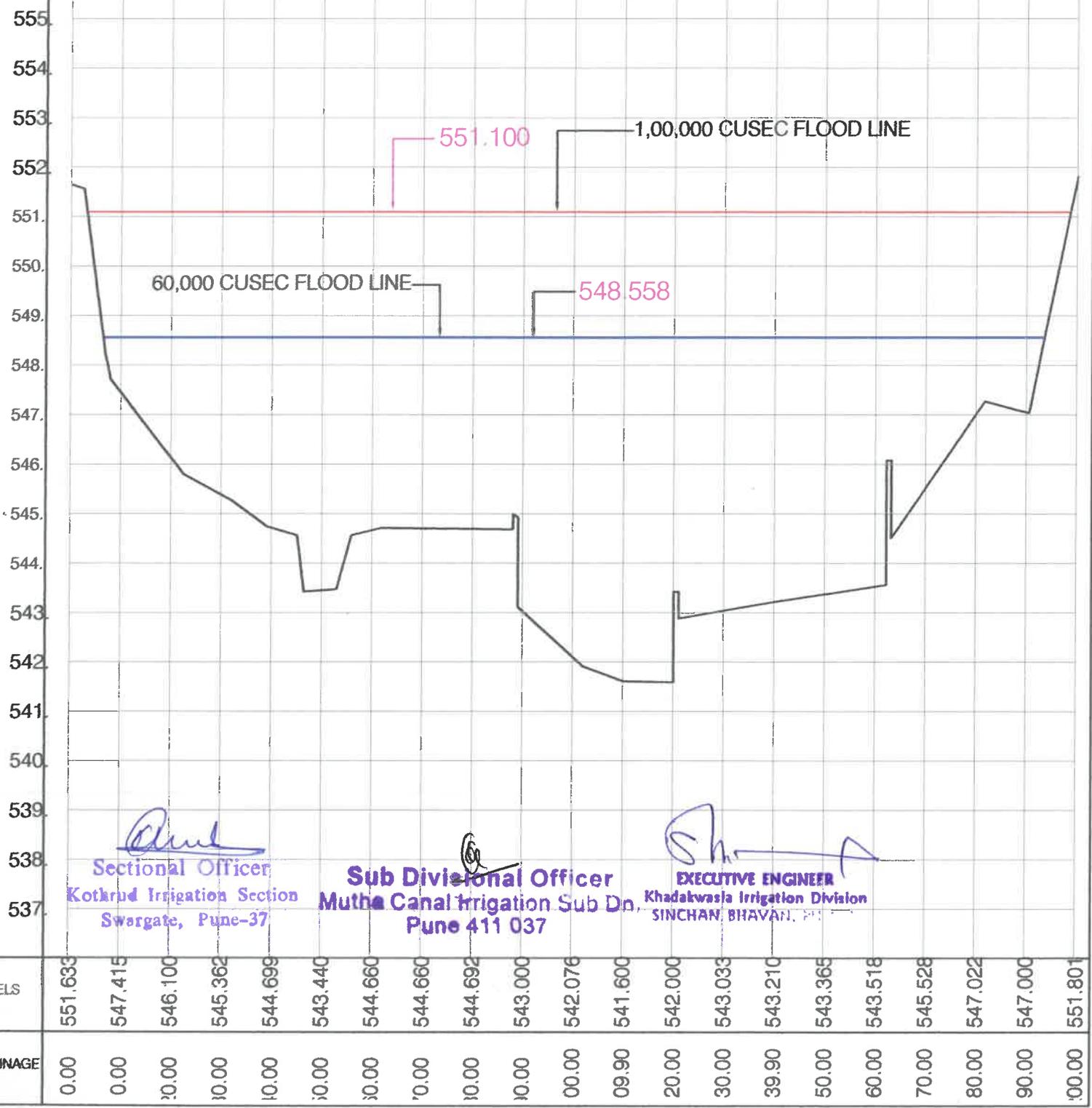
CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+100



LEVELS	551.677	549.739	548.676	547.804	547.390	546.329	547.347	547.328	547.309	547.291	547.291	547.239	547.132	547.062	547.074	546.969	545.852	544.291	544.067	544.029	543.981	542.773	542.893	542.826	543.038	543.467	543.467	544.344	545.260	546.176	548.671	552.630
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	89.75	100.00	110.00	120.00	130.35	140.00	150.00	160.00	170.00	180.00	180.00	200.00	210.00	220.00	230.00	240.00	250.00	260.00	270.00	280.00	290.00	300.00	305.95

**CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE
CH 11+130**



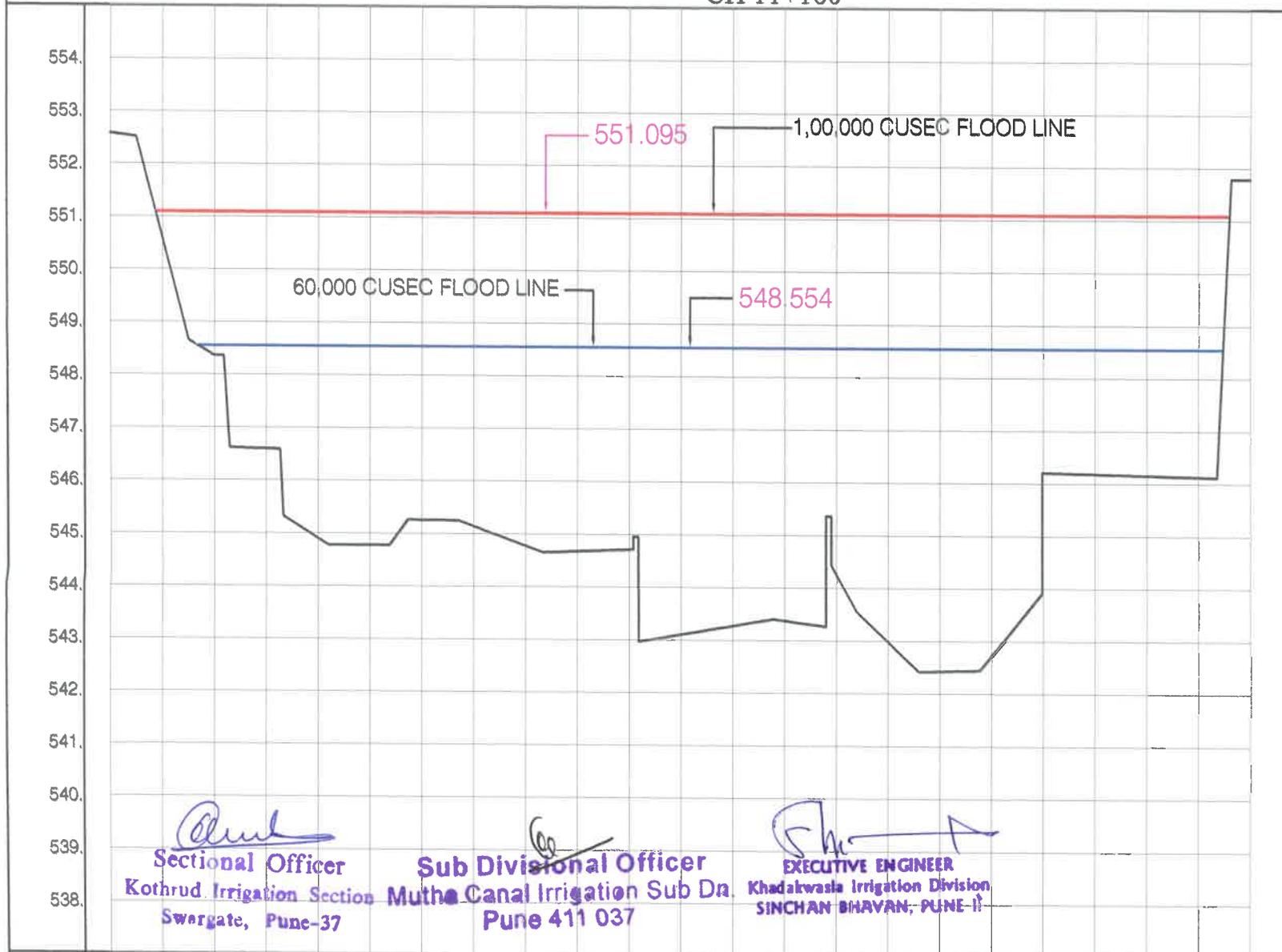
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn,
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+160



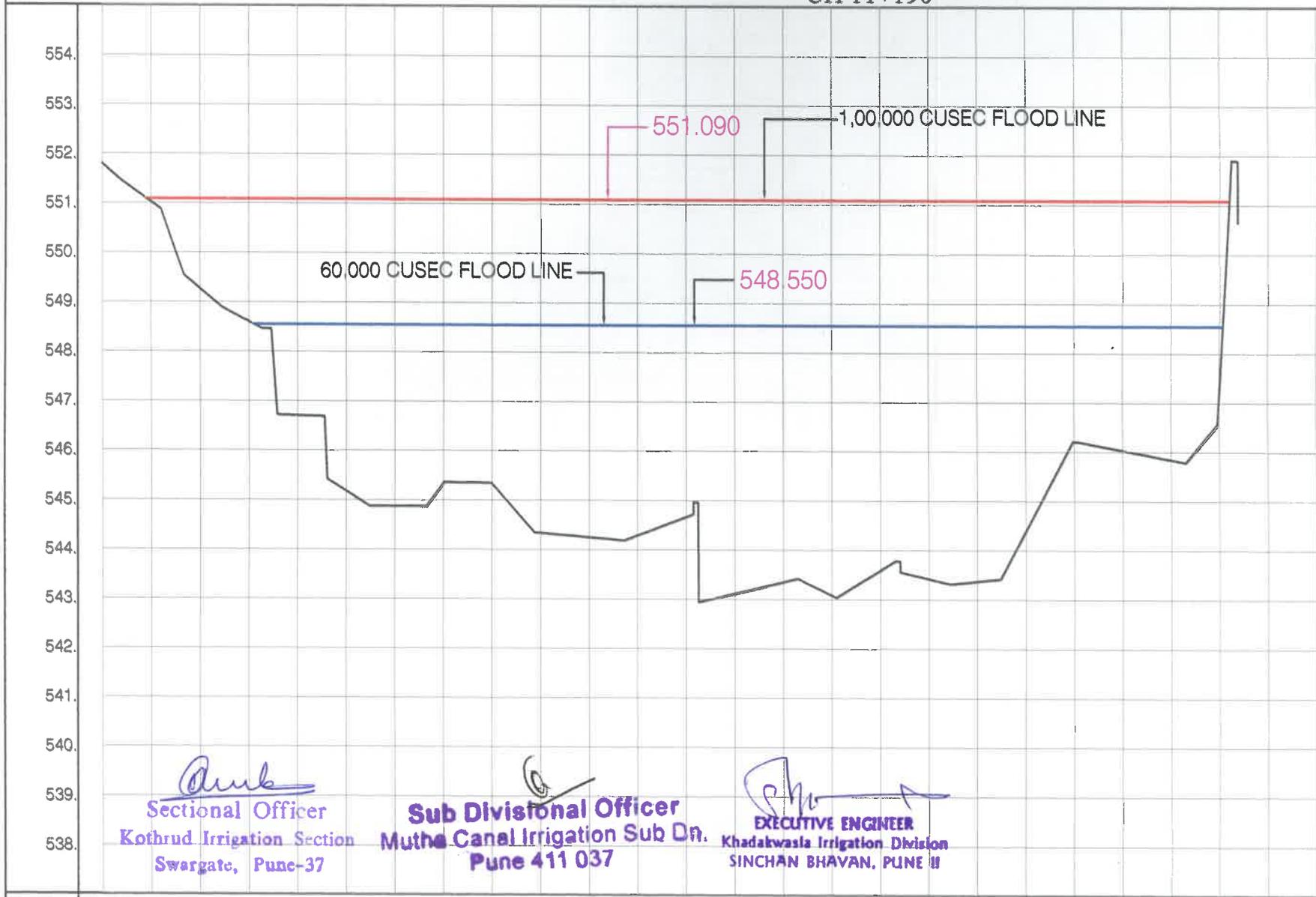
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE-II

LEVELS	552.688	550.587	548.346	546.578	544.885	544.758	545.238	545.128	544.763	544.659	544.697	543.087	543.256	543.361	544.261	543.000	542.410	542.687	543.900	546.166	546.139	546.113	551.776
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	149.73	160.00	170.00	179.90	190.00	200.00	210.00	220.00

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE
CH 11+190



LEVELS	551.781	551.000	549.258	548.592	546.686	545.169	544.858	545.341	545.330	544.321	544.234	544.266	544.640	543.083	543.327	543.068	543.566	543.406	543.352	544.352	546.190	546.000	545.829	551.888
CHAINAGE	0.00	10.08	20.00	30.00	40.00	50.00	60.00	70.28	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	199.85	210.00	220.00	232.60

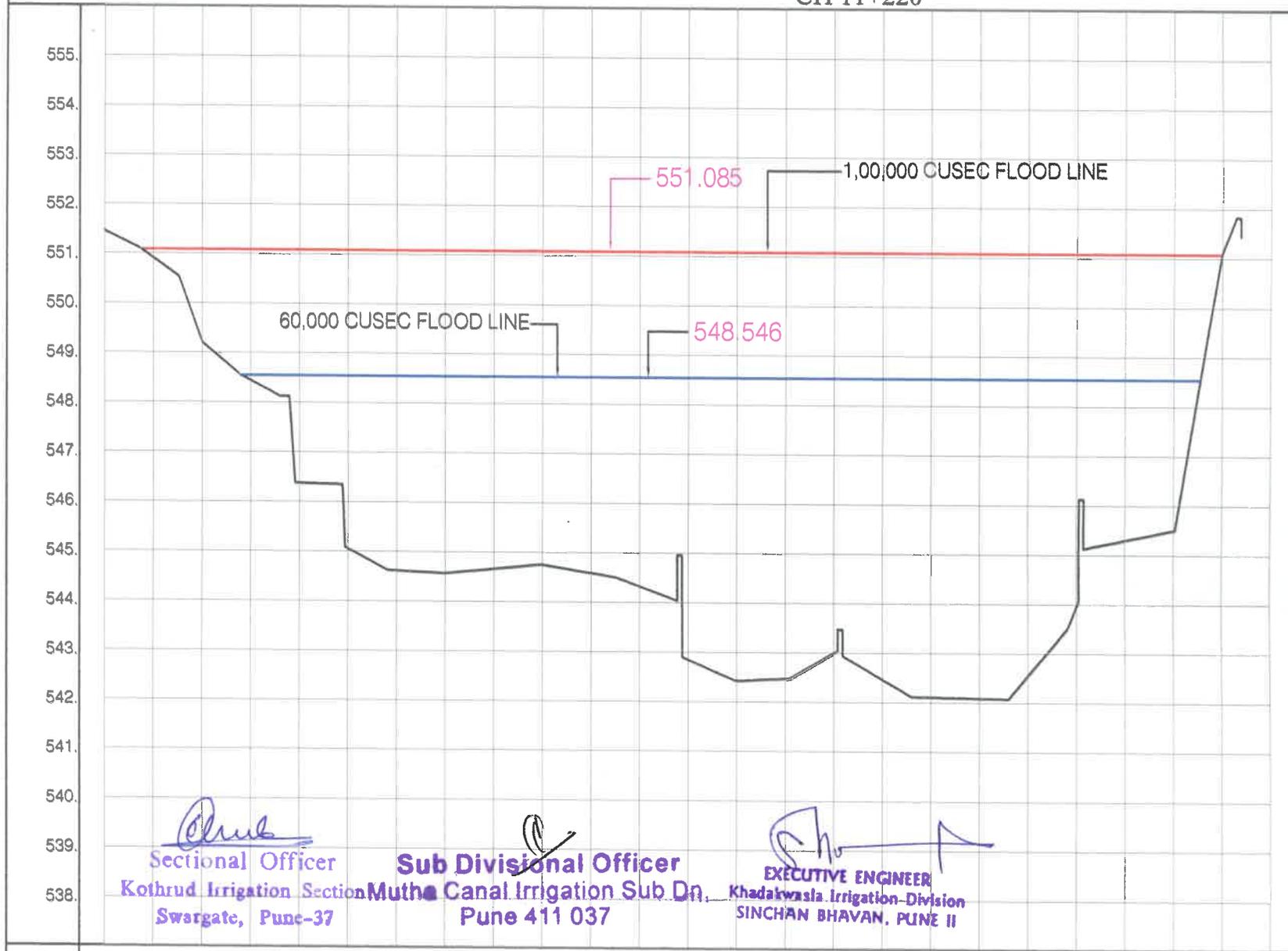
[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

[Signature]
Sub Divisional Officer
Mutha Canal Irrigation Sub Dn.
Pune 411 037

[Signature]
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+220



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

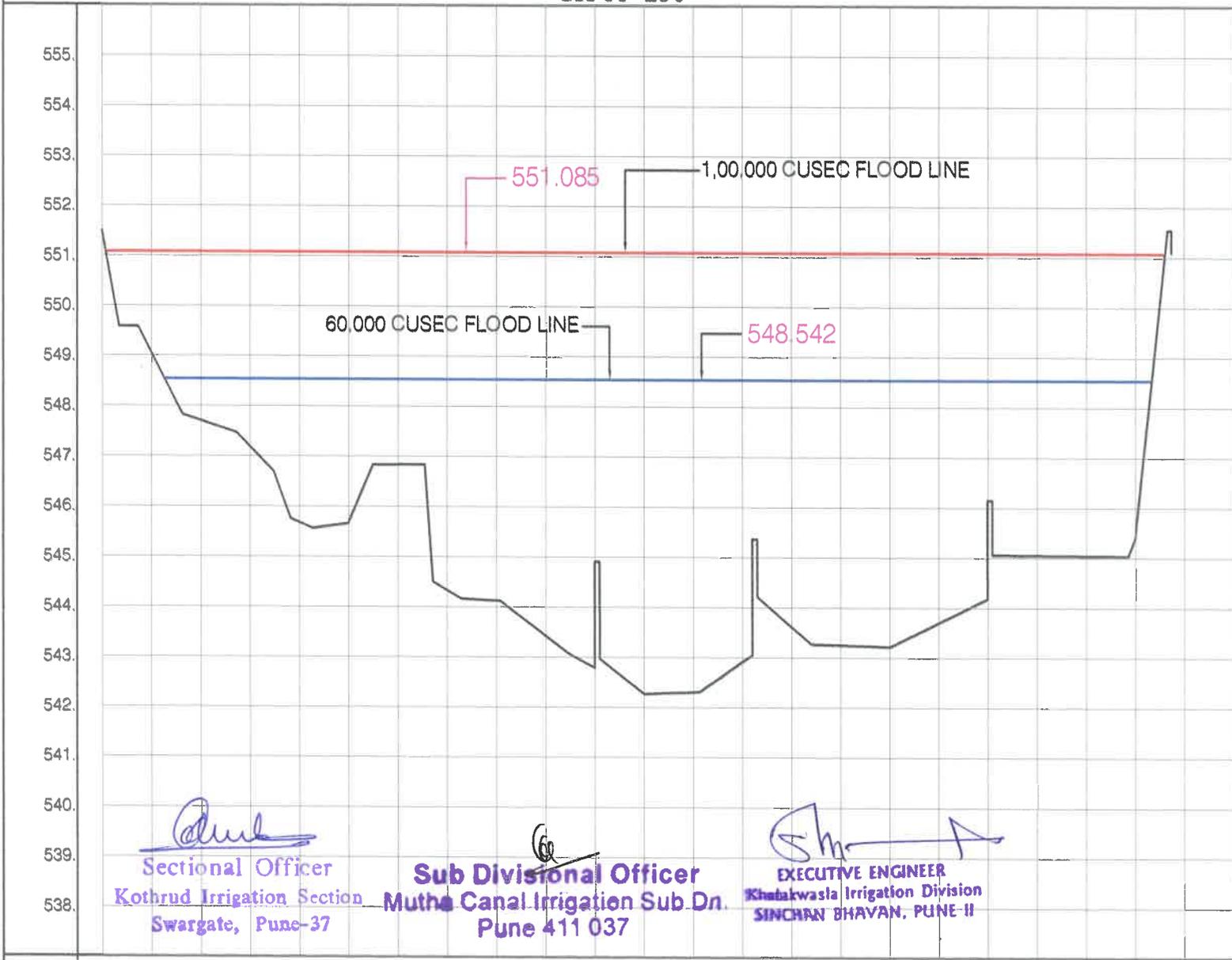
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.440	550.901	549.188	548.426	546.354	545.042	544.599	544.552	544.643	544.731	544.571	544.309	542.831	542.400	542.454	542.969	542.453	542.082	542.072	542.518	543.908	545.280	545.482	551.808
CHAINAGE	0.00	10.00	20.15	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	233.83

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+250



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

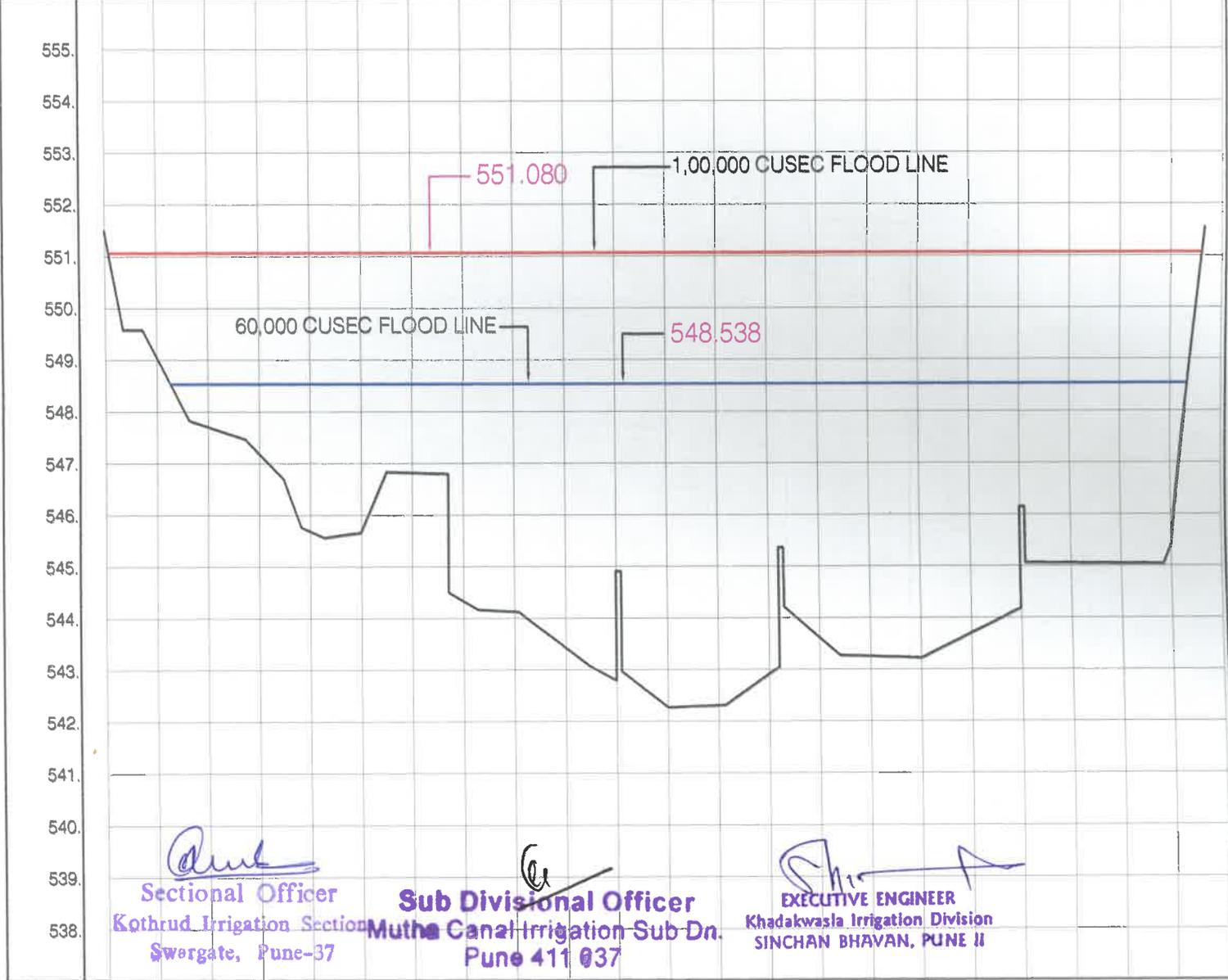
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwala Irrigation Division
 SINCHAN BHAVAN, PUNE-II

LEVELS	551.473	549.048	547.690	547.174	545.665	545.640	546.812	544.316	544.105	543.413	542.770	542.256	542.285	542.885	543.601	543.232	543.201	543.674	544.160	545.033	545.000	545.360	551.530
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.05	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	217.48

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+280



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swergate, Pune-37

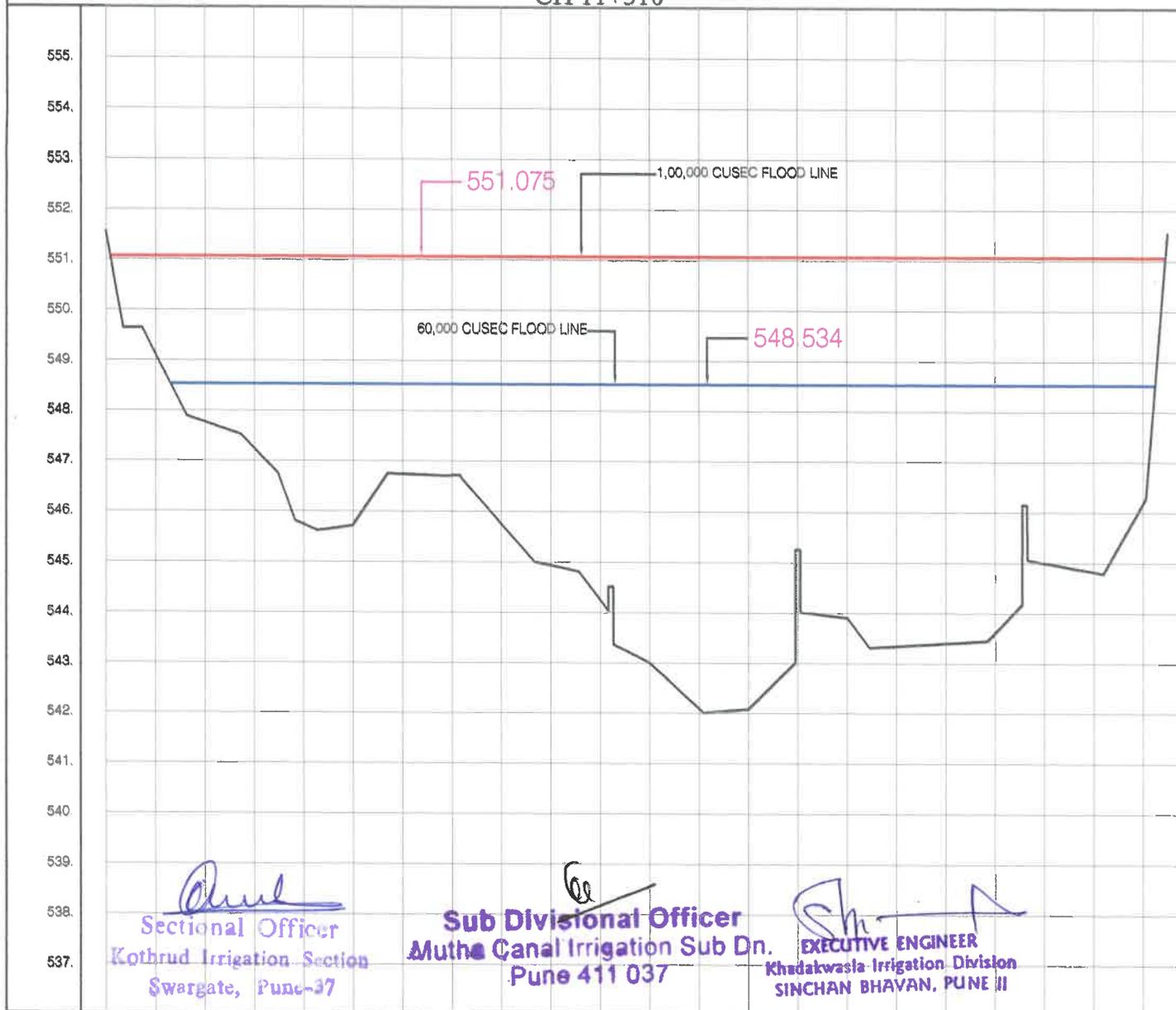
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.473	549.000	547.600	547.174	545.665	545.640	546.795	544.316	544.105	543.413	542.770	542.250	542.285	542.885	543.030	543.601	543.232	543.200	543.674	544.160	545.033	545.026	545.360	551.530
CHAINAGE	0.00	10.25	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.05	110.10	120.00	130.00	132.10	140.00	150.00	160.25	170.00	180.00	190.00	200.00	210.00	216.70

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

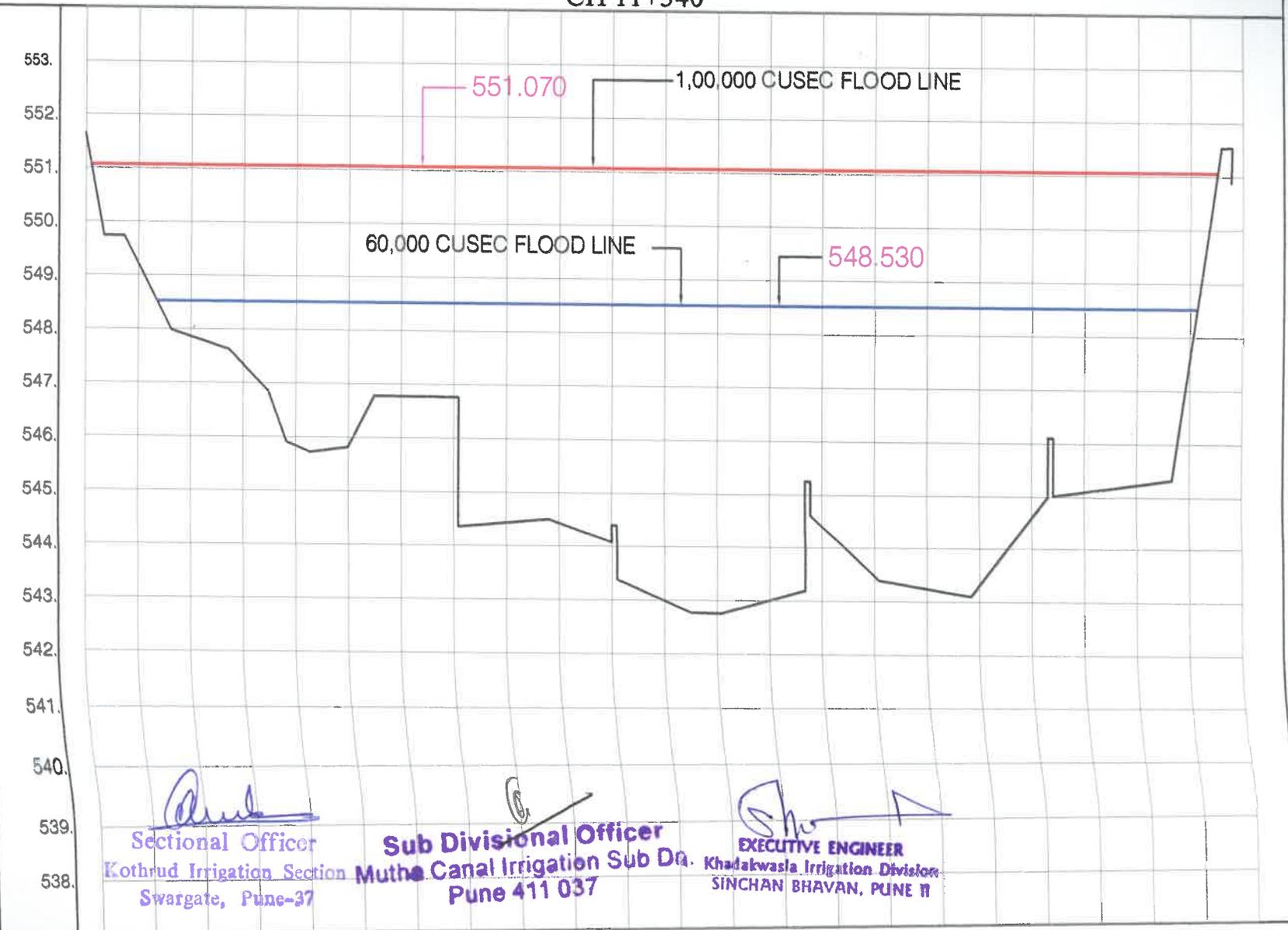
CH 11+310



LEVELS	551.533	549.108	547.750	547.234	545.725	545.700	546.720	546.685	545.753	544.922	544.249	542.990	542.000	542.000	543.000	543.880	543.321	543.380	543.575	545.000	544.807	546.139	551.538
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.20	160.00	170.00	180.00	190.00	200.00	210.00	215.21

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+340



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

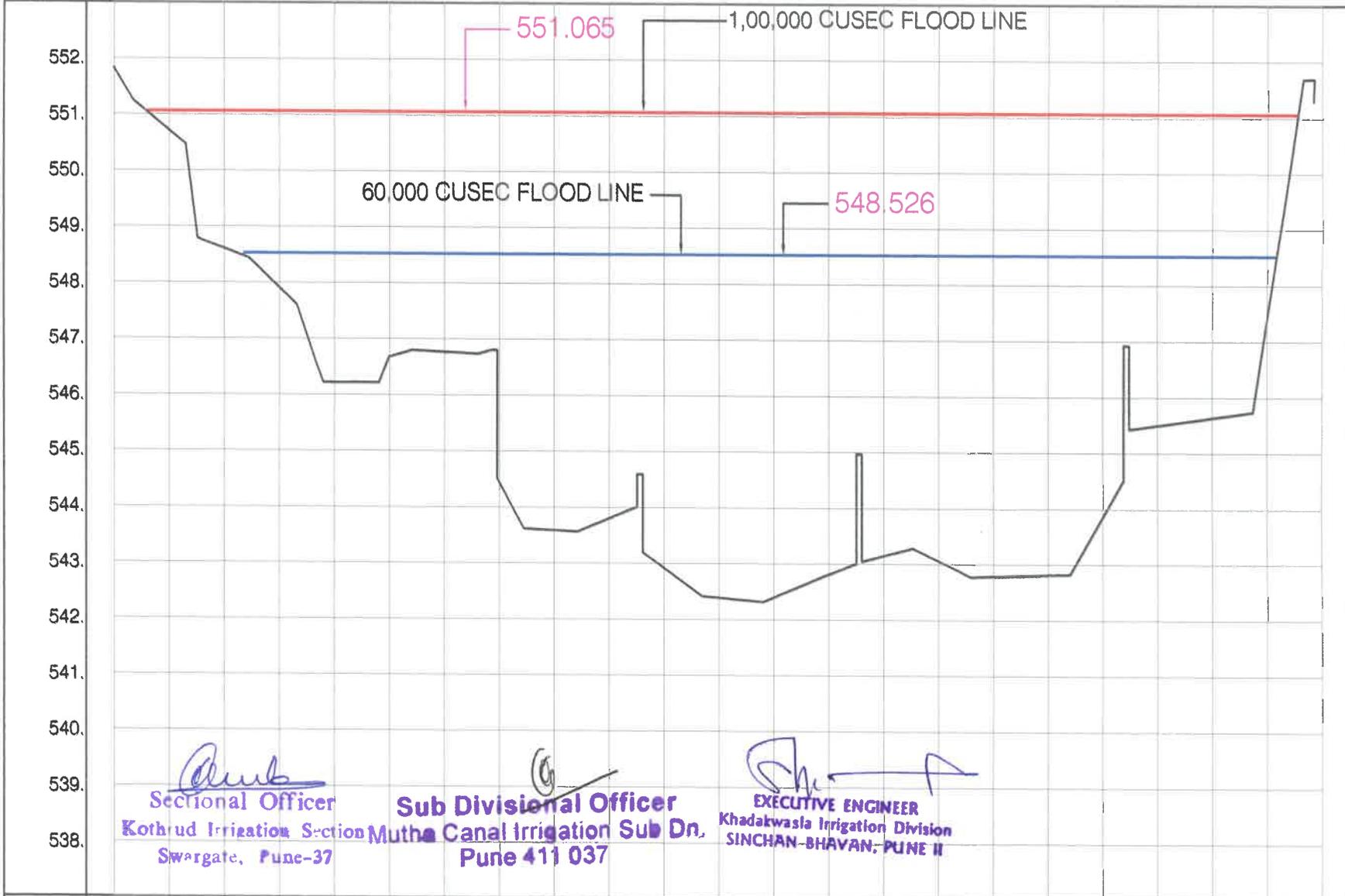
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Div.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.633	549.208	547.850	547.334	545.825	545.800	546.757	546.751	544.418	544.425	544.064	542.976	542.742	543.000	544.402	543.455	543.220	543.280	544.568	545.080	545.217	551.526
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.53	140.00	150.00	160.00	170.00	180.00	190.00	200.00	217.96

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+370



LEVELS	551.820	550.707	548.592	547.898	546.202	546.660	546.751	544.447	543.572	543.783	542.909	542.374	542.379	542.793	543.130	543.049	542.771	542.799	543.821	545.480	545.618	551.682
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	218.66

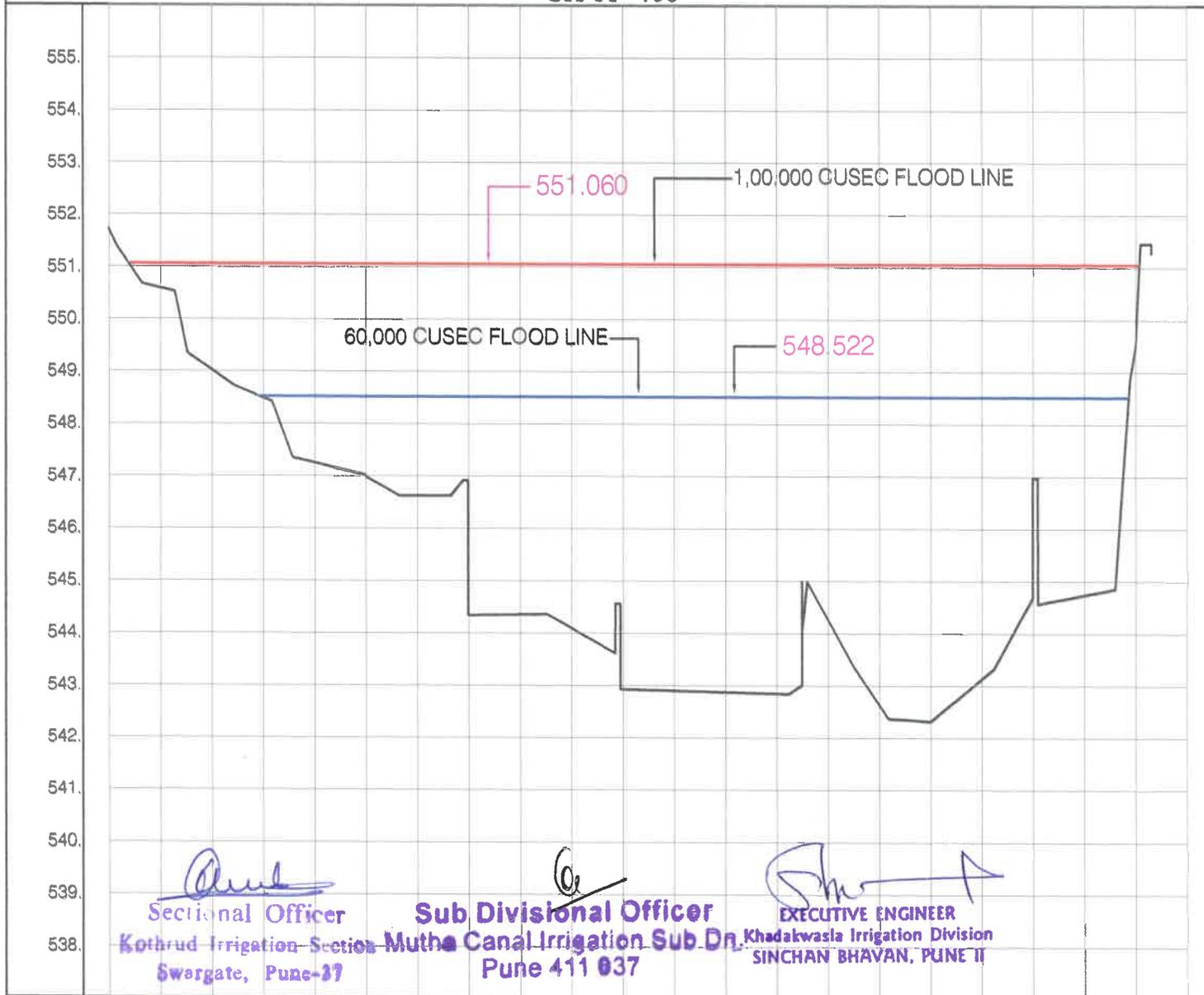
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn,
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN-BHAVAN, PUNE II

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+400



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swergate, Pune-37

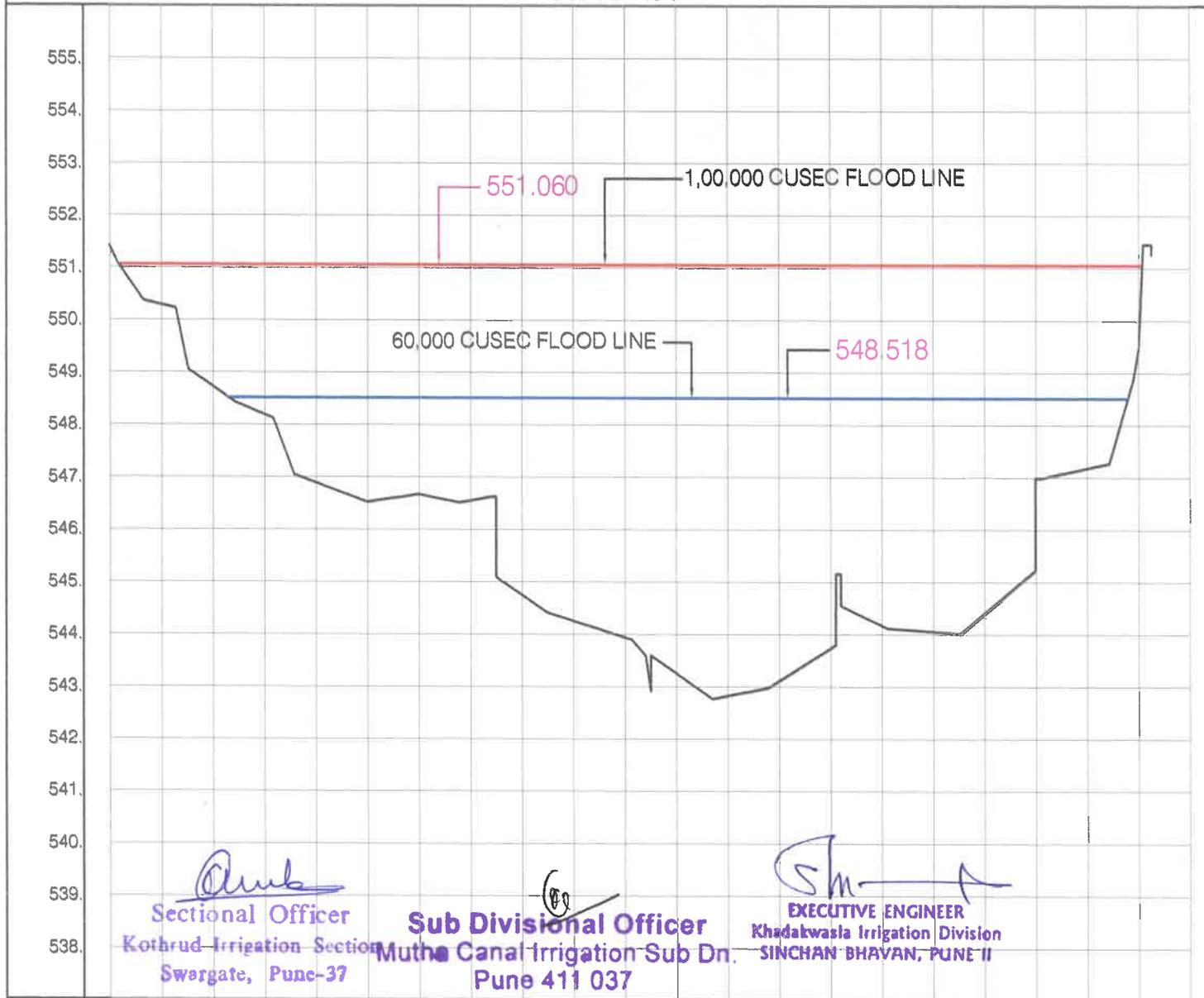
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.695	550.571	549.007	548.474	547.231	546.970	546.600	546.900	544.333	544.082	542.909	542.884	542.884	542.855	544.259	542.629	542.301	543.105	544.670	544.719	551.440
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	208.10

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+430



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

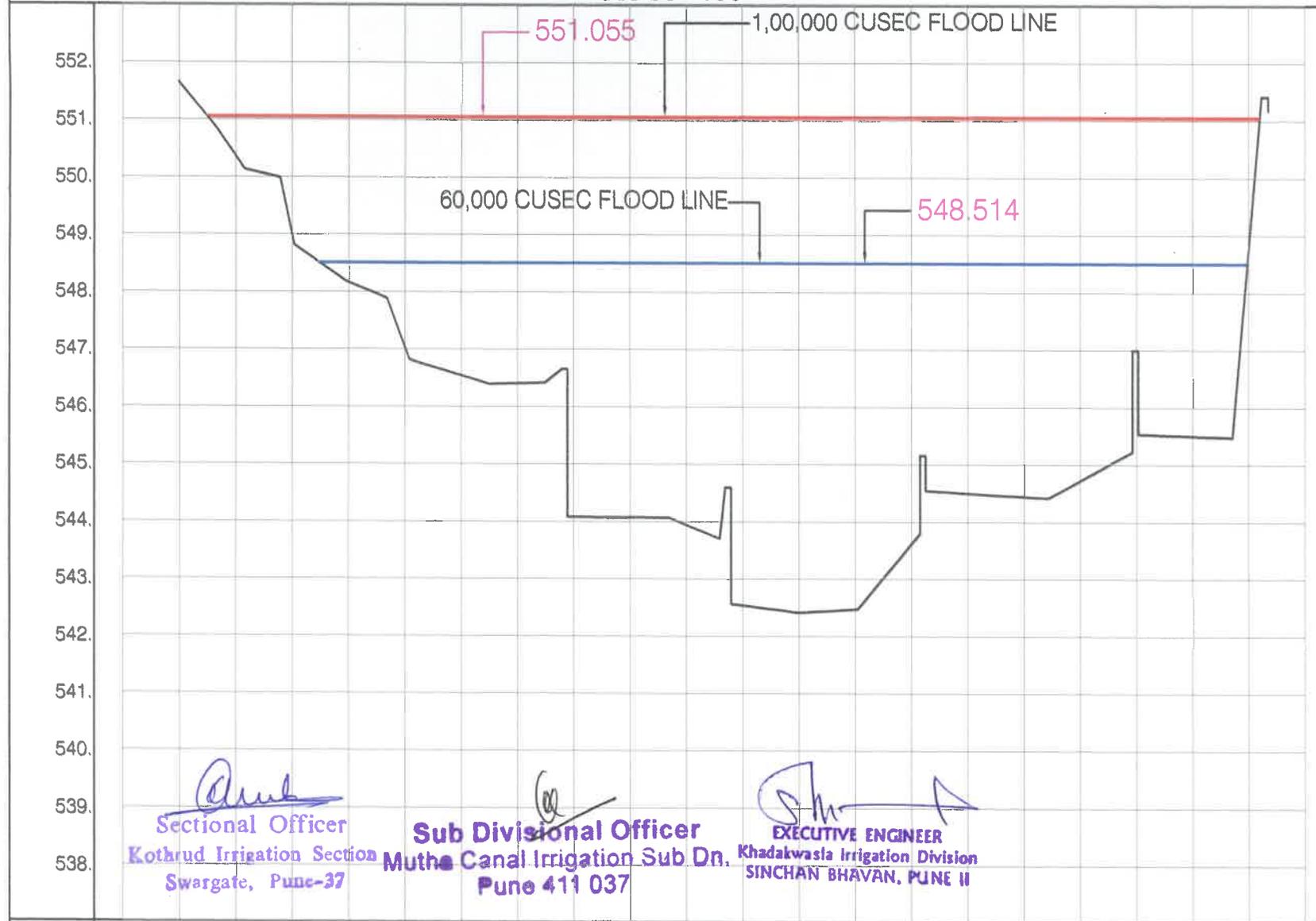
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAYAN, PUNE II

LEVELS	551.386	550.271	548.707	548.174	546.872	546.650	546.526	544.737	544.237	544.000	543.242	542.806	543.000	543.711	544.153	544.038	544.381	545.210	547.198	551.440
CHAINAGE	0.00	10.00	20.00	30.00	40.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	128.64	140.00	150.00	160.00	170.00	180.00	190.00	202.59

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

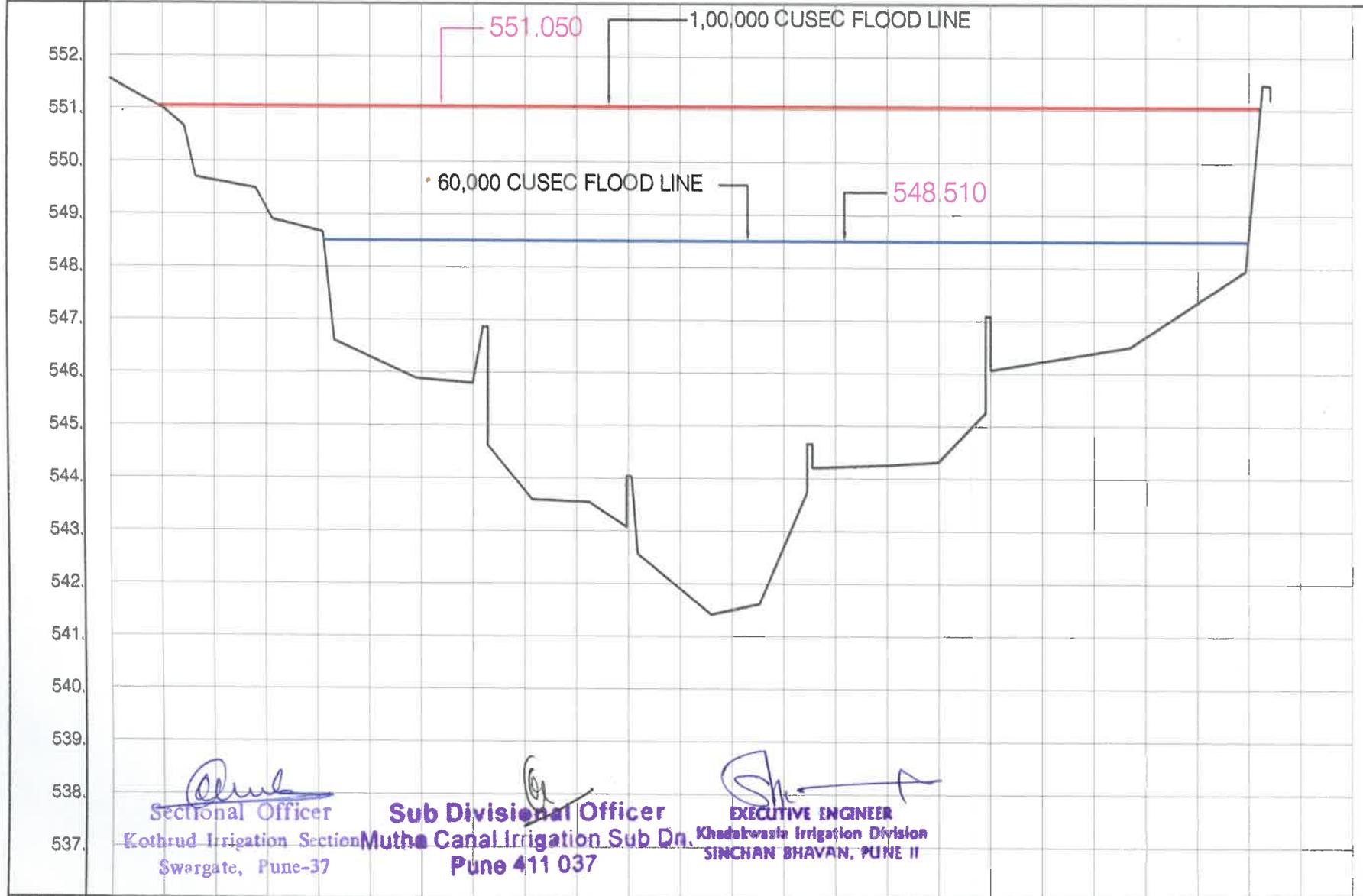
CH 11+460



LEVELS	551.644	550.358	548.993	548.152	547.043	546.529	546.389	544.059	544.054	544.000	542.525	542.400	542.460	543.590	544.483	544.425	544.701	546.980	545.490	551.410
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.50	130.00	140.00	150.00	160.00	170.00	180.00	193.53

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+490



LEVELS	551.542	551.000	549.619	549.116	548.669	546.280	545.863	545.780	543.758	543.541	544.020	541.893	541.484	542.665	544.204	544.240	544.300	547.070	546.211	546.374	546.679	547.329	551.451
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	224.22

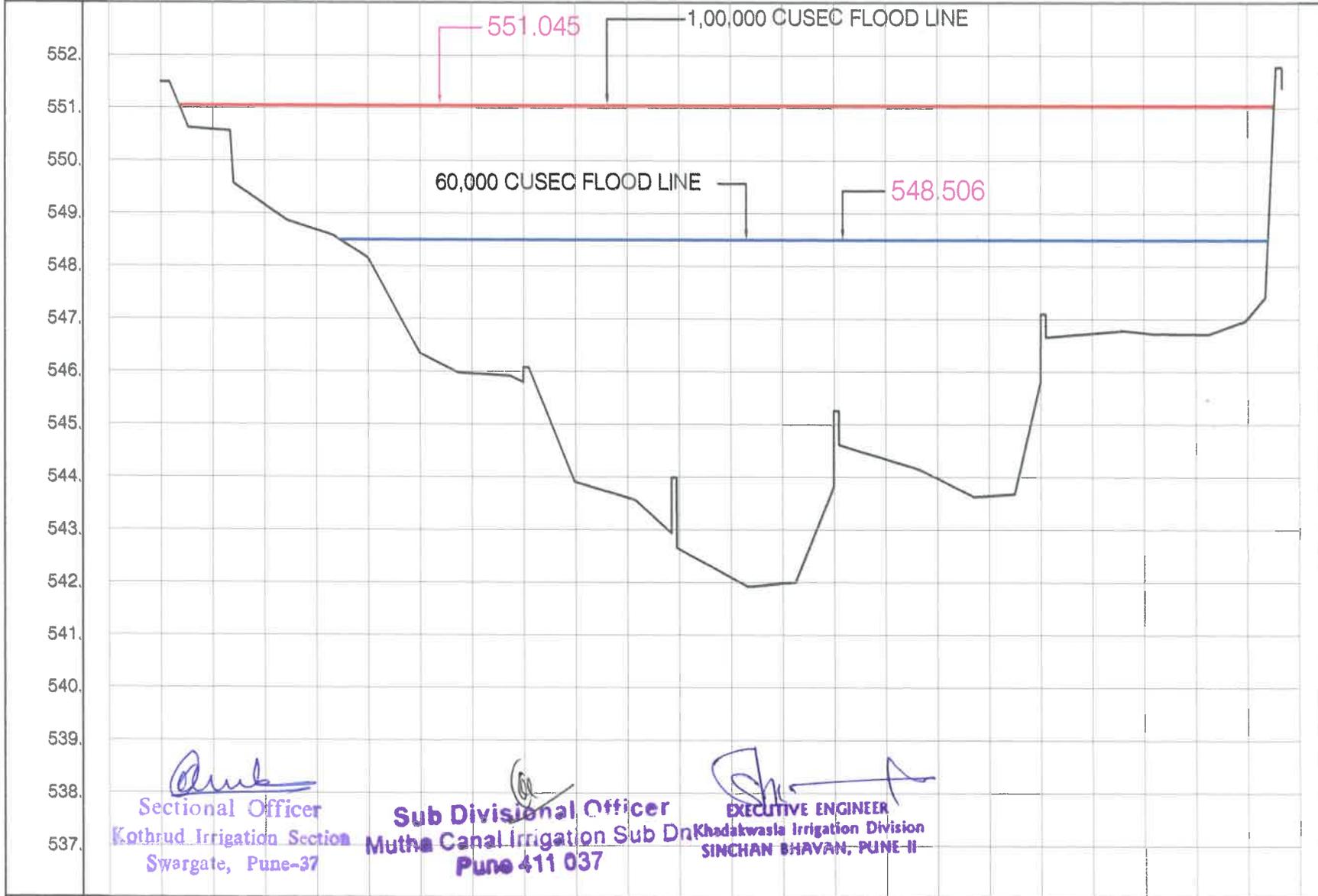
[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SIMCHAN BHAVAN, PUNE II

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

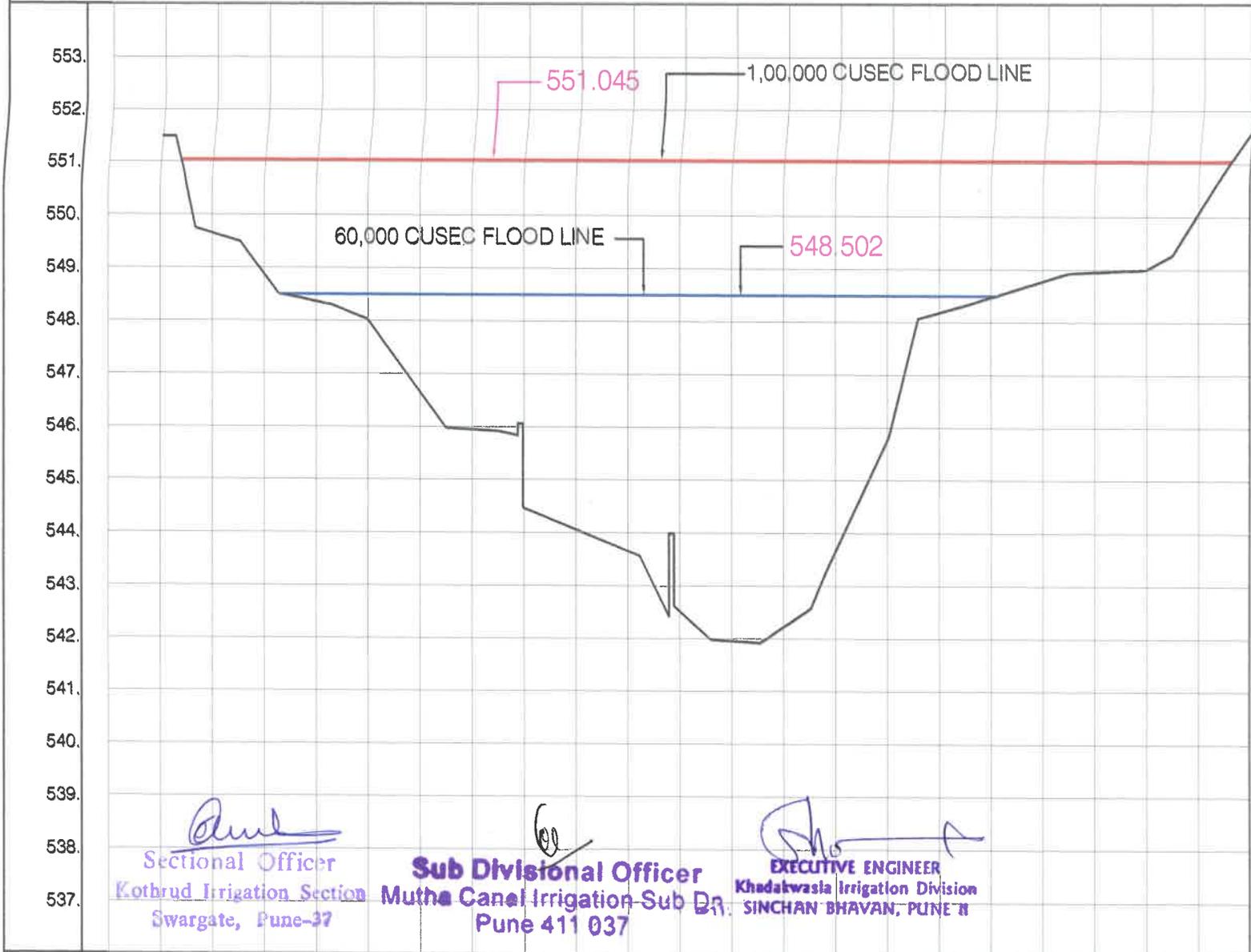
CH 11+520



LEVELS	551.476	550.577	549.149	548.669	548.140	546.330	546.000	546.060	543.887	543.596	542.620	541.965	543.800	544.325	543.962	543.628	547.080	546.715	546.726	546.698	547.000	551.763
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	120.00	130.00	140.00	150.00	160.00	170.06	180.00	190.00	200.00	210.10	216.79

CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE

CH 11+550



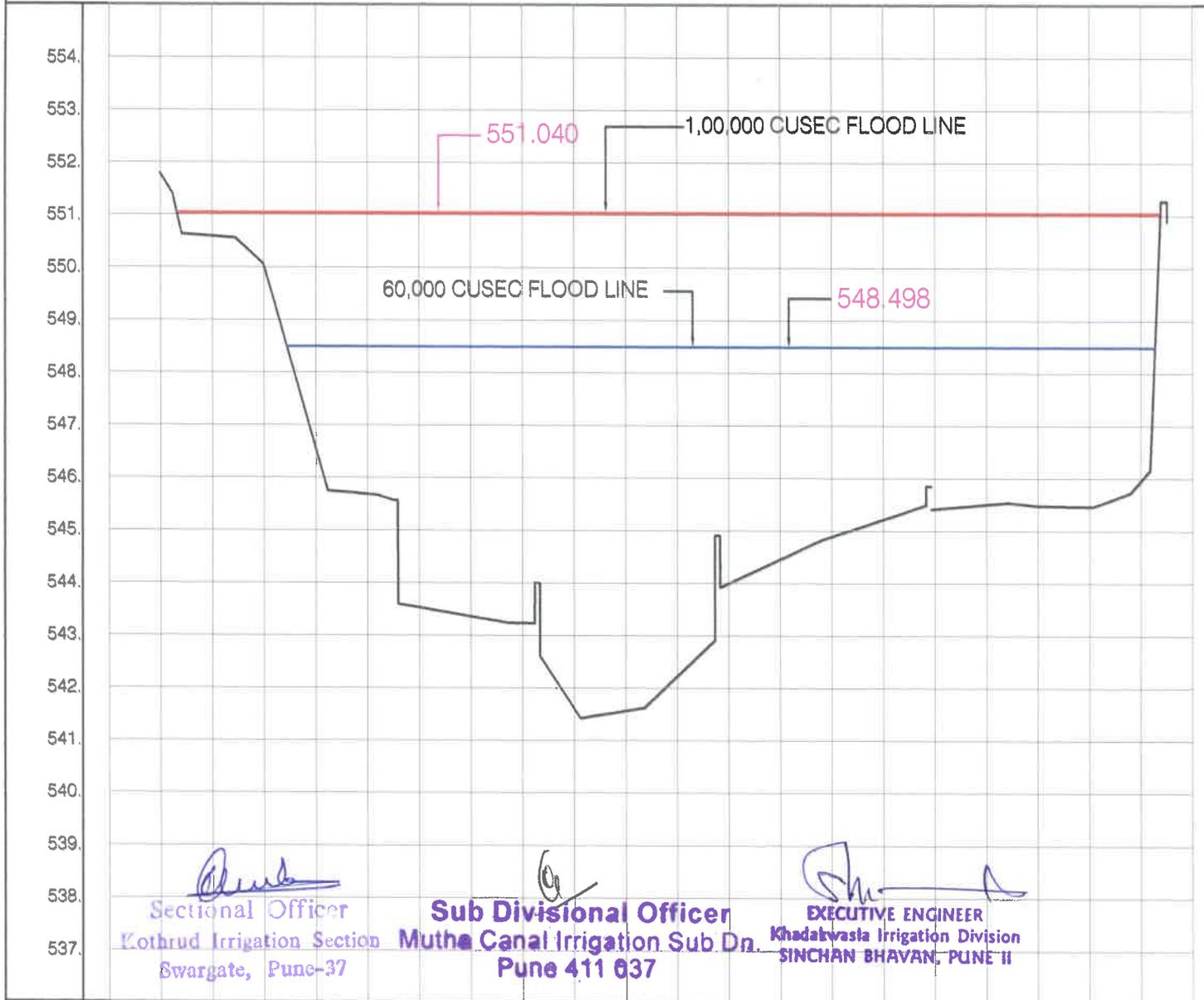
LEVELS	551.474	549.638	548.875	548.346	548.000	546.646	545.931	544.450	544.046	543.646	542.511	541.935	542.196	543.610	545.716	548.161	548.452	548.756	548.933	548.980	549.248	550.000	551.615
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	69.92	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	195.10	200.00	210.00

[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Div.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

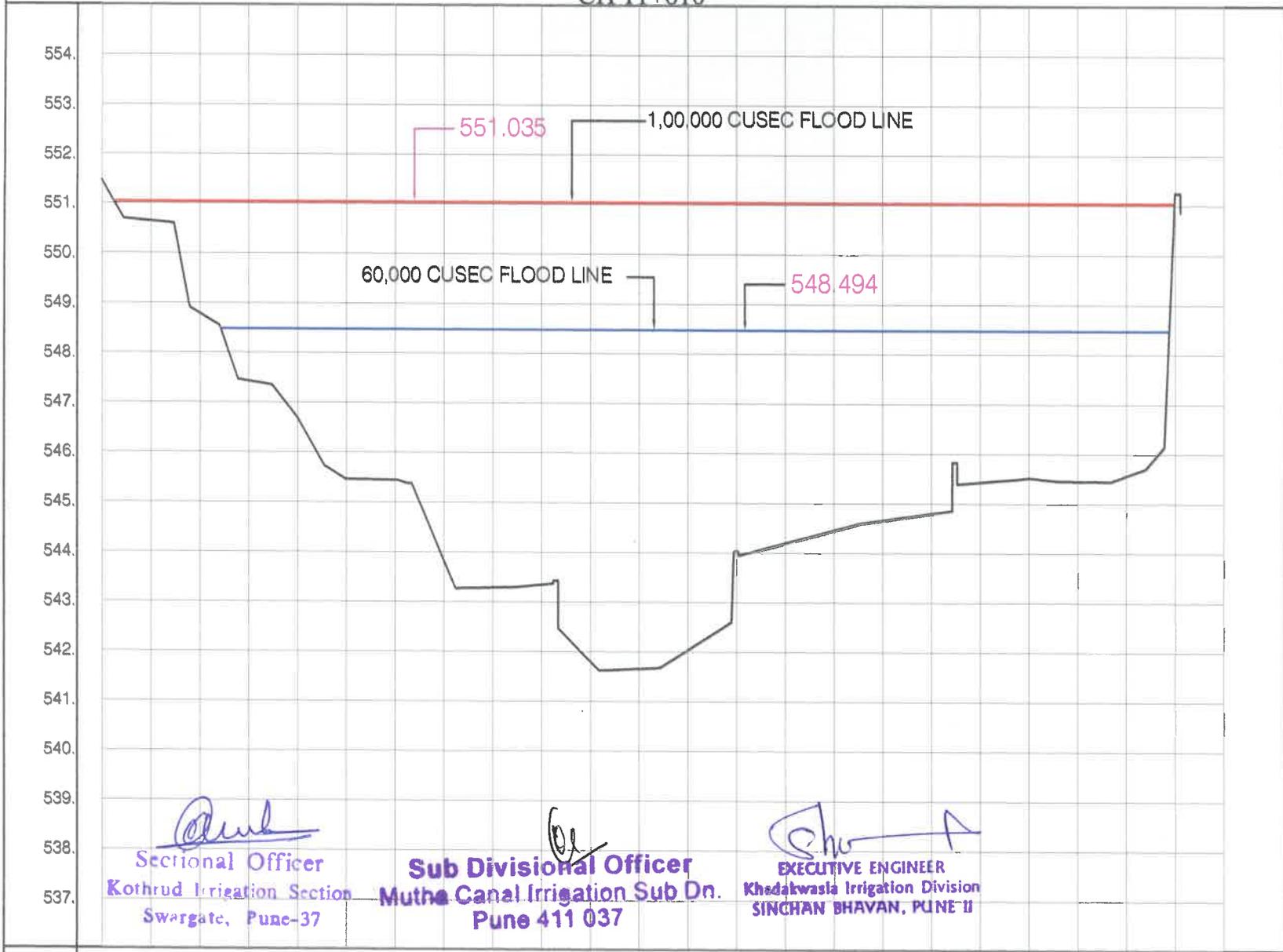
CROSS SECTION OF MUTHA RIVER U/S OF S.M. JOSHI BRIDGE
CH 11+580



LEVELS	551.772	550.571	550.000	546.564	545.667	543.513	543.345	543.215	541.611	541.540	542.193	543.973	544.432	544.866	545.194	545.395	545.479	545.459	545.446	545.929	551.253
CHAINAGE	0.00	10.00	20.12	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	195.14

CROSS SECTION OF MUTHA RIVER D/S OF S.M. JOSHI BRIDGE

CH 11+610



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

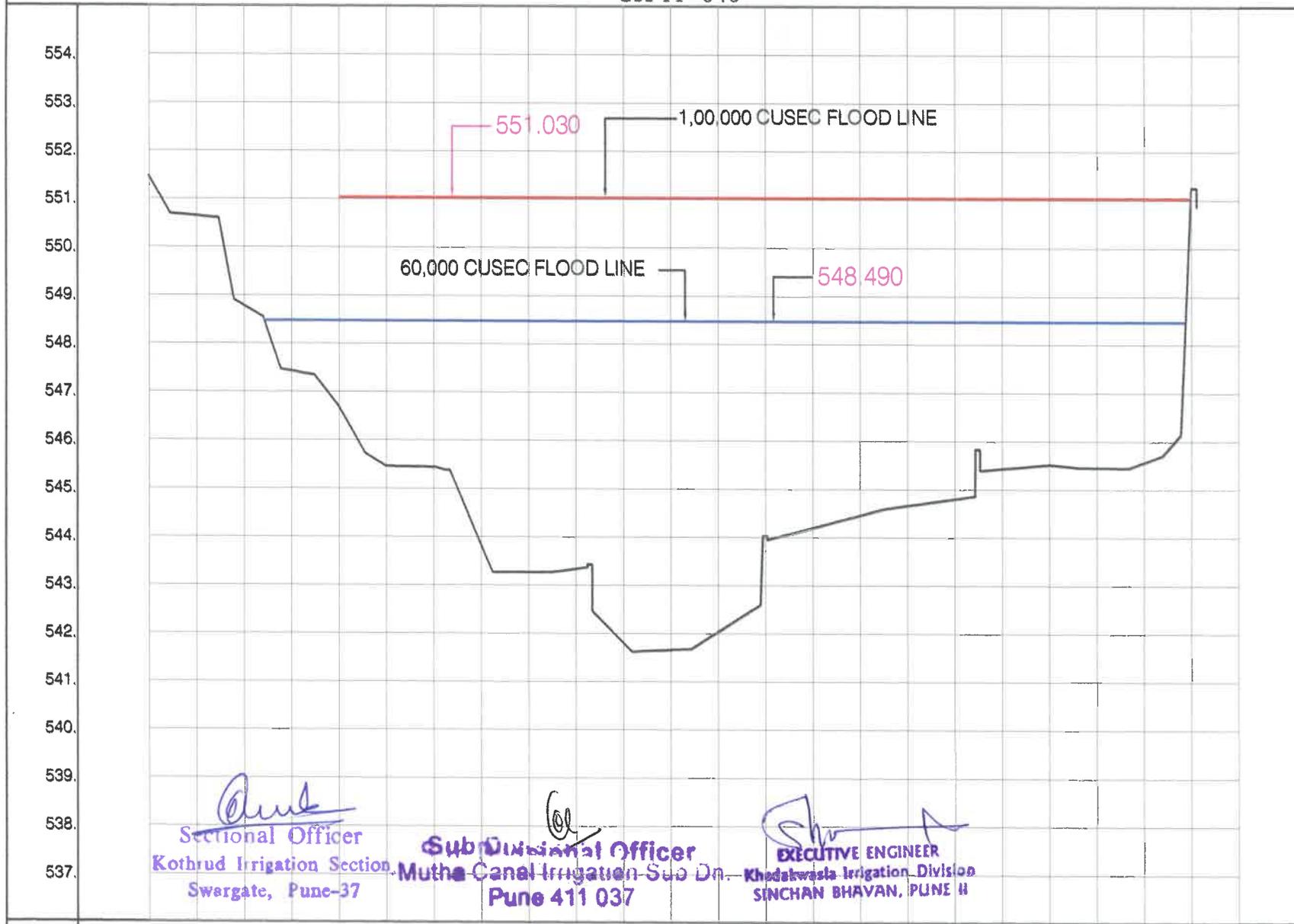
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	4551.450	4550.625	4548.769	4547.412	4546.680	4545.440	4545.421	4543.836	4543.269	4543.327	4541.793	4541.639	4542.013	4544.000	4544.178	4544.439	4544.643	4544.780	4545.408	4545.500	4545.433	4545.537	4551.233
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	221.14

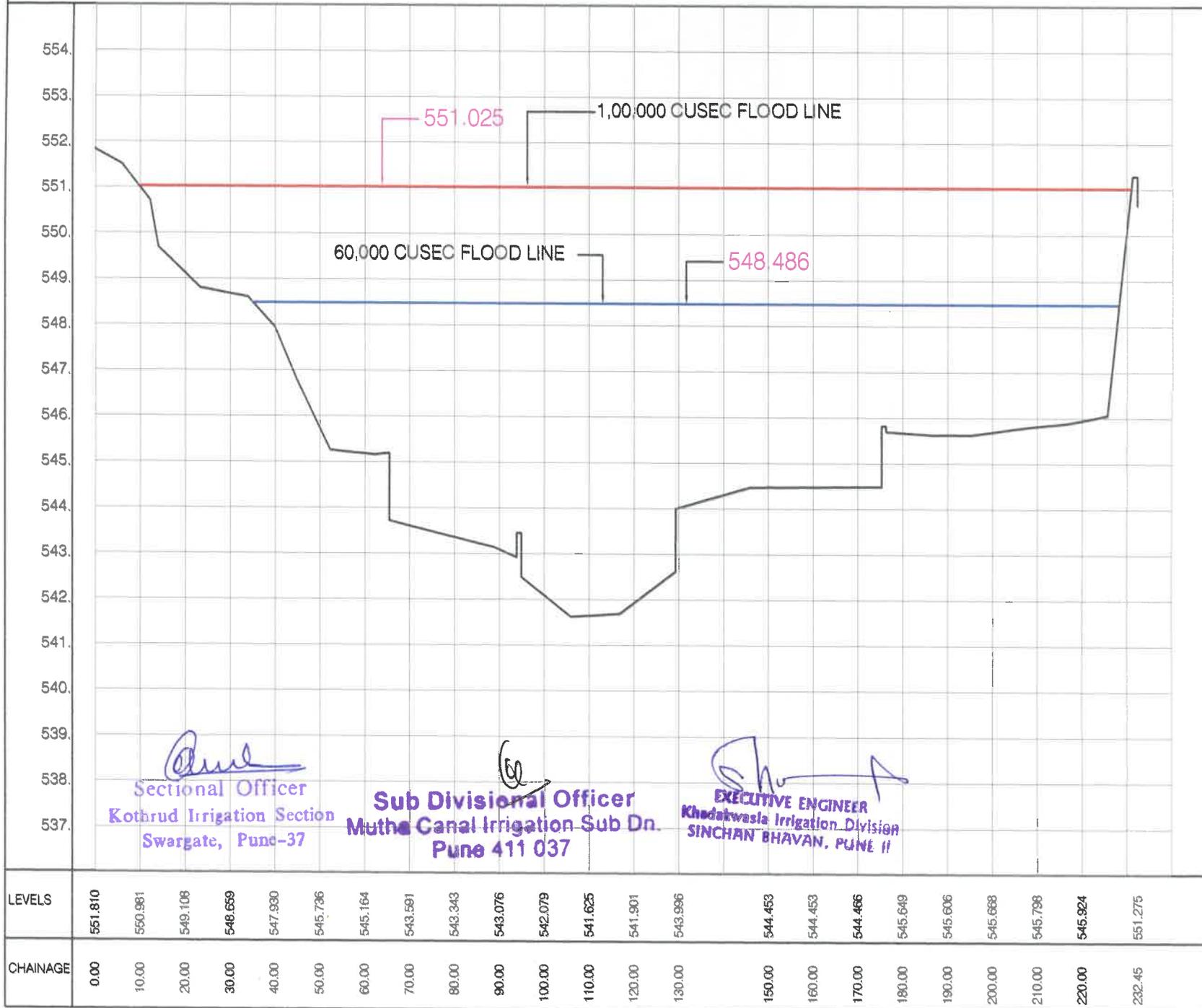
CROSS SECTION OF MUTHA RIVER D/S OF S.M. JOSHI BRIDGE

CH 11+640



LEVELS	551.450	550.625	548.769	547.412	546.680	545.440	545.421	543.636	543.249	543.316	541.793	541.600	542.000	544.000	544.178	544.439	544.643	544.799	545.408	545.500	545.433	545.537	551.233
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	119.80	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	221.14

CROSS SECTION OF MUTHA RIVER D/S OF S.M. JOSHI BRIDGE
CH 11+670

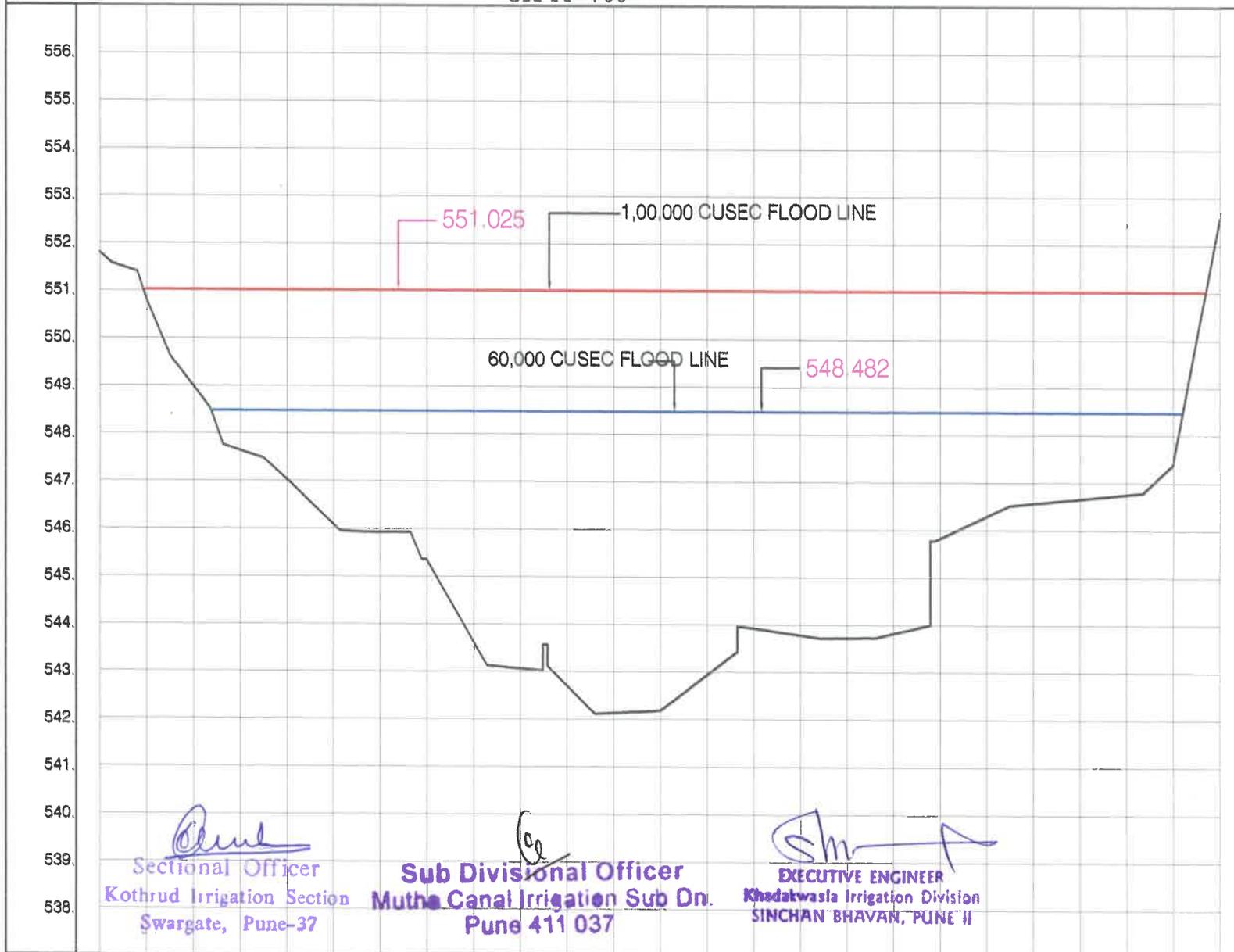


[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

[Signature]
Sub Divisional Officer
Mutha Canal Irrigation Sub Dn.
Pune 411 037

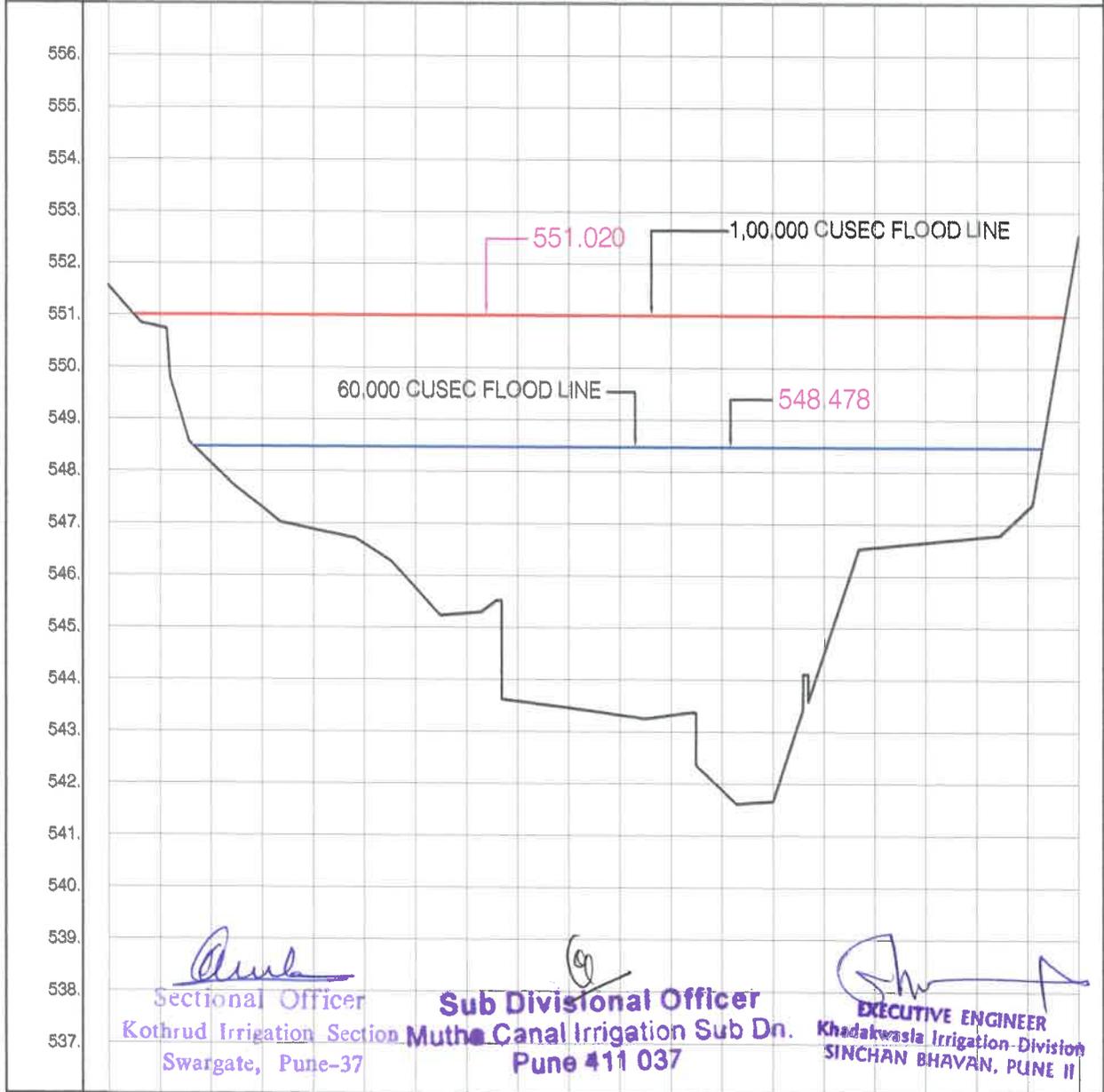
[Signature]
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

CROSS SECTION OF MUTHA RIVER D/S OF S.M. JOSHI BRIDGE
CH 11+700



LEVELS	551.775	550.788	548.988	547.619	547.020	546.073	545.910	545.340	543.625	543.000	542.685	542.110	542.160	542.910	543.906	543.763	543.705	543.798	545.806	546.269	546.547	546.642	546.736	547.485	552.550
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	230.00	240.00

CROSS SECTION OF MUTHA RIVER D/S OF S.M. JOSHI BRIDGE
CH 11+730



[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

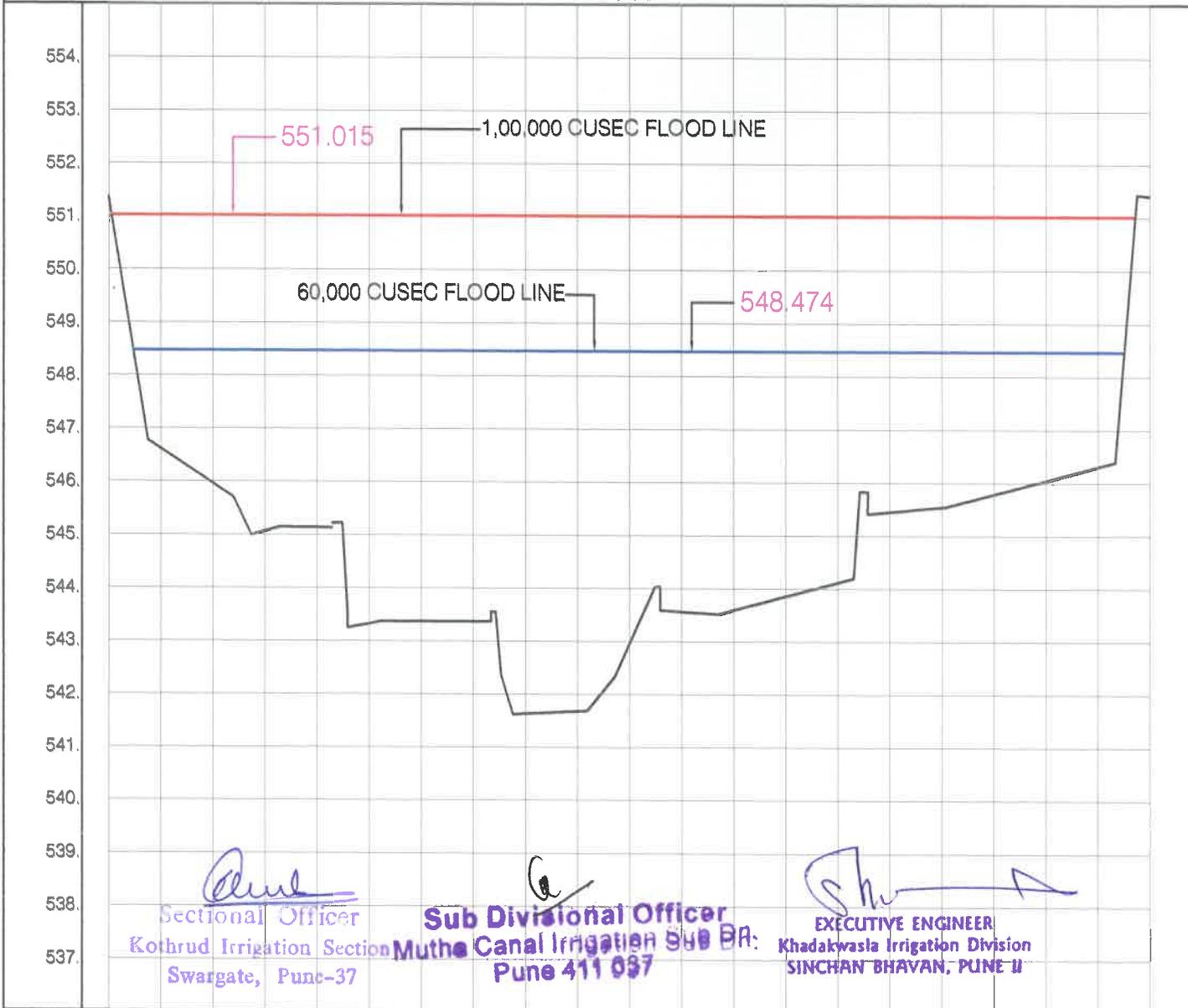
[Signature]
Sub Divisional Officer
Mutha Canal Irrigation Sub Dn.
Pune 411 037

[Signature]
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

LEVELS	551.534	550.747	548.142	547.288	546.867	546.589	545.762	545.254	543.563	543.438	543.301	543.297	541.872	541.590	541.640	544.445	546.529	546.627	546.725	547.268	552.540
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	123.00	130.10	140.00	150.00	160.00	170.00	180.00	190.00

CROSS SECTION OF MUTHA RIVER U/S OF CHAVAN CYCLE BRIDGE

CH 11+760



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

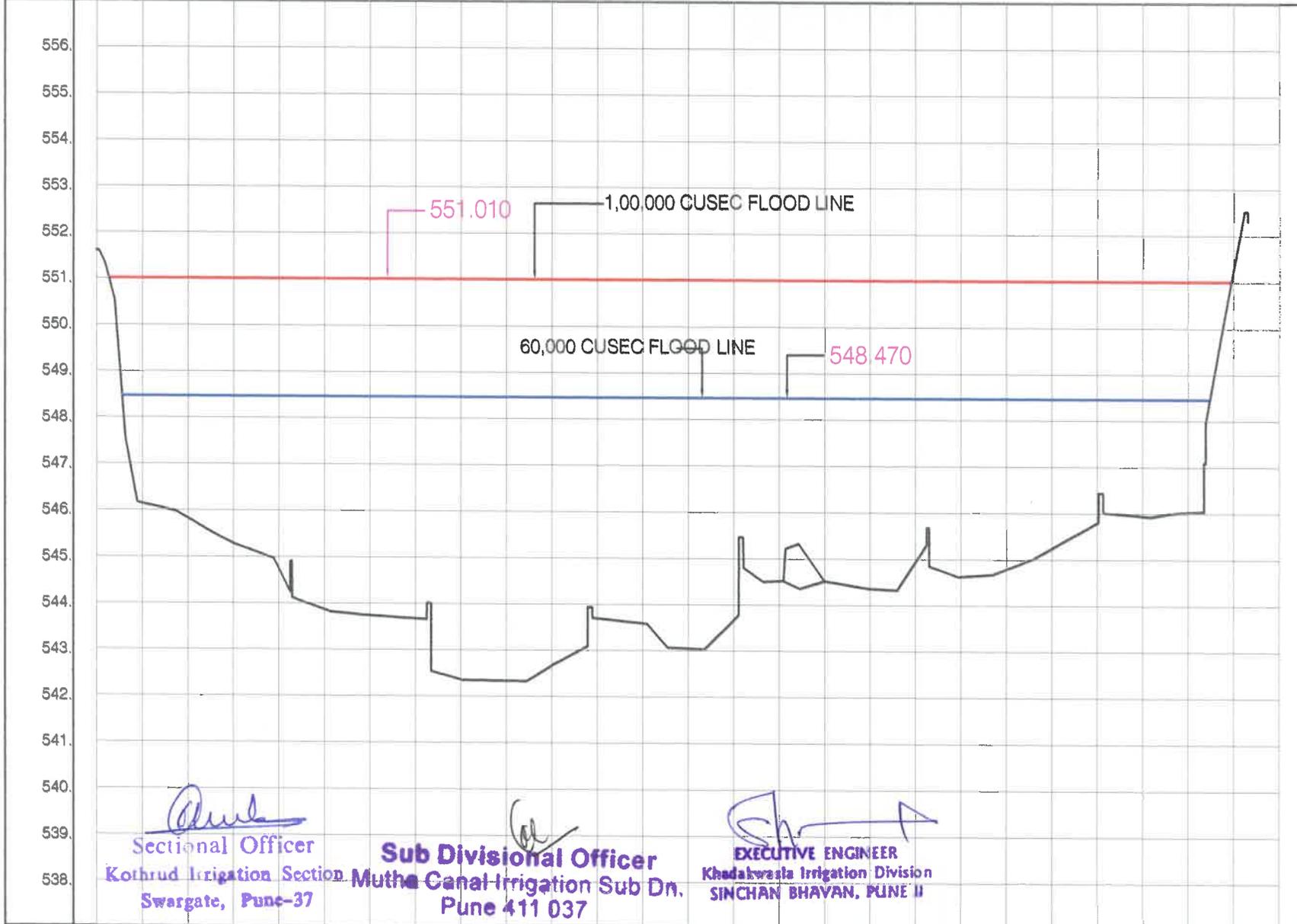
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation SUB BR:
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwada Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	551.343	546.603	546.000	545.000	545.000	543.000	543.350	543.350	541.611	541.660	543.000	543.545	543.576	543.836	544.000	545.423	545.522	545.522	545.766	533.383	546.000	551.390
CHAINAGE	0.00	10.00	19.25	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.40	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	184.26	190.00	200.00

CROSS SECTION OF MUTHA RIVER U/S OF CHAVAN CYCLE BRIDGE

CH 11+790



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

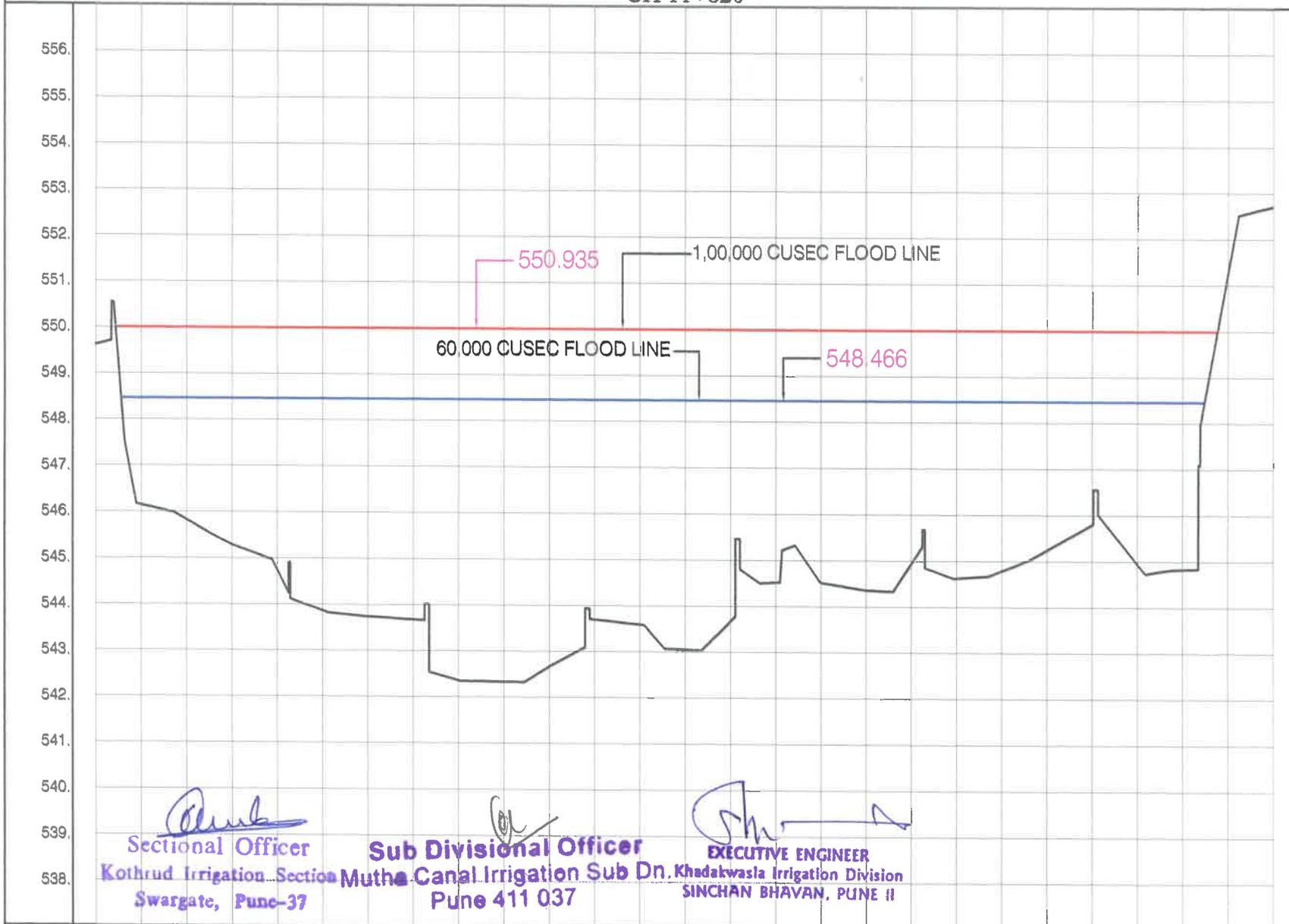
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	CHAINAGE
551.990	0.00
550.520	4.000
547.510	6.400
546.150	9.000
546.127	10.00
545.960	17.400
545.813	20.00
545.440	26.600
545.272	30.00
544.950	39.000
544.787	40.00
543.850	50.00
543.730	58.400
543.720	60.00
543.656	70.00
544.000	73.610
542.330	80.45
542.317	90.00
542.310	94.600
542.642	100.00
543.070	108.000
543.679	110.00
543.571	120.00
543.050	125.600
543.034	130.00
543.020	133.700
543.634	141.19
544.480	146.600
544.480	150.00
544.465	160.33
544.340	170.00
544.310	176.100
544.898	180.00
544.600	189.60
544.650	197.250
544.765	200.00
545.000	206.100
545.215	210.00
545.768	220.00
545.926	230.00
544.800	237.500
546.008	240.00
552.662	252.400
552.680	260.000

CROSS SECTION OF MUTHA RIVER U/S OF CHAVAN CYCLE BRIDGE

CH 11+820

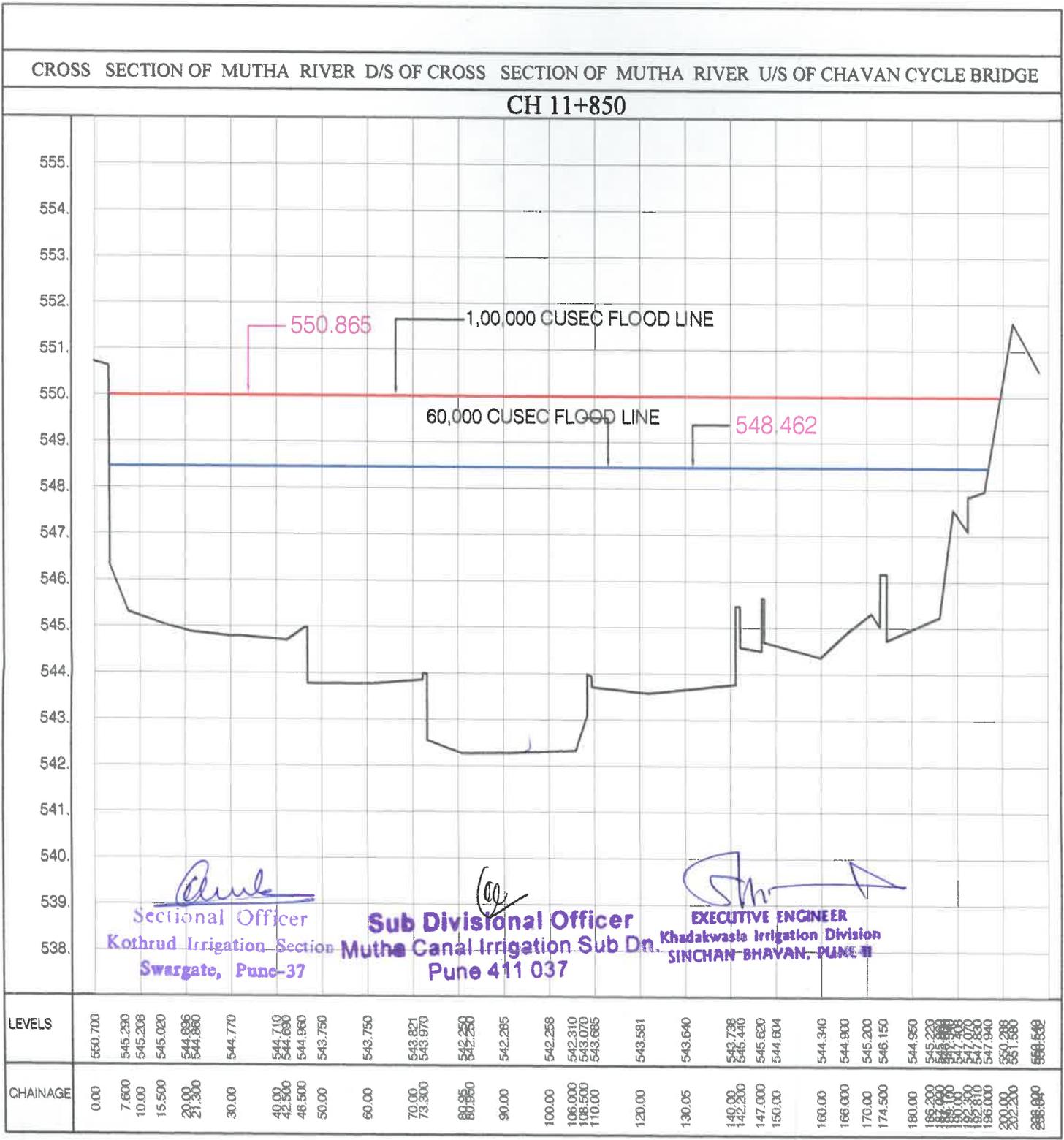


[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

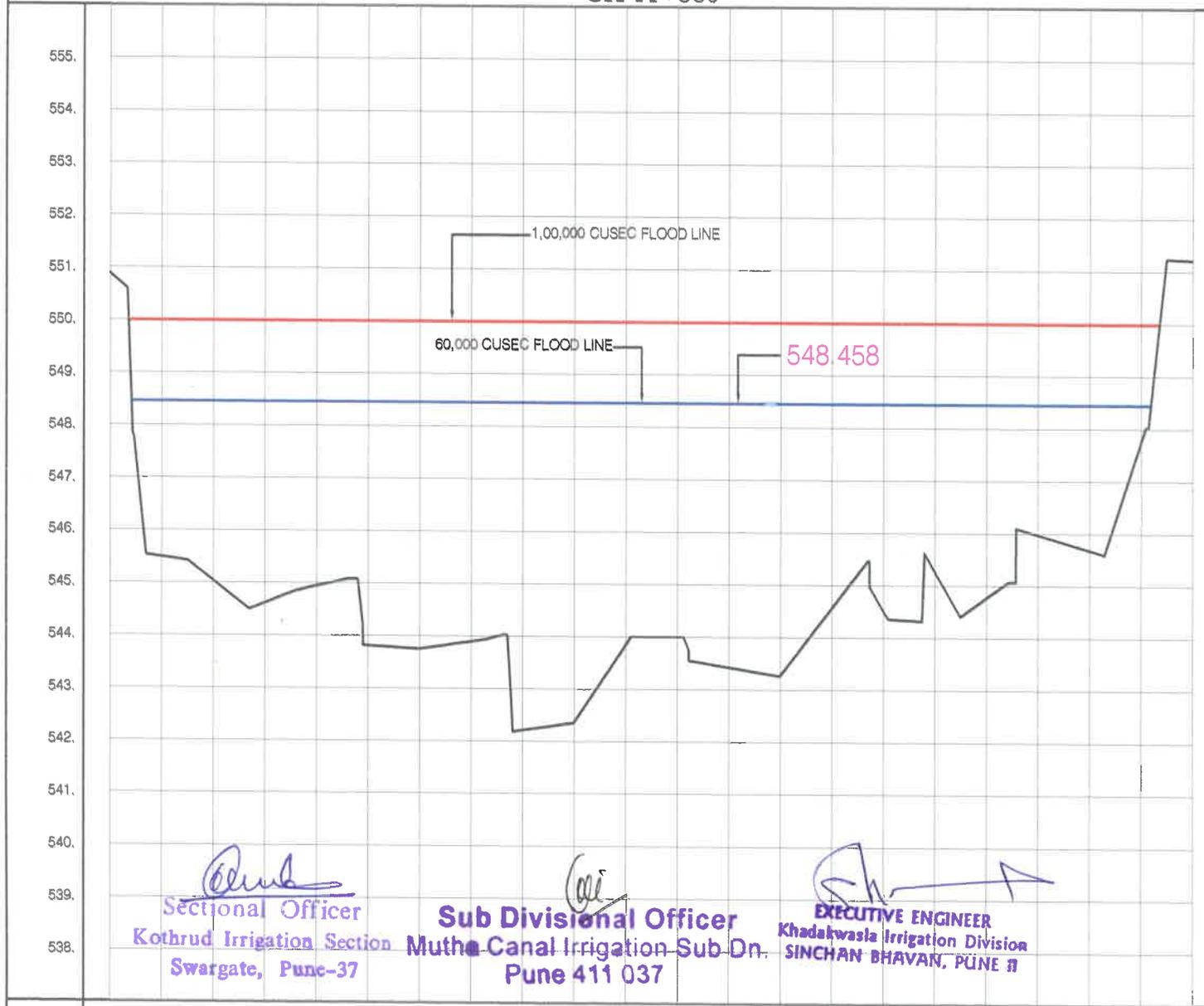
[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	549.600	547.510	546.150	546.127	545.960	545.813	545.440	545.272	544.980	544.787	543.850	543.730	543.720	543.656	542.838	542.317	542.310	542.642	543.070	543.679	543.571	543.050	543.034	543.020	543.634	544.480	544.485	544.507	544.340	544.310	544.888	545.680	544.603	544.650	544.765	545.000	545.215	546.150	546.768	545.000	544.710	544.800	544.808	547.070	552.500	552.680
CHAINAGE	0.00	6.400	8.000	10.00	17.400	20.00	26.600	30.00	38.000	40.00	50.00	58.400	60.00	70.00	80.80	90.00	94.600	100.00	108.000	110.00	120.00	125.600	130.00	133.700	140.00	146.600	150.00	160.00	170.00	176.100	180.00	183.110	190.00	197.250	200.00	206.100	210.00	220.400	220.00	229.55	231.900	237.500	240.00	244.000	252.400	268.000



CROSS SECTION OF MUTHA RIVER D/S OF CROSS SECTION OF MUTHA RIVER U/S OF CHAVAN CYCLE BRIDGE

CH 11+880



[Signature]
Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

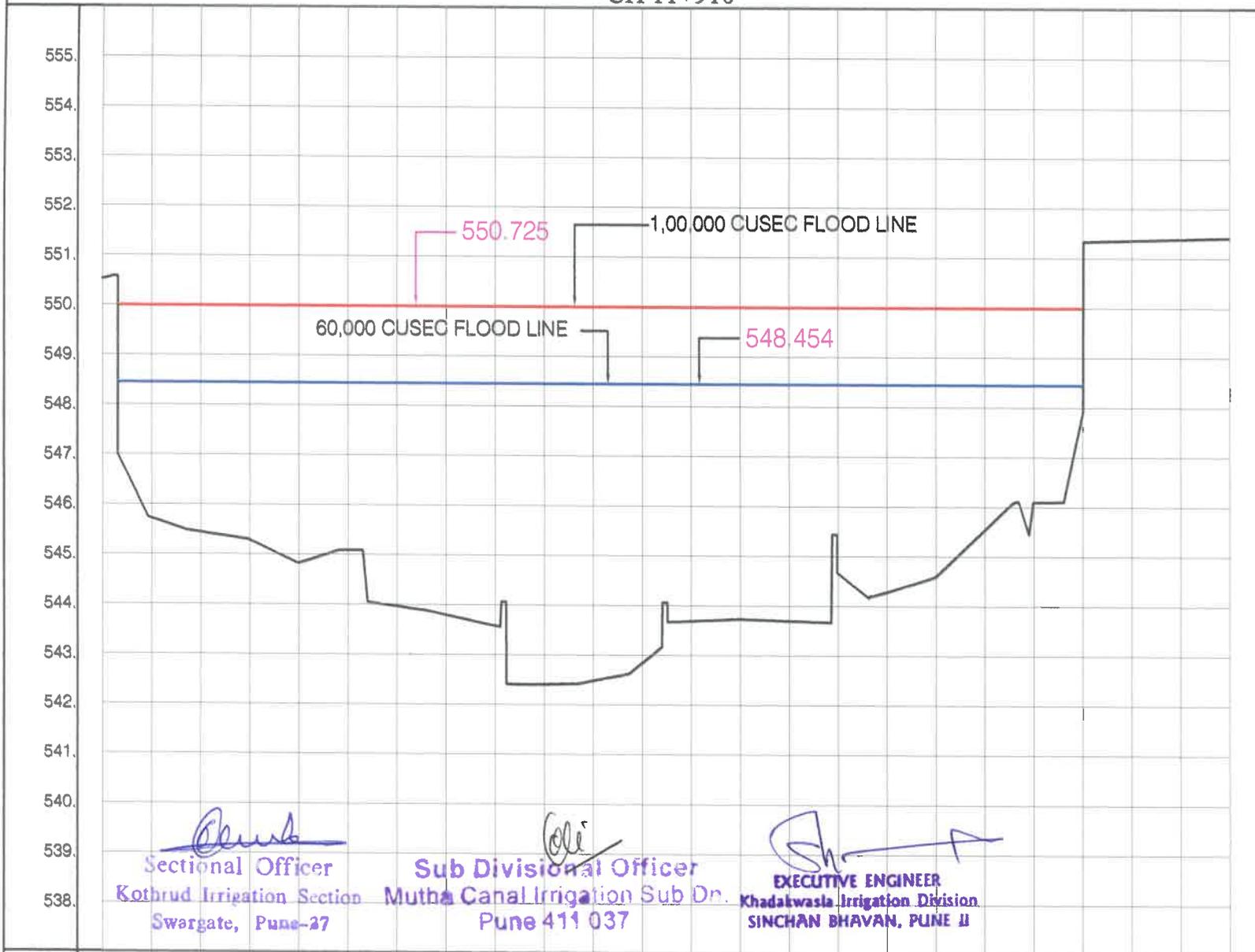
[Signature]
Sub Divisional Officer
 Mutha Canal Irrigation Sub-Dn.
 Pune 411 037

[Signature]
EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	CHAINAGE
550.870	0.00
547.030	4.400
545.510	7.100
545.471	10.00
545.400	15.200
545.029	20.00
544.480	27.100
544.593	30.00
544.830	36.100
544.920	40.00
544.180	48.100
543.800	48.110
543.794	50.00
543.730	60.00
543.875	70.00
543.920	73.100
544.010	77.100
542.380	78.100
542.187	80.00
542.330	90.00
543.819	100.00
543.950	101.150
543.950	110.00
543.950	112.300
543.530	112.300
543.404	120.00
543.240	129.95
544.535	140.00
544.535	150.00
544.340	151.000
545.600	158.100
545.287	160.00
544.390	165.000
544.745	170.00
545.050	174.300
546.080	175.820
545.958	180.00
545.580	193.000
548.010	201.000
551.220	206.000
551.200	210.00

CROSS SECTION OF MUTHA RIVER D/S OF CROSS SECTION OF MUTHA RIVER U/S OF CHAVAN CYCLE BRIDGE

CH 11+910



[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-27

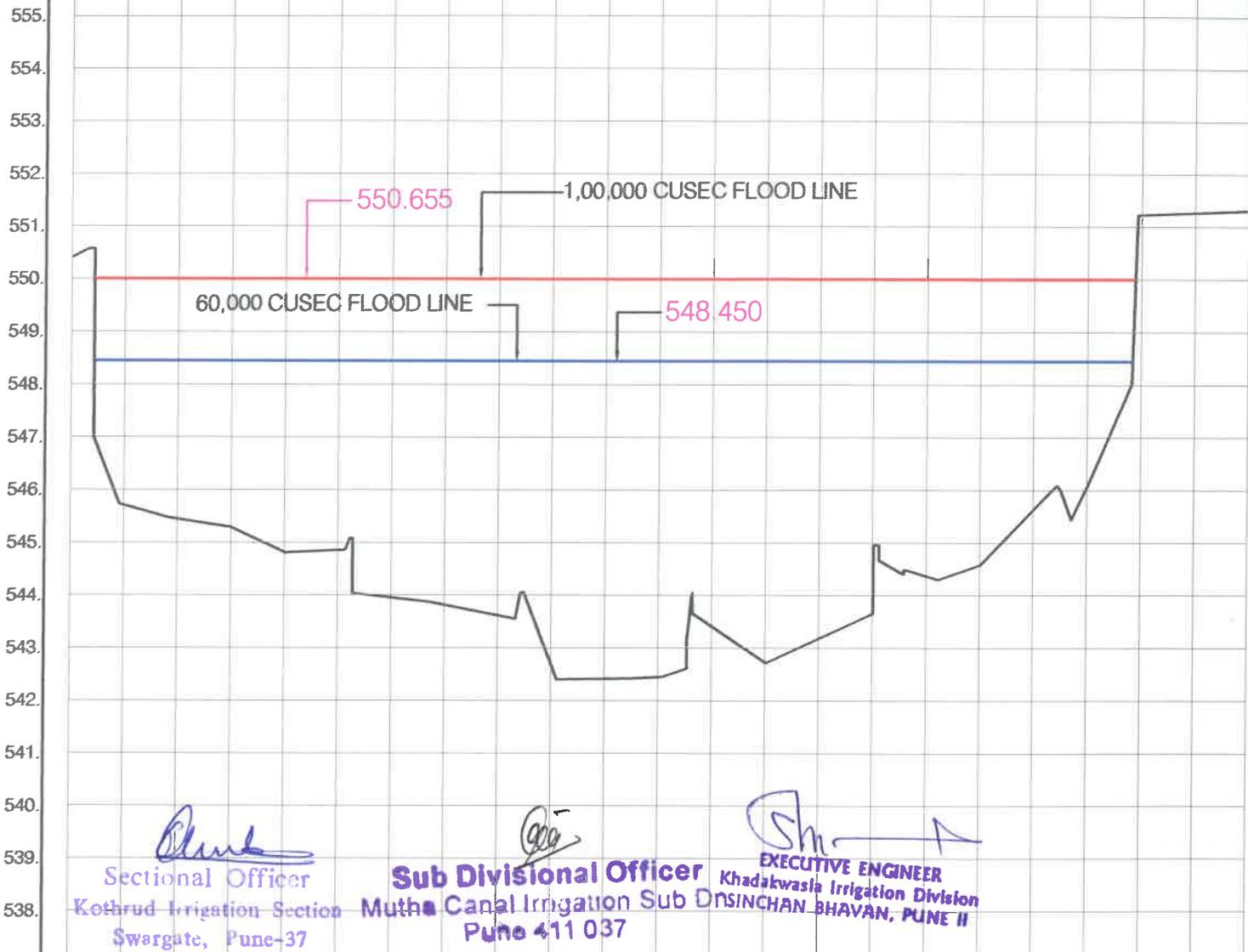
[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	550.500	545.720	545.460	545.421	545.280	545.271	544.800	545.070	544.030	543.947	543.860	543.778	543.564	542.380	542.400	542.400	542.458	542.600	542.813	543.669	543.669	543.678	545.420	544.290	544.282	544.570	545.514	546.000	546.030	551.320	551.320	551.395
CHAINAGE	0.00	9.40	17.300	20.00	29.800	30.00	40.00	50.00	54.110	60.00	66.200	70.00	80.00	87.600	90.00	96.950	100.00	107.400	110.00	120.00	130.00	140.00	148.900	161.000	160.00	170.00	180.00	190.00	196.200	200.710	200.71	230.00

CROSS SECTION OF MUTHA RIVER D/S OF CROSS SECTION OF MUTHA RIVER U/S OF CHAVAN CYCLE BRIDGE

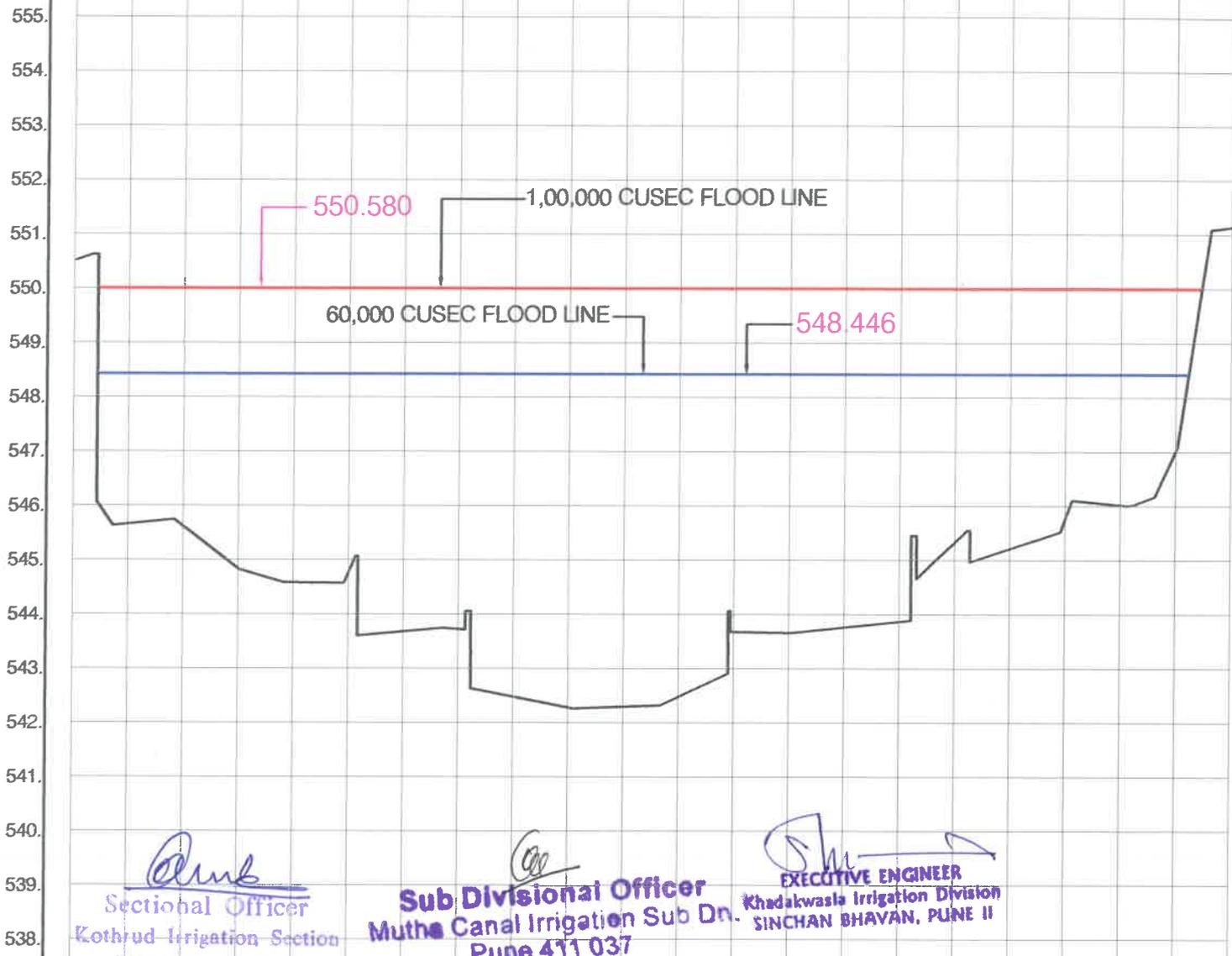
CH 11+940



LEVELS	550.400	545.720	545.692	545.460	545.432	545.271	544.800	544.800	544.800	544.000	543.860	543.804	543.602	544.040	542.830	542.390	542.403	542.410	542.440	542.600	543.392	542.710	543.180	543.650	544.355	544.570	545.633	546.080	546.080	546.430	546.080	548.010	551.222	551.261	551.960
CHAINAGE	0.00	18.00	18.200	20.00	30.00	40.00	50.00	50.900	60.00	67.200	70.00	80.00	84.120	90.00	90.900	100.00	104.600	110.65	115.200	120.00	130.00	140.00	150.00	160.00	170.00	180.00	184.200	184.900	186.900	190.00	190.00	198.100	200.00	210.00	228.00

CROSS SECTION OF MUTHA RIVER D/S OF CROSS SECTION OF MUTHA RIVER U/S OF CHAVAN CYCLE BRIDGE

CH 11+970



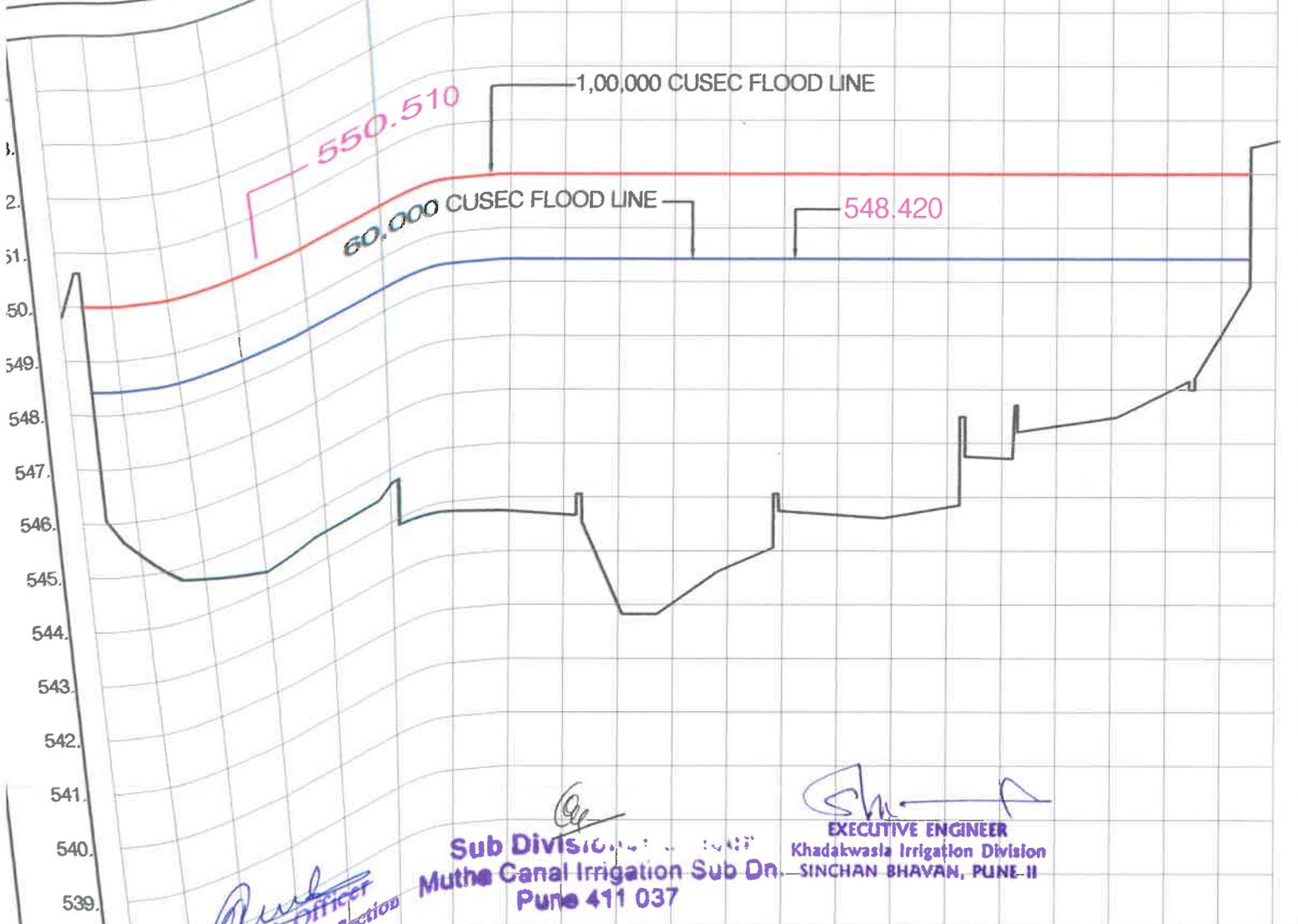
[Signature]
 Sectional Officer
 Kothrud Irrigation Section
 Swargate, Pune-37

[Signature]
 Sub Divisional Officer
 Mutha Canal Irrigation Sub Dn.
 Pune 411 037

[Signature]
 EXECUTIVE ENGINEER
 Khadakwasla Irrigation Division
 SINCHAN BHAVAN, PUNE II

LEVELS	550.500	546.080	545.620	545.649	545.730	545.590	544.810	544.570	544.588	544.560	544.792	545.100	543.666	543.730	543.708	542.464	542.285	542.310	542.474	542.900	543.668	543.650	543.650	543.860	545.336	545.208	545.518	545.518	546.080	546.000	546.160	547.000	551.080	551.127	
CHAINAGE	0.00	4.100	7.100	10.00	18.200	20.00	30.00	38.100	40.00	49.000	50.00	51.110	60.00	67.100	70.00	80.00	80.00	80.750	100.00	106.600	110.00	118.200	120.00	130.20	140.00	150.00	160.00	170.00	178.000	181.100	190.00	196.100	200.00	206.600	210.00

SS SECTION OF MUTHA RIVER D/S OF CROSS SECTION OF MUTHA RIVER U/S OF CHAVAN CYCLE BRIDGE
CH 12+000



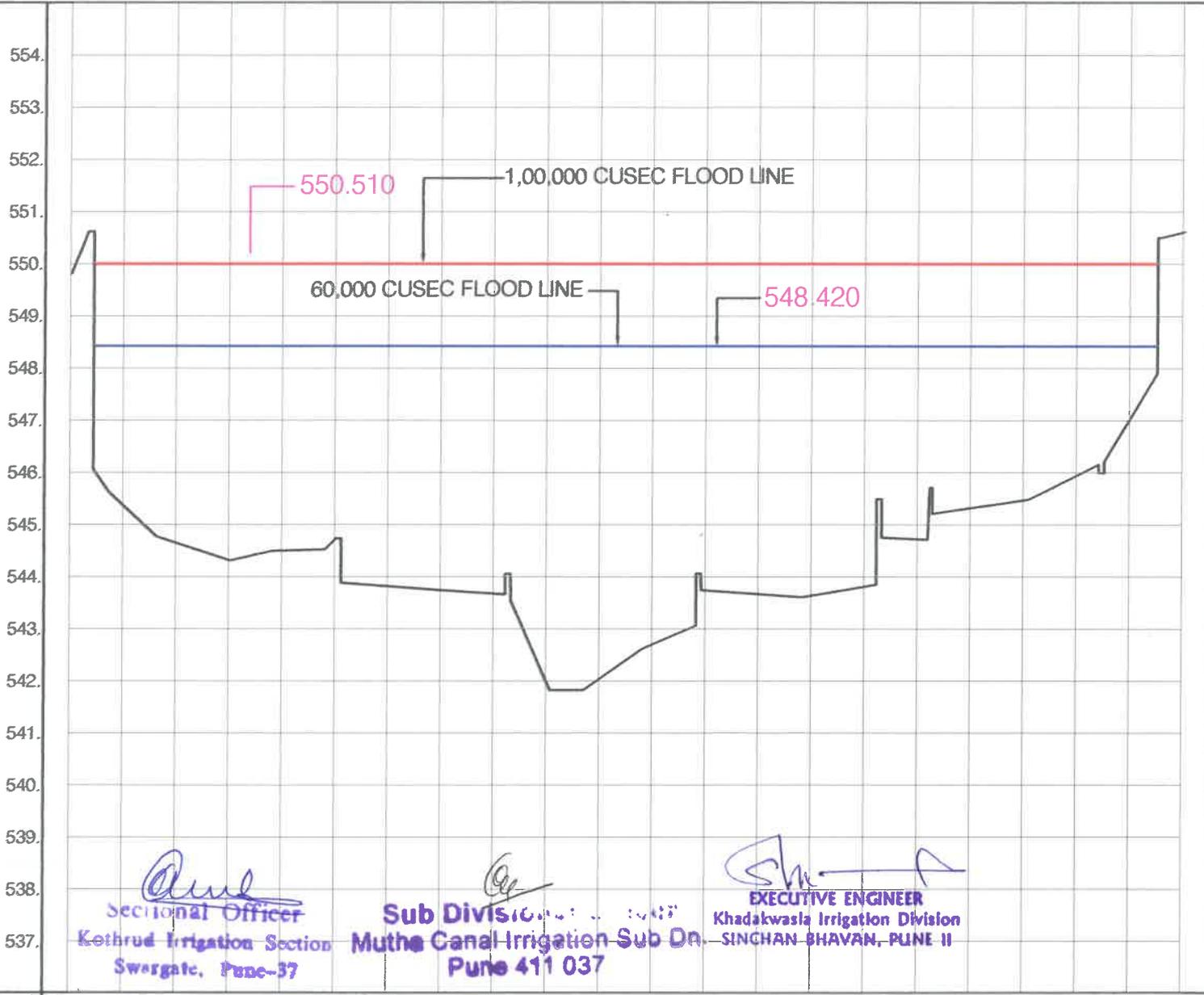
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

Sub Divisional Officer
Mutha Canal Irrigation Sub Division
Pune 411 037

EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE-II

LEVELS	549.790	550.610	545.620	545.245	544.760	544.934	544.308	544.890	544.486	544.510	544.720	543.802	543.740	543.728	543.864	541.949	541.810	542.030	542.600	542.693	543.050	543.730	543.724	543.656	543.600	543.631	543.804	544.708	545.308	545.457	545.470	545.932	547.000	550.595
CHAINAGE	0.00	3.200	7.100	10.00	16.200	20.00	30.00	38.000	40.00	48.000	60.00	68.100	70.00	80.00	90.00	96.950	100.00	107.900	110.00	118.100	119.110	120.00	130.00	138.200	140.00	150.00	160.00	170.00	180.00	180.900	190.00	199.84	210.200	

CROSS SECTION OF MUTHA RIVER D/S OF CROSS SECTION OF MUTHA RIVER U/S OF CHAVAN CYCLE BRIDGE
CH 12+000



[Signature]
Sectional Officer
Kothrud Irrigation Section
Swargate, Pune-37

[Signature]
Sub Divisional Engineer
Mutha Canal Irrigation Sub Divn.
Pune 411 037

[Signature]
EXECUTIVE ENGINEER
Khadakwasla Irrigation Division
SINCHAN BHAVAN, PUNE II

LEVELS	550.790	550.610	545.620	545.346	544.760	544.634	544.303	544.480	544.486	544.510	544.720	543.802	543.740	543.728	543.664	541.949	541.810	542.030	542.600	542.693	543.050	543.730	543.724	543.656	543.600	543.631	543.804	544.708	545.308	545.457	545.470	545.932	547.000	550.595
CHAINAGE	9.00	3.200	7.100	10.00	16.200	20.00	30.00	38.000	40.00	48.000		60.00	68.100	70.00	80.00	90.00	96.950	100.00	107.900	110.00	118.100	119.110	120.00	130.00	138.200	140.00	150.00	160.00	170.00	180.00	180.900	190.00	199.84	210.200

Exhibit “5”**Ratnakar pandey**

From: Ratnakar pandey
Sent: 05 December 2019 16:08
To: riteshvijay@gmail.com
Cc: renu.gera@gcnmrcl.com; 'Sandeep Jadhav'
Subject: Revised Reply in the matter of O.A. 70/2019 NGT order dated 5.11.2019
Attachments: NGT -5-12-19 Revised Document.docx.html

Dear Sir,

As suggested, please find enclosed revised document on the above cited subject.

Regards,
Ratnakar Pandey
DGM/Environment
Maha-Metro,Pune

From: Ratnakar pandey
Sent: Saturday, November 30, 2019 5:52 PM
To: riteshvijay@gmail.com
Cc: renu.gera@gcnmrcl.com
Subject: First Draft Reply in the matter of O.A. 70/2019 NGT order dated 5.11.2019

Dear Sir,

Please find enclosed 1st draft reply on NGT order dated 5/11/2019 in the matter of OA. 70/2019. Submergence calculation for 60,000 cusec discharge is not ready hence unable to incorporate but same will be submitted by Monday.

Regards,
Ratnakar Pandey
DGM/Environment

Before the NGT (WZ) Bench Pune

Original Application No.70/2019

Sarang Yadwadkar (Applicant)

Versus

Pune Municipal Corporation (Respondents)

Background:

Maharashtra Metro Rail Corporation Ltd. (Maha-Metro) Is a joint venture company of Government of India (GOI) and Government of Maharashtra (GOM) established under the companies Act 2013 for the purpose of implementation of Pune Metro Rail Project.

The total length of Pune Metro Rail Project is 31.25 km of which a stretch of 1.45 km passes along the left bank of the Mutha river (**Annexure-1**). The structure comprises a tall viaduct and two elevated stations viz. Deccan Gymkhana and Sambhaji Udyan. The viaduct and stations are supported on single RCC Columns and the soffits of the viaduct and station concourses are above the highest flood levels. Adequate free board is provided above the highest flood level.

Issue:

Objections were raised for laying the Metro alignment along the left bank of Mutha river marked within the Blue line and Red line (Blue line and Red line shown on the Map represent the extent of spread of river on both sides for flood discharges of 60,000 cusecs and 100,000 cusecs respectively) and the matter went through hearing in the National Green Tribunal (NGT) and further to the Hon'ble Supreme Court of India. Maha-Metro explained that the obstruction caused by the structure of viaduct envisaged is limited to the width of one pier (all the piers being proposed along the river flow). Based on the pleas of the applicants and defence by Maha-Metro, a final verdict has been given by the Hon'ble Supreme Court permitting the laying of **Elevated Metro** alignment along the left bank of Mutha river.

During a meeting held by Divisional Commissioner, Pune to hear the objections of the litigants in the above case with reference to the current (August 2019) floods and obstruction caused due to construction enabling works and detailed design of foundations of piers, following issues came to be raised:

- 1. Alteration in design of foundations in some locations along the stretch bringing the pile caps above the initial bed of river.**
- 2. Temporary earthen road constructed along Metro alignment along the left bank of Mutha river from Deccan Gymkhana Metro Station to Vrudheshwar Temple.**

Following are the rejoinders to each of the issue raised by the litigants:

1. Alteration in design of foundations in some locations along the stretch bringing the pile caps above the initial bed of river:

During the NGT proceedings Metro alignment along the left bank of the river was presented based on the initial assessment of the riverbed. The foundations of the viaduct were proposed to be embedded below the riverbed. However, while detailing it was noticed that a large length of this alignment was falling below the second retaining wall (i.e. within main riverbed) and closer to the channelized stream of the river. The construction along this would have entailed a much higher effective obstruction to the river flow due to higher water velocity in the central zone of the river. In order to have minimum obstruction a logical technical decision was taken to move the alignment towards the left bank above the Retaining Wall (**Annexure -2**). In the process the initial position of piers was pushed towards the bank by 7 m, 12.5 m, 17 m and closer to Vriddhehwar temple to an extent of 20 to 28 m.

In this area there are two large diameter embedded sewerage lines which could not be disrupted (as it could have caused very serious river contamination) thus a structural scheme became necessary to support the single column piers of the viaduct on foundations which span the pipelines by providing piles and pile caps whose bottom is clear of the top of the pipeline. The modified design had piles and pile caps (above the bed level), albeit the width of the piers was slightly reduced (**Annexure -3**). These were shared with the NGT Expert Committee members during their visit on 30.11.2018. The sewerage pipelines are not in a smooth alignment while Metro requires a smooth alignment and therefore this solution had to be adopted for 31 foundation locations (out of a total of 60 locations). At these locations the pile caps are above the bed level along the left bank. However, the flow velocity of the river at these locations is much less than in the central zone causing comparatively less obstruction due to pile caps.

Initial mathematical studies of river flow at the pier locations were carried out without pile foundations embedded in the riverbed. The calculated local afflux at SP 10 (Sambhaji station pier -10) worked out to 11.7 mm. When the design underwent modification and pile caps were proposed laid on the river bed the mathematical computations of afflux were reworked. The maximum local afflux thus worked out is at SP8 (Sambhaji station Pier) was 29.2 mm. This was worked out for a discharge of 100,000 cusecs and was presented to the Expert Committee of NGT on 30.11.2018.

Subsequently in the matter other NGT order dated 5.11.2019 (Application No.70/2019(WZ) highlighted that the width of the river has been misinterpreted. On verification it was found that due to manual digitisation of pdf file an error had indeed occurred which has now been rectified by using the recent data from irrigation department. The results of the revised mathematical analysis based on the above are as follows.

S. No.	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Submergence due to afflux (mm)
1.	100,000 cusecs	28.06	SP8	62.74
2.	60,000 cusecs	11.08	SP8	24.79

Based on the discussions during the Expert Committee's visit on 30th November 2018 detailed studies were undertaken generating hydrological model analysed by using HEC RAS 4.0Beta Software. This was considered for a stretch of 2.45 km which extends 0.5km either way beyond Metro Construction. This hydrological simulation model accounted for all obstructions such as sewerage pipeline, temples,

samadhis, Ghats, Immersion tanks and trees etc. (without the temporary murrum road to enable construction) at 30m intervals along the entire stretch of 2.45 km which encompasses the Metro Construction.

M/s Mitcon undertook this study and came up with a maximum global afflux of 160 mm for a discharge of 100,000 cusecs. The Expert Committee had desired that this Hydrological simulation to be undertaken by CPWRS. The study is underway and will be shared on completion.

Metro alignment on Riverbed -1.39km

Three alternatives for Metro Alignment were under consideration and the final selection was made on the basis of least disturbance to residential and commercial complexes, least number of affected trees and the shortest distance. Turning at Deccan Gymkhana Corner was a design constraint and the alternative along the river bank was found to be the most acceptable.

The original length of the metro alignment as per DPR was 1.7 km in two stretches of 1.5 km and 0.2m making a total of 1.7 km. The Metro alignment entered the river bed at chainage 4320 m and exited at chainage 5820 again entering at chainage 6195 meters and exiting at chainage 6395.

During the NGT first visit on 6.11.2017 the alternative alignment of length 1.45 km was shared where alignment enters the riverbed at chainage 4301.545 (Pier 152) and exited at chainage 5753.90 at (Pier -191). Subsequently the piers were pushed towards the left bank away from the river and the current alignment enters the river bed at chainage 4299.209 (Pier -152) and exits the river bed at chainage 5695.866 (Pier -189) with a length of 1.39 km. (Annexure -4 shows the three alignments)

As per our submission to NGT 32 trees were being affected and the Tree Authority had granted permission for the same. Of these 32 trees 23 were to be transplanted and balance nine to be cut. In the current alignment eleven trees have been transplanted and three cut leaving 18 trees unaffected

2. Temporary earthen road constructed along Metro alignment along the left bank of Mutha River from Deccan Gymkhana Metro Station to Vrudheshwar Temple:

A temporary murrum road was constructed to enable construction of Piers of the viaduct along the left bank of the river. In the process the bed under the road got raised by average 2.2 m This raising is **very small**, and it hugs the bed where the **velocity of river flow is minimal (Annexure 5)**. The cross-sectional area of the river flow at a representative **CH 5303.127 (SP 8)** gets **reduced by only 3.7 % including this road at the largest raised foundation. The obstruction at Sambhaji Bridge is 19.33 % for a flow of 60,000 cusecs.**

A revised hydrological model was analysed adding this temporary road by using HEC RAS 4.0 Beta Software. With this the global afflux at a discharge of 100,000 cusecs worked out to 180 mm (an increase of only 20 mm as compared to afflux without the road). **In any case when the work gets completed Maha Metro will ensure that this road will be removed, and the bed restored to its original profile.**

Maha metro's response to the six points raised in the petition.

1. The Expert Committee has failed to arrive at the scientific figures of rise in flood levels owing to the construction of the 59 piers of metro on riverbed of Mutha River through their study.

Initially a mathematical model was prepared based on Molesworth Formula recommended under Guide lines for Design and Construction of River Training and Control Works for Road Bridges, Indian

Roads Congress -1997.However the Expert Committee advised to undertake a hydrological Simulation Model which has been completed for the 60 piers on the river bed.

- Based on Committee advise HEC RAS 4.0 Beta Software for a stretch of 2.45 km which includes metro construction of 1.45 km plus 0.5 km on both the upstream and downstream of the construction were undertaken (An additional Numerical modelling study from CWPRS is also underway for the same stretch.)
- The water Afflux and submergence calculations have been undertaken including the foundations and piers emerging from the riverbed. The cross section of the river has been endorsed by the Irrigation Department.

The water Afflux and Submergence values have been calculated for flows of

Sn	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Max. submergence (in m)
M	100,000 cusecs	180	P160, P161, P162	DE-7- 4.158
2.	60,000 cusecs	100	P168	P175 – 2.736

Graphs depicting water afflux and submergence are attached as **Annexure 6**. Photographs taken during the high flow levels showing water afflux at piers -**Annexure -7**

Water afflux and submergence are a function of the area of obstruction to the flow. With reference to Maha Metro the widest pier is at SP8 at the narrowest section of the river. There are bridges upstream and along the route of construction. The table below provides the area of obstruction to the flow at each location.

Flow 60,000 cusecs

Sr.No	Name of structure	Obstruction Area (Sq. m.)	River Area (Sq.m.)	Obstruction %
1.	Sambhaji Bridge	131.92	682.56	19.33
2.	Gadgil Bridge	95.8	680.05	14.09
3.	Baba Bhide Bridge	72.84	572.189	12.28
4.	Shinde Bridge	9.684	294.493	3.29
5.	Metro Pier No SP8	13.505	365.469	3.70

Flow -100,000Cusecs

Sr.No	Name of structure	Obstruction Area (Sq. m.)	River Area (Sq.m.)	Obstruction %
1.	Sambhaji Bridge	196.794	1195.329	16.46
2.	Gadgil Bridge	147	1154.68	12.73
3.	Baba Bhide Bridge	70.284	994.973	7.06
4.	Shinde Bridge	35.874	690.465	5.20
5.	Metro Pier No SP8	27.217	751.205	3.62

2. The Expert Committee has hugely misrepresented the width of Mutha River and has misquoted the data on river width as available with the Irrigation Department Government of Maharashtra.

There is a discrepancy in the width of the riverbed taken for the mathematical model. While designing alignment through the Mutha riverbed detailed plane table Survey of Mutha river published by the Irrigation Department was considered. The pdf copies were printed and digitized for planning purposes. Subsequently soft copies of plane table and river cross section was procured from irrigation department. Discrepancies in the data are due to manual digitisation of pdf data.

This has now been corrected and the revised mathematical calculations are presented the data for which includes raised foundations and piers.

The water Afflux and Submergence values have been calculated for flows of

S.No.	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Submergence due to afflux (mm)
1.	100,000 cusecs	28.06	SP8	62.74
2.	60,000 cusecs	11.08	SP8	24.79

The HEC RAS study undertaken for a stretch of 2.45 km i.e. 0.5 km on the upstream side and 0.5 km on the downstream side beyond the Metro construction is calculated on data endorsed by the irrigation department.

The water Afflux and Submergence values have been calculated for flows of

S.No.	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Max. submergence (in m)
1.	100,000 cusecs	180	P160, P161, P162	DE-7-4.158
2.	60,000 cusecs	100	P168	Pier 175 -2.736

3.The Expert Committee has failed to comply with the directions or the terms of study as defined by this Hon'ble Tribunal in order dated 13.10.2017 in Sarang Yadwadkar & Ors vs Pune Municipal Corporation &Ors. (OA No 130/2018 previously OA 67/2017 WZ)

- On 6.11.2017 the Expert Committee visited the project site and a copy of the Environment Impact Assessment was shared with the committee members. However, the Committee asked for additional information.
 - a) Justification of reduction of length from 1.7km to 1.45 km.
 - b) Layout of the two stations on the riverbed.
 - c) Location of each pier, with dimensions demarcated with red and blue lines.
 - d) Incorporation of red line and blue lines in layout published by Irrigation Department.
 - e) Site photographs. -list of affected trees
 - f) Water Afflux and submergence computations at each of the piers.
 - g) Certification/Identification of affected tree species from Botanical Survey of India.
- 10.11.2017 -Analysis of Alignment and Afflux computations were submitted via e mail.
- 21.12.2017 -Formal letter from Expert Committee requesting for the above data was received.
- 23.12.2017 -Metro submitted the above data along with a list of 32 trees likely to be affected by this construction.
- On 30.11.2018 -During their supervisory visit Water Afflux and Submergence calculations based on structural changes due to presence of sewer lines were shared with them.

The following documents are now submitted to the Expert Committee.

- a) Report of initial Mathematical model depicting water afflux and submergence.

- b) Report on Revised Mathematical Model for revised structural changes proposed in 1.45 km stretch with reference to afflux and submergence.
- c) Report on Hydrological simulation study by HEC RAS for revised structural changes including temporary ramp for the proposed 1.45 km plus 0.5 km upstream and downstream stretch with reference to afflux.
- d) Mathematical model based on revised river width with foundations emerging beyond the river bed and 60 piers.

4. The Expert Committee violated the directions of this Hon'ble Tribunal by not carrying out any local investigation, failed to assess the cumulative impacts of the said constructions on the environment namely ground water recharge, bio-diversity in the river bed, free flow of water, risk of flooding debris disposal, water pollution and air pollution, failed to suggest any mitigation measures, failed to assess impacts of the river bed construction individually or cumulatively and make any recommendations.

The EIA document submitted by Maha Metro addresses the above concerns and has been vetted by NEERI and Pune University.

Ground Water Recharge

- With reference to Geology the Vertical Electrical Sounding (VES) shows that the strata below soil are not favourable to form aquifer. However unconfined aquifer reported from the project area has poor potential. It is envisaged that construction of Piers on the bank are not likely to cause significant impact on any aquifers. Natural springs are not observed in the area during the study period. Hence no adverse impacts during construction phase are envisaged on existing hydrogeological condition."
- Maha Metro has signed a memorandum of understanding with Ground Water Survey Development Agency and correspondence quantifying the amount of recharge expected from viaducts and stations is enclosed (**Annexure -8**).

Biodiversity

- The proposed metro route is part of riverine ecosystem. The floristic component of the project site does not include any rare or endangered species. Majority fauna listed from the study area will be least impacted because habitat requirement for the reported fauna is general at can be fulfil from adjoining area. Impacts due to construction activity are reversible and cause no further major adverse impact. As proposed metro rail alignment and metro stations are elevated hence no any significant impact are envisaged on ecology & biodiversity of the area during operational phase of the Project

Free Flow of Water

- The flow in Mutha River has two sources, the first and major source is water released from the Khadakwasla Dam during high rainfall days. Additional flow joins the river through small tributaries on the downstream side of Khadakwasla dam, these contribute less than 10% to the flow. Blue line and Red line of Mutha River are decided by the irrigation department on discharge of 60,000 cusecs and 100,000 cusecs respectively.

Mathematical calculations depict the obstruction to the river flow is insignificant due to proposed construction of metro rail alignment piers. At any cross section of the river, the area blocked by the width of a single pier is negligible compared to the cross-sectional area of river.

Risk of Flooding – Ref Minutes of meeting dated 30.11.2018

- The Expert committee recommended that while the impact of the individual piers may not be significant it would be worthwhile to undertake a hydrological Simulation study covering 0.5km upstream and downstream of the metro construction. The same has been undertaken and results were incorporated.

Water Pollution, Air Pollution and Waste Management -Ref Minutes of Meeting dated 30.11.2018

- Committee recommended strict compliance of Environment Management Plan as per Environmental Impact Assessment during construction and operation phases. This includes dust control measures, excavated soil control measures, solid and liquid waste management etc. Proper care needs to be taken for preventing spillage of mortar cementing material into the river during construction.
- Committee recommended effective solid and liquid waste management at both the stations (Deccan and Sambha Ji Park) as per solid waste Management 2016 and recent effluent discharge standards (October 13,2017) respectively .MMRCL has to assure by providing toilets, wash room and garbage collection bins (wet and dry) at prominent places for the passengers /visitors.
- No solid waste will be allowed in the river bed during construction and operation phases of the metro project. For decomposition of organic waste converter must be installed at each metro station. For non-degradable waste, it will be collected treated and disposed as per waste management practices of Pune Municipal Corporation. The Compost from organic waste convertor must be used as a fertilizer for onsite gardening and for landscaping within the project area site especially Deccan and Sambhaji Park Stations.
- No liquid waste will be allowed in the river bed during construction and operation phases .Liquid waste from toilets ,wash room and other activities must be properly collected and treated at the station through sewage treatment plant as per recent effluent discharge standards (Bio Chemical Oxygen Demand (BOD) 20 mg/i/total Suspended Solids (TSS) 50mg/l and Faecal Coliform (FC) <1000MPN /100ml.The treated effluent must be reused for flushing urinals, toilets ,land scaping and gardening and excess treated water may be discharged in city sewerage system of PMC.
- Committee also suggested installation of suitable number of dust sensors at a distance of 20m towards habitat side from the metro alignment for monitoring of Pm 10<100 mg/m3) during construction of metro corridor including stations.
- Air quality has been recorded at three places on the river bed Entry -Pier 153 near, Pier 165 mid way and pier 170 near Exit). All the values were within permissible limits. Water spraying is undertaken to ensure control of fugitive dust. The records were offered to Expert Committee for review.

5.Many residential localities around and on the upstream side of the metro piers are built on riverbed, were inundated at the release of 45,474 Cusecs water from the Khadakwasla dam into the Mutha river. The blue Line of Mutha River which is defined at 60,000 Cusecs was breached at many locations at the discharge of 45,474 Cusecs.

- While the discharge from Khadakwasla 45,474 cusec ,the distance between the dam and the reference site is about 12 km .In the absence of any official recorded data from concerned

Authority , it may be considered that the high intensity rainfall on the free catchment area during this period has contributed to the flow of the Mutha .Quantification of the same can be carried out by the relevant Department.

- To validate that 45,474 Cusecs has breached the blue line due to the construction of metro piers and ramp it is essential to have historical data of RL for discharge of 45,474 cusecs before the construction of metro work. This data is not available with the concerned Department

6.The flooding in August 2019 has proved that the Expert Committee observations that at the maximum rise in afflux level of the river would be 23 mm, is grossly flawed as it is based on incorrect data of river width for the Hydraulic study.

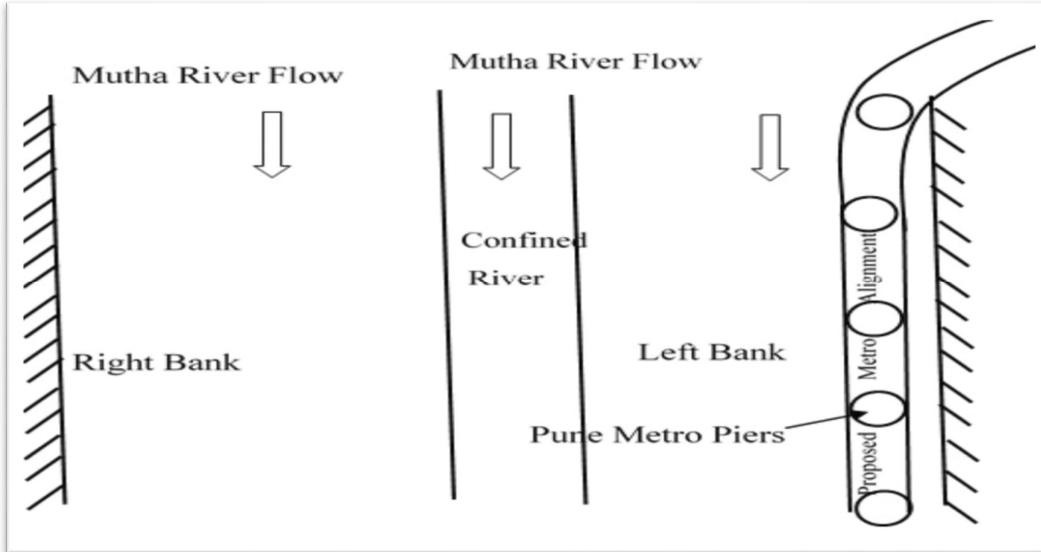
The Report on Hydrological Simulation Study by HEC RAS for revised structural changes proposed in 1.45 Km plus 0.5km upstream &downstream stretch with reference to afflux is based on data by the Irrigation Department and has included the foundations, piers including the temporary ramp.

The water Afflux and Submergence values have been calculated for flows of

Sn	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Max. submergence (in m)
M	100,000 cusecs	180	P160, P161, P162	DE-7-4.158
2.	60,000 cusecs	100	P168	Pier 175 -2.736

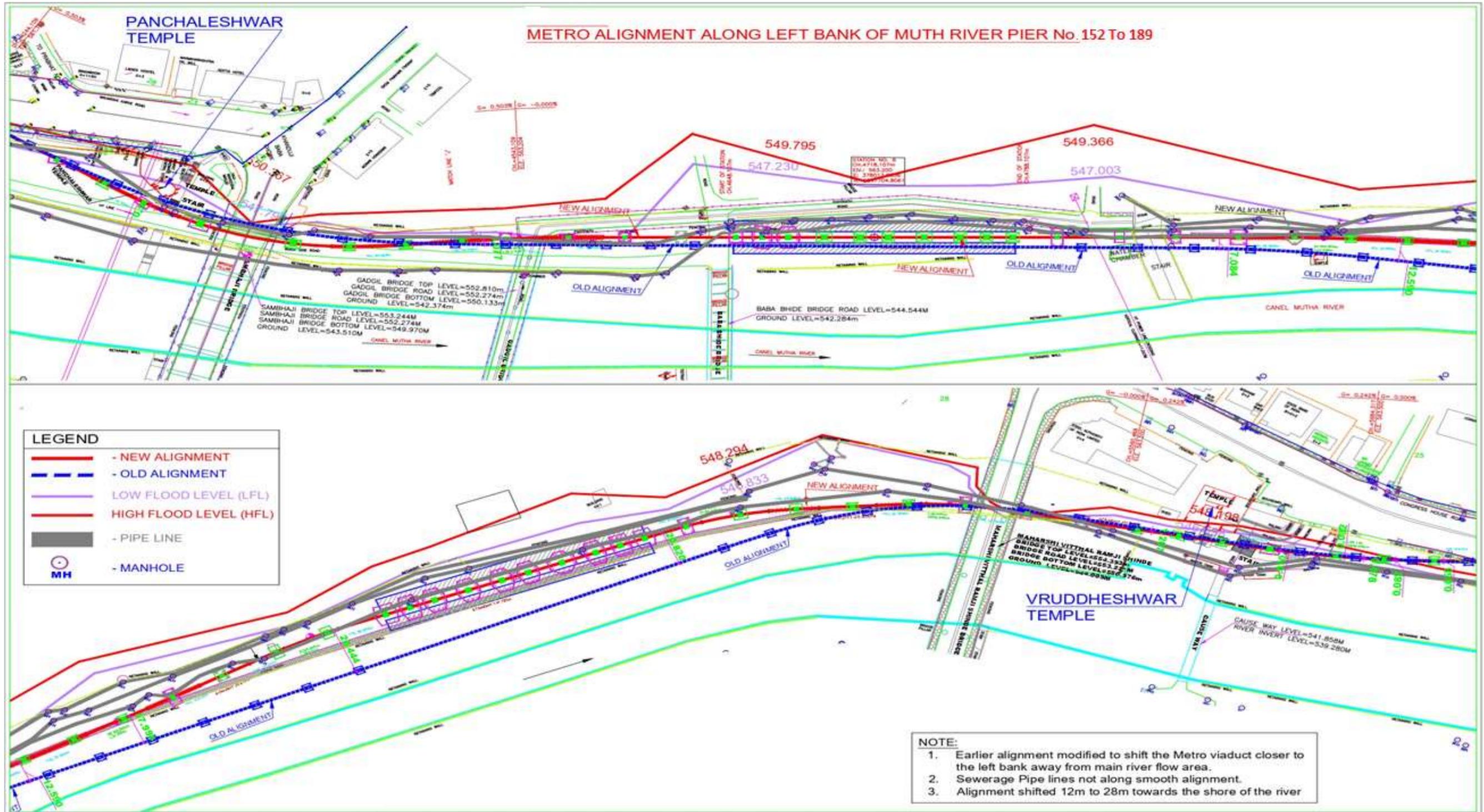
Annexures I

Schematic sketch- Pune Metro Alignment Along the River



Note: (Pier No 153-183) do not cross the river but are located along the left bank of the Mutha river.

Annexure 2 -Revised Layout of Metro Piers



Annexure-3

Note: Foundation are supported on piles to prevent damage to the active sewer lines

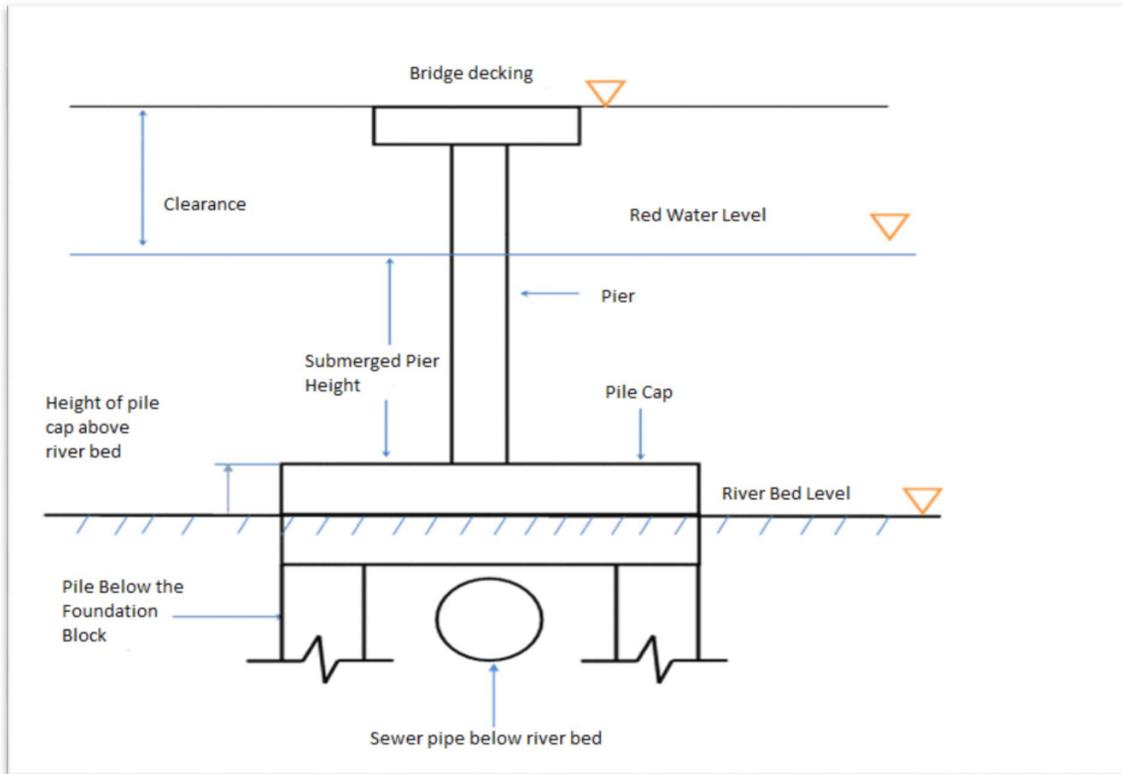


Table Showing revised piers dimension

Pier No.	Ground Level (m)	Pile Cap Top Level (m)	Height Above Ground (m)	Height Below Ground (m)	Length (m)	Width (m)	Height (m)
P 152	545.171	542.106	-	3.065	2.2	2.5	1.7
P 153	545.346	543.616	-	1.73	2.4	1.9	1.81
P 154	545.113	542.171	-	2.94	2.2	2.5	1.5
P 155	544.333	542.428	-	1.90	3	3.2	2.2
P 156	544.344	542.709	-	1.635	7.5	5.5	2.25
P 157	544.168	542.058	-	2.11	2.4	2.7	1.55
P 158	545.171	542.106	-	3.06	2.2	2.5	1.7
P 159	544.08	540.358	-	3.722	4.2	5.5	1.5
P 160	543.393	547.34	3.947	-	6.9	5.5	1.5
P 161	543.509	545.31	1.801	-	4.2	5.7	1.8
P 162	543.789	545.2	1.411	-	5.5	5.8	1.5
P 163	543.509	545.31	1.801	-	4.2	5.7	1.8
DE 1	544.356	545.056	0.7	-	7.5	6.3	1.8
DE 2	544.021	545.628	1.607	-	14.185	9.7	2
DE 3	544.432	545.927	1.495	-	11.2	13.5	2.4
DE 4	543.842	542.843	-	0.999	6.5	7.8	2.5

DE 5	543.727	541.613	-	2.114	6.75	6	2.05
DE 6	543.942	541.788	-	2.154	6.75	6	2.05
DE 7	543.85	542.853	-	0.997	6.5	7.8	2.5
DE 8	543.883	542.398	-	1.485	6.75	6	2.05
DE 9	544.001	541.763	-	2.238	6.3	6	1.85
DE 10	543.973	541.949	-	2.024	6.25	6.4	1.9
P 164	545.18	545.68	0.5	-	5.5	11.18	2
P 165	544.043	545.4	1.357	-	6.5	4.7	1.8
P 166	544.493	545.423	0.93	-	7.3	4.7	1.8
P 167	544.922	545.5	0.578	-	7.99	9.19	2.1
P 168	543.063	545.4	2.337	-	8.94	8.94	2
P 169	543.167	540.928	-	2.239	4.6	5.5	1.5
P 170	542.908	540.973	-	1.935	4.6	5.5	1.55
P 171	542.943	541.853	-	1.09	4.6	5.5	1.55
P 172	543.411	541.023	-	2.388	4.6	5.5	1.55
P 173	543.35	544.986	1.636	-	5.5	10.41	1.8
P 174	543.403	545.728	2.325	-	5.7	5.7	1.8
P 175	543.403	545.353	1.95	-	8.1	5.2	1.95
P 176	543.505	545.245	1.74	-	6.926	5.5	2
SP 1	543.637	545.669	2.032	-	12.03	11.2	2.4
SP 2	543.7	545.637	1.937	-	14.69	9.7	2.4
SP 3	543.932	545.376	1.444	-	14.5	11.2	2.4
SP 4	544.248	545.787	1.539	-	14.1	11.2	2.4
SP 5	544.449	545.849	1.4	-	14.1	11.2	2.4
SP 6	544.342	545.547	1.205	-	13.7	10.5	2.5
SP 7	544.341	545.744	1.403	-	14	13.7	2.65
SP 8	544.237	545.634	1.397	-	14.6	10.1	2.65
SP 9	544.142	545.53	1.388	-	13	8.7	2.4
SP 10	544.303	545.619	1.316	-	11.26	9.737	2.45
P 177	544.372	544.982	0.61	-	9.8	5.5	1.85
P 178	544.202	544.002	-	0.2	2.2	2.5	1.8
P 179	544.032	543.352	-	0.68	6.3	6	1.85
P 180	542.087	540.997	-	1.09	4.6	5.5	1.55
P 181	542.771	540.821	-	1.95	5.2	5.7	1.65
P 182	543.275	544.604	1.329	-	9.835	5.5	1.8
P 183	544.009	544.67	0.661	-	6.3	5.5	1.8
P 184	544.031	546.077	2.046	-	6.396	5.7	1.8
P 185	558.38	556.18	--	2.2	2.4	1.9	1.4
P 186	544.824	543.824	--	1	2.2	2.5	1.6
P 186 a	544.1	543.75	--	0.35	2.2	1.9	1.65
P 187	546.427	542.827	--	3.6	3.2	2.7	1.2
P 188	544.605	544.105	--	0.5	1.9	2.4	1.6
P 189	544.296	542.296	--	2	2.4	2.7	1.6
P 190	544.452	543.577	--	0.875	2.4	1.9	1.75
P 191	548.712	548.212	-	0.5	4.5	5	1

Annexure 4

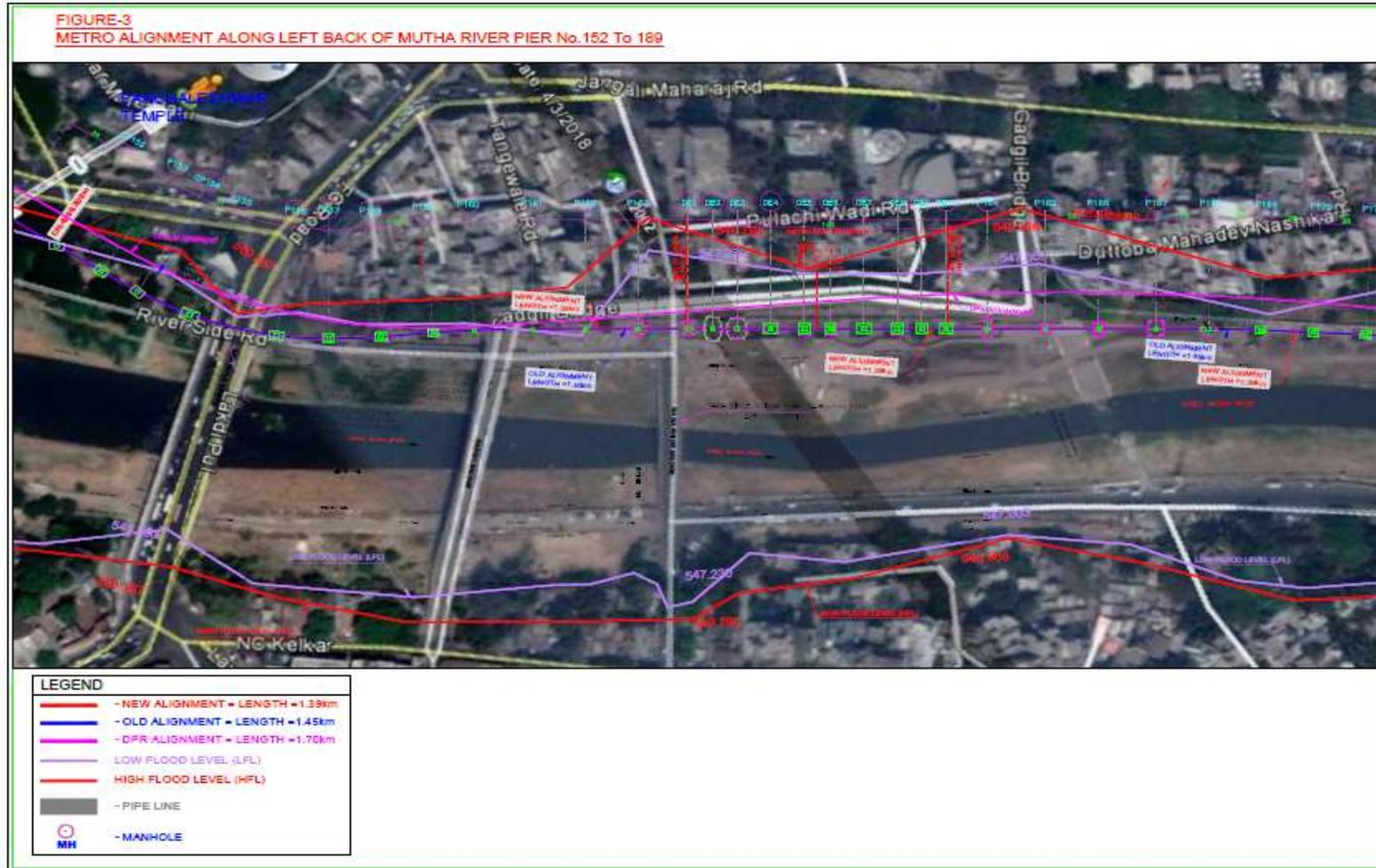
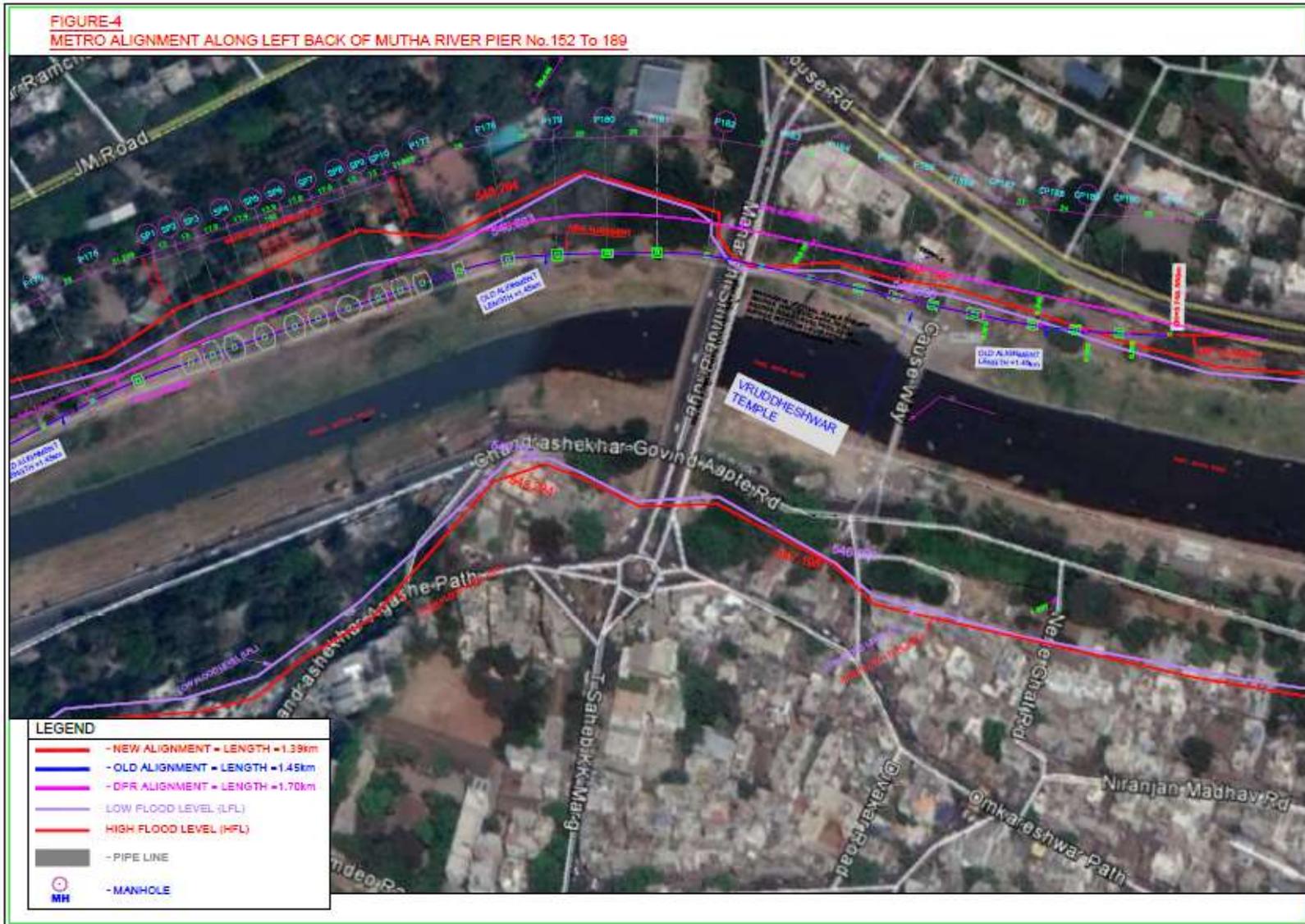
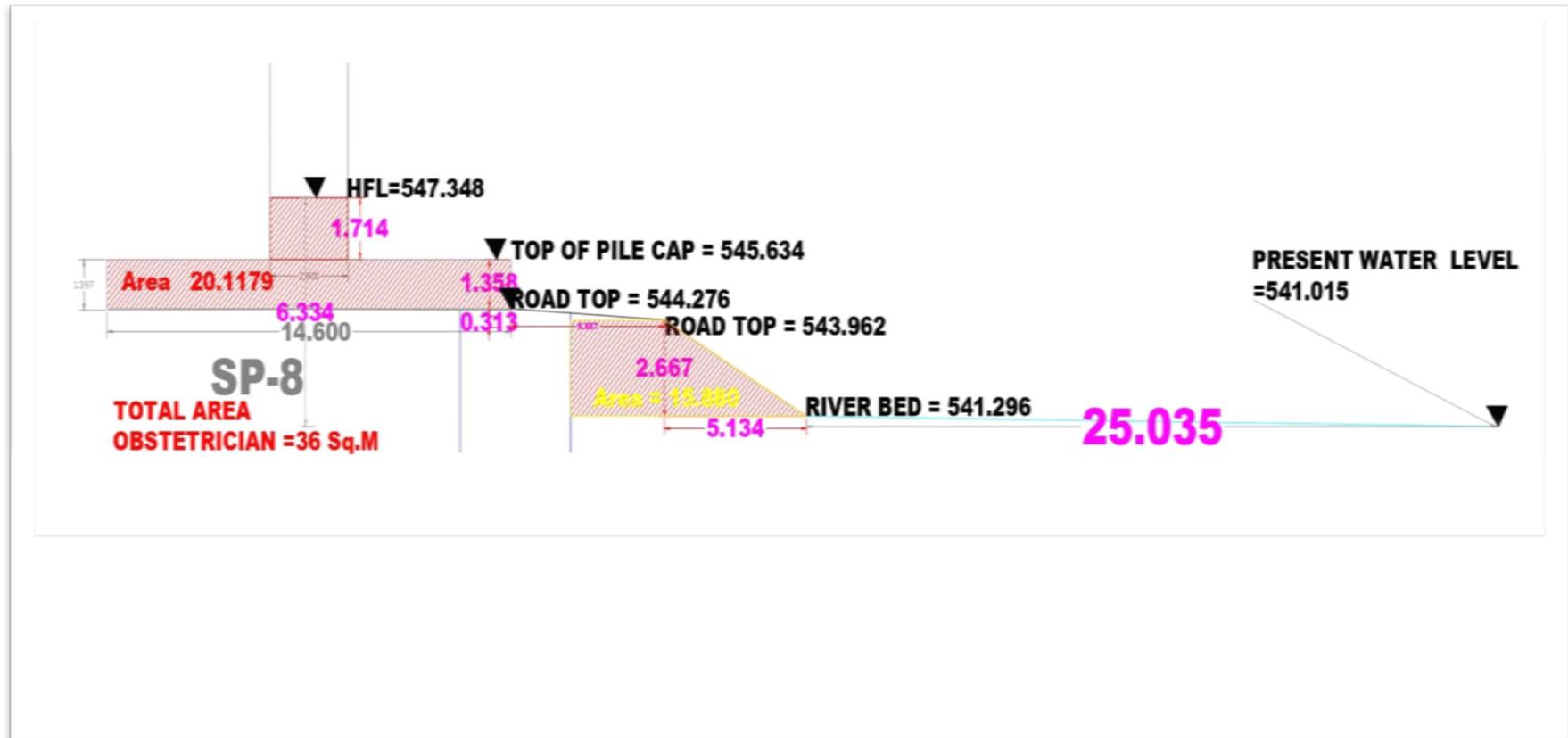


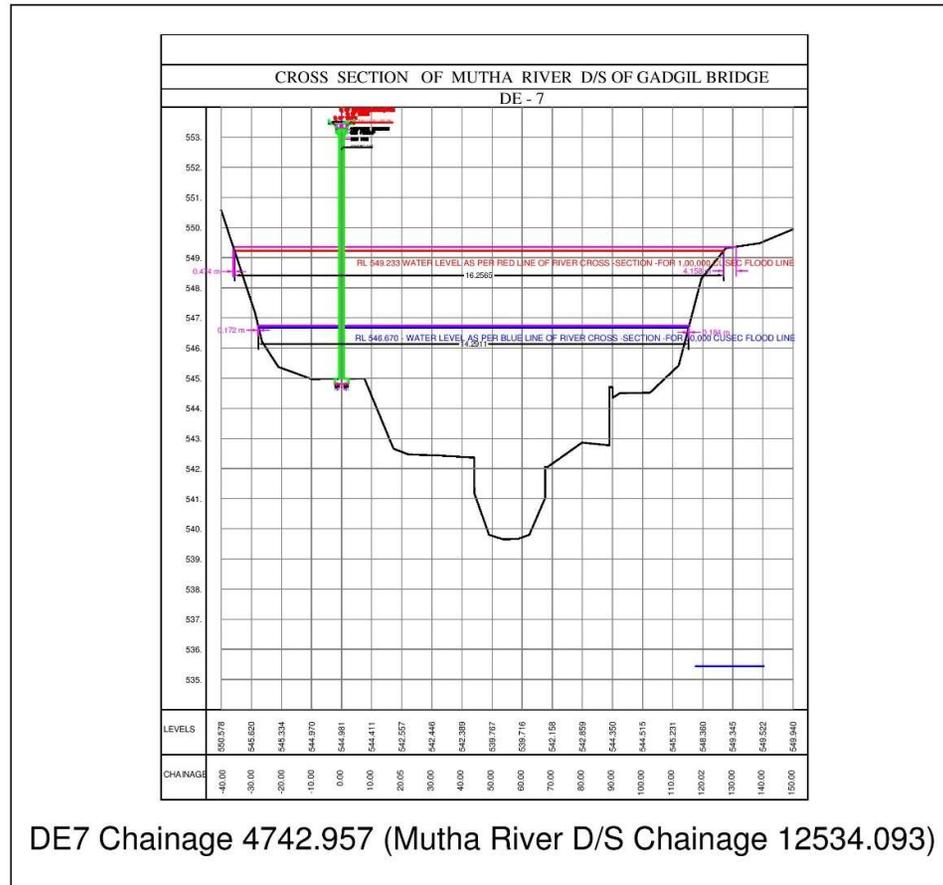
FIGURE-4
METRO ALIGNMENT ALONG LEFT BACK OF MUTHA RIVER PIER No. 152 To 189



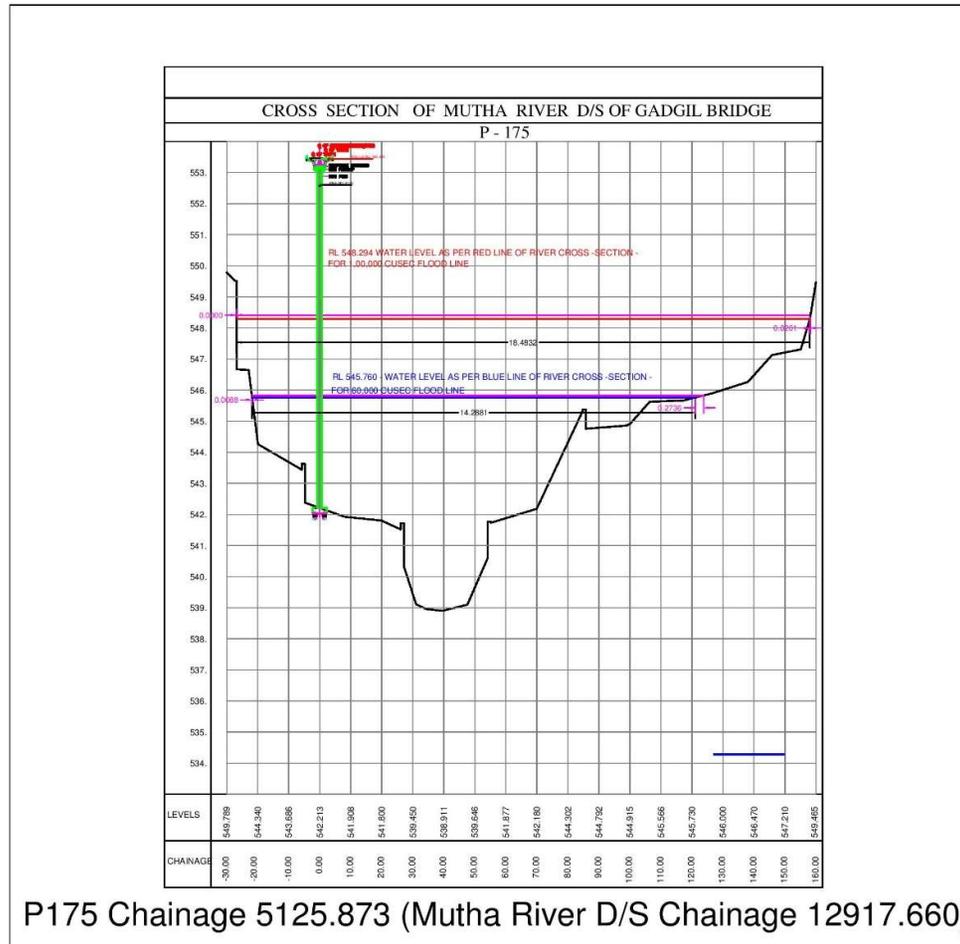
Annexure- 5 Details of Ramp, Foundation and Pier



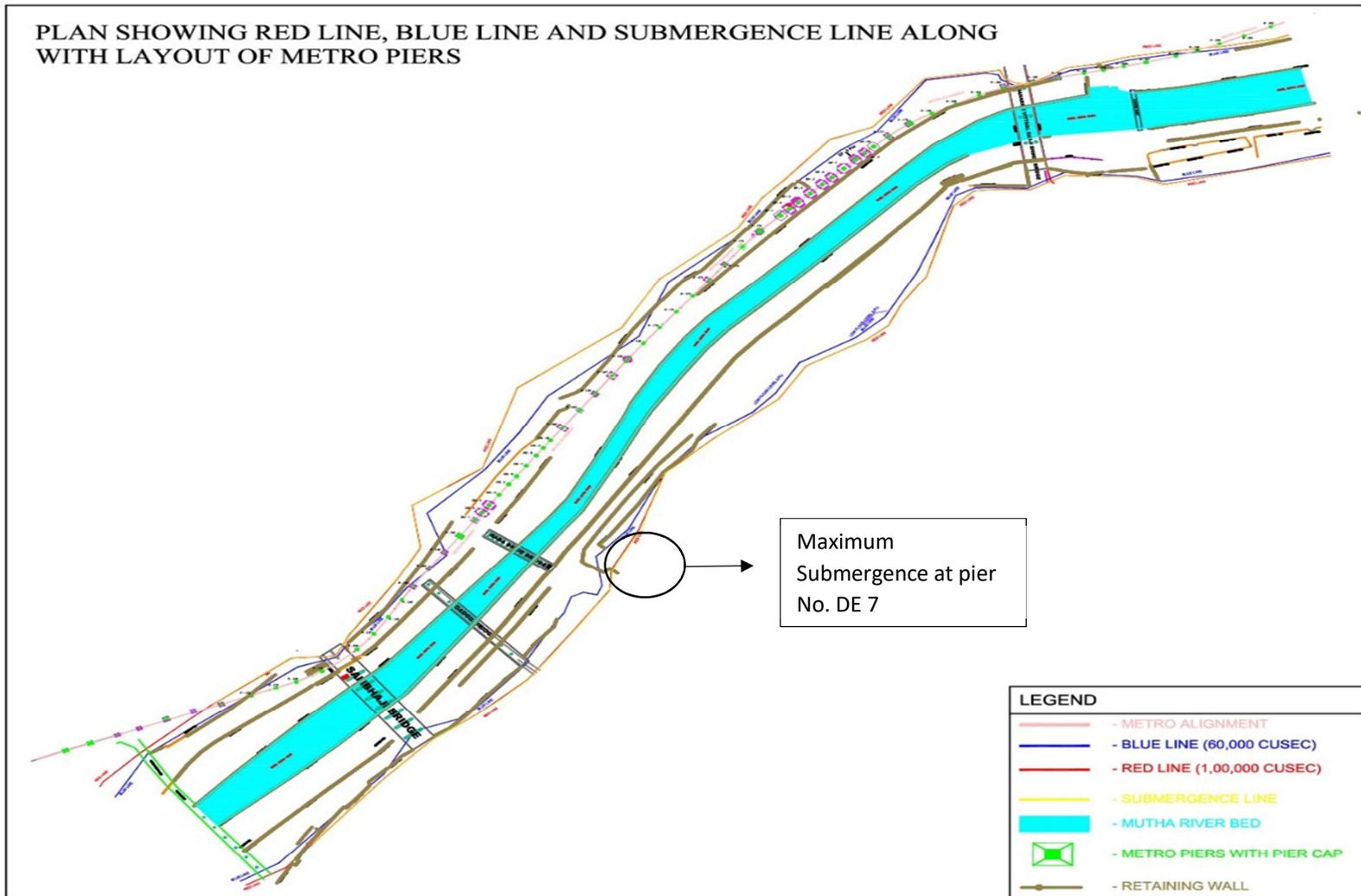
Annexure 6



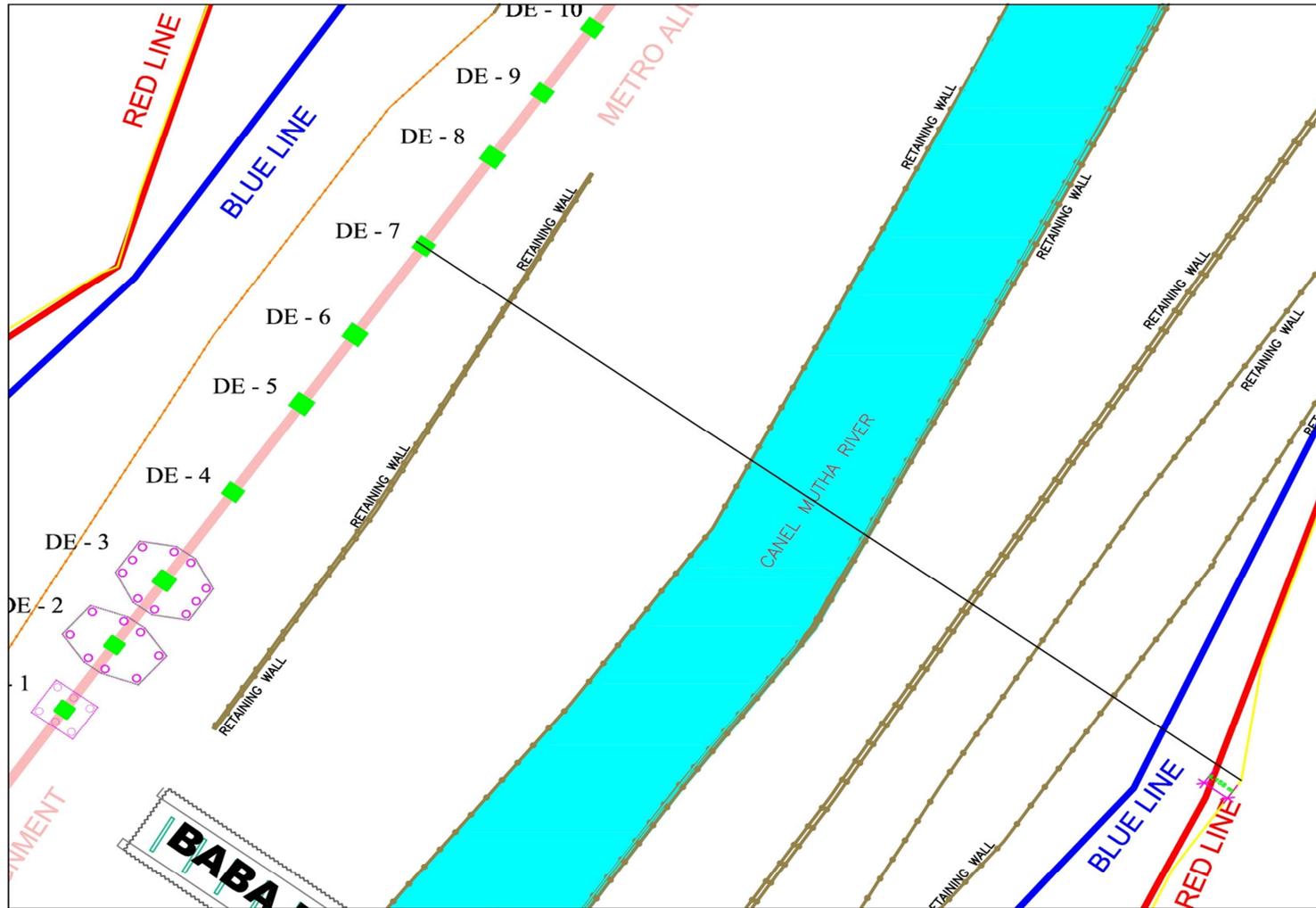
Cross Section of DE-7 which has maximum submergence for discharge of 1,00,000 cusecs.



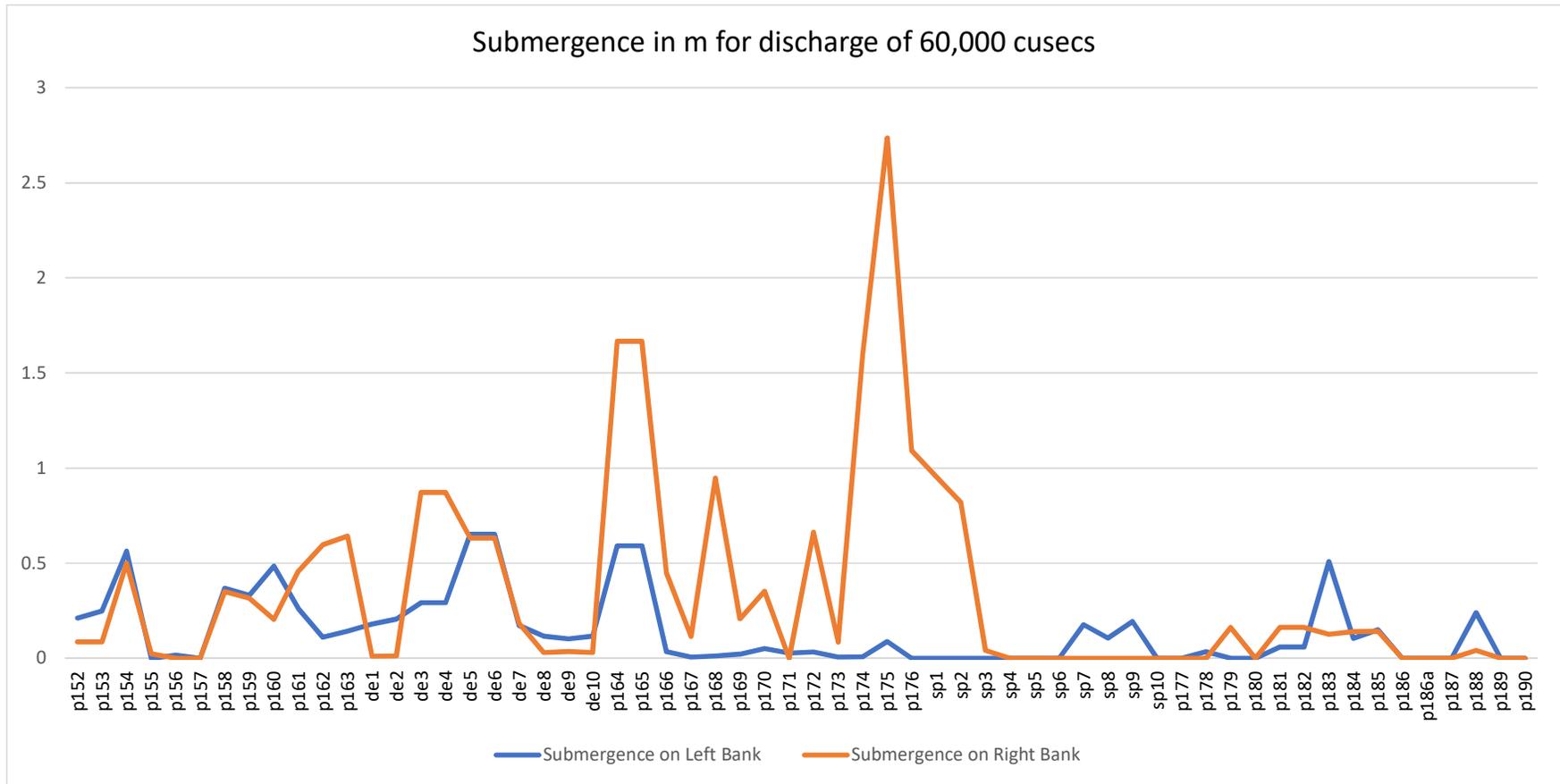
P175 Chainage 5125.873 (Mutha River D/S Chainage 12917.660)
Cross Section of DE-7 which has maximum submergence for discharge of 60,000 cusecs.



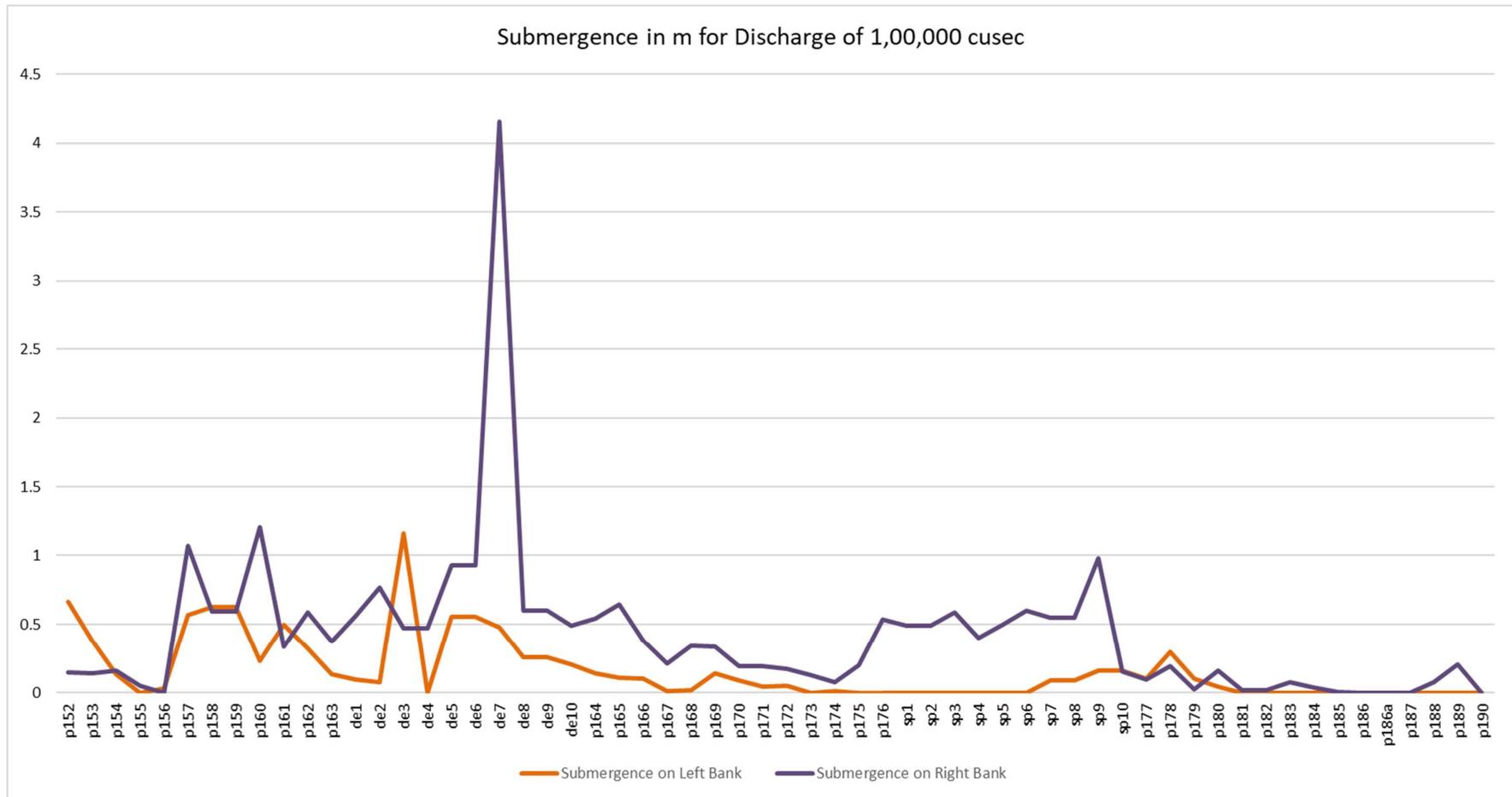
Plan Showing Red line, Blue Line and Submergence line at discharge of 1,00,000 cusecs.



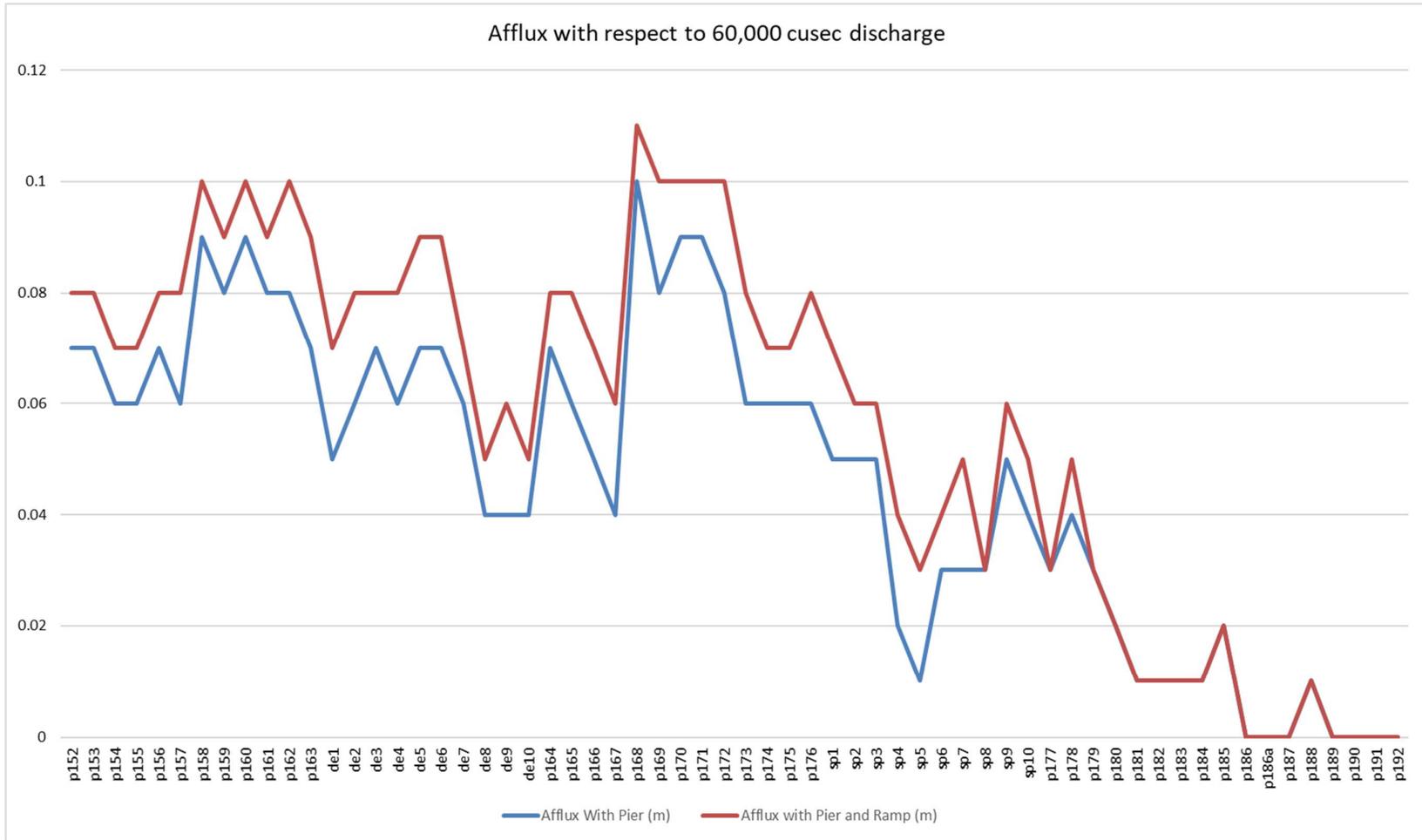
Enlarged Section of DE – 7 which has maximum submergence for discharge of 1,00,000 cusec



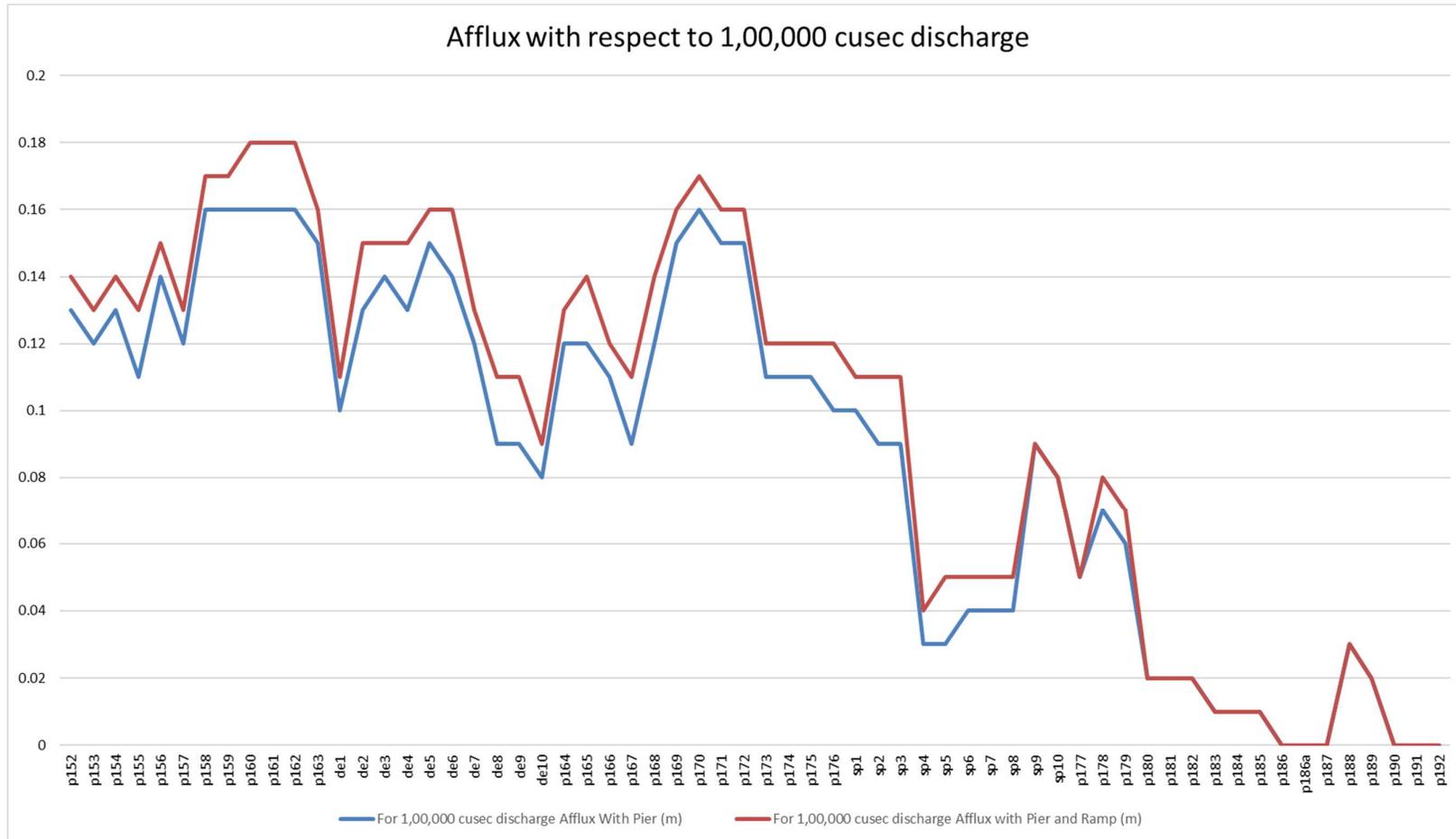
Graph showing submergence from P 152 tp P 190 for discharge of 60,000 cusec



Graph showing submergence from P 152 tp P 190 for discharge of 1,00,000 cusec



Graph showing afflux from P 152 tp P 190 for discharge of 60,000 cusec



Graph showing submergence from P 152 tp P 190 for discharge of 1,00,000 cusec

Annexure 7- Metro pier moved by 20 to 28 m on this stretch



Omkareshwar



Metro Viaduct



Metro Viaduct

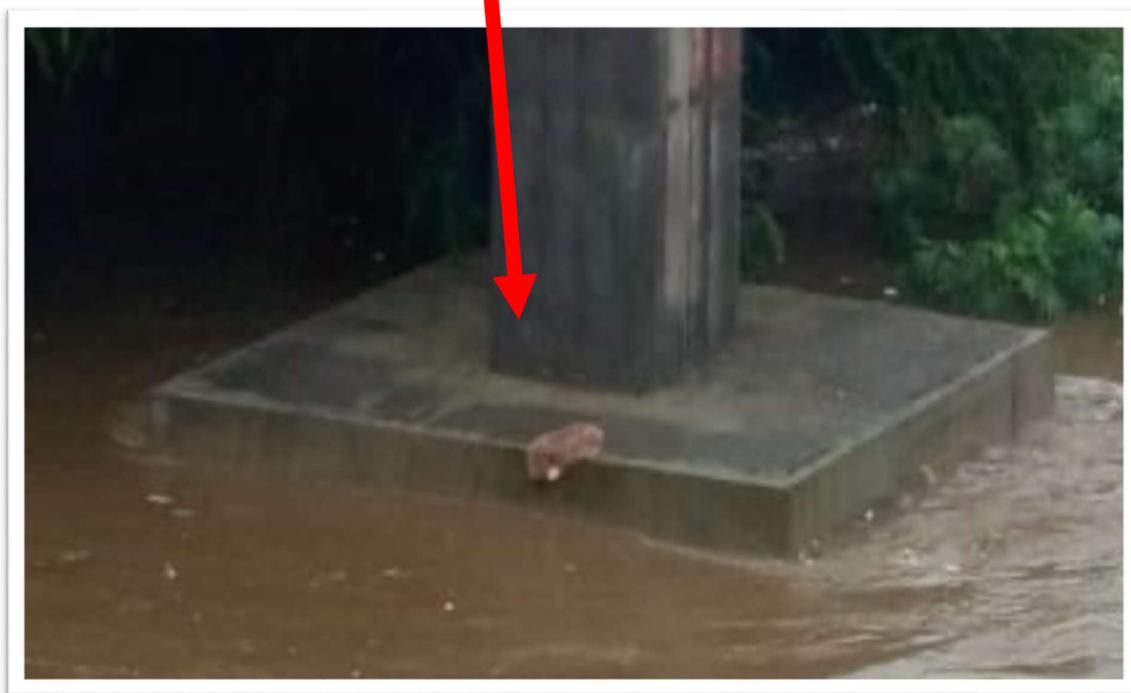
Pier no 154-Second pier on river bed low velocity and Local water afflux



Pi



Pier 170- Mid way of the Metro construction low velocity and local water afflux





Local water Afflux

Pier 182 On 5.08.2019 flow 45,474 cusecs- piers moved out of riverbed by 20-28 m to reduce impact of water afflux

Annexure 8

Govt Of Maharashtra
Water Supply And Sanitation Department

Deputy Director,
Ground Water Surveys And
Development Agency, Pune Region ,
K.B.Joshi Rd, Shivajinagar, Pune -
411005



Phone - 020-25531227,
25521852
Fax - 020-25531227
Email - ddgsdapntech@gmail.com

Out No/Tech/survey/GroundWater Survey/S.I./1812/2019.

दि. : 27/11/2019

To ,

Hon, Mr. Ramnath Subramanian,
Executive Director
Maharashtra Metro Rail Corporation, Ltd
Pune-01

Sub: Maha-Metro Pune- A brief feasibility study report on Rain Water harvesting Project proposed for Maharashtra Metro Corporation Pune. .

Ref: Official visit of Mrs. Gera.

Sir,

With respect to your request regarding Rainwater harvesting project this office has conducted technical study and field investigation to determine the feasibility of rainwater harvesting measures to be implemented for Metro project. On the basis of detailed investigation conducted in the field as well as study of Hydro geological and geophysical data for various parameters available with is office the observations drawn are as below. The various technical parameters studied and field observations drawn are as given below-

On the basis of field investigation and study of technical parameters it is inferred that, the area covered by the 2 routes is in Limits and is feasible for rainwater harvesting the rainwater can be obtained/ collected from the top surface of elevated span as well as roof top of the Depot.

As per the guidelines of IGBC considering the average rainfall of the last five years the rainwater available from every two span areas would be about 8.72m³. The water available can be utilized to recharge to subsurface i.e. moderate to deep aquifers so as to raise the water table and improve the quality of groundwater under urban domain.

Thus the rainwater harvesting system recommended is to collect the water store and recharge to subsurface as per the IGBC guidelines so as to conserve about 50% of rain fall.

The Assumptions are as below----

- Rainfall data - 5 years from year 2013-17 (Revenue department considered Pune city)
- Rainy days - Actual rainfall are considered for calculations of average normal rainfall per day.
- Pillars with span are considered for the calculations. Pillars of stations are not considered presently for calculations.

Rain Water Harvesting -Via duct.

Rainfall from via duct = $28\text{m} \times 8 \times 0.0205$ (rainfall) $\times 0.95$ Coefficient of runoff = 4.36 m^3

Each recharge structure system covers two spans = $4.36 \times 2 = 8.72 \text{ m}^3$

Rain water harvesting system consists of two collection chambers of size $1 \times 1 \times 1 \text{ m}^3$

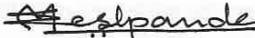
And Recharge chamber of $2.5 \times 1.5 \times 1.8 \text{ m} = 6.75 \text{ m}^3$

Total capacity for rain water harvesting system = $6.76 + 1 + 1 = 8.76 > 8.72 \text{ m}^3$ which is adequate to store the rainwater available.

	Route 1	Route 2
No of Pillars	469	371
Probable no of structure at every alternate pillar	170	108
No of Stations	9	8
Amount of annual rainfall to be collected from pillars and span from route 1 and 2	41210.72 m^3	
Amount of annual rainfall to be collected from Depot.	9482.09 m^3	
Amount of annual rainfall to be collected from 17 stations	15759.17 m^3	

The no of structures may vary, since depends on location and availability of land, site feasibility, road crossing area and bridge area.

Yours Sincerely,



(Dr. Milind Sharad Deshpande)

Regional Deputy Director,

Ground Water surveys and development Agency,
Pune Region, Pune.

Copy-

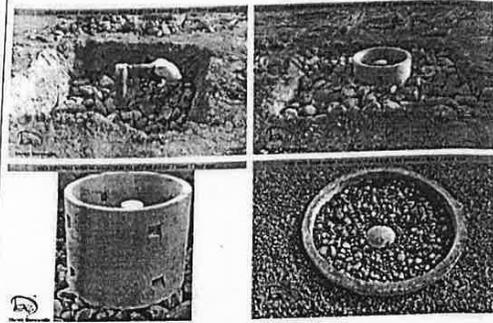
To The Hon. Director, Ground Water surveys and development Agency,
Maharashtra State, Pune.

Step 3,-Entire recharge pit is filled with boulders and then granular material.

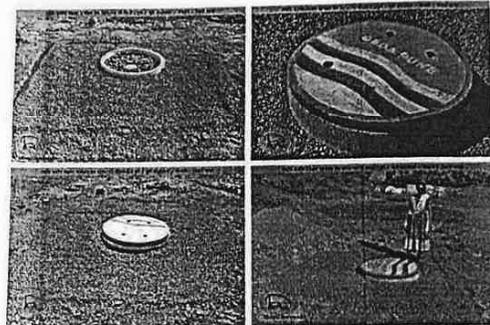
Step 4-Concrete ring is placed around the casing pipe called the recharge shaft.

Step 5-Concrete ring is filled with pebbles and coarse and fine sand.

Step 6 - The entire recharge pit area is filled with granular material



Step 7:-Manhole cover is placed over the shaft



The material from the shaft needs to be removed and cleaned and replaced.

The recharge pit is filled with granular material which also requires cleaning and the top layer needs to be replaced else it clogs and prevents flow of water.

To capture 8.72 m^3 of water the traditional design would be two one cubic meter collection chambers leaving a balance of $8.72-2=6.72 \text{ m}^3$.

In a recharge pit only 20% of volume is available for storage of water

So volume of pit for storing 6.72 m^3 of water = $6.72 \times 100 / 20 = 33.6 \text{ m}^3$

Assuming a depth of 2 meters and width of maxm 2.2 m the length of pit =7.6 m

Cost Comparison

Sn	Unit	Traditional	With filter	Remarks
	Collection chamber with cover -2 numbers	Size 1mx1mx1	Size 1x1x1	No difference
	Rain water harvesting storage tank	33.6 m^3	6.75 m^3	Cost saving due to smaller size.
	Boulders -1/3 volume	$11.2 \text{ m}^3 @ 2200 = 24,640$	Not Required Only filter	

Govt Of Maharashtra
Water Supply And Sanitation Department

Deputy Director,
Ground Water Surveys And
Development Agency, Pune Region,
K.B.Joshi Rd, Shivajinagar, Pune -
411005



Phone - 020-25531227,
25521852
Fax - 020-25531227
Email - ddgsdapntech@gmail.com

Out No/Tech/survey/GroundWater Survey/S.I./ 2391/2018.

दि. : ~~02/11/2018~~

26/12/2018

To ,

Hon. Mr. Ramnath Subramanian,
Executive Director
Maharashtra Metro Rail Corporation, Ltd
Pune-01

Sub : Maha-MetroPune- A brief feasibility study report on Rain Water harvesting Project
proposed for Maharashtra Metro Corporation Pune. .

Ref : 1.This official letter No. Tech/survey/Groundwater Survey/S.I. 05/ 2391/2018
Date -07/09/2018

Sir,

With respect to your request regarding Rainwater harvesting project this office has conducted technical study and field investigation to determine the feasibility of rainwater harvesting measures to be implemented for Metro project. On the basis of detailed investigation conducted in the field as well as study of Hydro geological data for various parameters available with is office the observations drawn are as below. The various technical parameters studied and field observation drawn is as given below-

On the basis of field investigation and study of technical parameters it is inferred that, the area covered by the 2 routes is in Limits and is feasible for rainwater harvesting the rainwater can be obtained/ collected from the top surface of elevated span as well as roof top of the Metro stations.

The Measures and recommendations proposed are as below----

Rain Water Harvesting -Via duct.

Rainfall from Via duct =28mx8x.0205 (rainfall) x.95
Coefficient of runoff=4.36 m³

Each recharge pit covers two spans =4.36x2=8.72

Rain water harvesting system consists of two collection
chambers of size 1x1x1 i=1m³

Recharge chamber of 2.5x1.5x1.8 m=6.75

Total capacity for rain water harvesting =6.76 +1+1=8.76
>8.72 adequate



Maharashtra Metro Rail Corporation Limited	Environmental Impact Assessment (EIA) and Hydraulic Studies of River with Reference to the Pune Metro Rail Alignment (1.45 Km) Passing through Mutha River and Suggest Measures to Mitigate the Side Effects EME/CS/MMRCL /2017-18/102 R00 Date 17/10/2017; R01 Date 26/10/2017; R02 Date 16/11/2017; R03 Date 07/12/2017 R04 Date 29/01/2018; R05 Dte 21/04/2018	Final EIA EMP Report
---	---	----------------------------

Figure No. 3.27. Electric Resistivity surveys in progress at Z-Bridge along the Mutha River channel



Table No.3.7. Electric Resistivity data of 14 VES stations.

No	AB/2	MN/2	VES 1	VES 2	VES 3	VES 4	VES 5	VES 6	VES 7	VES 8
1	1	0.5	145.44	224.07	78.93	22.69	13.45	80.82	23.40	75.87
2	2	0.5	123.95	186.14	72.10	16.49	12.49	34.52	21.21	20.38
3	3	0.5	55.68	74.22	41.78	17.40	13.25	29.41	21.14	16.22
4	5	0.5	30.60	41.21	22.55	20.84	16.56	32.19	29.70	25.97
5	5	1.5	29.73	36.93	25.01	20.73	17.72	31.69	28.11	26.21
6	6	1.5	27.06	33.58	22.80	24.21	20.60	33.79	33.47	35.10
7	8	1.5	28.06	38.15	20.30	28.26	23.02	44.62	44.75	42.42
8	10	1.5	31.99	43.40	23.24	31.53	27.64	47.50	49.65	51.49
9	10	5	28.36	36.29	22.81	29.45	23.28	40.76	42.41	45.00
10	15	5	35.44	44.61	29.22	35.19	37.89	54.73	60.95	60.26
11	20	5	42.41	54.78	33.58	40.06	47.48	64.68	69.98	67.50
12	25	5	46.87	59.19	38.45	39.96	52.78	69.74	72.38	69.93
13	30	5	50.93	65.42	40.68	38.76	58.00	72.30	74.22	67.90

Maharashtra Metro Rail Corporation Limited
 Environmental Impact Assessment (EIA) and Hydraulic Studies of River with Reference to the Pune Metro Rail Alignment (1.45 Km) Passing through Mutha River and Suggest Measures to Mitigate the Side Effects
 EME/CS/MMRCL/2017-18/102 R00 Date 17/10/2017; R01 Date 26/10/2017; R02 Date 16/11/2017; R03 Date 07/12/2017 R04 Date 29/01/2018; R05 Dte 21/04/2018
 Final EIA EMP Report

No	AB/2	MN/2	VES 9	VES 10	VES 11	VES 12	VES 13	VES 14
1	1	0.5	36.52	32.04	22.86	24.27	36.52	45.24
2	2	0.5	21.32	27.33	22.15	16.85	21.44	39.00
3	3	0.5	21.72	19.24	21.72	14.27	16.49	31.34
4	5	0.5	30.32	22.78	21.46	16.79	17.88	29.16
5	5	1.5	29.06	21.49	22.78	15.08	18.11	34.54
6	6	1.5	34.99	25.55	24.03	16.86	19.51	29.94
7	8	1.5	40.16	33.56	27.94	21.53	24.77	29.68
8	10	1.5	45.24	40.84	33.88	26.92	31.53	35.01
9	10	5	38.88	35.58	30.39	22.57	28.27	33.22
10	15	5	50.52	51.40	42.85	39.02	40.84	42.85
11	20	5	59.38	57.37	49.72	15.43	46.89	54.31
12	25	5	62.02	60.32	57.49	62.77	53.34	61.64
13	30	5	68.17	64.32	60.75	61.30	58.28	67.90

Figure No. 3.28. Electrical Resistivity Modelled layers

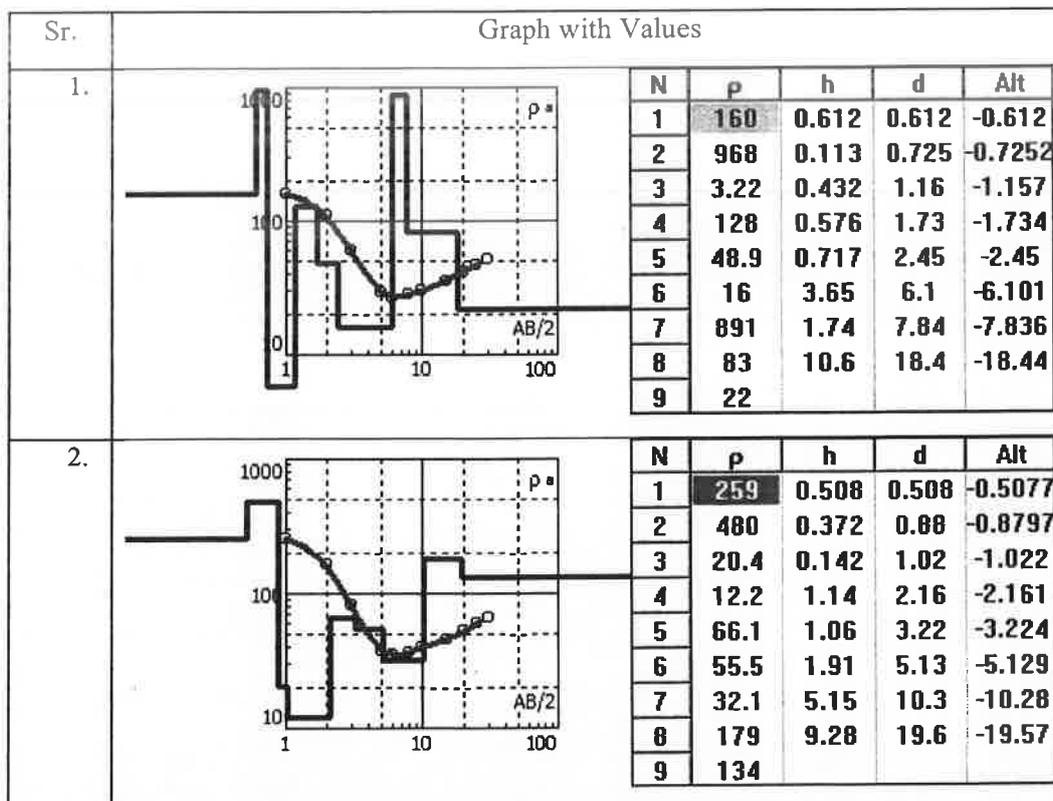
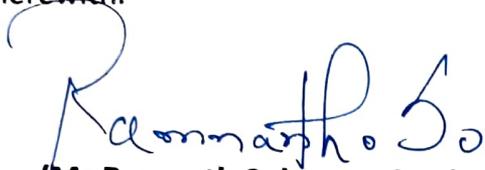


Exhibit "7"

MEMORANDUM OF UNDERSTANDING-

We The Maharashtra metro rail corporation, Pune and Groundwater Surveys and Development Agency, GOM, Pune hereby agree that the Project on Rainwater Harvesting of the Pune Metro Rail Project will be undertaken by the Groundwater Surveys and Development Agency, GOM, Pune as per the Terms of Reference attached herewith.



(Mr. Ramnath Subramaniam)

Executive Director, Strategic Planning
The Maharashtra Metro rail corporation,
Pune-01



(Dr. Milind Sharad Deshpande)

Regional Deputy Director,
Ground Water surveys & development agency,
Pune-05

Place- Pune

Date- 24/09/19

Terms of Reference-

This Memorandum of Understanding is made on this ----- between The Maharashtra metro rail corporation, Pune and Groundwater Surveys and Development Agency, GOM, Pune , herein after referred to as Mahametro Pune on the one part and the Groundwater Surveys and Development Agency, GOM, Pune herein after referred to as GSDA on the other part.

Where in the GSDA has been selected as a single source agency for undertaking a project on Rainwater Harvesting of the Pune Metro Rail Project .Whereas the GSDA offers to undertake this work and represents that it has the historical database, required technical know-how and the expertise to undertake such a study and have submitted their technical and financial proposal for the work.

Now therefore it is agreed to the following.

1. Unless repugnant to the subject or context, the following words and expression shall in this agreement have the following meaning.

1.1 MOU shall mean this document.

1.2 A study shall mean- Field survey for(Hydrogeological, geophysical) of appropriate area for routs and depots of Rainwater Harvesting of the Pune Metro Rail Project and preparation of technical reports thereof for entire Project area/Routes& Depots

1.3 Effective date of Agreement shall mean the day on which both parties sign the agreement.

2. Validity period of agreement

2.a this document will remain valid for a period of five years starting from the date of signing.

2.b Project period: The project period will be **Five years** and the work of the project will be started from the date or receipt of the advance payment at GSDA.

3. Objectives of Project:

Water is the most important resource for any life to exist. One issue that urban areas in the country face continuously is the water crisis. They get most of their water supply from rivers and lakes. As the local footprints dry out due to mismanagement and overuse, the search for another resource turns even more distant. The situation has an ironical turn. At one side the cities are facing severe water crisis and on the other hand they are flooded with rainwater, which is the most common and primary source of fresh water in the monsoon. The neglected harvesting systems have simply worsened the situations. Today, the hunt for a water source and its sustainability is a big concern. One of the solutions for water crisis is capturing of this abundant rainwater through rainwater harvesting.

Rainwater harvesting is the most effective method of water conservation. It is used to collect and store rainwater for use by humans, animals, agriculture and industries. The rainwater in this process is collected at the surface before it is lost as surface run off. The ground water is then recharged artificially through the process.

The first and the foremost reason for rainwater harvesting is to overcome the situation of inadequacy of surface water to meet the ever increasing demands.

- To increase the groundwater table, this is the easiest and most economical choice.
- To replenish the subsoil of the city area, which is covered with pavements.
- To recharge the subsurface water tables at places where the availability of rainwater is higher and to overcome the situation of water logging.
- Rainwater harvesting also improves the quality of underground water through a process called dilution.
- To get water for domestic use, irrigation of greenbelts, farms, gardens etc.

To accomplish the above objectives, the following activities are envisaged-

1. To provide the historical data for study purpose.
2. To carry out the hydrogeological surveys to ascertain the groundwater potential
3. To carry out Rainwater harvesting feasibility studies for the Pune Metro Rail Project as per the I.G.B.C. guidelines.
4. To carry out supervision of rainwater harvesting for Pune Metro Rail Project to ensure scientific methodology.

4. Area of operation-

The study area includes Mahametro, Pune Metro routes extending from PCMC to Shivajinagar in the north –south direction and from Vanaz to Ramvadi in the East-West direction with vanaz and range hill depot area, The required surveys/ investigation and exact demarcation of the area will be undertaken in consultation with the Mahametro Authorities.

5. Obligation of Mahametro-

1. To Provide all baseline data available with Mahametro as and when required.
2. To Appoint a Nodal Officer who will co-ordinate with GSDA.
3. To support during hydrogeological and geophysical survey in and around Metro Area.
4. Submit daily/weekly progress report regarding status of implementation of works in the Metro area.

6. Obligation of GSDA

1. Undertake the activities for comprehensive hydrogeological surveys and geophysical surveys.
2. Supervision of Rainwater Harvesting structures during construction period at Mahametro Pune as per the progress/implementation status submitted by Mahametro Pune to GSDA for onsite monitoring of works.
3. Appoint a Nodal officer who will co-ordinate with Mahametro and provide necessary support for field visits.
4. To finalize the feasible sites for the Rainwater Harvesting structures in the area.

7. Deliverables

1. Report on - Rainwater harvesting at Pune Metro for consultancy and supervision.
2. To select and for location for implementation of RWH structures on the routes and area of Mahametro.

8. Schedule of rate

The Rate/charges applicable to the activities included at no.6 and the 7 of this TOR are as per actual worked out by GSDA for undertaking comprehensive geohydrological survey under the Project on Rainwater Harvesting of the Pune Metro Rail Project cost estimate for the entire work is RS 14,05,230/-.

9. Schedule of Payment

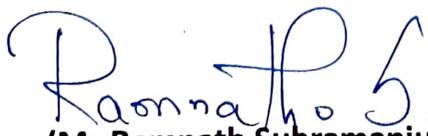
Mahametro will pay 100 % of the total cost as advance at the time of MOU to GSDA before the commencement of the actual work under this project. The fund received will be utilized by GSDA for survey work, supervision, vehicular expenditures & other administrative expenditures. The agreement may be discontinued by giving a notice of minimum period of three months from either side after working out the mutual agreeable time frame.

10. Force Majeure

The term force Majeure shall include acts of Nature, Earthquake war riots, fire, flood, famine law and order situation and local disturbances in the area of operation. all payments due for work done before the interruption due to force Majeure shall be extended by the period for which such cause lasts.

11. Other General Obligations-

Any dispute or differences of opinion arising out of this agreement shall be settled through mutual and amicable consultation with the Regional deputy director Groundwater Surveys and Development Agency Pune region, GOM, Pune and Executive Director, Maharashtra Metro rail corporation Pune.


(Mr. Ramnath Subramaniam)

Executive Director, Strategic Planning
The Maharashtra Metro rail corporation,
Pune-01



(Dr. Milind Sharad Deshpande)
Regional Deputy Director,
Ground Water surveys & development agency,
Pune-05

**महाराष्ट्र मेट्रो रेल कॉर्पोरेशन लिमिटेड**
MAHARASHTRA METRO RAIL CORPORATION LIMITED

(भारत सरकार आणि महाराष्ट्र शासनाचा संयुक्त उपक्रम)
Joint Venture of Govt. of India & Govt. of Maharashtra
PUNE METRO RAIL PROJECT

Ref No.: Maha-Metro/Pune/EMD/C01

Date: 15th July, 2020

To,

- i) Dr. Ritesh Vijay- Principal Scientist, NEERI and convener of the Expert Committee.
- ii) Dr. A. Benniamin- Scientist, State Biodiversity board, Member of the Expert Committee
- iii) Dr. Y.B. Sontakke - Joint Director, Maharashtra Pollution Control Board, Member of the Expert Committee

Sub: i) Minutes of Meeting (MoM) dated 20/11/2019 issued by Divisional Commissioner vide No/NP-4/WS/909/2019 dated 16th December, 2019 in matter of NGT Order dated 3rd August, 2018 in Original Application No. 130 of 2018 (M.A. No. 343/2018, 344/2018, 345/2018 and 346/2018) (Earlier O.A. No. 67/2018 (WZ)

- ii) Reply from Maha-Metro in the matter of NGT order dated 5th November, 2019 in Original Application No. 70/2019 (WZ).

Dear Sir,

Reference to the above, please find enclosed Annexure-1 and Annexure-2 for point wise compliance and reply on subject item no. (i) & (ii) respectively.

This is for your information and reference please.

(Ratnakar Pandey)
DGM/Environment
Maha-Metro Rail Corporation, Pune

Copy to- Divisional Commissioner, Council Hall, Pune

CORPORATE OFFICE: PUNE

**Point wise Reply to the MoM dated 20th Nov,2019 in the matter of
Sarang Yadwadkar (Applicant)**

Versus

Pune Municipal Corporation (Respondents)

Ref: NGT Order in Original Application No. 130 of 2018 (M.A. No. 343/2018, 344/2018, 345/2018 and 346/2018) (Earlier O.A. No. 67/2018 (WZ))

Committee Suggestion: Coordinates of survived trees, location of new planted trees and their photographs shall be presented in the final report.

Compliance: Coordinates of survived trees has been presented below. The location of new planted trees and their photographs is enclosed as Annexure-1A.

Trees	Transplanted location coordinates	
	Latitude N	Longitude E
Peltophorum	18.512947	73.841195
Peltophorum	18.513074	73.841135
Peltophorum	18.512921	73.841126
Silk Cotton	18.513223	73.841424

Committee Suggestion: Additional data on afflux and submergence to be provided in suggested format.

Compliance: As per the suggestion of the Expert committeeThe water Afflux and submergence calculations have been undertaken afresh which includes the foundations and piers emerging from the riverbed. The cross section of the river has been endorsed by the Irrigation Department. The water afflux and Submergence values have been calculated for flows of 100,000 cusecs and 60,000 cusecs and same is mentioned in the below Table-1.

Table-1: Water afflux and Submergence for flows of 100,000 cusecs and 60,000 cusecs

S.No.	Flow in cusecs	Max. Water Afflux (mm)	Location of afflux	Max. submergence (in m)
1.	100,000 cusecs	180	P160, P161, P162	DE-7- 4.158
2.	60,000 cusecs	100	P168	P175 - 2.736

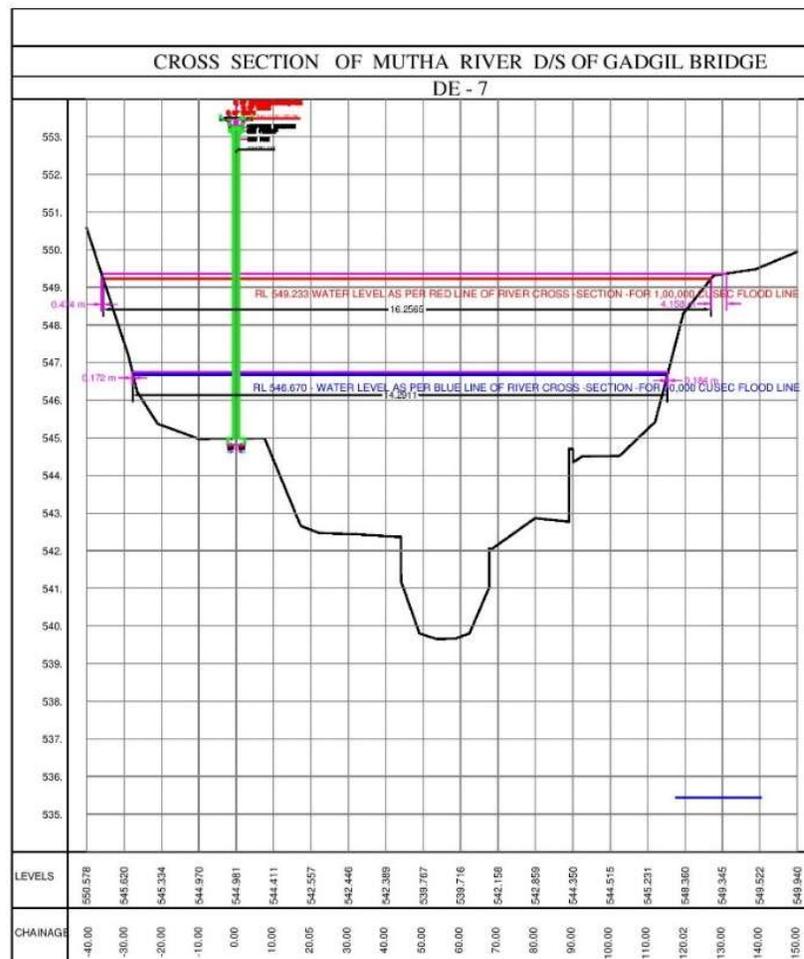
Committee Suggestion: As the piers at the stations are in a line hence the area of obstruction would increase. This has to be considered while calculating afflux and submergence.

Compliance: Revised HECK RAS study has considered this aspect and calculated the afflux and submergence accordingly.

Committee Suggestion: Water levels at pier locations for discharges of 45,474 cusecs, 60,000 cusecs and 100,000 cusecs to be presented in graphical format considering the scenarios i.e. without Metro Piers and with Metro piers with pile caps.

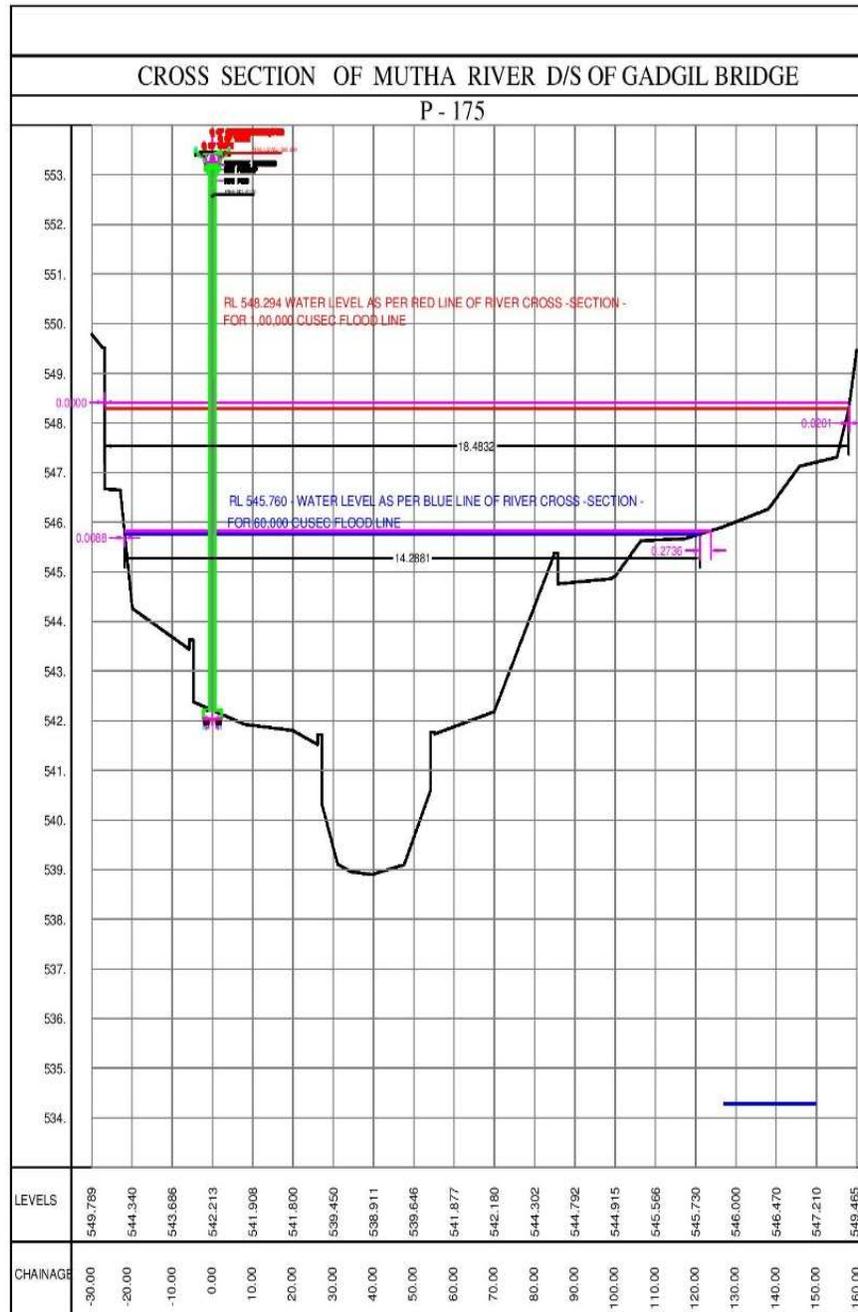
Compliance: Water levels for the discharge of 100,000 and 60,000 cusecs has provided in graphical form in the HEC RAS report and same is being given in Figure-1 &2. Water level for the discharge of 45,474 cusecs is not available with concerned department hence we are not able to provide the same. Pertaining to this discharge we presume that it will not serve any purpose as the higher discharge has already been taken into account while calculating the water level.

Figure-1 Cross Section of DE-7 which has maximum submergence for discharge of 100,000 cusecs.



DE7 Chainage 4742.957 (Mutha River D/S Chainage 12534.093)

Figure-2 Cross Section of P-175 which has maximum submergence for discharge of 60,000 cusecs



P175 Chainage 5125.873 (Mutha River D/S Chainage 12917.660)

Fig-3 Plan Showing Red line, Blue Line and Submergence line at discharge of 1,00,000 cusecs.

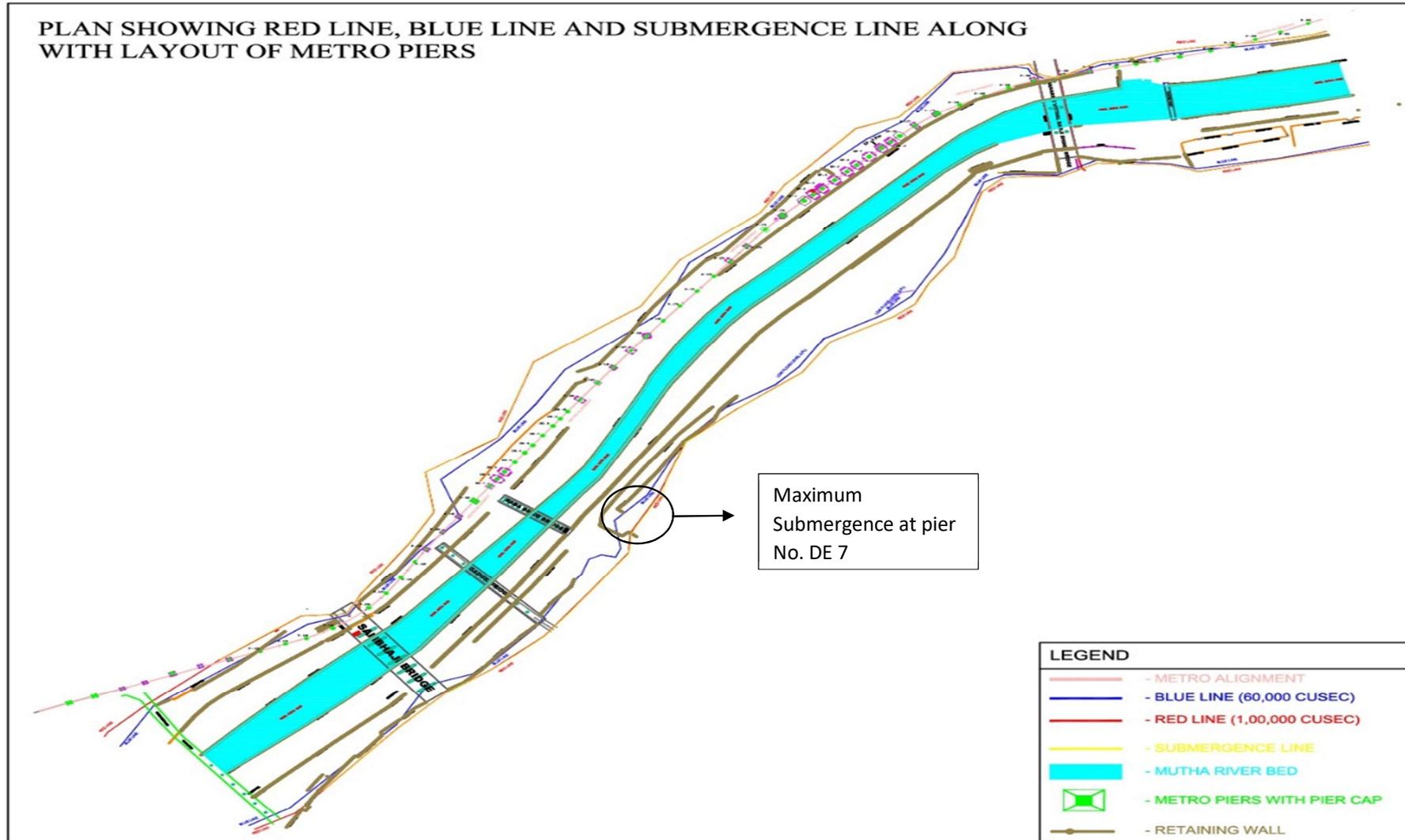
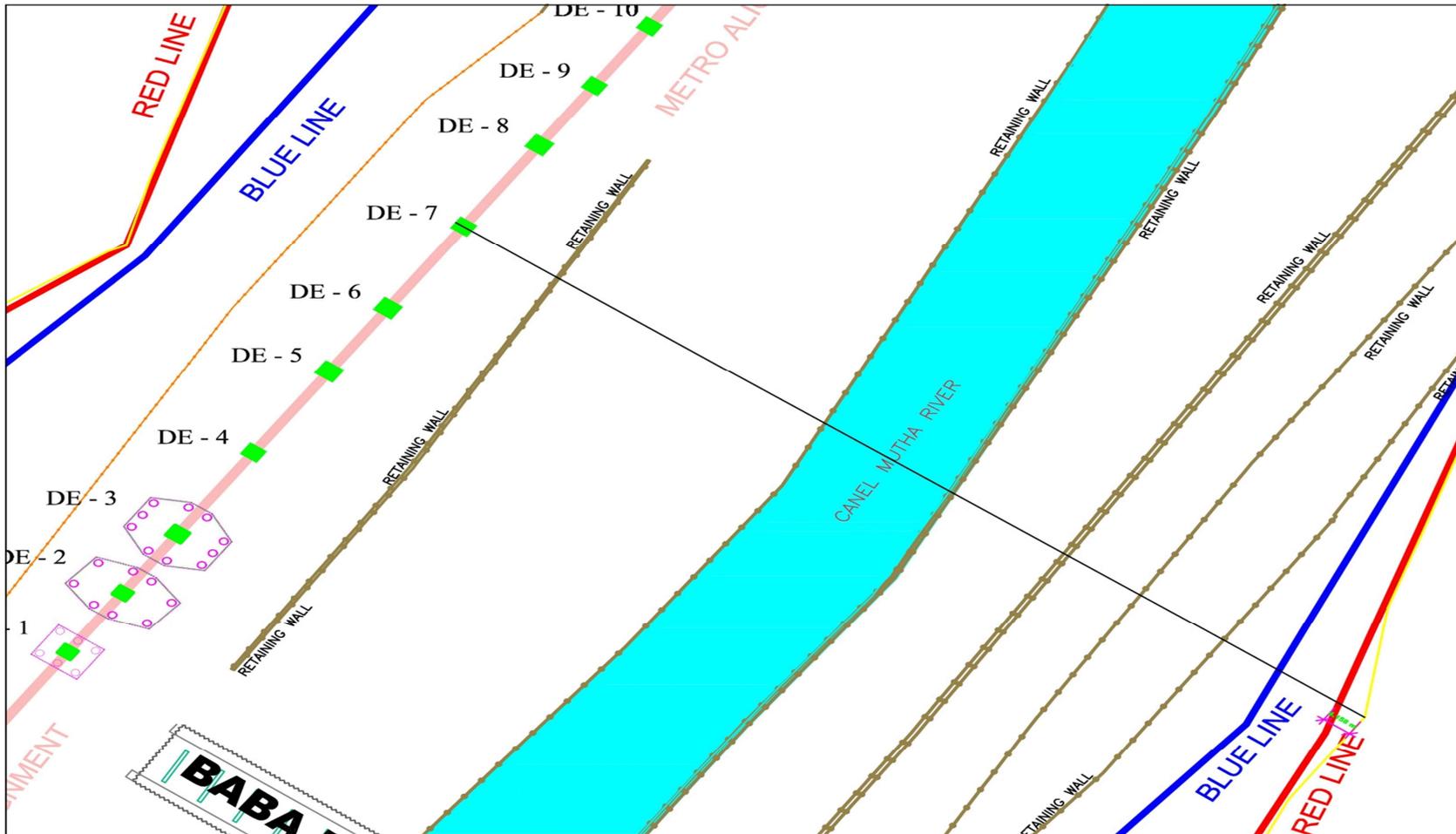


Fig-4 Enlarged Section of DE - 7 which has maximum submergence for discharge of 1,00,000 cusec



Committee Suggestion: Submergence also needs to be depicted in a similar manner and if it is found to be very meagre in that case an enlarged section of the same to be presented.

Compliance: Enlarge section of submergence has been presented in below figures.

Fig: Graph showing submergence from P 152-P 190 for discharge of 60,000 cusec

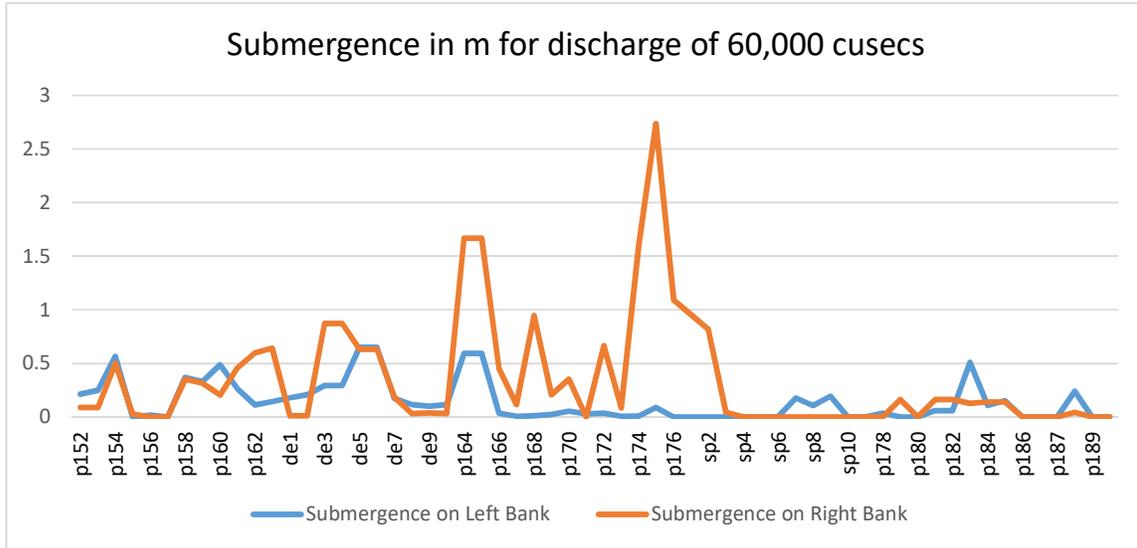
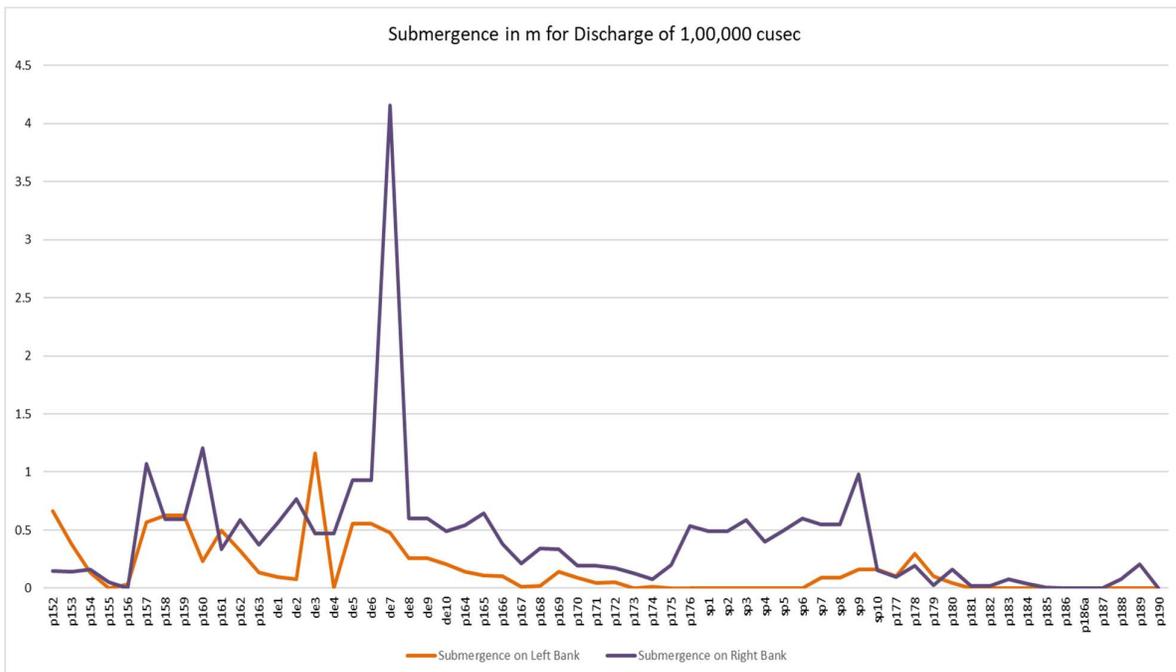


Fig: Graph showing submergence from P 152-P 190 for discharge of 1,00,000 cusec



Committee Suggestion: Verify the river dimensions with the irrigation Department and provide appropriate computations in case of discrepancy. Validation/ Endorsement from Irrigation Department is required.

Compliance: The River dimensions were verified with irrigation department and fresh computations was done in revised HEC RAS study. Revised water afflux and Submergence for flows of 100,000 cusecs and 60,000 cusecs has been presented in above Table-1.

Committee Suggestion: Impact on ground water recharge due Metro pier construction.

Compliance: The EIA study of this particular alignment reveals that the strata below soil are not favourable to form aquifer. However, unconfined aquifer reported from the project area has poor potential. It is envisaged that construction of Piers on the bank are not likely to cause significant impact on any aquifers. Natural springs are not observed in the area during the study period. Hence no adverse impacts during construction phase are envisaged on existing hydrogeological condition. This study has been vetted by Pune University. Maha Metro has signed a memorandum of understanding with Ground Water Survey Development Agency for rain water harvesting and is being implemented on sites.

Committee Suggestion: Issues to be recorded in chronological order and replies to be submitted.

Compliance: Issues has been recorded in chronological order and reply has been enclosed as Annexure-2 in the matter of Original Application No.70/2019.

Committee Suggestion: Numerical Model study from CWPRS to be conducted at earliest and report to be submitted.

Compliance: Maha-Metro has awarded this assignment to CWPRS in the month of December, 2019.As per the CWPRS proposal this study has to be completed in 4 months' timeline but due to pandemic situations the work has been stuck and study could not be completed so far. Maha-Metro is perusing this matter with CWPRS for earliest completion of the study (copy of reply received from CWPRS is enclosed)



सत्यमेव जयते

भारत सरकार

Government of India

जल शक्ति मंत्रालय

Ministry of Jal Shakti

जल संसाधन, नदी विकास और गंगा संरक्षण विभाग

Department of Water Resources, River Development and
Ganga Rejuvenation

केन्द्रीय जल और विद्युत अनुसंधान शाला

खड़कवासला, पुणे - 411 024

Central Water & Power Research Station

Khadakwasla, Pune - 411 024



टेलीफोन : 020-24103331

फैक्स : 020-24381004

ई-मेल : n_isaac@rediffmail.com

No. HAPT/Metro/2020

Date: 13.07.2020

Shri Ratanakar Pandey
Dy. General Manager (Environment),
Maharashtra Metro Rail Corporation Ltd.
1st floor, The Orion Bldg,
Arjun Mansukahni Marg,
Pune-411001

Sub: Mathematical model studies of river Mutha for Maha-Metro Rail Corporation Ltd. Pune.
Ref: Email dated 11 July 2020

Sir,

CWPRS has been awarded the mathematical model studies of river Mutha for Maha Metro Rail Corporation Ltd. Pune. CWPRS has received the full estimated amount on 28 January 2020. In this connection, CWPRS has completed the model set up. Initial calibration runs have also been completed. A joint site inspection was also carried out on 17 March 2020 for fine tuning of the model in terms of incorporating all the existing bridges and other structures along the river. Further, due to the ongoing COVID-19 crisis, CWPRS offices were completely closed (except for Essential Services) from 22nd March to 17th May 2020. Since 18th May 2020, CWPRS was functioning with only 50% of staff till 22nd June 2020. From 23rd June 2020, it is further reduced to 33%. As per the new guidelines of State government regarding COVID-19 issued on 12th July 2020, CWPRS will be closed again for the next 10 days. Taking into account the difficulties as mentioned above, it is requested to extend the time-line for the studies by about 3 months.

Thanking you and assuring of our best services.

Yours sincerely,

Neena Isaac
13/07/2020
Dr. (Mrs) Neena Isaac
Scientist 'E'

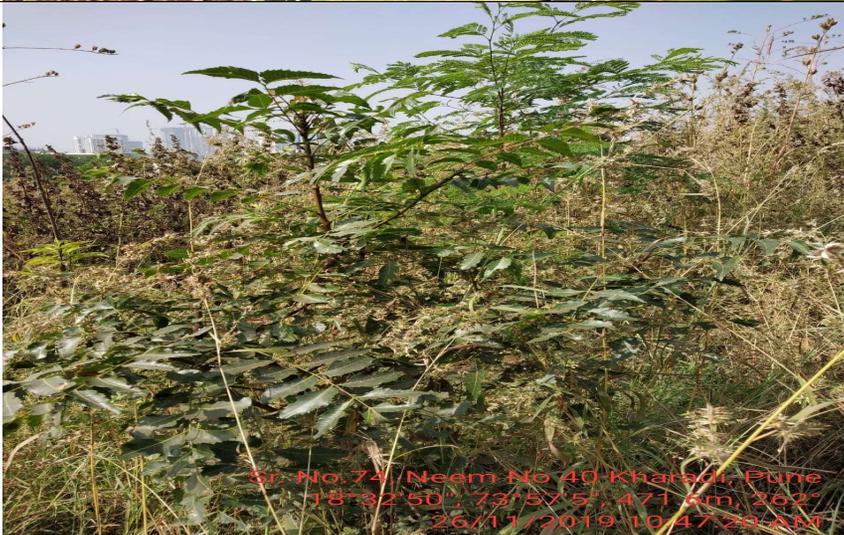
List of 36 planted trees at Kharadi Forest Survey no. 74

Annexure-1A

Sr. No	Tree Name and No	Coordinates	Photographs
1	Vad No 37	18° 32'50", 73° 57'5", 470.8m, 211°	 <p data-bbox="1255 630 1793 678">Sr. No. 74, Vad No 37 Kharadi, Pune 18° 32'50", 73° 57'5", 470.8m, 211° 26/11/2019 10:44:59 AM</p>
2	Kanchan No 36	18° 32'50", 73° 57'5", 469.1m, 100°	 <p data-bbox="1180 1110 1793 1159">Sr. No. 74, Kanchan No 36 Kharadi, Pune 18° 32'50", 73° 57'5", 469.1m, 100° 26/11/2019 10:44:21 AM</p>

3	Neem No 35	18° 32'50", 73° 57'5", 468.2m, 67°	 <p>Sr. No. 74, Neem No 35 Kharadi, Pune 18° 32'50", 73° 57'5", 468.2m, 67° 26/11/2019 10:43:30 AM</p>
4	Vad No 34	18° 32'50", 73° 57'5", 466.2m, 67°	 <p>Sr. No. 74, Vad No 34 Kharadi, Pune 18° 32'50", 73° 57'5", 466.2m, 67° 26/11/2019 10:42:17 AM</p>

5	Neem No 42	18° 32'50", 73° 57'5", 470.9m, 263°	 <p data-bbox="1249 760 1795 836">Sr. No. 74, Vad No 34 Kharadi, Pune 18° 32' 50", 73° 57' 5", 467.3m, 47° 26/11/2019 10:42:09 AM</p>
6	Pimpal no 15	18° 32'51", 73° 57'4", 477. 5m, 351°	 <p data-bbox="1197 1258 1795 1323">Sr. No. 74, Pimpal No. 15 Kharadi, Pune 18° 32' 51", 73° 57' 4", 477.5m, 351° 26/11/2019 10:16:35 AM</p>

7	Vad No 14	18° 32'51", 73° 57'4", 475.0m, 266°	 <p data-bbox="1249 699 1793 764">Sr. No. 74, Vad No 14 Kharadi, Pune 18°32'51", 73°57'4", 475.0m, 266° 26/11/2019 10:15:47 AM</p>
8	Neem No 40	18° 32'50", 73° 57'5", 471.6m, 262°	 <p data-bbox="1213 1235 1793 1300">Sr. No. 74, Neem No 40 Kharadi, Pune 18°32'50", 73°57'5", 471.6m, 262° 26/11/2019 10:47:29 AM</p>

9	Vad no 11	18° 32'51", 73° 57'4", 474.4m, 6°	 <p data-bbox="1249 730 1795 803">Sl. No. 74, Vad No 11, Kharadi, Pune 18° 32' 51", 73° 57' 4", 474.4m, 6° 26/11/2019 10:15:13 AM</p>
10	Nem No 13	18° 32'51", 73° 57'4", 474.0m, 338°	 <p data-bbox="1249 1242 1795 1315">Sl. No. 74, Nem No 13, Kharadi, Pune 18° 32' 51", 73° 57' 4", 474.0m, 338° 26/11/2019 10:15:41 AM</p>

11	Kanchan No 10	18° 32'51", 73° 57'4", 475.0m, 180°	 <p>Sr. No. 74, Kanchan No 10 Kharadi, Pune 18° 32'51", 73° 57'4", 475.0m, 180° 26/11/2019 10:12:35 AM</p>
12	Neem No 12	18° 32'51", 73° 57'4", 473.6m, 6°	 <p>Sr. No. 74, Neem No 12 Kharadi, Pune 18° 32'52", 73° 57'4", 473.6m, 6° 26/11/2019 10:13:50 AM</p>

13	Pathodiya No 39	18° 32'50", 73° 57'5", 471. 4m, 6°	 <p>Sr. No. 74, Pathodiya No. 39 Kharadi, Pune 18° 32' 50", 73° 57' 5", 471.4m, 6° 26/11/2019 10:46:40 AM</p>
14	Vad No 38	18° 32'50", 73° 57'5", 471. 0m, 94°	 <p>Sr. No. 74, Vad No. 38 Kharadi, Pune 18° 32' 50", 73° 57' 5", 471.0m, 94° 26/11/2019 10:45:57 AM</p>

15	Pimpal No 8	18° 32'51", 73° 57'4", 472.9m, 276°	 <p data-bbox="1218 706 1795 771">Sr. No 74, Pimpal No 8 Kharadi, Pune 18°32'51", 73°57'4", 472.9m, 276° 25/11/2019 10:09:57 AM</p>
16	Vad No 7	18° 32'51", 73° 57'4", 479.9m, 245°	 <p data-bbox="1260 1258 1795 1323">Sr. No 74, Vad No 7 Kharadi, Pune 18°32'51", 73°57'4", 479.9m, 245° 25/11/2019 10:08:37 AM</p>

17	Kanchan No 15	18° 32'51", 73° 57'4", 475.1m, 222° ⁰	 <p data-bbox="1171 727 1793 802">Sr. No. 74, Kanchan No 15 Kharadi, Pune 18° 32'51", 73° 57'4", 475.1m, 222°⁰ 26/11/2019 10:17:19 AM</p>
18	Neem No 24	18° 32'51", 73° 57'4", 478.1m, 276° ⁰	 <p data-bbox="1205 1279 1793 1349">Sr. No. 74, Neem No 24 Kharadi, Pune 18° 32'51", 73° 57'4", 478.1m, 276°⁰ 26/11/2019 10:26:45 AM</p>

19	Vad No 5	18° 32'51", 73° 57'5", 479. 7m, 145°	 <p data-bbox="1255 630 1793 685">Sr. No.74, Vad No 5, Kharadi, Pune 18°32'51", 73°57'5", 479.7m, 145° 26/11/2019 10:06:52 AM</p>
20	Neem No 6	18° 32'51", 73° 57'4", 480. 7m, 291°	 <p data-bbox="1255 1123 1793 1179">Sr. No.74, Neem No 6, Kharadi, Pune 18°32'51", 73°57'4", 480.7m, 291° 26/11/2019 10:07:58 AM</p>

21	Pathodiya No 33	18° 32'50", 73° 57'5", 472. 2m, 11°	 <p>Sl. No. 74, Pathodiya No 33, Kharadi, Pune 18° 32'50", 73° 57'5", 472.3m, 11° 26/11/2019 10:41:07 AM</p>
22	Pimpal No 4	18° 32'51", 73° 57'4", 478.0m, 66°	 <p>Sl. No. 74, Pimpal No 4, Kharadi, Pune 18° 32'51", 73° 57'4", 478.0m, 66° 26/11/2019 10:05:34 AM</p>

23	Vad No 32	18° 32'50", 73° 57'5", 474. 1m, 82°	
24	Pimpal No 3	18° 32'51", 73° 57'4", 479. 5m, 89°	

25	Van No 30	18° 32'50", 73° 57'5", 473.3m, 292°	 <p data-bbox="1249 646 1795 708">Sr. No. 74, Van No 30 Kharadi, Pune 18°32'50", 73°57'5", 473.3m, 292° 26/11/2019 10:38:30 AM</p>
26	Pimpal No 1	18° 32'52", 73° 57'4", 475.1m, 243°	 <p data-bbox="1207 1193 1795 1265">Sr. No 74, Pimpal No 1, Kharadi, Pune 18°32'52", 73°57'4", 475.1m, 243° 26/11/2019 10:03:21 AM</p>

27	Pathodiya No 31	18° 32'50", 73° 57'5", 473. 5m, 349°	 <p>Sr. No. 74, Pathodiya No 31, Kharadi, Pune 18°32'50", 73°57'5", 473.5m, 349° 26/11/2019 10:39:31 AM</p>
28	Vad No 2	18° 32'51", 73° 57'4", 474. 2m, 259°	 <p>Sr. No. 74, Vad No 2, Kharadi, Pune 18°32'51", 73°57'4", 474.2m, 259° 26/11/2019 10:02:28 AM</p>

29	Khaya No 43	18° 32'51", 73° 57'5", 477.1m, 290°	
30	Kanchan No 29	18° 32'50", 73° 57'4", 474.1m, 37°	

31	Vad No 28	18° 32'50", 73° 57'4", 471. 3m, 70°	 <p data-bbox="1247 678 1793 737">Sr. No.74, Vad No 28 Kharadi, Pune 18°32'50", 73°57'4", 471.3m, 70° 26/11/2019 10:32:32 AM</p>
32	Mahogani Ni 42	18° 32'51", 73° 57'5", 480. 2m, 14°	 <p data-bbox="1150 1192 1793 1250">Sr. No. 74, Mahogani Ni 42 Kharadi, Pune 18°32'51", 73°57'5", 480.2m, 14° 26/11/2019 10:32:34 AM</p>

33	Neem No 26	18° 32'51", 73° 57'4", 473. 2m, 9°	 <p>Sr. No.74, Neem No 26, Kharadi, Pune 18° 32'51", 73° 57'4", 473.2m, 9° 26/11/2019 10:39:00 AM</p>
34	Pimpal No 41	18° 32'50", 73° 57'5", 470. 5m, 306°	 <p>Sr. No.74, Pimpal No 41, Kharadi, Pune 18° 32'50", 73° 57'5", 470.5m, 306° 26/11/2019 10:48:31 AM</p>

35	Neem No 25	18° 32'51", 73° 57'4", 472. 4m, 217°	 <p>Sr. No 74, Neem No 25 Kharadi, Pune 18°32'51", 73°57'4", 472.4m, 217° 26/11/2019 10:29:01 AM</p>
36	Pimpal No 41	18° 32'50", 73° 57'5", 470. 2m, 14°	 <p>Sr. No 74, Pimpal No 41 Kharadi, Pune 18°32'50", 73°57'5", 470.2m, 14° 26/11/2019 10:48:21 AM</p>

Before the NGT (WZ) Bench Pune

Sarang Yadwadkar (Applicant)

Versus

Pune Municipal Corporation (Respondents)

Ref: Original Application No. 70/2019 (WZ)

Background:

Maharashtra Metro Rail Corporation Ltd. (Maha-Metro) Is a joint venture company of Government of India (GOI) and Government of Maharashtra (GOM) established under the companies Act 2013 for the purpose of implementation of Pune Metro Rail Project.

The total length of Pune Metro Rail Project is 31.25 km of which a stretch of 1.45 km passes along the left bank of the Mutha river (**Annexure-1**). The structure comprises a tall viaduct and two elevated stations viz. Deccan Gymkhana and Sambhaji Udyan. The viaduct and stations are supported on single RCC Columns and the soffits of the viaduct and station concourses are above the highest flood levels. Adequate free board is provided above the highest flood level.

Issue:

Objections were raised for laying the Metro alignment along the left bank of Mutha river marked within the Blue line and Red line (Blue line and Red line shown on the Map represent the extent of spread of river on both sides for flood discharges of 60,000 cusecs and 100,000 cusecs respectively) and the matter went through hearing in the National Green Tribunal (NGT) and further to the Hon'ble Supreme Court of India. Maha-Metro explained that the obstruction caused by the structure of viaduct envisaged is limited to the width of one pier (all the piers being proposed along the river flow). Based on the pleas of the applicants and defence by Maha-Metro, a final verdict has been given by the Hon'ble Supreme Court permitting the laying of **Elevated Metro** alignment along the left bank of Mutha river.

During a meeting held by Divisional Commissioner, Pune to hear the objections of the litigants in the above case with reference to the current (August 2019) floods and obstruction caused due to construction enabling works and detailed design of foundations of piers, following issues came to be raised:

1. ***Alteration in design of foundations in some locations along the stretch bringing the pile caps above the initial bed of river.***
2. ***Temporary earthen road constructed along Metro alignment along the left bank of Mutha river from Deccan Gymkhana Metro Station to Vrudheshwar Temple.***

Following are the rejoinders to each of the issue raised by the litigants:

1. ***Alteration in design of foundations in some locations along the stretch bringing the pile caps above the initial bed of river:***

During the NGT proceedings Metro alignment along the left bank of the river was presented based on the initial assessment of the riverbed. The foundations of the

viaduct were proposed to be embedded below the riverbed. However, while detailing it was noticed that a large length of this alignment was falling below the second retaining wall (i.e. within main riverbed) and closer to the channelized stream of the river. The construction along this would have entailed a much higher effective obstruction to the river flow due to higher water velocity in the central zone of the river. In order to have minimum obstruction a logical technical decision was taken to move the alignment towards the left bank above the Retaining Wall (**Annexure -2**). In the process the initial position of piers was pushed towards the bank by 7 m, 12.5 m, 17 m and closer to Vruddhehwar temple to an extent of 20 to 28 m.

In this area there are two large diameter embedded sewerage lines which could not be disrupted (as it could have caused very serious river contamination) thus a structural scheme became necessary to support the single column piers of the viaduct on foundations which span the pipelines by providing piles and pile caps whose bottom is clear of the top of the pipeline. The modified design had piles and pile caps (above the bed level), albeit the width of the piers was slightly reduced (**Annexure -3**). These were shared with the NGT Expert Committee members during their visit on 30.11.2018. The sewerage pipelines are not in a smooth alignment while Metro requires a smooth alignment and therefore this solution had to be adopted for 31 foundation locations (out of a total of 60 locations). At these locations the pile caps are above the bed level along the left bank. However, the flow velocity of the river at these locations is much less than in the central zone causing comparatively less obstruction due to pile caps.

Initial mathematical studies of river flow at the pier locations were carried out without pile foundations embedded in the riverbed. The calculated local afflux at SP 10 (Sambhaji station pier -10) worked out to 11.7 mm. When the design underwent modification and pile caps were proposed laid on the river bed the mathematical computations of afflux were reworked. The maximum local afflux thus worked out is at SP8 (Sambhaji station Pier) was 29.2 mm. This was worked out for a discharge of 100,000 cusecs and was presented to the Expert Committee of NGT on 30.11.2018.

Subsequently in the matter other NGT order dated 5.11.2019 (Application No.70/2019(WZ)) highlighted that the width of the river has been misinterpreted. On verification it was found that due to manual digitisation of pdf file an error had indeed occurred which has now been rectified by using the recent data from irrigation department. The results of the revised mathematical analysis based on the above are as follows.

S. No.	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Submergence due to afflux (mm)
1.	100,000 cusecs	28.06	SP8	62.74
2.	60,000 cusecs	11.08	SP8	24.79

Based on the discussions during the Expert Committee's visit on 30th November 2018 detailed studies were undertaken generating hydrological model analysed by using HEC RAS 4.0Beta Software. This was considered for a stretch of 2.45 km which extends 0.5km either way beyond Metro Construction. This hydrological simulation model accounted for all obstructions such as sewerage pipeline, temples, samadhis, Ghats, Immersion tanks and trees etc. (without the temporary murrum road to enable construction) at 30m intervals along the entire stretch of 2.45 km which encompasses the Metro Construction.

M/s Mitcon undertook this study and came up with a maximum global afflux of 160 mm for a discharge of 100,000 cusecs. The Expert Committee had desired that this Hydrological

simulation to be undertaken by CPWRS. The study is underway and will be shared on completion.

Metro alignment on Riverbed -1.39km

Three alternatives for Metro Alignment were under consideration and the final selection was made on the basis of least disturbance to residential and commercial complexes, least number of affected trees and the shortest distance. Turning at Deccan Gymkhana Corner was a design constraint and the alternative along the river bank was found to be the most acceptable.

The original length of the metro alignment as per DPR was 1.7 km in two stretches of 1.5 km and 0.2m making a total of 1.7 km. The Metro alignment entered the river bed at chainage 4320 m and exited at chainage 5820 again entering at chainage 6195 meters and exiting at chainage 6395.

During the NGT first visit on 6.11.2017 the alternative alignment of length 1.45 km was shared where alignment enters the riverbed at chainage 4301.545 (Pier 152) and exited at chainage 5753.90 at (Pier -191). Subsequently the piers were pushed towards the left bank away from the river and the current alignment enters the river bed at chainage 4299.209 (Pier -152) and exits the river bed at chainage 5695.866 (Pier -189) with a length of 1.39 km. (Annexure -4 shows the three alignments)

As per our submission to NGT 32 trees were being affected and the Tree Authority had granted permission for the same. Of these 32 trees 23 were to be transplanted and balance nine to be cut. In the current alignment eleven trees have been transplanted and three cut leaving 18 trees unaffected

2. *Temporary earthen road constructed along Metro alignment along the left bank of Mutha River from Deccan Gymkhana Metro Station to Vrudheshwar Temple:*

A temporary murrum road was constructed to enable construction of Piers of the viaduct along the left bank of the river. In the process the bed under the road got raised by average 2.2 m This raising is **very small**, and it hugs the bed where the **velocity of river flow is minimal (Annexure 5)**. The cross-sectional area of the river flow at a representative CH 5303.127 (SP 8) gets reduced by only 3.7 % including this road at the largest raised foundation. The obstruction at Sambhaji Bridge is 19.33 % for a flow of 60,000 cusecs.

A revised hydrological model was analysed adding this temporary road by using HEC RAS 4.0 Beta Software. With this the global afflux at a discharge of 100,000 cusecs worked out to 180 mm (an increase of only 20 mm as compared to afflux without the road). Further, Maha-Metro has committed that temporary road will be removed once the works gets completed. **Now the temporary road constructed for machinery movement has been removed and photograph of the same presented in below sections.**



Maha metro's response to the six points raised in the petition.

1. The Expert Committee has failed to arrive at the scientific figures of rise in flood levels owing to the construction of the 59 piers of metro on riverbed of Mutha River through their study.

Initially a mathematical model was prepared based on Molesworth Formula recommended under Guide lines for Design and Construction of River Training and Control Works for Road Bridges, Indian Roads Congress -1997. However the Expert Committee advised to undertake a hydrological Simulation Model which has been completed for the 60 piers on the river bed.

- Based on Committee advise HEC RAS 4.0 Beta Software for a stretch of 2.45 km which includes metro construction of 1.45 km plus 0.5 km on both the upstream and downstream of the construction were undertaken (An additional Numerical modelling study from CWPRS is also underway for the same stretch.)
- The water Afflux and submergence calculations have been undertaken including the foundations and piers emerging from the riverbed. The cross section of the river has been endorsed by the Irrigation Department.

The water Afflux and Submergence values have been calculated for flows of

Sn	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Max. submergence (in m)
M	100,000 cusecs	180	P160, P161, P162	DE-7- 4.158
2.	60,000 cusecs	100	P168	P175 - 2.736

Graphs depicting water afflux and submergence are attached as **Annexure 6**. Photographs taken during the high flow levels showing water afflux at piers -**Annexure -7**

Water afflux and submergence are a function of the area of obstruction to the flow. With reference to Maha Metro the widest pier is at SP8 at the narrowest section of the river. There are bridges upstream and along the route of construction. The table below provides the area of obstruction to the flow at each location.

Flow 60,000 cusecs

Sr.No	Name of structure	Obstruction Area (Sq. m.)	River Area (Sq.m.)	Obstruction %
1.	Sambhaji Bridge	131.92	682.56	19.33
2.	Gadgil Bridge	95.8	680.05	14.09
3.	Baba Bhide Bridge	72.84	572.189	12.28
4.	Shinde Bridge	9.684	294.493	3.29
5.	Metro Pier No SP8	13.505	365.469	3.70

Flow -100,000Cusecs

Sr.No	Name of structure	Obstruction Area (Sq. m.)	River Area (Sq.m.)	Obstruction %
1.	Sambhaji Bridge	196.794	1195.329	16.46
2.	Gadgil Bridge	147	1154.68	12.73
3.	Baba Bhide Bridge	70.284	994.973	7.06
4.	Shinde Bridge	35.874	690.465	5.20
5.	Metro Pier No SP8	27.217	751.205	3.62

2. The Expert Committee has hugely misrepresented the width of Mutha River and has misquoted the data on river width as available with the Irrigation Department Government of Maharashtra.

There is a discrepancy in the width of the riverbed taken for the mathematical model. While designing alignment through the Mutha riverbed detailed plane table Survey of Mutha river published by the Irrigation Department was considered. The pdf copies were printed and digitized for planning purposes. Subsequently soft copies of plane table and river cross section was procured from irrigation department. Discrepancies in the data are due to manual digitisation of pdf data.

This has now been corrected and the revised mathematical calculations are presented the data for which includes raised foundations and piers.

The water Afflux and Submergence values have been calculated for flows of

S.No.	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Submergence due to afflux (mm)
1.	100,000 cusecs	28.06	SP8	62.74
2.	60,000 cusecs	11.08	SP8	24.79

The HEC RAS study undertaken for a stretch of 2.45 km i.e. 0.5 km on the upstream side and 0.5 km on the downstream side beyond the Metro construction is calculated on data endorsed by the irrigation department.

The water Afflux and Submergence values have been calculated for flows of

S.No.	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Max. submergence (in m)
1.	100,000 cusecs	180	P160, P161, P162	DE-7-4.158
2.	60,000 cusecs	100	P168	Pier 175 -2.736

3. The Expert Committee has failed to comply with the directions or the terms of study as defined by this Hon'ble Tribunal in order dated 13.10.2017 in Sarang Yadwadkar & Ors vs Pune Municipal Corporation & Ors. (OA No 130/2018 previously OA 67/2017 WZ)

- On 6.11.2017 the Expert Committee visited the project site and a copy of the Environment Impact Assessment was shared with the committee members. However, the Committee asked for additional information.
 - a) Justification of reduction of length from 1.7km to 1.45 km.
 - b) Layout of the two stations on the riverbed.
 - c) Location of each pier, with dimensions demarcated with red and blue lines.
 - d) Incorporation of red line and blue lines in layout published by Irrigation Department.
 - e) Site photographs. -list of affected trees
 - f) Water Afflux and submergence computations at each of the piers.
 - g) Certification/Identification of affected tree species from Botanical Survey of India.
- 10.11.2017 -Analysis of Alignment and Afflux computations were submitted via e mail.
- 21.12.2017 -Formal letter from Expert Committee requesting for the above data was received.
- 23.12.2017 -Metro submitted the above data along with a list of 32 trees likely to be affected by this construction.
- On 30.11.2018 -During their supervisory visit Water Afflux and Submergence calculations based on structural changes due to presence of sewer lines were shared with them.

The following documents are now submitted to the Expert Committee.

- a) Report of initial Mathematical model depicting water afflux and submergence.
- b) Report on Revised Mathematical Model for revised structural changes proposed in 1.45 km stretch with reference to afflux and submergence.
- c) Report on Hydrological simulation study by HEC RAS for revised structural changes including temporary ramp for the proposed 1.45 km plus 0.5 km upstream and downstream stretch with reference to afflux.
- d) Mathematical model based on revised river width with foundations emerging beyond the river bed and 60 piers.

4. The Expert Committee violated the directions of this Hon'ble Tribunal by not carrying out any local investigation ,failed to assess the cumulative impacts of the said constructions on the environment namely ground water recharge, bio-diversity in the river bed ,free flow of water ,risk of flooding debris disposal ,water pollution and air pollution ,failed to suggest any mitigation measures ,failed to assess impacts of the river bed construction individually or cumulatively and make any recommendations.

The EIA document submitted by Maha Metro addresses the above concerns and has been vetted by NEERI and Pune University.

Ground Water Recharge

- With reference to Geology the Vertical Electrical Sounding (VES) shows that the strata below soil are not favourable to form aquifer. However unconfined aquifer reported from the project area has poor potential. It is envisaged that construction of Piers on the bank are not likely to cause significant impact on any aquifers. Natural springs are not observed in the area during the study period. Hence no adverse impacts during construction phase are envisaged on existing hydrogeological condition.”
- Maha Metro has signed a memorandum of understanding with Ground Water Survey Development Agency and correspondence quantifying the amount of recharge expected from viaducts and stations is enclosed (**Annexure -8**).

Biodiversity

- The proposed metro route is part of riverine ecosystem. The floristic component of the project site does not include any rare or endangered species. Majority fauna listed from the study area will be least impacted because habitat requirement for the reported fauna is general at can be fulfilled from adjoining area. Impacts due to construction activity are reversible and cause no further major adverse impact. As proposed metro rail alignment and metro stations are elevated hence no any significant impact are envisaged on ecology & biodiversity of the area during operational phase of the Project

Free Flow of Water

- The flow in Mutha River has two sources, the first and major source is water released from the Khadakwasla Dam during high rainfall days. Additional flow joins the river through small tributaries on the downstream side of Khadakwasla dam, these contribute less than 10% to the flow. Blue line and Red line of Mutha River are decided by the irrigation department on discharge of 60,000 cusecs and 100,000 cusecs respectively.

Mathematical calculations depict the obstruction to the river flow is insignificant due to proposed construction of metro rail alignment piers. At any cross section of the river, the area blocked by the width of a single pier is negligible compared to the cross-sectional area of river.

Risk of Flooding - Ref Minutes of meeting dated 30.11.2018

- The Expert committee recommended that while the impact of the individual piers may not be significant it would be worthwhile to undertake a hydrological Simulation study covering 0.5km upstream and downstream of the metro construction. The same has been undertaken and results were incorporated.

Water Pollution, Air Pollution and Waste Management -Ref Minutes of Meeting dated 30.11.2018

- Committee recommended strict compliance of Environment Management Plan as per Environmental Impact Assessment during construction and operation phases. This includes dust control measures, excavated soil control measures, solid and liquid waste management etc. Proper care needs to be taken for preventing spillage of mortar cementing material into the river during construction.

- Committee recommended effective solid and liquid waste management at both the stations (Deccan and Sambha Ji Park) as per solid waste Management 2016 and recent effluent discharge standards (October 13,2017) respectively .MMRCL has to assure by providing toilets, wash room and garbage collection bins (wet and dry) at prominent places for the passengers /visitors.
- No solid waste will be allowed in the river bed during construction and operation phases of the metro project. For decomposition of organic waste converter must be installed at each metro station. For non-degradable waste, it will be collected treated and disposed as per waste management practices of Pune Municipal Corporation. The Compost from organic waste convertor must be used as a fertilizer for onsite gardening and for landscaping within the project area site especially Deccan and Sambhaji Park Stations.
- No liquid waste will be allowed in the river bed during construction and operation phases .Liquid waste from toilets ,wash room and other activities must be properly collected and treated at the station through sewage treatment plant as per recent effluent discharge standards (Bio Chemical Oxygen Demand (BOD) 20 mg/l/total Suspended Solids (TSS) 50mg/l and Faecal Coliform (FC) <1000MPN /100ml.The treated effluent must be reused for flushing urinals, toilets ,land scaping and gardening and excess treated water may be discharged in city sewerage system of PMC.
- Committee also suggested installation of suitable number of dust sensors at a distance of 20m towards habitat side from the metro alignment for monitoring of Pm 10<100 mg/m3) during construction of metro corridor including stations.
- Air quality has been recorded at three places on the river bed Entry -Pier 153 near, Pier 165 mid way and pier 170 near Exit). All the values were within permissible limits. Water spraying is undertaken to ensure control of fugitive dust. The records were offered to Expert Committee for review.

5.Many residential localities around and on the upstream side of the metro piers are built on riverbed, were inundated at the release of 45,474 Cusecs water from the Khadakwasla dam into the Mutha river. The blue Line of Mutha River which is defined at 60,000 Cusecs was breached at many locations at the discharge of 45,474 Cusecs.

- While the discharge from Khadakwasla 45,474 cusecs ,the distance between the dam and the reference site is about 12 km .In the absence of any official recorded data from concerned Authority , it may be considered that the high intensity rainfall on the free catchment area during this period has contributed to the flow of the Mutha .Quantification of the same can be carried out by the relevant Department.
- To validate that 45,474 Cusecs has breached the blue line due to the construction of metro piers and ramp it is essential to have historical data of RL for discharge of 45,474 cusecs before the construction of metro work. This data is not available with the concerned Department

6.The flooding in August 2019 has proved that the Expert Committee observations that at the maximum rise in afflux level of the river would be 23 mm, is grossly flawed as it is based on incorrect data of river width for the Hydraulic study.

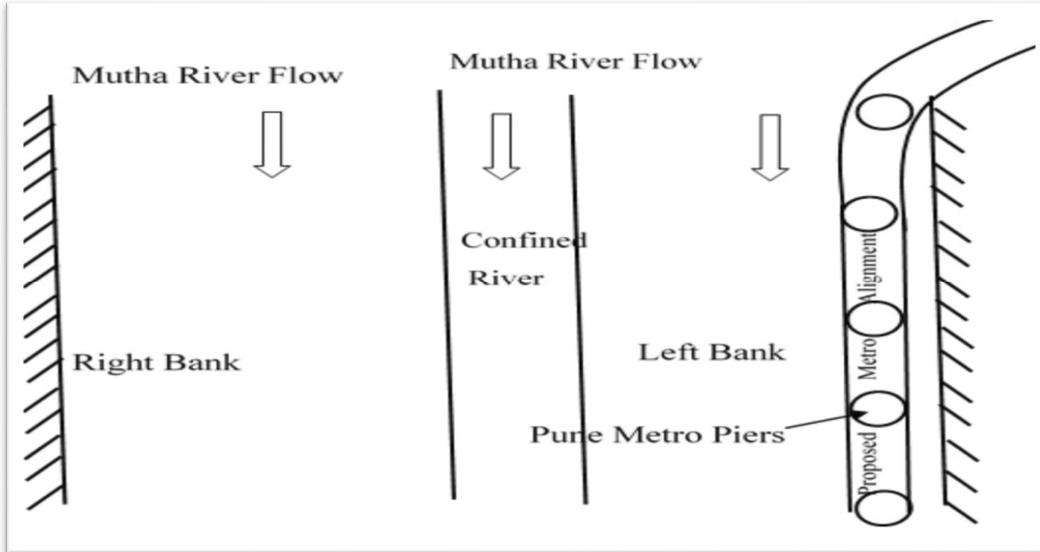
The Report on Hydrological Simulation Study by HEC RAS for revised structural changes proposed in 1.45 Km plus 0.5km upstream & downstream stretch with reference to afflux is based on data by the Irrigation Department and has included the foundations, piers including the temporary ramp.

The water Afflux and Submergence values have been calculated for flows of

Sn	Flow in cusecs	Maximum Water Afflux (mm)	Location of afflux	Max. submergence (in m)
M	100,000 cusecs	180	P160, P161, P162	DE-7-4.158
2.	60,000 cusecs	100	P168	Pier 175 -2.736

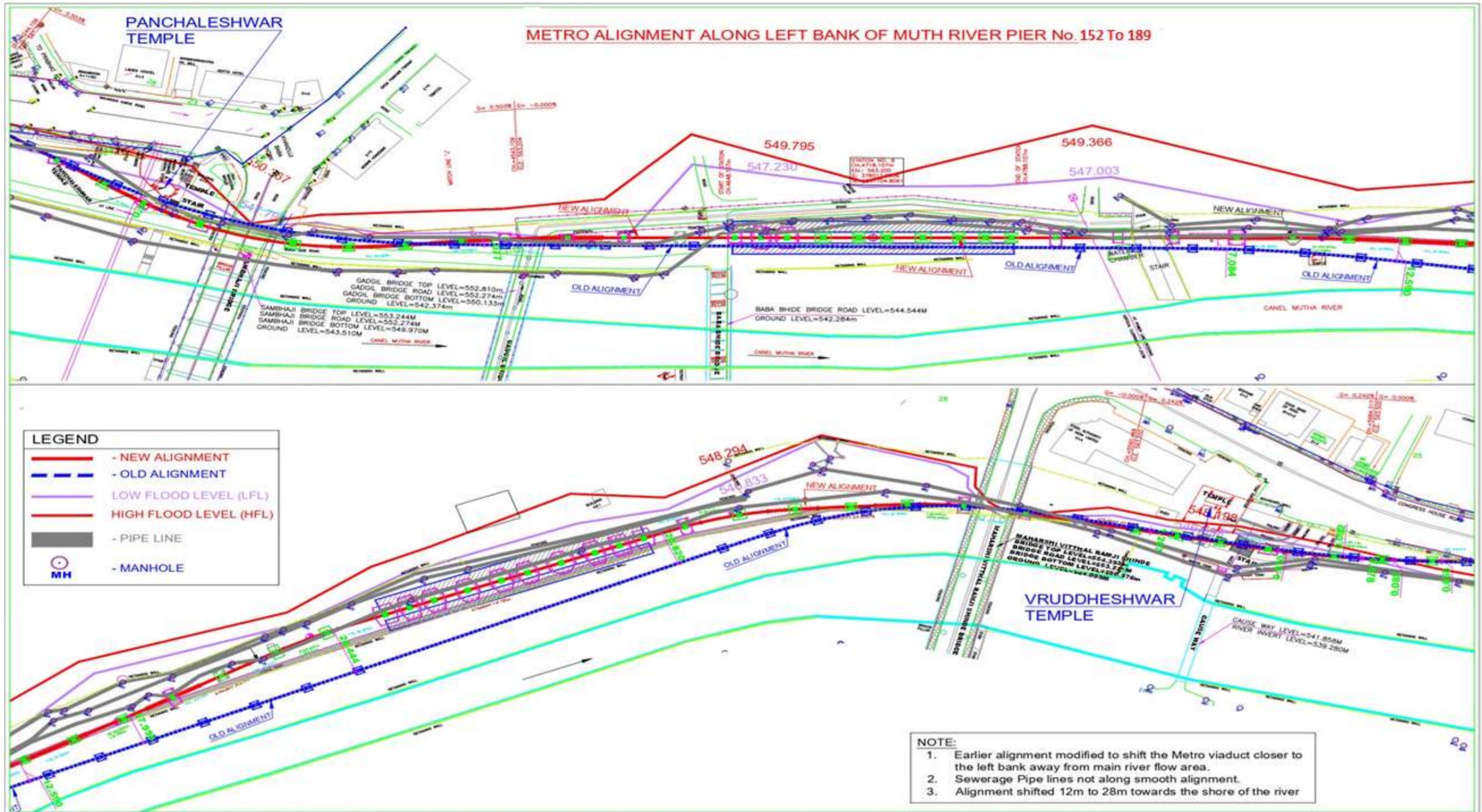
Annexures I

Schematic sketch- Pune Metro Alignment Along the River



Note: (Pier No 153-183) do not cross the river but are located along the left bank of the Mutha river.

Annexure 2 -Revised Layout of Metro Piers



Annexure-3

Note: Foundation are supported on piles to prevent damage to the active sewer lines

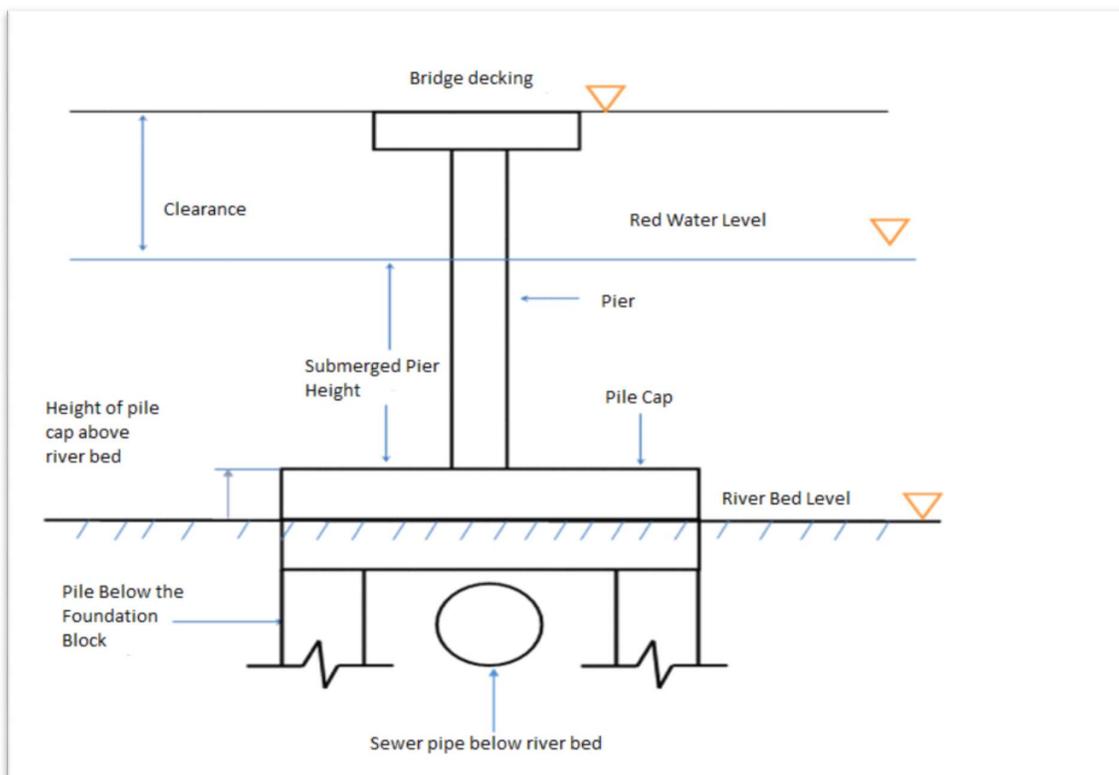


Table Showing revised piers dimension

Pier No.	Ground Level (m)	Pile Cap Top Level (m)	Height Above Ground (m)	Height Below Ground (m)	Length (m)	Width (m)	Height (m)
P 152	545.171	542.106	-	3.065	2.2	2.5	1.7
P 153	545.346	543.616	-	1.73	2.4	1.9	1.81
P 154	545.113	542.171	-	2.94	2.2	2.5	1.5
P 155	544.333	542.428	-	1.90	3	3.2	2.2
P 156	544.344	542.709	-	1.635	7.5	5.5	2.25
P 157	544.168	542.058	-	2.11	2.4	2.7	1.55
P 158	545.171	542.106	-	3.06	2.2	2.5	1.7
P 159	544.08	540.358	-	3.722	4.2	5.5	1.5
P 160	543.393	547.34	3.947	-	6.9	5.5	1.5
P 161	543.509	545.31	1.801	-	4.2	5.7	1.8
P 162	543.789	545.2	1.411	-	5.5	5.8	1.5
P 163	543.509	545.31	1.801	-	4.2	5.7	1.8
DE 1	544.356	545.056	0.7	-	7.5	6.3	1.8
DE 2	544.021	545.628	1.607	-	14.185	9.7	2
DE 3	544.432	545.927	1.495	-	11.2	13.5	2.4
DE 4	543.842	542.843	-	0.999	6.5	7.8	2.5

DE 5	543.727	541.613	-	2.114	6.75	6	2.05
DE 6	543.942	541.788	-	2.154	6.75	6	2.05
DE 7	543.85	542.853	-	0.997	6.5	7.8	2.5
DE 8	543.883	542.398	-	1.485	6.75	6	2.05
DE 9	544.001	541.763	-	2.238	6.3	6	1.85
DE 10	543.973	541.949	-	2.024	6.25	6.4	1.9
P 164	545.18	545.68	0.5	-	5.5	11.18	2
P 165	544.043	545.4	1.357	-	6.5	4.7	1.8
P 166	544.493	545.423	0.93	-	7.3	4.7	1.8
P 167	544.922	545.5	0.578	-	7.99	9.19	2.1
P 168	543.063	545.4	2.337	-	8.94	8.94	2
P 169	543.167	540.928	-	2.239	4.6	5.5	1.5
P 170	542.908	540.973	-	1.935	4.6	5.5	1.55
P 171	542.943	541.853	-	1.09	4.6	5.5	1.55
P 172	543.411	541.023	-	2.388	4.6	5.5	1.55
P 173	543.35	544.986	1.636	-	5.5	10.41	1.8
P 174	543.403	545.728	2.325	-	5.7	5.7	1.8
P 175	543.403	545.353	1.95	-	8.1	5.2	1.95
P 176	543.505	545.245	1.74	-	6.926	5.5	2
SP 1	543.637	545.669	2.032	-	12.03	11.2	2.4
SP 2	543.7	545.637	1.937	-	14.69	9.7	2.4
SP 3	543.932	545.376	1.444	-	14.5	11.2	2.4
SP 4	544.248	545.787	1.539	-	14.1	11.2	2.4
SP 5	544.449	545.849	1.4	-	14.1	11.2	2.4
SP 6	544.342	545.547	1.205	-	13.7	10.5	2.5
SP 7	544.341	545.744	1.403	-	14	13.7	2.65
SP 8	544.237	545.634	1.397	-	14.6	10.1	2.65
SP 9	544.142	545.53	1.388	-	13	8.7	2.4
SP 10	544.303	545.619	1.316	-	11.26	9.737	2.45
P 177	544.372	544.982	0.61	-	9.8	5.5	1.85
P 178	544.202	544.002	-	0.2	2.2	2.5	1.8
P 179	544.032	543.352	-	0.68	6.3	6	1.85
P 180	542.087	540.997	-	1.09	4.6	5.5	1.55
P 181	542.771	540.821	-	1.95	5.2	5.7	1.65
P 182	543.275	544.604	1.329	-	9.835	5.5	1.8
P 183	544.009	544.67	0.661	-	6.3	5.5	1.8
P 184	544.031	546.077	2.046	-	6.396	5.7	1.8
P 185	558.38	556.18	--	2.2	2.4	1.9	1.4
P 186	544.824	543.824	--	1	2.2	2.5	1.6
P 186 a	544.1	543.75	--	0.35	2.2	1.9	1.65
P 187	546.427	542.827	--	3.6	3.2	2.7	1.2
P 188	544.605	544.105	--	0.5	1.9	2.4	1.6
P 189	544.296	542.296	--	2	2.4	2.7	1.6
P 190	544.452	543.577	--	0.875	2.4	1.9	1.75
P 191	548.712	548.212	-	0.5	4.5	5	1

Annexure 4

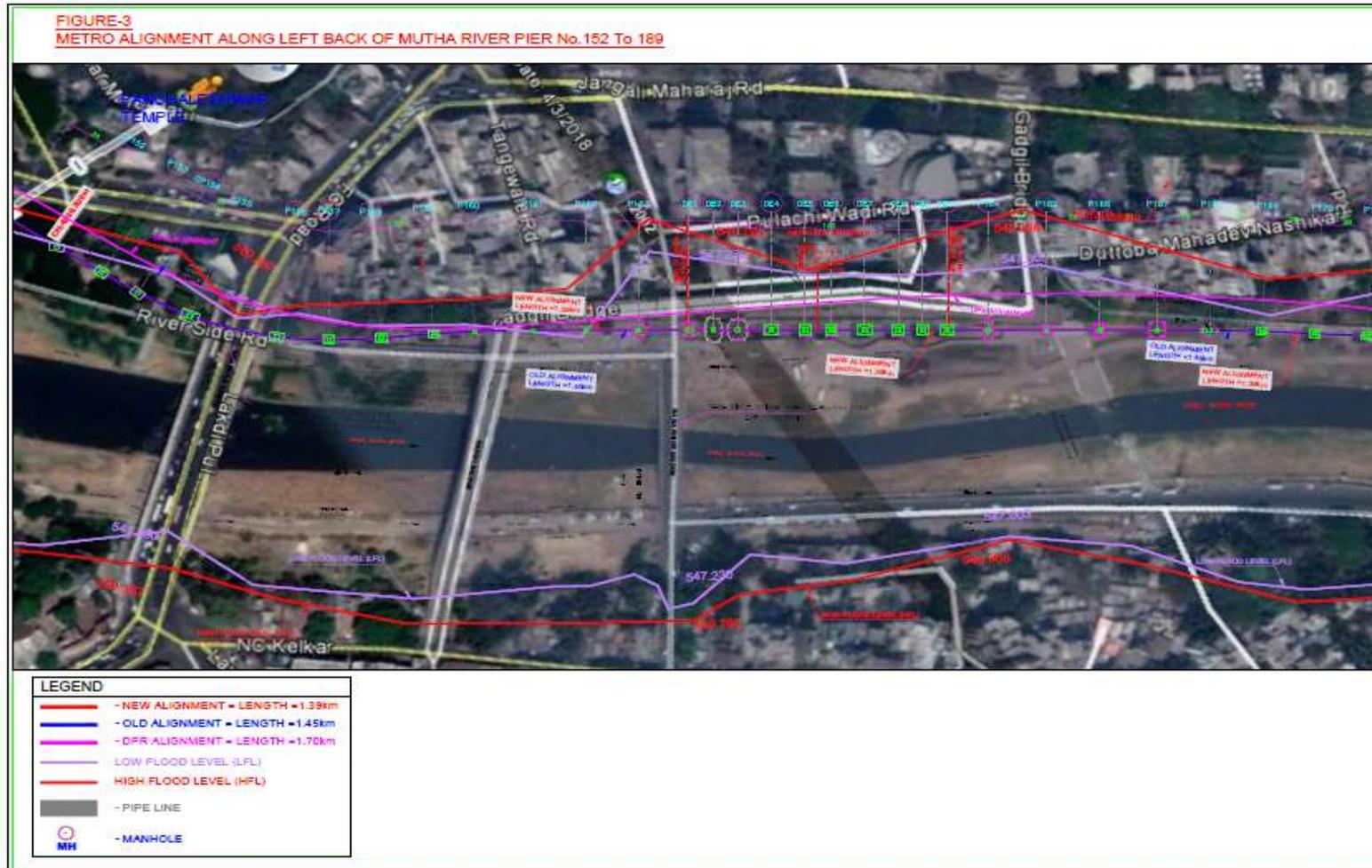
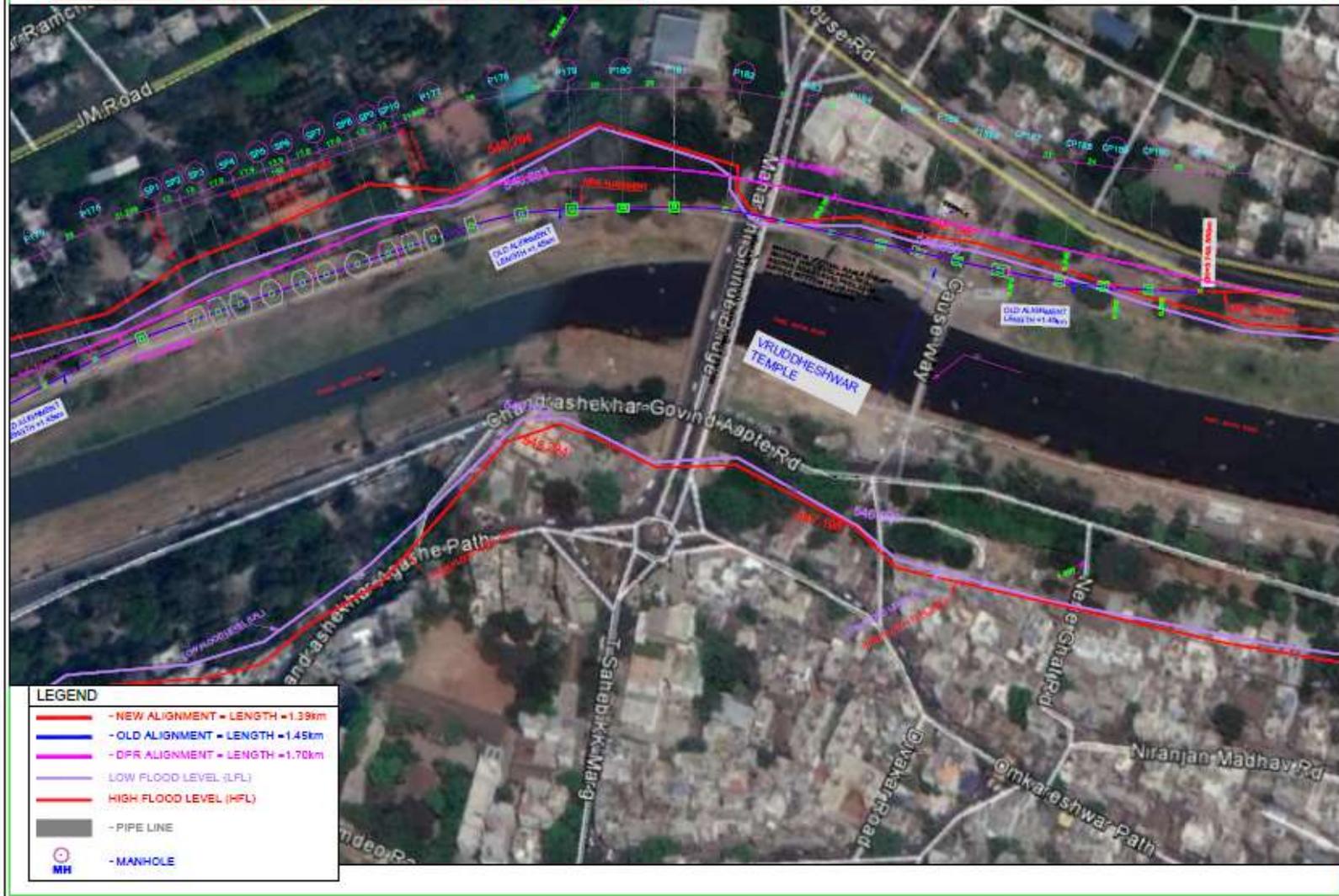
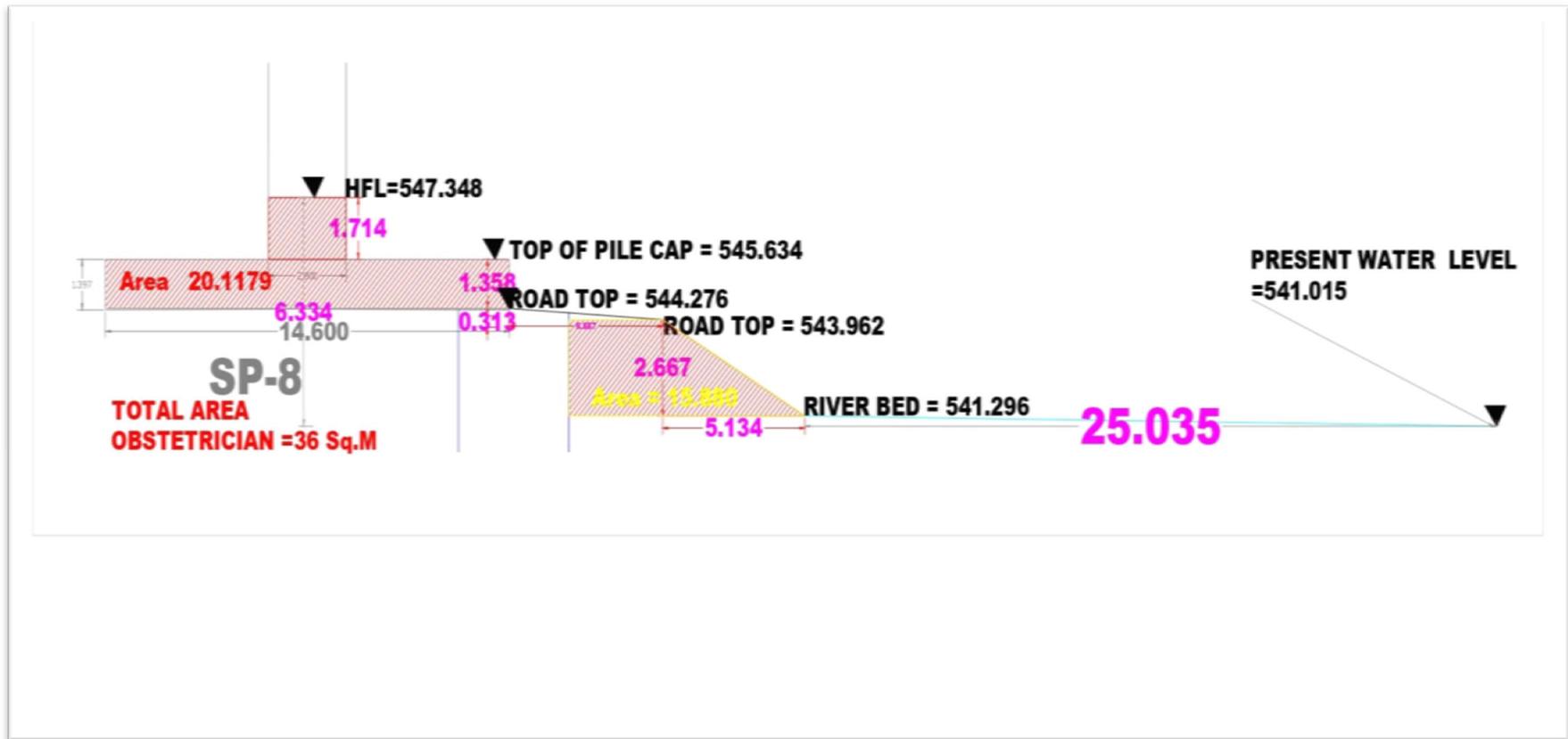


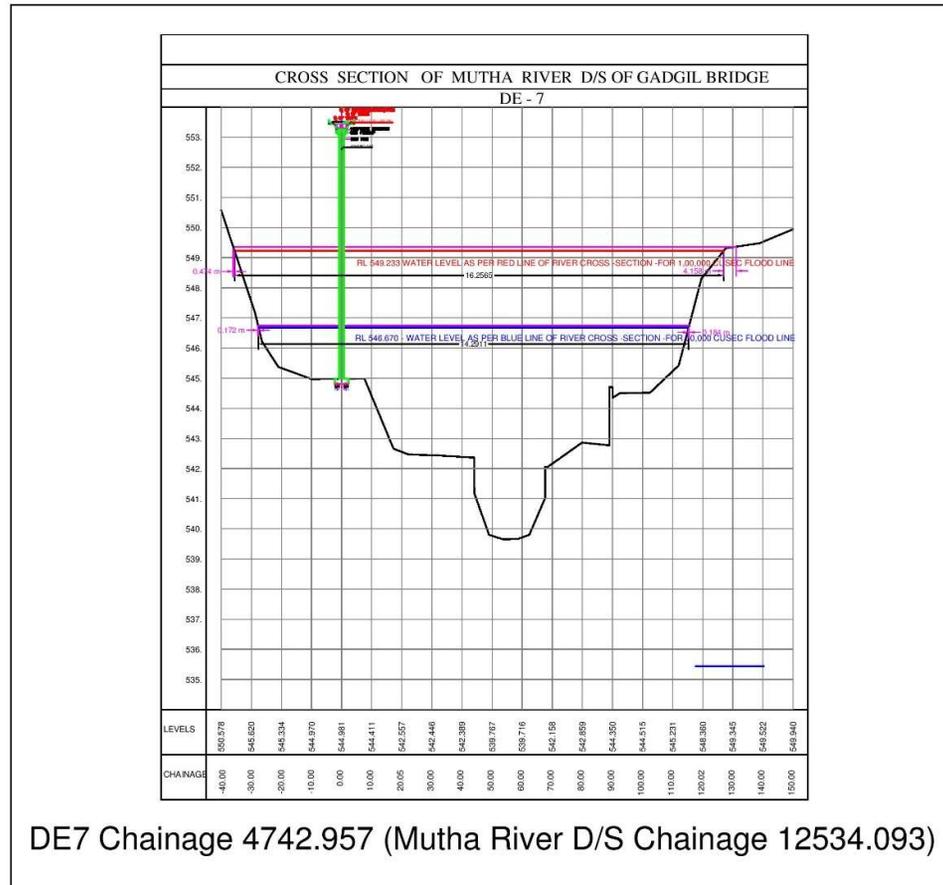
FIGURE-4
METRO ALIGNMENT ALONG LEFT BACK OF MUTHA RIVER PIER No. 152 To 189



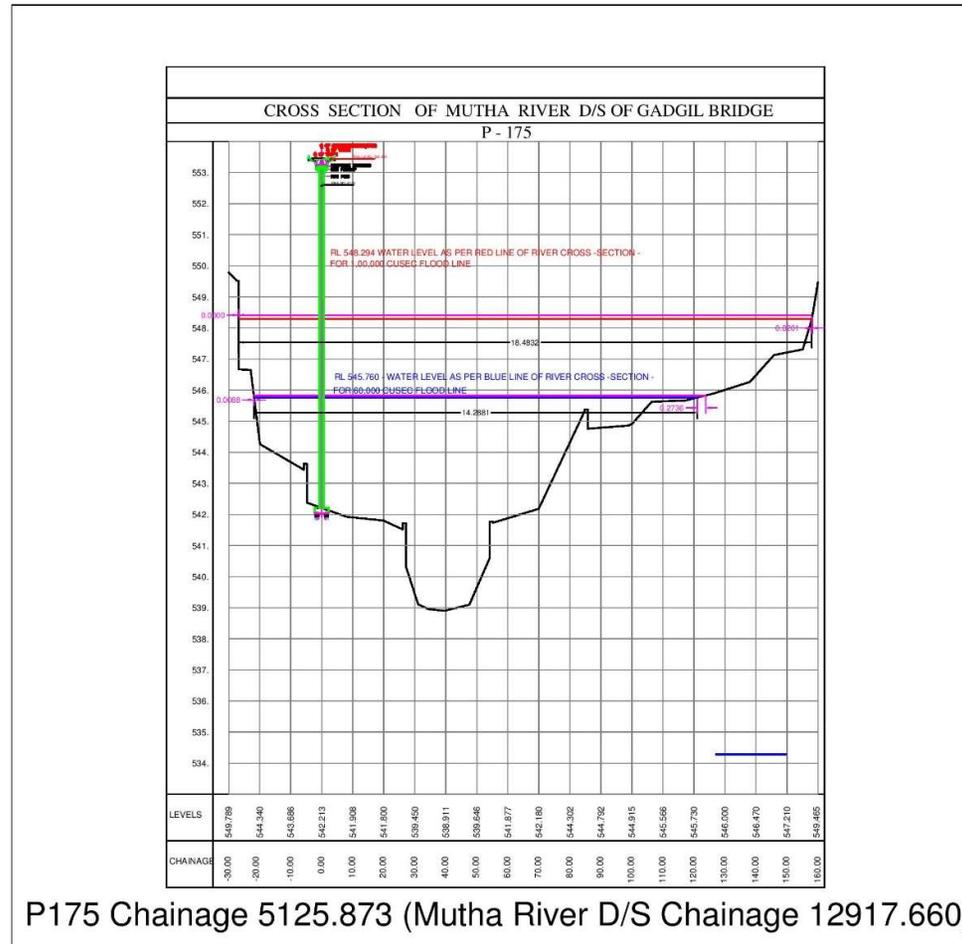
Annexure- 5 Details of Ramp, Foundation and Pier



Annexure 6

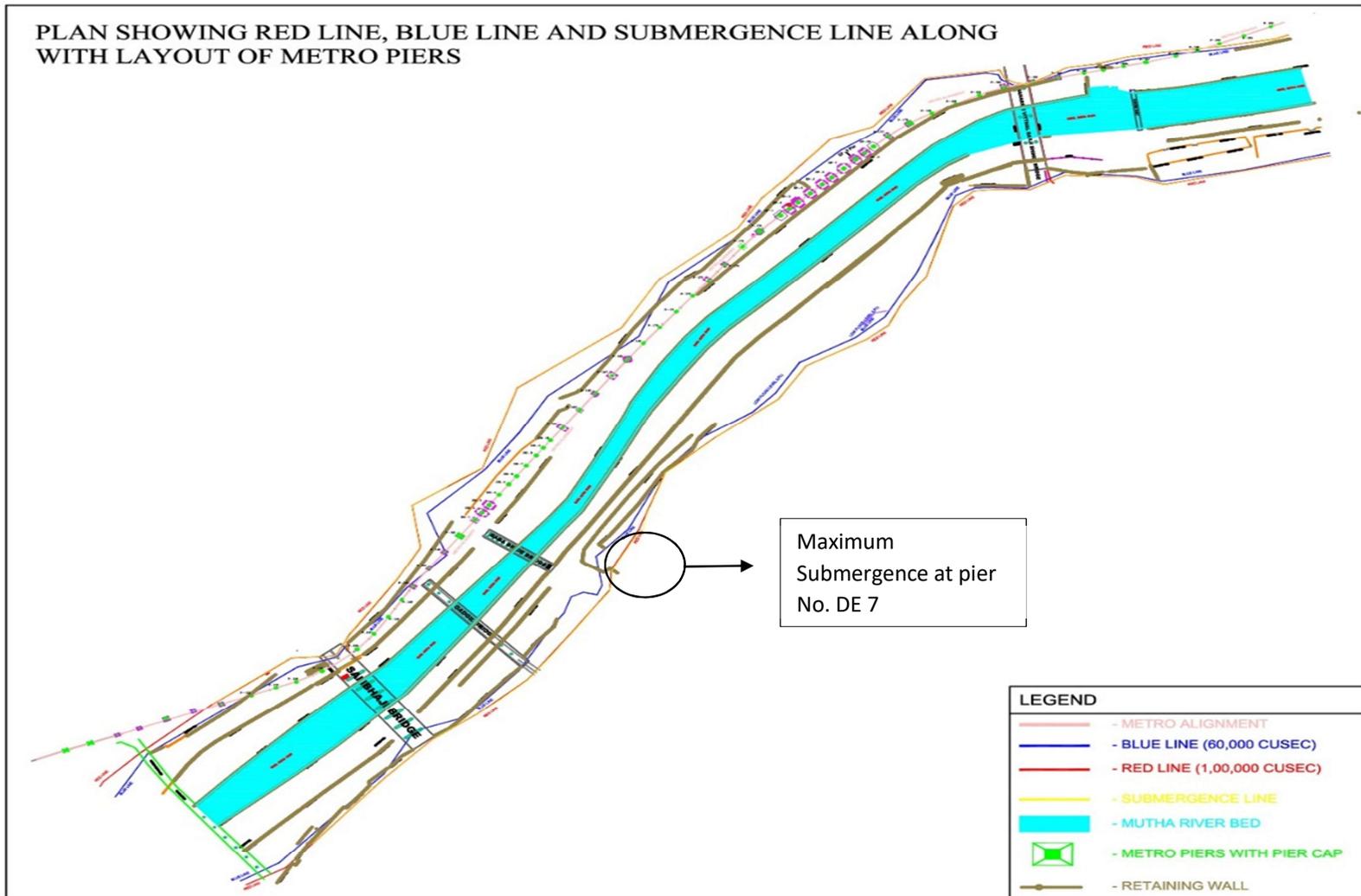


Cross Section of DE-7 which has maximum submergence for discharge of 1,00,000 cusecs.

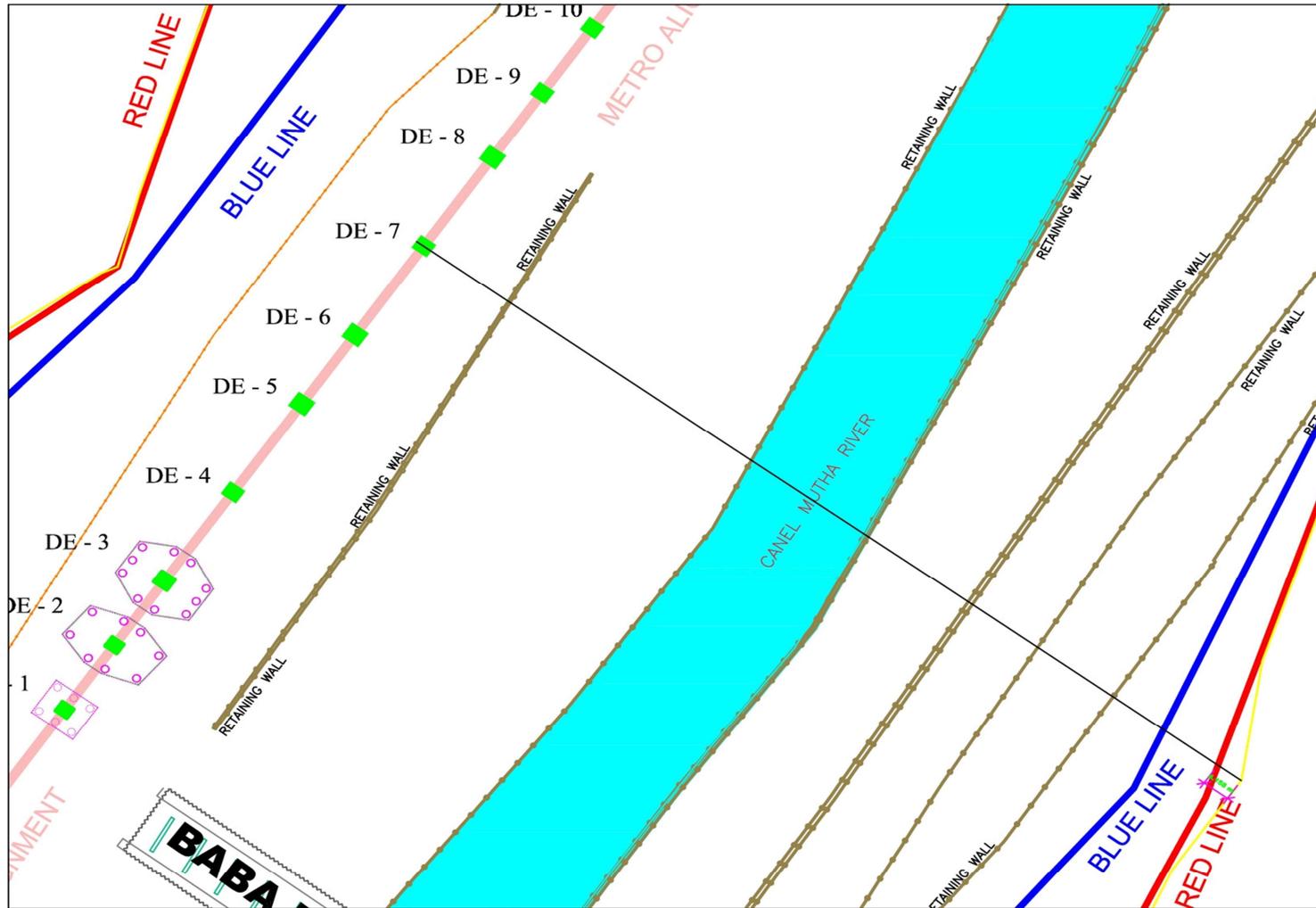


P175 Chainage 5125.873 (Mutha River D/S Chainage 12917.660)

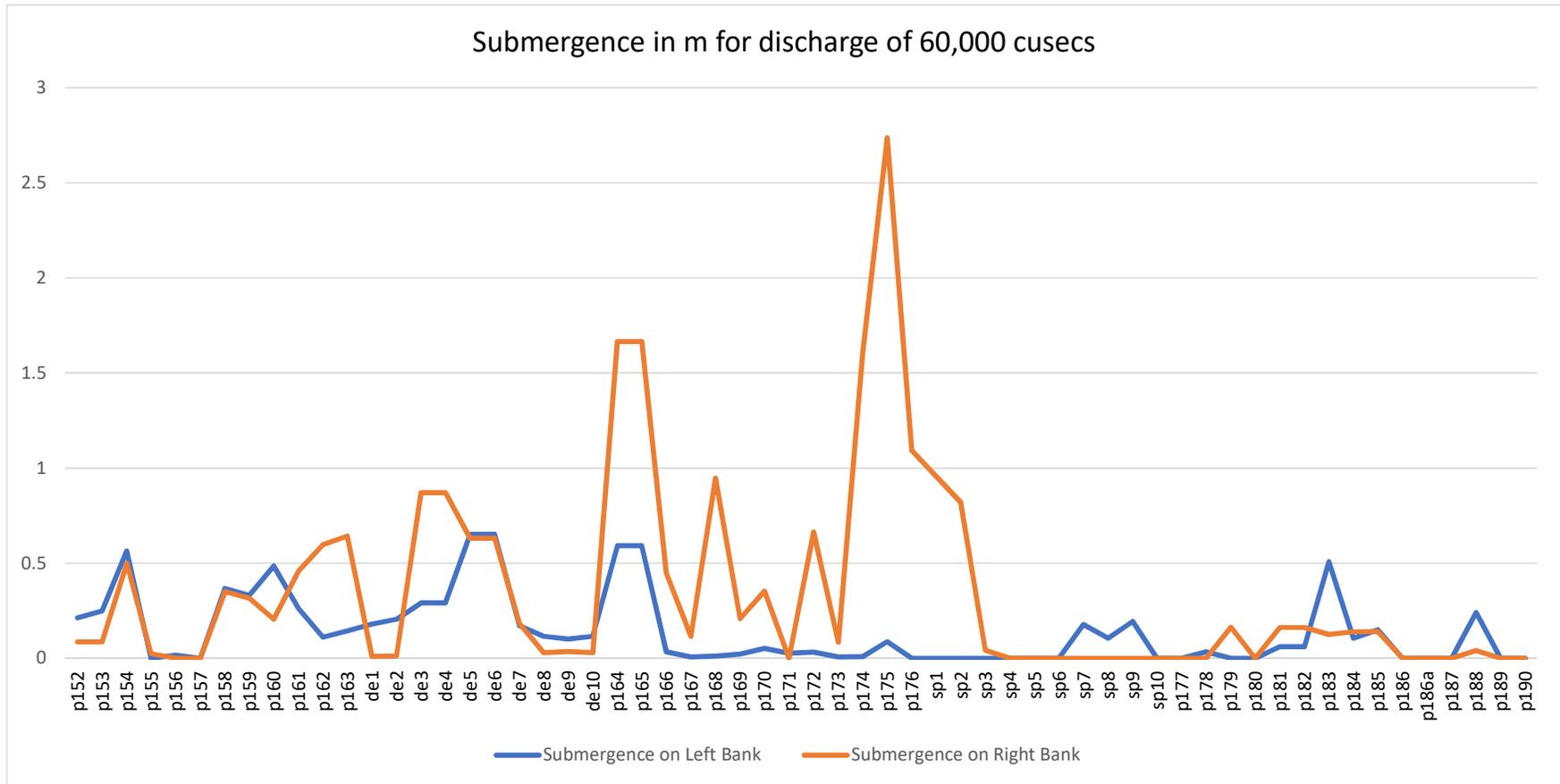
Cross Section of DE-7 which has maximum submergence for discharge of 60,000 cusecs.



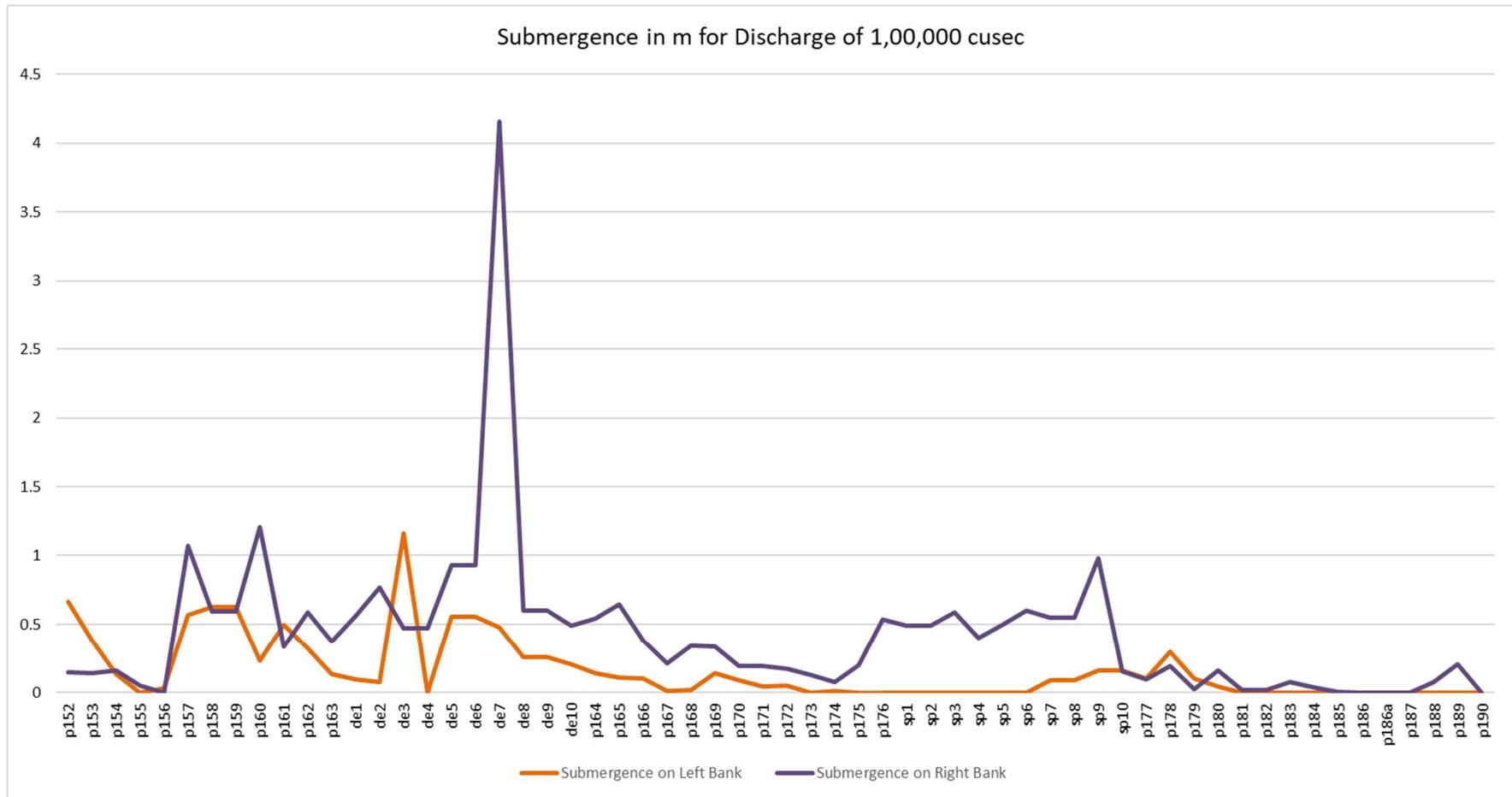
Plan Showing Red line, Blue Line and Submergence line at discharge of 1,00,000 cusecs.



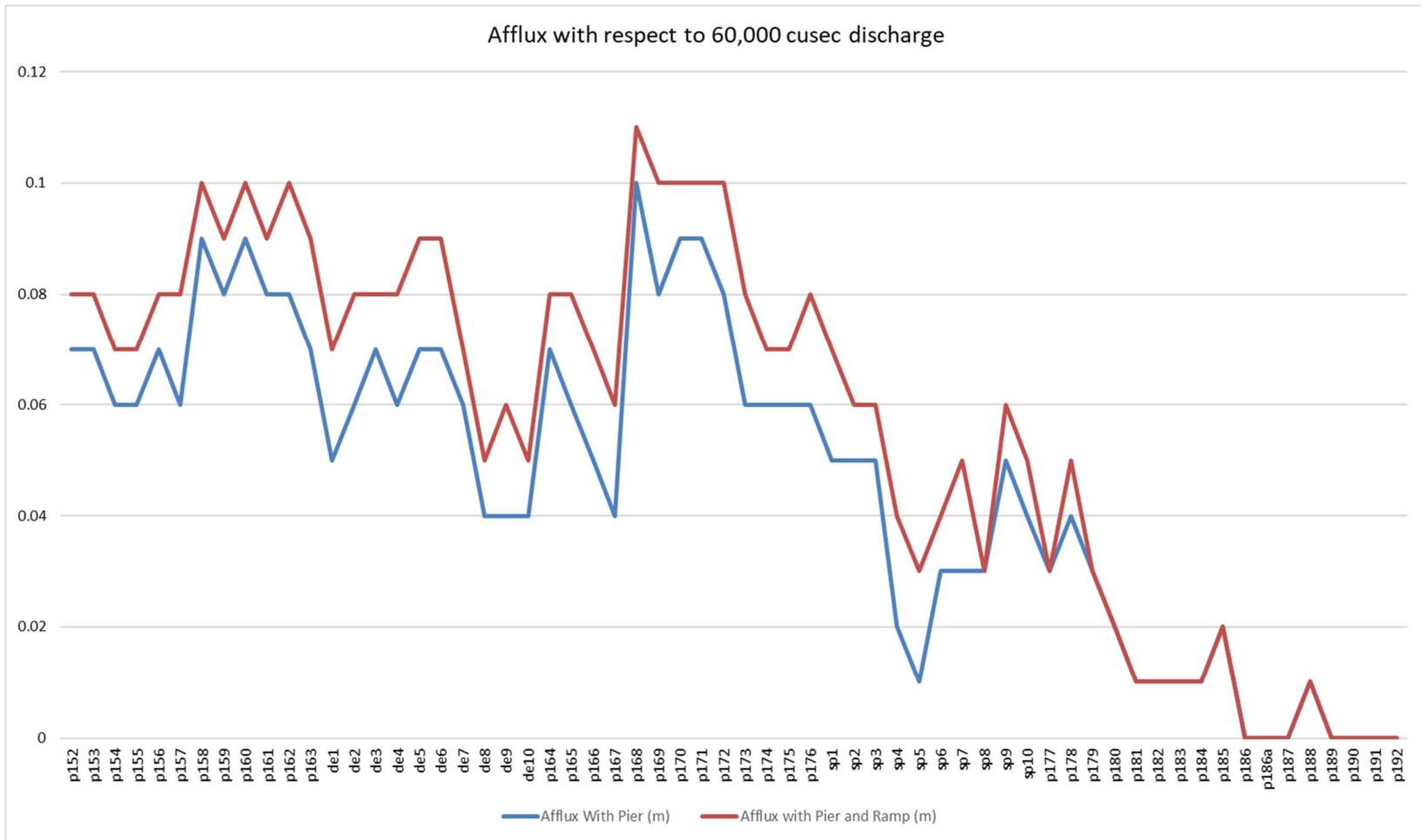
Enlarged Section of DE – 7 which has maximum submergence for discharge of 1,00,000 cusec



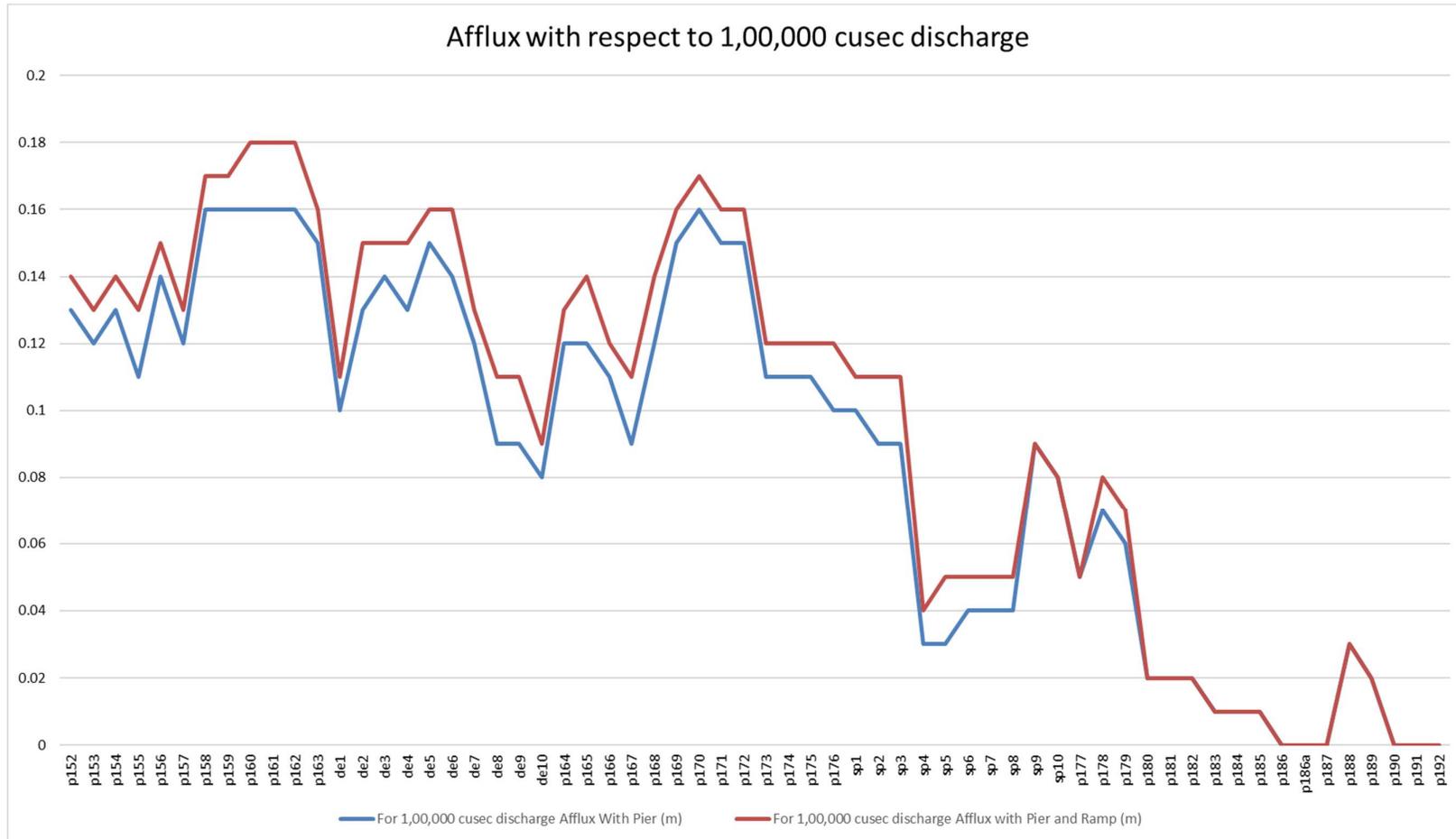
Graph showing submergence from P 152 tp P 190 for discharge of 60,000 cusec



Graph showing submergence from P 152 tp P 190 for discharge of 1,00,000 cusec



Graph showing afflux from P 152 tp P 190 for discharge of 60,000 cusec



Graph showing submergence from P 152 tp P 190 for discharge of 1,00,000 cusec

Annexure 7- Metro pier moved by 20 to 28 m on this stretch



Omkareshwar



Metro Viaduct



Metro Viaduct

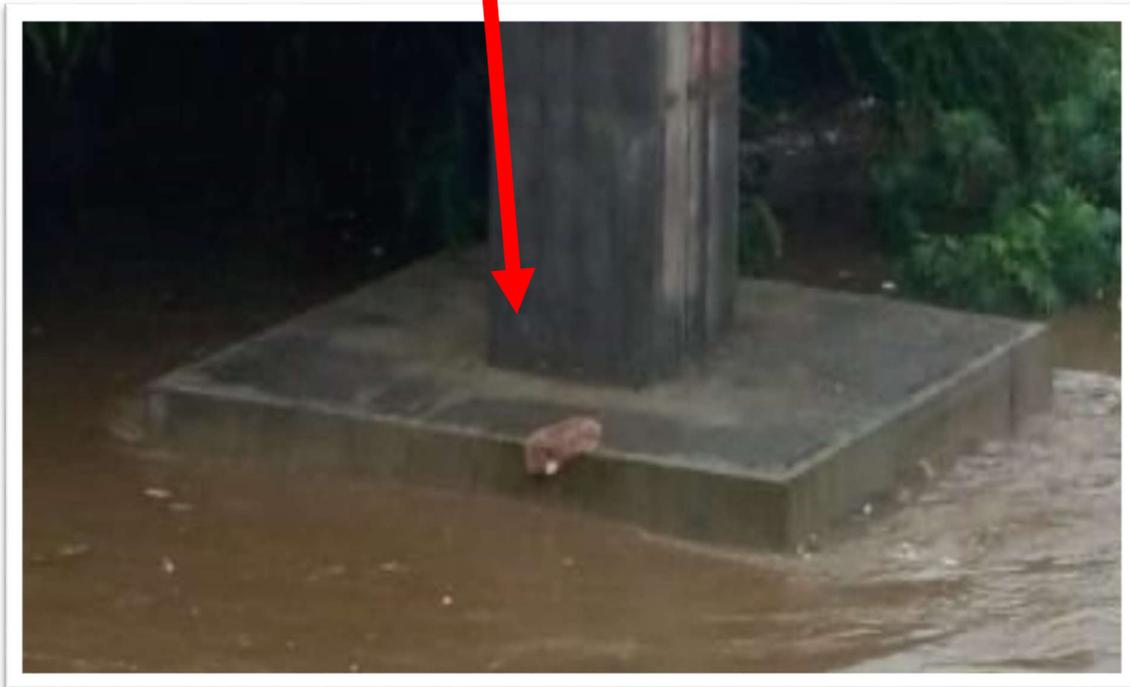
Pier no 154-Second pier on river bed low velocity and Local water afflux



Pi



Pier 170- Mid way of the Metro construction low velocity and local water afflux





Local water Afflux

Pier 182 On 5.08.2019 flow 45,474 cusecs- piers moved out of riverbed by 20-28 m to reduce impact of water afflux

Annexure 8

Govt Of Maharashtra
Water Supply And Sanitation Department

Deputy Director,
Ground Water Surveys And
Development Agency,Pune Region ,
K.B.Joshi Rd, Shivajinagar,Pune -
411005



Phone - 020-25531227,
25521852
Fax - 020-25531227
Email - ddgsdapntech@gmail.com

Out No/Tech/survey/GroundWater Survey/S.I./1812/2019.

दि. : 27/11/2019

To ,

Hon, Mr. Ramnath Subramanian,
Executive Director
Maharashtra Metro Rail Corporation, Ltd
Pune-01

**Sub: Maha-Metro Pune- A brief feasibility study report on Rain Water harvesting
Project proposed for Maharashtra Metro Corporation Pune. .**

Ref: Official visit of Mrs. Gera.

Sir,

With respect to your request regarding Rainwater harvesting project this office has conducted technical study and field investigation to determine the feasibility of rainwater harvesting measures to be implemented for Metro project. On the basis of detailed investigation conducted in the field as well as study of Hydro geological and geophysical data for various parameters available with is office the observations drawn are as below. The various technical parameters studied and field observations drawn are as given below-

On the basis of field investigation and study of technical parameters it is inferred that, the area covered by the 2 routes is in Limits and is feasible for rainwater harvesting the rainwater can be obtained/ collected from the top surface of elevated span as well as roof top of the Depot.

As per the guidelines of IGBC considering the average rainfall of the last five years the rainwater available from every two span areas would be about 8.72m³. The water available can be utilized to recharge to subsurface i.e. moderate to deep aquifers so as to raise the water table and improve the quality of groundwater under urban domain.

Thus the rainwater harvesting system recommended is to collect the water store and recharge to subsurface as per the IGBC guidelines so as to conserve about 50% of rain fall.

The Assumptions are as below----

- Rainfall data - 5 years from year 2013-17 (Revenue department considered Pune city)
- Rainy days - Actual rainfall are considered for calculations of average normal rainfall per day.
- Pillars with span are considered for the calculations. Pillars of stations are not considered presently for calculations.

Rain Water Harvesting -Via duct.

Rainfall from via duct = $28\text{m} \times 8 \times 0.0205$ (rainfall) $\times 0.95$ Coefficient of runoff = 4.36 m^3

Each recharge structure system covers two spans = $4.36 \times 2 = 8.72 \text{ m}^3$

Rain water harvesting system consists of two collection chambers of size $1 \times 1 \times 1 \text{ m} = 1 \text{ m}^3$

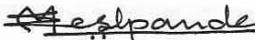
And Recharge chamber of $2.5 \times 1.5 \times 1.8 \text{ m} = 6.75 \text{ m}^3$

Total capacity for rain water harvesting system = $6.76 + 1 + 1 = 8.76 > 8.72 \text{ m}^3$ which is adequate to store the rainwater available.

	Route 1	Route 2
No of Pillars	469	371
Probable no of structure at every alternate pillar	170	108
No of Stations	9	8
Amount of annual rainfall to be collected from pillars and span from route 1 and 2	41210.72 m^3	
Amount of annual rainfall to be collected from Depot.	9482.09 m^3	
Amount of annual rainfall to be collected from 17 stations	15759.17 m^3	

The no of structures may vary, since depends on location and availability of land, site feasibility, road crossing area and bridge area.

Yours Sincerely,



(Dr. Milind Sharad Deshpande)

Regional Deputy Director,

Ground Water surveys and development Agency,
Pune Region, Pune.

Copy-

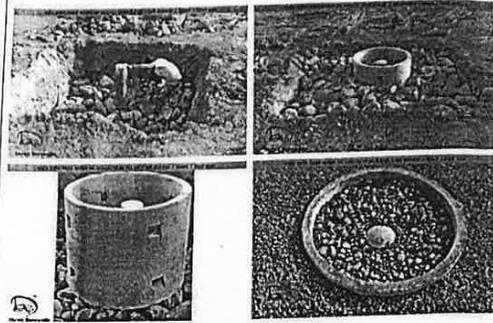
To The Hon. Director, Ground Water surveys and development Agency,
Maharashtra State, Pune.

Step 3,-Entire recharge pit is filled with boulders and then granular material.

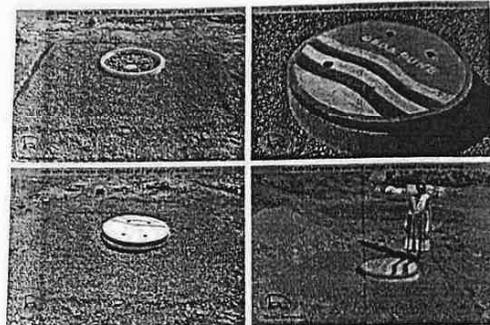
Step 4-Concrete ring is placed around the casing pipe called the recharge shaft.

Step 5-Concrete ring is filled with pebbles and coarse and fine sand.

Step 6 - The entire recharge pit area is filled with granular material



Step 7:-Manhole cover is placed over the shaft



The material from the shaft needs to be removed and cleaned and replaced.

The recharge pit is filled with granular material which also requires cleaning and the top layer needs to be replaced else it clogs and prevents flow of water.

To capture 8.72 m^3 of water the traditional design would be two one cubic meter collection chambers leaving a balance of $8.72-2=6.72 \text{ m}^3$.

In a recharge pit only 20% of volume is available for storage of water

So volume of pit for storing 6.72 m^3 of water = $6.72 \times 100/20=33.6 \text{ m}^3$

Assuming a depth of 2 meters and width of maxm 2.2 m the length of pit =7.6 m

Cost Comparison

Sn	Unit	Traditional	With filter	Remarks
	Collection chamber with cover -2 numbers	Size 1mx1mx1	Size 1x1x1	No difference
	Rain water harvesting storage tank	33.6 m^3	6.75 m^3	Cost saving due to smaller size.
	Boulders -1/3 volume	$11.2 \text{ m}^3 @ 2200=24,640$	Not Required Only filter	

Govt Of Maharashtra
Water Supply And Sanitation Department

Deputy Director,
Ground Water Surveys And
Development Agency, Pune Region,
K.B.Joshi Rd, Shivajinagar, Pune -
411005



Phone - 020-25531227,
25521852
Fax - 020-25531227
Email - ddgsdapntech@gmail.com

Out No/Tech/survey/GroundWater Survey/S.I./ 2391/2018.

दि. : ~~02/11/2018~~

26/12/2018

To ,

Hon. Mr. Ramnath Subramanian,
Executive Director
Maharashtra Metro Rail Corporation, Ltd
Pune-01

Sub : Maha-MetroPune- A brief feasibility study report on Rain Water harvesting Project
proposed for Maharashtra Metro Corporation Pune. .

Ref : 1.This official letter No. Tech/survey/Groundwater Survey/S.I. 05/ 2391/2018
Date -07/09/2018

Sir,

With respect to your request regarding Rainwater harvesting project this office has conducted technical study and field investigation to determine the feasibility of rainwater harvesting measures to be implemented for Metro project. On the basis of detailed investigation conducted in the field as well as study of Hydro geological data for various parameters available with is office the observations drawn are as below. The various technical parameters studied and field observation drawn is as given below-

On the basis of field investigation and study of technical parameters it is inferred that, the area covered by the 2 routes is in Limits and is feasible for rainwater harvesting the rainwater can be obtained/ collected from the top surface of elevated span as well as roof top of the Metro stations.

The Measures and recommendations proposed are as below----

Rain Water Harvesting -Via duct.

Rainfall from Via duct = $28\text{m} \times 8 \times 0.205$ (rainfall) $\times 0.95$
Coefficient of runoff= 4.36 m^3

Each recharge pit covers two spans = $4.36 \times 2 = 8.72$

Rain water harvesting system consists of two collection
chambers of size $1 \times 1 \times 1 \text{ m}^3$

Recharge chamber of $2.5 \times 1.5 \times 1.8 \text{ m} = 6.75$

Total capacity for rain water harvesting = $6.76 + 1 + 1 = 8.76$
> 8.72 adequate





सत्यमेव जयते

भारत सरकार

Government of India

जल शक्ति मंत्रालय

Ministry of Jal Shakti

जल संसाधन, नदी विकास और गंगा संरक्षण विभाग

Department of Water Resources, River Development and
Ganga Rejuvenation

केन्द्रीय जल और विद्युत अनुसंधान शाला

खड़कवासला, पुणे - 411 024

Central Water & Power Research Station

Khadakwasla, Pune - 411 024



टेलीफोन : 020-24103331

फैक्स : 020-24381004

ई-मेल : n_isaac@rediffmail.com

No. HAPT/Metro/2020

Date: 13.07.2020

Shri Ratanakar Pandey
Dy. General Manager (Environment),
Maharashtra Metro Rail Corporation Ltd.
1st floor, The Orion Bldg,
Arjun Mansukahni Marg,
Pune-411001

Sub: Mathematical model studies of river Mutha for Maha-Metro Rail Corporation Ltd. Pune.
Ref: Email dated 11 July 2020

Sir,

CWPRS has been awarded the mathematical model studies of river Mutha for Maha Metro Rail Corporation Ltd. Pune. CWPRS has received the full estimated amount on 28 January 2020. In this connection, CWPRS has completed the model set up. Initial calibration runs have also been completed. A joint site inspection was also carried out on 17 March 2020 for fine tuning of the model in terms of incorporating all the existing bridges and other structures along the river. Further, due to the ongoing COVID-19 crisis, CWPRS offices were completely closed (except for Essential Services) from 22nd March to 17th May 2020. Since 18th May 2020, CWPRS was functioning with only 50% of staff till 22nd June 2020. From 23rd June 2020, it is further reduced to 33%. As per the new guidelines of State government regarding COVID-19 issued on 12th July 2020, CWPRS will be closed again for the next 10 days. Taking into account the difficulties as mentioned above, it is requested to extend the time-line for the studies by about 3 months.

Thanking you and assuring of our best services.

Yours sincerely,

Neena Isaac
13/07/2020
Dr. (Mrs) Neena Isaac
Scientist 'E'

NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI**Sarang Yadvadkar and others****against****Pune Municipal Corporation and others**

Minutes of the Meeting dated 24.09.2020 at Divisional Commissioners Office, Pune under the Chairmanship of Mr. Saurabh Rao, Divisional Commissioner, Pune

Quorum: (Through Video conferencing)

1. Dr. Ritesh Vijay- Principal Scientist, NEERI and convener of the Expert Committee.
2. Dr. A. Benniamin- Scientist. State Biodiversity board, Member of the Expert Committee
3. Dr. Y.B. Sontakke – Joint Director, Maharashtra Pollution Control Board, Member of the Expert Committee
4. Ms. Swati Vaidya-Pandit – Law Officer, Collector Office, Pune
5. Mr. Jitendra Sangewar – MPCB, Regional Officer
6. Ms. Manjusha Idhate – Legal officer, PMC
7. Mr. Raghunath Mahabal – Advocate, Divisional Commissioner Office, Pune

Quorum (Physical presence)

1. Mr. Ramnath S. – Director, Maharashtra Metro Rail Corporation Limited
2. Mr. Vijay Patil – Executive Engineer, Irrigation Department, Pune
3. Ms. Harsha Chaudhary – Scientist – B, CWPRS
4. Dr. Prashad Kunjir – Scientist – C, CWPRS
5. Mr. Parag Patil – Scientist – B, CWPRS
6. Mr. Mangesh Dighe – Environmental Officer, PMC
7. Mr. Ratnankar Pandey – Environmental Officer, Maharashtra Metro Rail Corporation Limited
8. Ms. Renu Gera – Environmental Officer, Maharashtra Metro Rail Corporation Limited
9. Ms. Agniva Ghosh – Assistant Manager (Legal), Maharashtra Metro Rail Corporation Limited
10. Mr. Sandeep Jadhav – Environmental Expert, MITCON
11. Mr. Akshay Sonkusre – Assistant Manager (CMS), Maharashtra Metro Rail Corporation Limited
12. Mr. Santosh Patil – Manager, Maharashtra Metro Rail Corporation Limited
13. Mr. Sandip Thorat – Law Officer, Divisional Commissioner Office, Pune

Purpose: Review of the compliance made in accordance with the order dated 03.08.2018 of the Hon'ble NGT wherein, Divisional Commissioner, Pune has been directed to associate with the committee and supervise the project with respect to environmental aspect.

Proceedings: This is the fifth meeting of the Expert Committee on the issue of Environmental compliance for compliance at river front.

The meeting was supposed to commence with an Executive Committee meeting followed by the Expert Committee meeting, but due to paucity of time, both the meetings were clubbed together, under the direction of Hon'ble Divisional Commissioner. Maharashtra Metro Rail Corporation (hereinafter referred to as MMRC L) started with a presentation listing down the various directions of the committee in the meeting held on 20.11.2019 and compliances made by MMRC L accordingly with minimum footprints on the river bed. The technicalities of the ad interim CWPRS report and the various aspects of the Project Proponent were then substantiated by the officials of CWPRS, headed by Dr. Kunjeer Prasad, following which the committee analysed the same and gave its views.

Recommendations of the Expert Committee	Compliances by Maha Metro			Observations and suggestions of the Expert Committee
<p>1. As per the initial layout 32 trees were affected of which 23 to be transplanted and 9 to be cut down</p>	<p>TREES</p>	<p>TRANSPLANTED LOCATION CO ORDINATES</p>		<p>Maha Metro has complied with the directions</p>
	<p>LATITUDE N</p>	<p>LATITUDE E</p>		
<p>Peltophorum</p>	<p>18.512947</p>	<p>73.841195</p>		
<p>Peltophorum</p>	<p>18.513074</p>	<p>73.841135</p>		
<p>Peltophorum</p>	<p>18.512921</p>	<p>73.841126</p>		
<p>Silk Cotton</p>	<p>18.513223</p>	<p>73.841424</p>		
<p>2. Additional data on afflux and submergence to be provided in suggested format.</p>	<p>The co-ordinates of the remaining plants have already been submitted. These were the ones on the river bed and they are alive.</p> <p>Water afflux and submergence calculations have been undertaken afresh which includes the foundations and piers emerging from the riverbed. The cross section of the river has also been endorsed by the Irrigation Dept.</p>			<p>Maha metro has complied with the directions.</p>
<p>3. As the piers at the stations are in a line hence the area of obstruction would increase. This has to be considered while calculating afflux and sub-mergence.</p>	<p>Revised HEC RAS study has already considered this aspect and has calculated the afflux and the submergence accordingly.</p>			<p>Maha metro has complied with the directions.</p>

4. Water levels at pier locations; for discharges of 45,474 cusecs, 60,000 cusecs and 100,000 cusecs to be presented in graphical format considering both the scenarios i.e. without Metro piers and Metro piers with pile caps

Upon structural changes, the afflux and submergence calculation was revised in HEC RAS study and the results have been shared with Expert Committee via E-mail dated 5.12 .2020 and vide a formal letter Maha-Metro/Pune/EMD/C01 dated 15.07.2020. Water afflux and submergence at a discharge of 100,000 cusecs and 60,000

Maha Metro has complied with the directions.

SL.	Flow in cusecs	Max. Water Afflux	Location of afflux	Max. submergence (m)
1	100,000 cusecs	180	P-160, P-161, P162	DE-7-4.158
2	60,000 Cusecs	100	P168	P175-2.736

cusecs is presented in below Table -1

However, it may be noted that since the data was not available with the concerned department of Irrigation, water level for the discharge of 45,474 cusecs could not be furnished.

5. Submergence also needs to be depicted in a similar manner. In case if it is found to be very meagre then an enlarged section of the same to be presented.

As the submergence is found to be 4.15m, an enlarged section of the same has already been graphically submitted vide our response.

Maha metro has complied with the directions.

<p>6. Verify the river dimensions with the Irrigations Department and provide appropriate computations in case of discrepancy. Validation/ Endorsement from Irrigation Department is required.</p>	<p>The Irrigation Department was approached for providing cross section and discharge data vide letter no. Maha-Metro/Pune/ENV/02 dated 21st November, 2019. Upon receipt of data from Irrigation Department, the revised Hydrological Simulation Study by HEC RAS for revised structural changes in 2.45 km including 0.5 km upstream & 0.5 km downstream stretch was conducted and the technical note on the same was submitted to the Expert committee via mail dated 5.12.2019 and hereafter the same was submitted through formal letter ref Maha-Metro/Pune/EMD/C01 dated 15th July 2020</p>	<p>Maha metro has complied with the directions.</p>
<p>7. Impact on ground water recharge due to Metro pier construction.</p>	<p>The study was carried out by Savitribai Phule Pune University and is referred to in section 3.7 (pages 62-125) of the Environmental Impact Assessment and <u>Hydraulic Studies of River</u> report submitted to the EC. Vertical Electrical soundings were carried out at 14 different locations to understand the shallow subsurface geological and aquifer conditions extending up to >30 meters depth. <u>With reference to Geology</u>, the Vertical Electrical Sounding (VES) shows that the strata below soil are not favourable to form aquifer. However, unconfined aquifer reported from the project area has poor potential. It is envisaged that construction of Piers on the bank are not likely to cause significant impact on any aquifers. Natural springs are not observed in the area during the study period. Hence no adverse impacts during construction phase are envisaged on existing hydrogeological Condition. Further, Maha Metro has an <u>existing MOU with the Ground Water Survey Agency</u> dated on 1.1.2019 for a duration of five years. The GSDA will provide all the technical help while</p>	<p>Maha metro has complied with the directions.</p>

	<p>implementing the Rainwater harvesting as mentioned below.</p> <ol style="list-style-type: none"> 1. Undertake the Activities for comprehensive hydrological surveys and geo physical surveys. 2. Supervision of Rainwater Harvesting structures during construction period, as per the progress/implementation status submitted by Maha metro Pune to GSDA for onsite monitoring. 3. To finalise the feasible sites for rain water harvesting structures in the area 4. Recharge activity for the entire stretch will be undertaken with the guidance of GSDA including their supervision. This will also apply to the stations of Sambhaji and Deccan station. 5. 	
<p>8. Numerical Model study from CWPRS to be conducted at an earliest and report to be submitted.</p>	<p>The study has been awarded to CWPRS in the month of December, 2019. Maha –Metro informed that as per the CWPRS proposal, Numerical Modelling study would take 4 months' time but it was agreed by CWPRS officials that they will try to expedite the study within 2 months' time. CWPRS has completed the initial studies and submitted a technical note which contains afflux in Mutha River on introduction of Metro Piers. The second part of study on inundation is expected shortly from CWPRS.</p>	<p>CWPRS has submitted the initial report which has been submitted to the Expert Committee via ref Maha-Metro/Pune/EMD/C-04 dated 4th August 2020.</p> <p>*The conclusion of the studies are as follows.</p>

*The CWPRS technical note was explained and a presentation was made by the Scientist, Dr, Kunjeer CWPRS, Pune. The scope of the study was the 15.0 km reach from Khadakwasla dam to Sangam Bridge near the confluence of Mutha River with Mula River. The cross sections are 30 m in interval, centre to centre.

The simulation studies were carried out for the discharges of 1, 00,000 cusecs and for 60,000 cusecs for two scenarios i.e. one under the existing conditions (with only bridges) and other with the Metro structures. A variation was observed in the simulated and observed water surface profile for both the discharges under existing scenario (without metro structures). This variation may be attributed to the limited width of the cross sections in the simulation studies. It was also observed for the 60,000 cusecs, (i.e. Blue line) that the data provided by the Irrigation Department, on the flood levels, between Mhatre bridge and Sambhaji bridge was horizontal and that there was no afflux observed.

Further, simulations were conducted considering the metro structures to compute the afflux. It was observed that maximum afflux of 380 mm occurs at pier no. 152 for the discharge of 1, 00,000 cusecs. Similarly, for the discharge of 60,000 cusecs the afflux was observed to be 290 mm at pier no. 153. The flood submergence map for the two discharges will be included as a part of the final CWPRS report. For the preparation of submergence map, a Digital Elevation Model is required which is developed using properly orientated cross section data. The orientation of such cross section data is awaited.

The final report will be submitted by the 15th of November, 2020 and will include feasibility for mitigating afflux levels.

The Expert committee has perused that Maharashtra Metro Rail Corporation has conducted all studies and submitted reports directed by the committee in fourth meeting dated 20.11.2019. Maha-Metro is taking utmost care during construction of the project and complying all the guideline issued by the Expert Committee. There is no impediments in proceeding of the work.

The meeting concluded formally with a vote of thanks.

No.Np-4/ws/ ⁶¹⁾ ~~61)~~ /2020
Date : 24/09/2020



(Saurabh Rao)
Divisional Commissioner Pune,
Division Pune

To,

1. Mr. Ramnath S. – Director, Maharashtra Metro Rail Corporation Limited
2. Mr. Vijay Patil – Executive Engineer, Irrigation Department, Pune
3. Ms. Harsha Chaudhary – Scientist – B, CWPRS

4. **Dr. Prashad Kunjir** – Scientist – C, CWPRS
5. **Mr. Parag Patil** – Scientist – B, CWPRS
6. **Mr. Mangesh Dighe** – Environmental Officer, PMC
7. **Mr. Ratnankar Pandey** – Environmental Officer, Maharashtra Metro Rail Corporation Limited
8. **Ms. Renu Gera** – Environmental Officer, Maharashtra Metro Rail Corporation Limited
9. **Ms. Agniva Ghosh** – Assistant Manager (Legal), Maharashtra Metro Rail Corporation Limited
10. **Mr. Sandeep Jadhav** – Environmental Expert, MITCON
11. **Mr. Akshay Sonkusre** – Assistant Manager (CMS), Maharashtra Metro Rail Corporation Limited
12. **Mr. Santosh Patil** – Manager, Maharashtra Metro Rail Corporation Limited
13. **Mr. Sandip Thorat** – Law Officer, Divisional Commissioner Office, Pune
14. **Dr. Ritesh Vijay**- Principal Scientist, NEERI and convener of the Expert Committee.
15. **Dr. A. Benniamin**- Scientist, State Biodiversity board, Member of the Expert Committee
16. **Dr. Y.B. Sontakke** – Joint Director, Maharashtra Pollution Control Board, Member of the Expert Committee
17. **Ms. Swati Vaidya-Pandit** – Law Officer, Collocor Office, Pune
18. **Mr. Jitendra Sangewar** – MPCB, Regional Officer
19. **Ms. Manjusha Idhate** – Legal officer, PMC
20. **Mr. Raghunath Mahabal** – Advocate, Divisional Commissioner Office, Pune