Appendices

1. Member List of Study Team
2. Survey Itinerary
3. List of Parties Concerned
4. Minutes of Discussions
5. Other Relevant Data

Appendix-1
Member List of Study Team

Appendix-1 : Member List of the Study Team

1. Explanation of Inception Report and 1st Field Survey (August 11, 2005 to December 22, 2005)

Name	Position	Company
OMURA, Yoshiki	Leader of the Mission	Senior Advisor, Institute for International Cooperation, JICA
KENMIYA, Misa	Planning Management Officer	Assistant Resident Representative, JICA Kenya Office
SAKAMOTO, Masanobu	Chief Consultant/ Water Supply Planner	Nippon Koei Co., Ltd.
KIKAWADA, Atsusa	Groundwater Development Specialist	Nippon Koei Co., Ltd.
YABUTA, Takuya	Geophysical Prospecting Specialist/ Test Boring Specialist	Nippon Koei Co., Ltd.
KITAUCHI, Yoko	Social Survey Specialist/ Operation and Maintenance Planner/ Environmental and Social Consideration Specialist	Nippon Koei Co., Ltd.
SUZUKI, Keiichi	High Density Two Dimensional Electrical Sounding Specialist	Nippon Koei Co., Ltd.
KITANO, Tomoyuki	Jr. Water Supply Planner	Nippon Koei Co., Ltd.
UEMATSU, Masao	Test Boring Specialist/ Pumping Test Specialist	Nippon Koei Co., Ltd.

2. 2nd Field Survey (January 14, 2006 to March 16, 2006)

Name	Position	Company
OMURA, Yoshiki	Leader of the Mission	Senior Advisor, Institute for International Cooperation, JICA
MATSUMOTO, Shigeyuki	Planning Management Officer	Water Resources Development and Environmental Management Team, Project Management Group III, Grant Aid Management Department, JICA
SAKAMOTO, Masanobu	Chief Consultant/ Water Supply Planner	Nippon Koei Co., Ltd.
KIKAWADA, Atsusa	Groundwater Development Specialist	Nippon Koei Co., Ltd.
KITAUCHI, Yoko	Social Survey Specialist/ Operation and Maintenance Planner/ Environmental and Social Consideration Specialist	Nippon Koei Co., Ltd.
ISHII, Kenichi	Water Supply Facility Designer/ Construction Planner	Nippon Koei Co., Ltd.
TAMURA, Hidehisa	Cost Estimation Specialist	Nippon Koei Co., Ltd.
KITANO, Tomoyuki	Jr. Water Supply Planner	Nippon Koei Co., Ltd.

3. Explanation of Draft Final Report (May 27, 2006 to June 4, 2006)

Name	Position	Company
OMURA, Yoshiki	Leader of the Mission	Senior Advisor, Institute for International Cooperation, JICA
EZAKI, Chie	Planning Management Officer	Assistant Resident Representative, JICA Kenya Office
SAKAMOTO, Masanobu	Chief Consultant/ Water Supply Planner	Nippon Koei Co., Ltd.

Appendix-2
Survey Itinerary

Appendix-2: Survey Itinerary

1. Explanation of Inception Report and 1st Field Survey (August 11, 2005 to December 22, 2005)

No	Date		Member	Activities	Stay
1	Aug. 11	Thu.	Omura/Sakamoto	Move(Tokyo – Kansai – Dubai)	On board
2	12	Fri.	Omura/Sakamoto Kenmiya	Move(Dubai – Cairo) Courtesy call to Embassy of Japan / JICA Kenya Office	Nairobi
3	13	Sat.	Omura/Kenmiya/Sakamoto	Move(Nairobi – Cairo)	On board
			Kikawada	Move(Tokyo – Kansai – Dubai)	On board
4	14	Sun.	Omura/ Kenmiya /Sakamoto	Move(Cairo – Asmara)	Asmara
			Kikawada	Move(Dubai – Asmara)	Asmara
5	15	Mon.	Omura/Kenmiya/Sakamoto/ Kikawada	Courtesy call to MoND, MoLWE, EDA Discussion with WRD	Asmara
6	16	Tue.	Omura/Kenmiya/Sakamoto/ Kikawada	Courtesy call to ECDF and Honorary Consulate General of Japan Explanation of the outline of the Basic Design Study Report to WRD	Asmara
7	17	Wed.	Omura/Kenmiya/Sakamoto/ Kikawada	Explanation of the outline of the Basic Design Study Report to Debub Regional Govener	Asmara
8	18	Thu.	Omura/Kenmiya/Sakamoto	Discussion with WRD on draft Minutes of Discussion	Asmara
			Kikawada	Field Survey	Asmara
9	19	Fri.	Omura/Kenmiya/Sakamoto	Discussion on draft Minutes of Discussion, Signing of Minutes of Discussion, Courtesy call to UNICEF and GTZ	Asmara
			Kikawada	Field Survey	Asmara
10	20	Sat.	Kenmiya/Sakamoto/Kikawada	Field Survey at May-dima	Asmara
			Omura	Move(Asmara – Frankfurt)	On board
			Kitauchi	Move(Tokyo – Kansai – Dubai)	On board
11	21	Sun.	Kenmiya/Sakamoto/Kikawada	Meeting	Asmara
			Omura	Move (Frankfurt – Tokyo)	On board
			Kitauchi	Move(Dubai – Asmara)	Asmara
12	22	Mon.	Kenmiya/Sakamoto/Kikawada/ Kitauchi	Field Survey	Asmara
			Omura	Move (Frankfurt – Tokyo)	
13	23	Tue.	Kenmiya/Sakamoto/Kikawada/ Kitauchi	Field Survey	Asmara
			Kitano	Move(Tokyo – Kansai – Dubai)	On board
14	24	Wed.	Kenmiya/Sakamoto/Kikawada/ Kitauchi	Field Survey	Asmara
			Kitano	Move(Dubai – Asmara)	Asmara
・	・	・	・	・	・
21	31	Wed.	Kikawada/Kitauchi/Kitano	Field Survey	Asmara
			Sakamoto	Move(Asmara – Dubai)	On board
22	Sep. 1	Thu.	Kikawada/Kitauchi/Kitano	Field Survey	
			Sakamoto	Move(Dubai – Kansai – Tokyo)	
23	2	Fri.	Kikawada/Kitauchi/Kitano	Field Survey	Asmara
24	3	Sat.	Kikawada/Kitauchi/Kitano	Field Survey	
			Yabuta/Suzuki	Move(Tokyo – Kansai – Dubai)	On board
25	4	Sun.	Kikawada/Kitauchi/Kitano	Field Survey	Asmara
			Yabuta/Suzuki	Move(Dubai – Asmara)	Asmara
・	・	・	・	・	・
46	25	Sun.	Kikawada/Yabuta/Suzuki/Kitano	Field Survey	Asmara
			Kitauchi	Move(Asmara – Dubai)	On board
47	26	Mon.	Kikawada/Yabuta/Suzuki/Kitano	Field Survey	Asmara
			Kitauchi	Move(Dubai – Kansai – Tokyo)	On board

・	・	・	・	・	・
56	Oct. 5	Wed.	Yabuta/Kitano	Field Survey	Asmara
			Kikawada/Suzuki	Move(Asmara – Dubai)	On board
57	6	Thu	Yabuta/Kitano	Field Survey	Asmara
			Kikawada/Suzuki	Move(Dubai – Kansai – Tokyo)	On board
・	・	・	・	・	・
90	Nov. 8	Tue.	Yabuta/Kitano	Field Survey	Asmara
			Uematsu	Move(Tokyo – Kansai – Dubai)	On board
91	9	Wed.	Yabuta/Kitano	Field Survey	Asmara
			Uematsu	Move(Dubai – Asmara)	Asmara
92	10	Thu.	Yabuta/Kitano/Uematsu	Field Survey	Asmara
・	・	・	・	・	・
109	27	Sun.	Yabuta/Kitano	Field Survey	Asmara
			Uematsu	Move(Asmara – Dubai)	On board
110	28	Mon.	Yabuta/Kitano	Field Survey	Asmara
			Uematsu	Move(Dubai – Kansai – Tokyo)	On board
111	29	Tue.	Yabuta/Kitano	Field Survey	Asmara
112	30	Wed.	Kitano	Field Survey	Asmara
			Yabuta	Move(Asmara – Dubai)	On board
113	Dec. 1	Thu.	Kitano	Field Survey	Asmara
			Yabuta	Move(Dubai – Kansai – Tokyo)	On board
114	2	Fri.	Kitano	Field Survey	Asmara
・	・	・	・	・	・
126	14	Wed.	Kitano	Field Survey	Asmara
			Kenmiya/Sakamoto	Move(Nairobi – Dubai – Asmara)	Asmara
127	15	Thu.	Sakamoto/Kitano	Preparation of 1st Technical Note	Asmara
128	16	Fri.	Sakamoto/Kitano	Discussion on 1st Technical Note to WRD Report to ODA Coordinator (Ms.Watabe)	Asmara
129	17	Sat.	Sakamoto/Kitano	Report Preparation	Asmara
130	18	Sun.	Kitano	Report Preparation	Asmara
			Sakamoto	Move(Asmara – Dubai)	On board
131	19	Mon.	Kitano	Report Preparation	Asmara
132	20	Tue.	Kitano	Report Preparation	Asmara
133	21	Wed.	Kitano	Move(Asmara – Dubai)	On board
134	22	Thu.	Kitano	Move(Dubai – Kansai – Tokyo)	

Note: MoND: Ministry of National Development, MoLWE: Ministry of Land, Water and Environment, EDA: Eritrean Demining Authority, WRD: Water Resources Department, ECDF: Eritrean Community Development Fund

2.2nd Field Survey (January 14, 2006 to March 16, 2006)

No	Date		Member	Activities	Stay
1	Jan. 14	Sat.	Omura/Matsumoto/Sakamoto/ Kikawada/Kitauchi/Ishii/Kitano	Move(Tokyo – Kansai – Dubai)	On board
2	15	Sun.	Omura/Matsumoto/Sakamoto/ Kikawada/Kitauchi/Ishii/Kitano	Move(Dubai – Asmara)	Asmara
3	16	Mon.	Omura/Matsumoto/Sakamoto/ Kikawada/Kitauchi/Ishii/Kitano	Courtesy call to MoND, Discussion with WRD	Asmara
4	17	Tue.	Omura/Matsumoto/Sakamoto/ Kikawada/Kitauchi/Ishii/Kitano	Discussion with WRD on draft Minutes of Discussion	Asmara
5	18	Wed.	Omura/Matsumoto/Sakamoto/ Kikawada/Kitauchi/Ishii/Kitano	Signing Minutes of Discussion	Asmara
6	19	Thu.	Sakamoto/Kikawada/Kitauchi/Ishii/ Kitano	Field Survey	Asmara
			Omura/Matsumoto	Move (Asmara – Frankfurt)	On board
7	20	Fri.	Sakamoto/Kikawada/Kitauchi/Ishii/ Kitano	Field Survey	Asmara
			Omura/Matsumoto	Move (Frankfurt – Tokyo)	
•	•	•	•	•	•
12	25	Wed.	Kikawada/Kitauchi/Ishii/Kitano	Field Survey	Asmara
			Sakamoto	Move(Asmara – Dubai)	On board
13	26	Thu.	Kikawada/Kitauchi/Ishii/Kitano	Field Survey	
			Sakamoto	Move(Dubai – Kansai – Tokyo)	
14	27	Fri.	Kikawada/Kitauchi/Ishii/Kitano	Field Survey	Asmara
15	28	Sat.	Kikawada/Kitauchi/Ishii/Kitano	Field Survey	Asmara
			Tamura	Move(Tokyo – Kansai – Dubai)	On board
16	29	Sun.	Kitauchi/Ishii/Kitano	Field Survey	Asmara
			Tamura	Move(Dubai – Asmara)	Asmara
			Kikawada	Move(Asmara – Dubai)	On board
17	30	Mon.	Kitauchi/Ishii/Tamura/Kitano	Field Survey	Asmara
			Kikawada	Move(Dubai – Kansai – Tokyo)	
•	•	•	•	•	•
23	Feb. 5	Sun.	Ishii/Tamura/Kitano	Field Survey	Asmara
			Kitauchi	Move(Asmara – Dubai)	On board
24	6	Mon.	Ishii/Tamura/Kitano	Field Survey	Asmara
			Kitauchi	Move(Dubai – Kansai – Tokyo)	
25	7	Thu.	Ishii/Tamura/Kitano	Field Survey	Asmara
•	•	•	•	•	•
39	21	Tue.	Ishii/Tamura/Kitano	Discussion on 2nd Technical Note to WRD	Asmara
40	22	Wed.	Tamura/Kitano	Field Survey	Asmara
			Ishii	Move(Asmara – Dubai)	On board
41	23	Thu.	Tamura/Kitano	Field Survey	Asmara
			Ishii	Move(Dubai – Kansai – Tokyo)	
42	24	Fri.	Tamura/Kitano	Field Survey	Asmara
•	•	•	•	•	•
44	26	Sun.	Kitano	Field Survey	Asmara
			Tamura	Move(Asmara – Dubai)	On board
45	27	Mon.	Kitano	Field Survey	Asmara
			Tamura	Move(Dubai – Kansai – Tokyo)	
46	28	Tue.	Kitano	Field Survey	Asmara
•	•	•	•	•	•
60	Mar. 14	Tue.	Kitano	Discussion on Updated 2nd Technical Note to WRD	Asmara
61	15	Wed.	Kitano	Move(Asmara – Dubai)	On board
62	16	Thu.	Kitano	Move(Dubai – Kansai – Tokyo)	

3. Explanation of Draft Final Report (May 27, 2006 to June 4, 2006)

No	Date		Member	Activities	Stay
1	May. 27	Sat.	Sakamoto	Move (Tokyo – Kansai – Dubai)	On board
2	28	Sun.	Omura	Move (Tokyo – Frankfurt)	On board
			Sakamoto	Move (Dubai – Asmara)	Asmara
3	29	Mon.	Omura	Move (Frankfurt – Asmara)	Asmara
			Sakamoto	Discussion on Draft Basic Design Study Report with WRD	
4	30	Tue.	Esaki	Move (Nairobi – Asmara)	Asmara
			Omura/Sakamoto	Discussion with WRD, Courtesy call to MoND, Courtesy call to Honorary Consulate General of Japan	
5	31	Wed.	Omura/Esaki/Sakamoto	Courtesy call to Debub Regional Governer, Explanation of Draft Basic Design Study Report with Debub Regional Govener and each four target town	Asmara
6	Jun. 1	Thu.	Omura/Esaki/Sakamoto	Explanation of Draft Basic Design Study Report with WRD, Discussion on draft Minutes of Discussion	Asmara
7	2	Fri.	Omura/Esaki/Sakamoto	Signing Minutes of Discussion, Courtesy call to GTZ	Asmara
8	3	Sat.	Omura/Esaki/Sakamoto	Documentation	Asmara
9	4	Sun.	Omura Sakamoto	Move (Asmara – Cairo) Move (Asmara – Dubai)	

Appendix-3
List of Parties Concerned

Appendix-3: List of Parties Concerned

Ministry of National Development (MoND)

Dr. Woldai Futur	Minister
Mr. Solomon Tecle	Expert (Japan Desk)

Ministry of Foreign Affairs (MoF)

Dr. Andeab Fesseha

Ministry of Land, Water and Environment (MoLWE)

Mr. Mebrahto Iyassu	Director General of Water Resources Department (WRD)
Mr. Tesfamichael Keleta	Director of Water Resource Assessment and Information Division, WRD
Mr. Sengel Woldetensae	Director of Water Resources Management and Use Division, WRD
Mr. Misghina G.Sellorsie	Head of Water Supply Project, WRD
Mr. Semere Berne	Head of Groundwater Unit, WRD
Mr. Ephrem Yohannes	Head of Hydro-Meteorology Unit, WRD
Mr. Michael Abraha	Head of Development Unit, WRD
Mr. Yohannes	Head of Management Unit, WRD
Mr. Tecle Yamane	Head of Information (GIS and Remote Sensing), WRD
Mr. Ato Simon Efrem Amare	Head of Planning Unit, WRD
Mr. Fesha Kefflemariam	Geophysicist, WRD
Mr. Henok Tesfamariam	Geophysicist, WRD
Mr. Teklebrhan Mengis	Geophysicist, WRD
Mr. Temesgen Zigta	Geophysicist, WRD
Mr. Fessha	Geologist and Supervisor of Well Drilling, WRD
Mr. Biniam	Geologist and Supervisor of Well Drilling, WRD
Mr. Alexander Mebrahto	Water Laboratory, WRD
Mr. Yonas Woldemichael	Geologist, WRD
Mr. Tesfu Andmariam	Geologist, WRD
Mr. Tewolde Selomon	Private consultant for WRD
Mr. Kibrom Asmeron	Unit Head of Environment Management, Environment Department
Mr. Tewelde Zerizzhi	Unit Head of Environment Management, Environment Department

Ministry of Energy and Mines Department of Mines

Mr. Michael Abraha	Director, Geological Survey

Eritrean Demining Authority

Mr. Habtom Seghid	Deputy General Manager
Mr. Yohannes Embaye	Operation Officer

Debub Regional Administration

Mr. Mustafa Hassen	Governor
Mr. Weldemichael Ghebretnsae	Director General, Department of Infrastructure
Mr. Kaled Saleh	Director, Engineering and Project Management Division

Mendefera Town Administration

Mr. Abrahm Hagos	Mayor
Mr. Tanese Haile	Head of Water Supply
Mr. Tesfamariam Haile	Head of Water Supply

Debarwa Town Administration

Mr. Andemariam Mehreteab	Administrator (Mayor)
Mr. Issak Kiros	Head of Water Supply
Mr. Asmerom Tesfai	Engineer of Samsal Consultant Engineering Office

Dekemhare Town Administration

Mr. Mohamed O.Gulay	Administrator (Mayor)
Mr. Tesfay Abraha	Head of Water Supply Service
Mr. Yamane	Engineer, Dekemhare Town Administration

Adi Keyih Town Administration

Mr. Osmaan Aref	Administrator (Mayor)
Mr. Teklezghi Ghidey	Vice Mayor
Mr. Zerai Kibrab	Head of Water Supply Service

May-dima Town Administration

Mr. Mohammed	Administrator (Mayor)
Mr. Woide Micael Kidane	Deputy Administrator
Mr. Medhanie Semere	Engineer, May-dima Town Administration

Eritrean Community Development Fund (ECDF)

Mr. Seltene Abraha	Head of Water Supply and Sanitation

GTZ

Mr. Elmar Kreutzer	RWSS (Western Eritrea Rehabilitation Water Supply System)
Ms. Esther Geiss	RWSS (Western Eritrea Rehabilitation Water Supply System)

Local Consultant, Topographic Survey Company, Drilling Company

Mr. Teklay Zerai	Geophysicist, Universal Water Consultants
Mr. Ketema Gebremeskel	Geophysicist, Universal Water Consultants
Mr. Tefade Bahremichael	Geophysicist, Universal Water Consultants
Mr. Solomon Fantahun	Engineer, Hadgu Raessu Consulting Water Engineers
Mr. Samiel Gehbehamoiot	Consulting Engineer, Samsal Engineering Consultancy
Mr. Kebreab Tesfay	General Manager, ECDC (Eritrean Core Well Drilling Co)
Mr. Emanuel	Hydro-geologist, ECDC (Eritrean Core Well Drilling Co)

Embassy of Japan in Kenya

Mr. Satoshi Suwa	1st Secretary
Mr. Satoshi Ominato	2nd Secretary

JICA

Ms. Hanako Watabe	ODA Coordinator
Mr. Tadahiro Sasaki	Expert for Aid Coordination
Mr. G.Michael Stephanos	Eritrean Liaison Officer

JICA Kenya Office

Mr. Yoshiaki Kano	Resident Representative
Mr. Jiro Inamura	Deputy Resident Representative
Ms. Misa Kenmiya	Assistant Resident Representative
Ms. Chie Esaki	Assistant Resident Representative

International Committee of the Red Cross (ICRC)

Mr. Rene Saameli	Water & Habitat Program Coordinator

Appendix-4
Minutes of Discussion

MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY
ON THE PROJECT FOR URBAN WATER SUPPLY IN DEBUB REGION
IN THE STATE OF ERITREA

Based on the results of the Preliminary Study, the Government of Japan decided to conduct a Basic Design Study on the Project for Urban Water Supply in Debub Region (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the State of Eritrea (hereinafter referred to as "Eritrea") the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Omura Yoshiki, Senior Advisor, Institute for International Cooperation, JICA, and is scheduled to stay in the country from August 14 to December 14 for the Phase 1 field survey.

The Team held discussions with the officials concerned of the Government of Eritrea and conducted a field survey at the study area.

In the course of the discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Asmara, August 19, 2005

Mr. Omura Yoshiki
Leader
Basic Design Study Team
Japan International Cooperation Agency
Japan

Mr. Mebrahtu Iyassu
Director General
Water Resources Department
Ministry of Land, Water and Environment
Eritrea

for Matheus Woldu

Dr. Woldai Futur
Minister for National Development
Eritrea

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve the health and living standard of the people who live in the project sites through development of water supply.

2. Project sites

The project sites are Debarwa, Dekemhare, Adi Keyih and May-dima in Debub Region. The location of the sites is shown in Annex-1.

3. Responsible and Implementing Agency

The Responsible and Implementing Agency is Ministry of Land, Water and Environment/Water Resources Department (WRD).

4. Items requested by the Government of Eritrea

After discussions with the Team, water supply facilities for four towns, Debarwa, Dekemhare, Adi Keyih, and May-dima, were finally requested by the Eritrean side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

The Eritrean side emphasized that the residents of four towns are suffering from severe water shortage and strongly requested implementation of the project in all of four towns.

5. Japan's Grant Aid Scheme

The Eritrean side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Eritrea as explained by the Team and described in Annex-4 of the Minutes of Discussions signed by both parties on February 11.

6. Schedule of the Study

6-1 The consultants will proceed to further studies in Eritrea until December 14, 2005 for the Phase 1 field survey.

6-2 The second filed survey will be conducted from January to February 2006.

6-3 JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around May 2006.

6-4 In case that the contents of the report are accepted in principle by the Government of Eritrea, JICA will complete the final report and send it to the Government of Eritrea by August 2006.

6-5 JICA Study Team will provide WRD with processed data and information upon request of WRD.

7. Other relevant issues

7-1. Planning framework

As for the planning framework such as population projection, per capita consumption, water supply amount, etc., the Team explained its policy as follows:

(1) Present and future population is the important basis of planning. In order to grasp precise figure and set realistic unit water consumption reflecting actual conditions, the Team will conduct a baseline survey covering all the households in the four towns.

(2) Water sources are very limited in the project sites. The first field survey aims at evaluating potential of groundwater development by systematic exploration and test boring. Water supply plan should be formulated based on the estimated availability of groundwater derived from survey results. It will be necessary to adjust service levels, for example, by: (a) increasing public taps and restricting house connections and yard connections, (b) increasing coverage area allocated to each public tap, (c) regulating service hours, (d) suppressing house connections by controlling water tariff structure. It also will be necessary to build consensus among stakeholders through public hearings, etc. To ensure equitable access to water is important.

(3) JICA received the letter dated on March 7, 2005 from Director General of Water Resources Department to the leader of the Preliminary Study Team, mentioning the project target year as 2020. As already agreed in the Minutes of Discussion signed on February 11, the target year should remain the same as 2015, to reflect the Japanese Grant Aid policy to meet urgent and essential needs.

(4) Although the Eritrean Community Development Fund (ECDF) conducted feasibility studies and detailed designs for Debarwa, Adi Keyih and May-dima, its estimation of unit water consumption and service ratio might have needs of updating and re-assessment in view of Japan's Grant Aid Scheme. The Team therefore will revise it to set more practical framework, if necessary.

7-2. Water Sources Development Plan

The Team explained its policy on water sources development as follows:

(1) The Project components will be construction of new boreholes, installation of motorized pumps to existing wells and replacement of existing pumps.

(2) Capacity of existing wells will be assessed by pumping tests.

(3) Test boring is planned up to 40 boreholes. Additional trial is beyond the scope of the study. Successful test boreholes will be converted to production wells during the implementation stage to cover a part of necessary wells to meet the demand. Groundwater exploration and test boring will be carried out within approximately 5 km range of the proposed service area in each town, considering operation cost.

(4) Successful test boreholes should be protected carefully against human-caused clogging and accidents. If the Eritrean side uses them as filling stations to water tankers, they should be

carefully managed by: (a) installing suitable pumps instructed by the Team to avoid over pumping and degradation of aquifers, (b) preventing pollution from the surface.

(5) If the Eritrean side continues own effort to develop water sources, it is necessary to integrate it to the Team's planning process.

(6) Both sides agreed that the following criteria under the guideline of JICA should be applied for the Basic Design Study, in order to achieve cost-effectiveness of groundwater development projects under the Grant Aid Scheme:

1) Safe yield of 5 m3/hour per a borehole,

2) Location of boreholes within the extent of approximately 5 km from proposed service area,

3) Test borehole drilling at 40 sites at maximum, and

4) Completion of successful test boreholes including provision of casing, screen, gravel packing and so on at 20 sites among the 40 test boreholes.

(7) General work flow of the Basic Design Study is shown in Annex-2.

7-3. Operation and maintenance

Under the decentralization policy of the Eritrean Government, the Japanese side recognized ever increasing importance of Zoba Debub Regional Administration. Therefore the Eritrean side agreed to keep the Administration well informed about the Project.

The Team pointed out the problem of Unaccounted-for Water (UFW) caused by weakness of operation and maintenance. The Eritrean side requested technical assistance (so-called "soft component") to improve financial management and operation and maintenance skills of Water Supply Service (WSS).

7-4. Environmental and social considerations

The Eritrean side explained the progress of procedures on environmental and social considerations and agreed to provide the Study Team with the result by the second field survey.

The Team pointed out that the following three points should be examined:

(1) Location of test boring should be carefully selected to avoid negative impact on existing surrounding wells.

(2) Social consideration is necessary for water venders because the Project might cause risk of unemployment.

(3) Water quality should be monitored because some existing wells are contaminated by nitrate.

7-5. Undertakings to be taken by the Eritrean side

The Eritrean side will extend following facilities to the Team:

1) To secure land for borehole construction by test boring (site location will be indicated by the Team mainly from the view point of hydrogeology),

2) To provide data and information necessary for the Basic Design Study,

3) To provide counterpart personnel for attending the Team members from WRD, town administrations and water supply service offices of the four towns,

4) To prepare travel permissions for the study team members,

5) To make appointment and provide necessary coordination with related organizations,

6) To inform the police (security authority) of the four towns about the study and stay of Japanese members through the town administrations,

7) To allow the Study Team to use telephone lines of town administrations or water supply service offices of the four towns in case of emergency.

The Team emphasized that the Eritrean side should take the necessary measures, as described below, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

1) To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country,

2) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work such as issuance of work permit,

3) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services for the Project,

4) To bear all the expenses, other than those to be borne by the Grant Aid,

5) To improve access roads to construction sites where necessary.

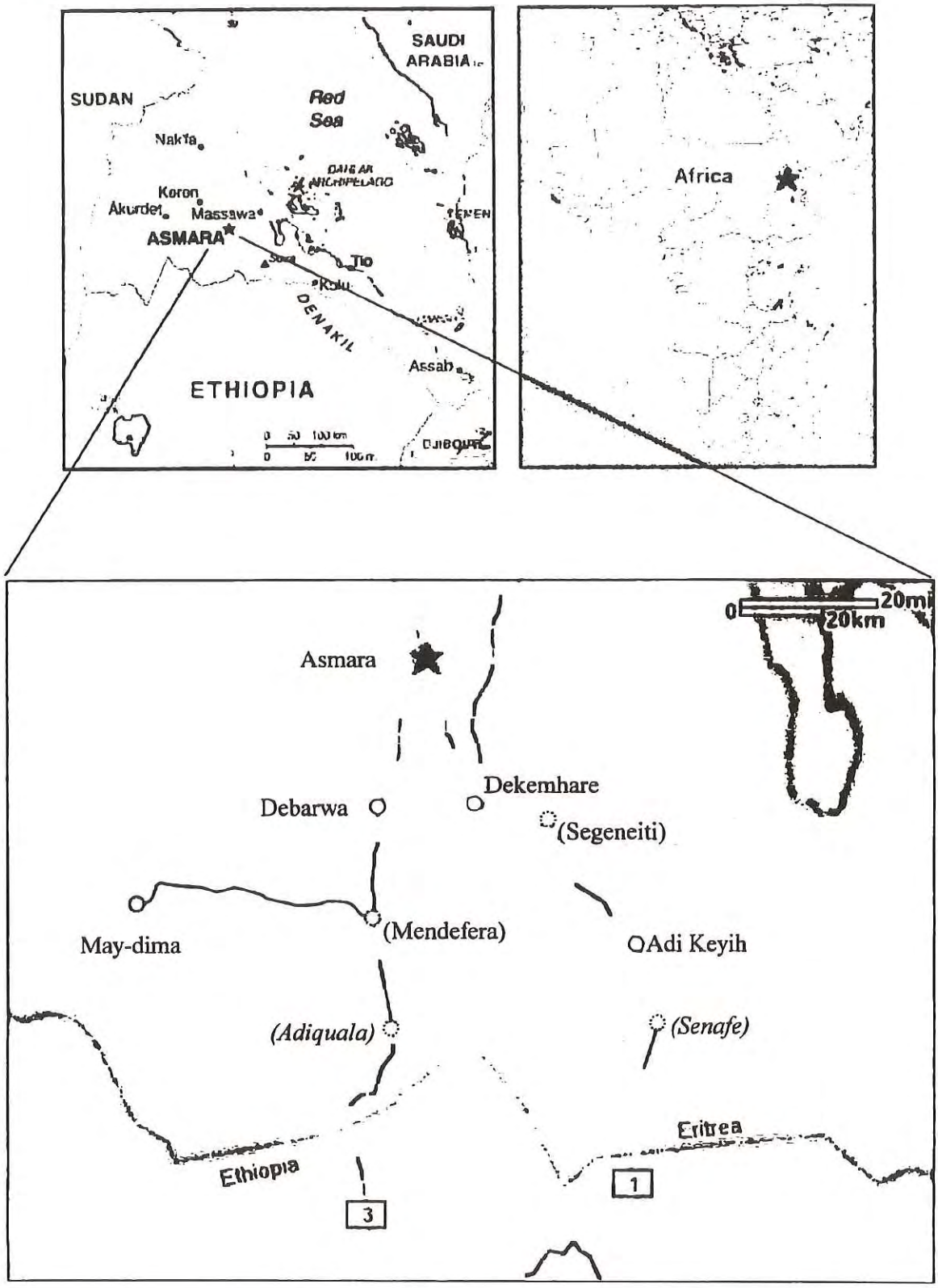
6) To secure, clear, level and reclaim sites for construction,

7) To provide land for a temporary site office, warehouse and stockyard during the implementation of the Project,

8) To assign personnel to participate in the Project, and

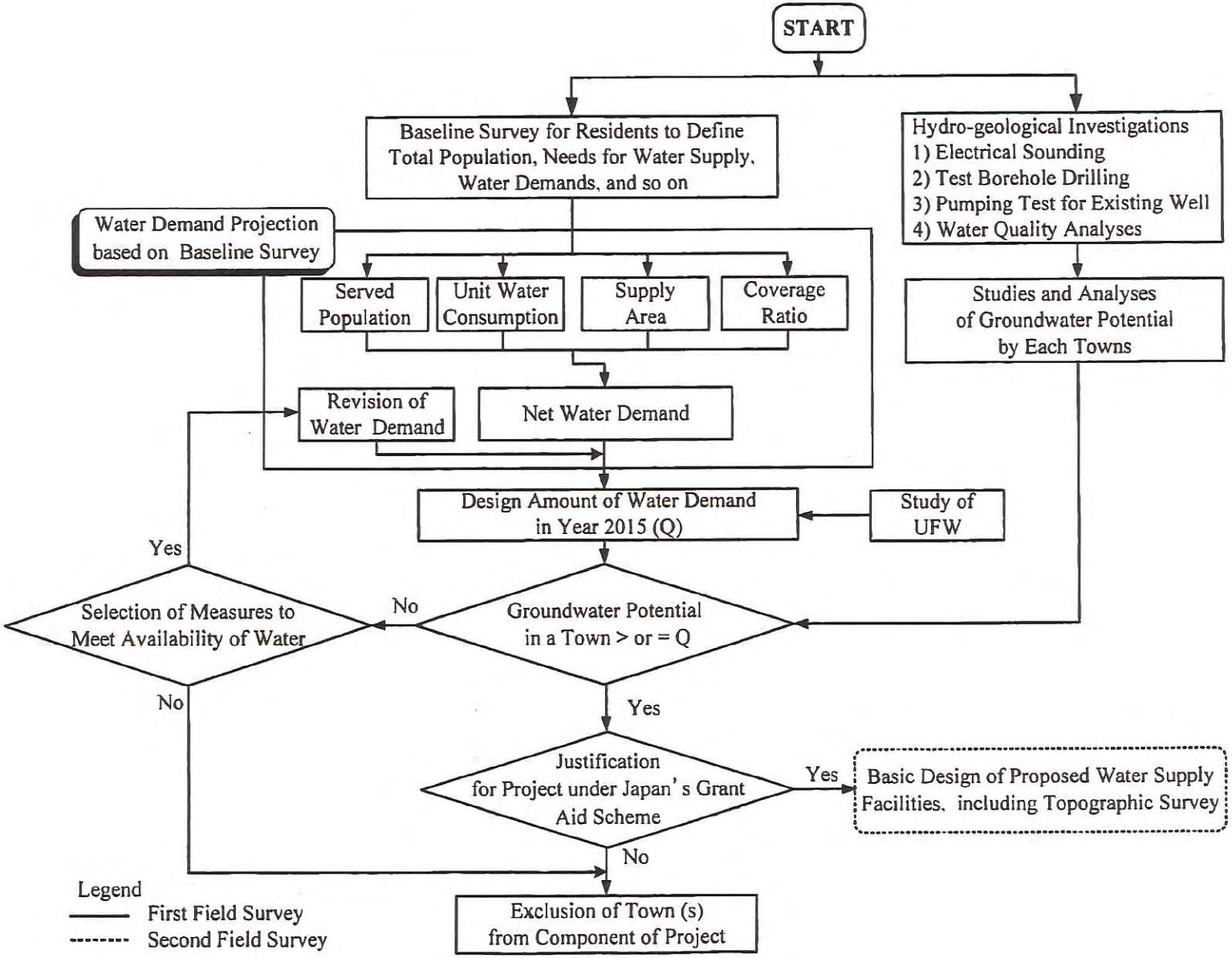
9) To coordinate with other donors, NGOs and related organizations.

ANNEX-1 : Project Site



*) Adiquala, Senafe, Mendefera and Segeneiti were excluded and May-dima was included as a result of the Preliminary Study in February 2005.

Annex-2: General Work Flow of the Basic Design Study



MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY (SECOND FIELD SURVEY)
ON THE PROJECT FOR URBAN WATER SUPPLY IN DEBUB REGION
IN THE STATE OF ERITREA

Based on the results of the Preliminary Study, the Government of Japan decided to conduct a Basic Design Study on the Project for Urban Water Supply in Debub Region (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the State of Eritrea (hereinafter referred to as "Eritrea") the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Omura Yoshiki, Senior Advisor, Institute for International Cooperation, JICA, and is scheduled to stay in the country from January 15 to March 15 for the second field survey.

The Team held discussions with the officials concerned of the Government of Eritrea.

In the course of the discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Asmara, January 18, 2006

Mr. Omura Yoshiki
Leader
Basic Design Study Team
Japan International Cooperation Agency
Japan

Mr. Mebrahtu Iyassu
Director General
Water Resources Department
Ministry of Land, Water and Environment
Eritrea

Dr. Woldai Futur
Minister for National Development
Eritrea

ATTACHMENT

1. Schedule of the Study

The Team will proceed to further studies in Eritrea until March 15, 2006 for the second field survey.

JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around May 2006.

In case that the contents of the report are accepted in principle by the Government of Eritrea, JICA will finalize the report and send it to the Government of Eritrea by August 2006.

2. Water Sources Development Plan

The Team explained the findings of the groundwater investigations during the first field survey including the test drilling. In the course of the first field survey, the Eritrean side strongly requested additional pumping tests for the existing and drilled boreholes during the dry season in order to confirm seasonal fluctuation of groundwater potential. The Team recognized the necessity and will consider conducting the tests in the second field survey.

3. Water Supply Plan

As a result of the groundwater investigations, 15 boreholes are reported to have a safe yield more than 5 m^3/hour per borehole in Debarwa, Dekemhare and Adi Keyih. Promising areas for groundwater exploitation are identified for those towns. Therefore, water supply plans will be developed as urban-type piped schemes composed of house connections, yard taps and public fountains.

As for May-dima, the test boreholes did not indicate the groundwater potential with a yield more than 5 m^3/hour per borehole. However, the 10 boreholes out of 18 drilled by the Team and by the Eritrean Community Development Fund (ECDF) have a yield more than 2 m^3/hour per borehole, corresponding to the water demand of 1,500 people through public fountains. Accordingly a water supply plan will be developed for May-dima as a combination of separate supply systems reflecting geological conditions and town layout.

4. Planning framework

As for the planning framework such as population projection, per capita consumption, water supply amount, etc., the Team explained its policy as follows:

(1) Future population will be estimated based on the present population and social increase of the past grasped by the baseline survey covering all the households in the four towns as well as the national rate of natural population increase.

(2) Water supply areas will be investigated based on the town plans and accessibility.

(3) Unit water consumption will be proposed for each water supply modes taking into account the current water supply situation and the feasibility study for Mendefera as follows:

1) House connection 50 liter/capita/day
2) Yard connection 30 liter/capita/day
3) Public fountain 20 liter/capita/day

5. Water Supply Facility Plan

The water supply projects by ECDF are ongoing or almost completed in Debarwa, Adi Keyih and May-dima. Those facilities should be incorporated in the water supply facility plan for the Project.

6. Operation and maintenance

Addressing the strong request of the Eritrean side, the Team will investigate a plan for technical assistance (so-called "soft component") to improve financial management and operation and maintenance skills of Water Supply Service (WSS) as a component of the Project.

7. Environmental and social considerations

The Team requested the Eritrean side to proceed with the process of the Environmental Evaluation in accordance with laws and regulations of Eritrea in order to obtain the Environmental Clearance. The Eritrean side agreed to complete the process by the end of March 2006.

8. Undertakings to be taken by the Eritrean side

The Team will clarify details of requirements to be undertaken by the Eritrean side as a condition for the Japanese Grant Aid to be implemented. The Eritrean side is requested to make arrangements through all the relevant ministries and local administration bodies to ensure the requirements.

9. Project implementation plan

The Team requested the Eritrean side to prioritize the four towns just in case the Project would be implemented in phases over two Japanese fiscal years. The Eritrean side prioritized Adi Keyih and May-dima to be implemented first.

MINUTES OF DISCUSSIONS
ON BASIC DESIGN STUDY ON
THE PROJECT FOR URBAN WATER SUPPLY IN DEBUB REGION
IN THE STATE OF ERITREA
(EXPLANATION ON DRAFT FINAL REPORT)

In August 2005, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for Urban Water Supply in Debub Region in the State of Eritrea (hereinafter referred to as "the Project") to the State of Eritrea (hereinafter referred to as "Eritrea"), and through discussion, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult the Eritrea on the components of the draft final report, JICA sent to Eritrea the Draft Final Report Explanation Team (hereinafter referred to as " the Team "), which is headed by Mr. Yoshiki Omura, Senior Advisor, Institute for International Cooperation, JICA , from 28 May, 2006 to 4 June, 2006.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Asmara, June 2, 2006

Mr. Omura Yoshiki
Leader
Basic Design Study Team
Japan International Cooperation Agency
Japan

Mr. Mebrahtu Iyassu
Director General
Water Resources Department
Ministry of Land, Water and Environment
Eritrea

Dr. Woldai Futur
Minister for National Development
Eritrea

ATTACHMENT

1. Components of the Draft Final Report

The Government of Eritrea agreed and accepted in principle the components of the draft final report explained by the Team.

2. Japan's Grant Aid Scheme

Eritrean side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Eritrea as explained by the Team and described in Annex-4 of the Minutes of Discussions signed by both parties on February 11, 2005.

3. Schedule of the Study

JICA will finalize the report and send it to the Government of Eritrea by August 2006.

4. Other relevant issues

(1) Environmental Issue

The Team discussed the procedures of Environmental Evaluation with the Eritrean side and submitted the required information to the Eritrean side. The Team requested the Eritrean side to prepare Environmental Evaluation Report in accordance with the explained procedures.

The Eritrean side agreed to complete the process and send the permission to JICA Kenya Office by the end of June 2006.

(2) Technical Guidance under the Soft-component Scheme

The Team explained the contents and schedule of the technical guidance during the implementation stage of the Project. The Team requested the Eritrean side to organize counterpart personnel in the Water Resources Department (WRD) and the Water Supply Service (WSS) of the four towns of Debarwa, Dekemhare, May-dima and Adi Keyih.

The Eritrean side agreed to organize counterpart personnel in WRD and WSS during the implementation stage of the Project.

(3) Undertakings to be taken by the Eritrean Side

The Team requested the following undertakings to be taken by the Eritrean side during implementation stages of the Project and the Eritrean side agreed those undertakings:

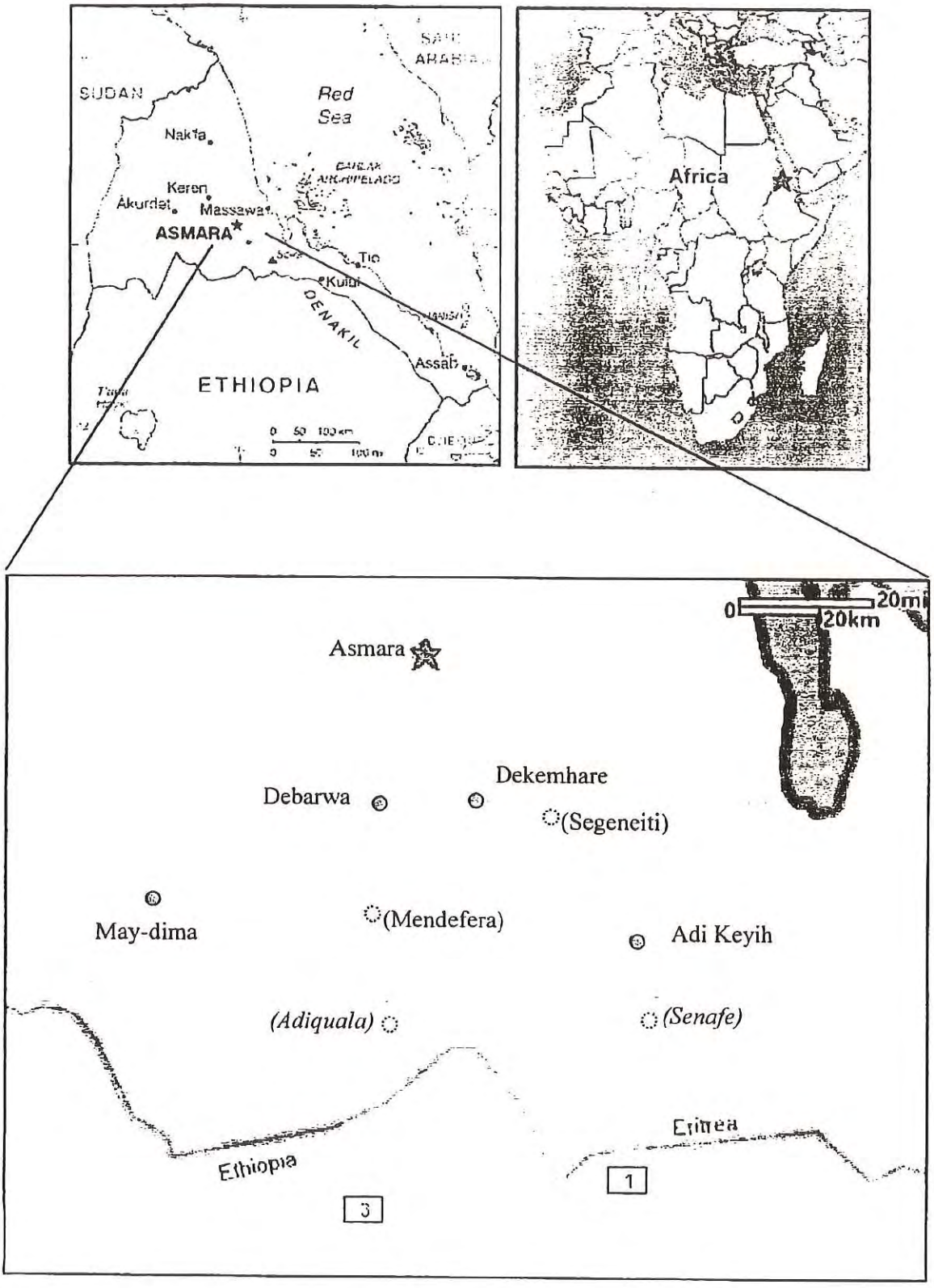
3-1) General Issues

1) Provision and arrangement of land necessary for implementation of the Project.
2) Construction of access roads to construction sites, including cutting of bushes,
3) Provision of electric distribution line to Hawatu in Adi Keyih,
4) Budget arrangement and payment of import tax, internal tax, and other levies.

5) Explanation of works to inhabitants, and requesting their cooperation in the construction,
6) Application of permission of construction works and payment of necessary expenses, and
7) Arrangement of necessary counterpart personnel of WRD and WSS, and coordinate with other relevant donors and NGOs.

3-2) Undertakings at Construction Sites

1) To secure the site for proposed water supply facilities,
2) To clear, level and reclaim the site prior to commencement of construction,
3) To provide data and information necessary for the Project,
4) To provide the land for access roads, temporary site offices, warehouses and stock yards during implementation of the Project,
5) To provide warehouse or storing space of spare parts handed over to the Eritrean side, if any,
6) To bear the commissions for banking services based upon the Banking Arrangement,
7) To exempt taxes and to take necessary measures for customs clearance of materials and equipment procured by the Project at the port of disembarkation,
8) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Eritrea with respect to the supply of the products and services under the contracts verified by the Japanese Government,
9) To accord Japanese nationals whose services may be required in connection with supply of the products and services under verified contracts, and provide them with such facilities as may be necessary for their entry into Eritrea and stay therein for the performance of their work,
10) To assign necessary staff and secure necessary budget for operation and maintenance of facilities constructed under the Grant Aid,
11) To maintain and use properly and effectively facilities constructed under the Grant Aid,
12) To connect the existing service pipes with the constructed pipeline and to explain interruption of water supply during such work to residents,
13) To provide water for disinfection, pressure test, and water leakage test of facilities, and
14) To bear all the expenses other than those to be borne by the Grant Aid but necessary for construction of the facilities.



Location Map

Appendix-5 Other Relevant Data

5.1 Electric Prospecting Results

5.2 Test Drilling Log

5.3 Pumping Test Results

5.4 Water Quality Test Results

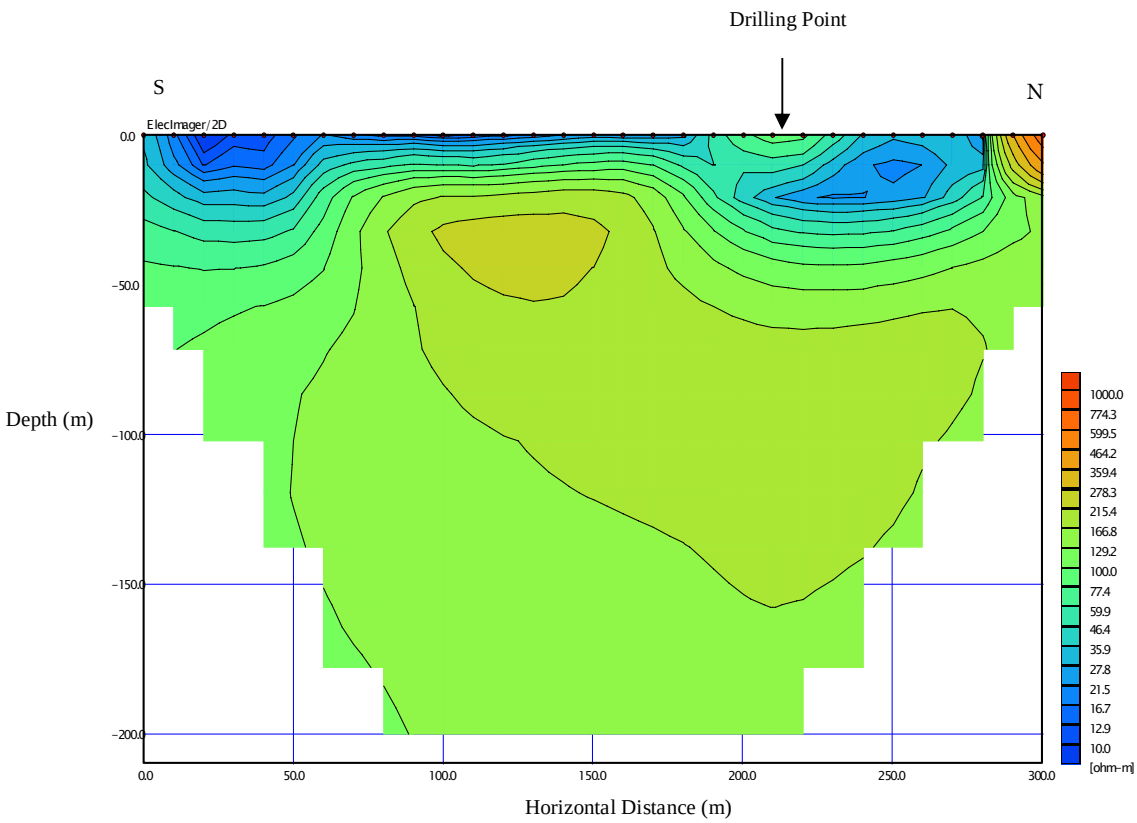
5.5 Baseline Survey Results

5.6 Basic Design Drawings

5.1
Electric Prospecting Results

Two Dimensional Electric Resistivity Survey Result

Debarwa 10Lines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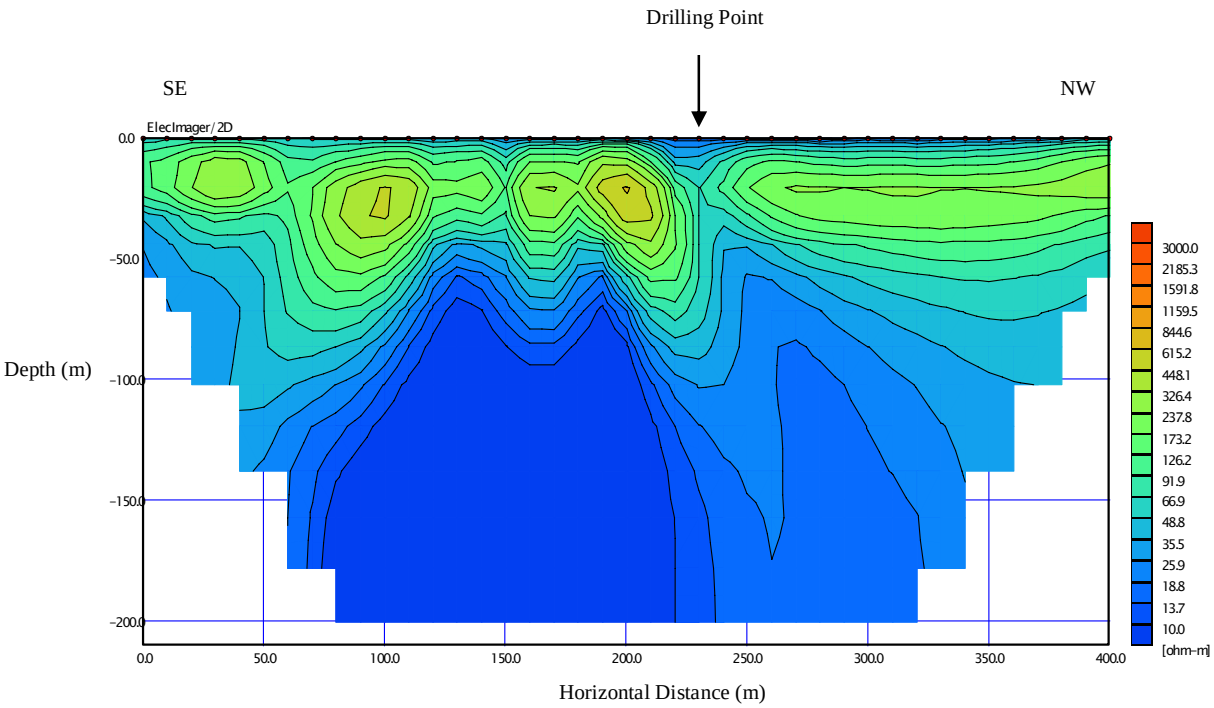
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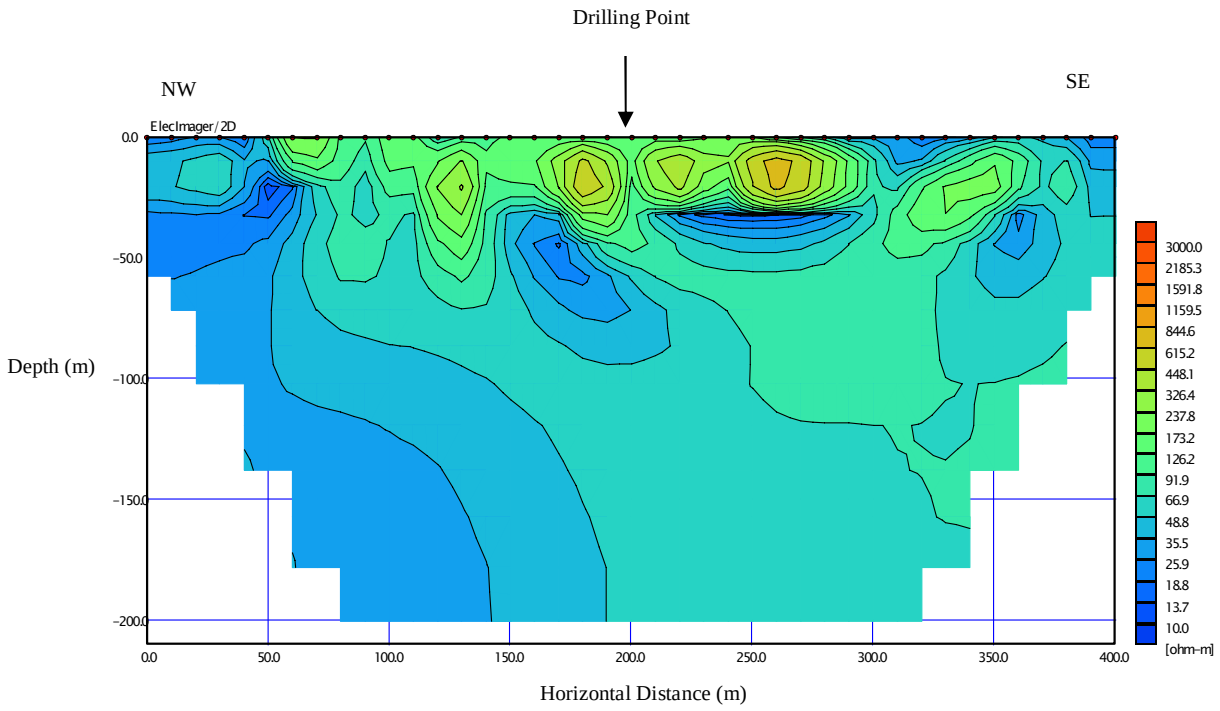
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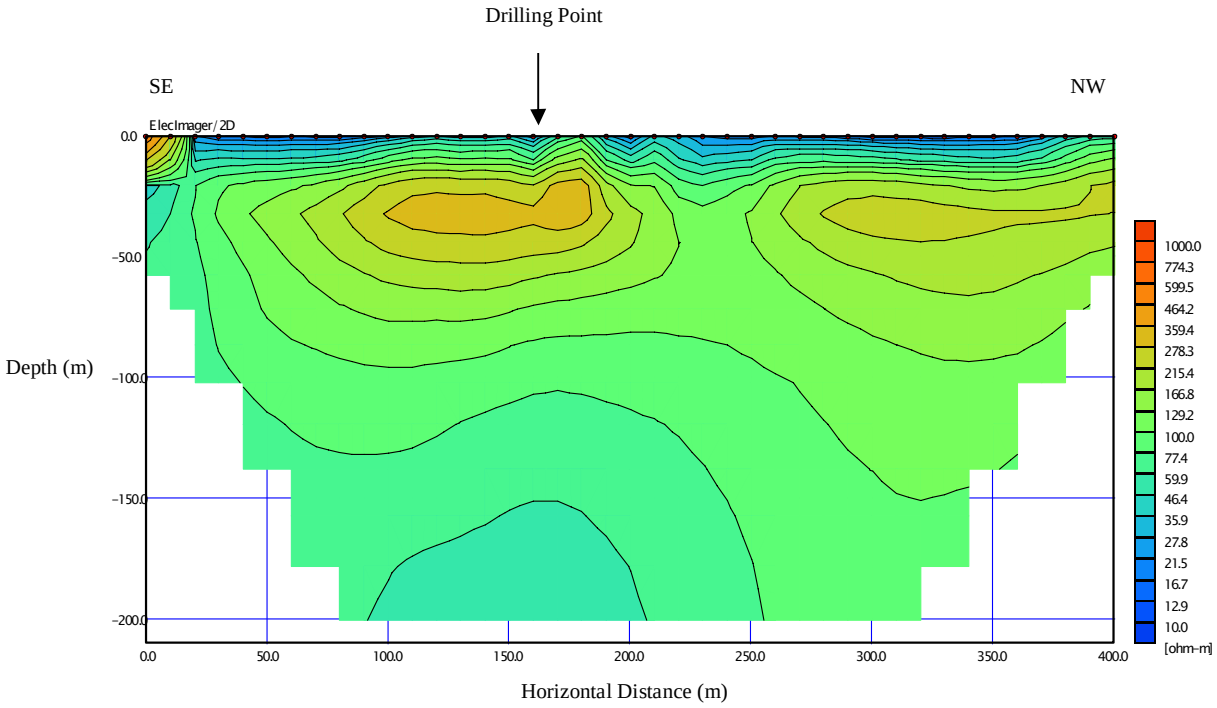
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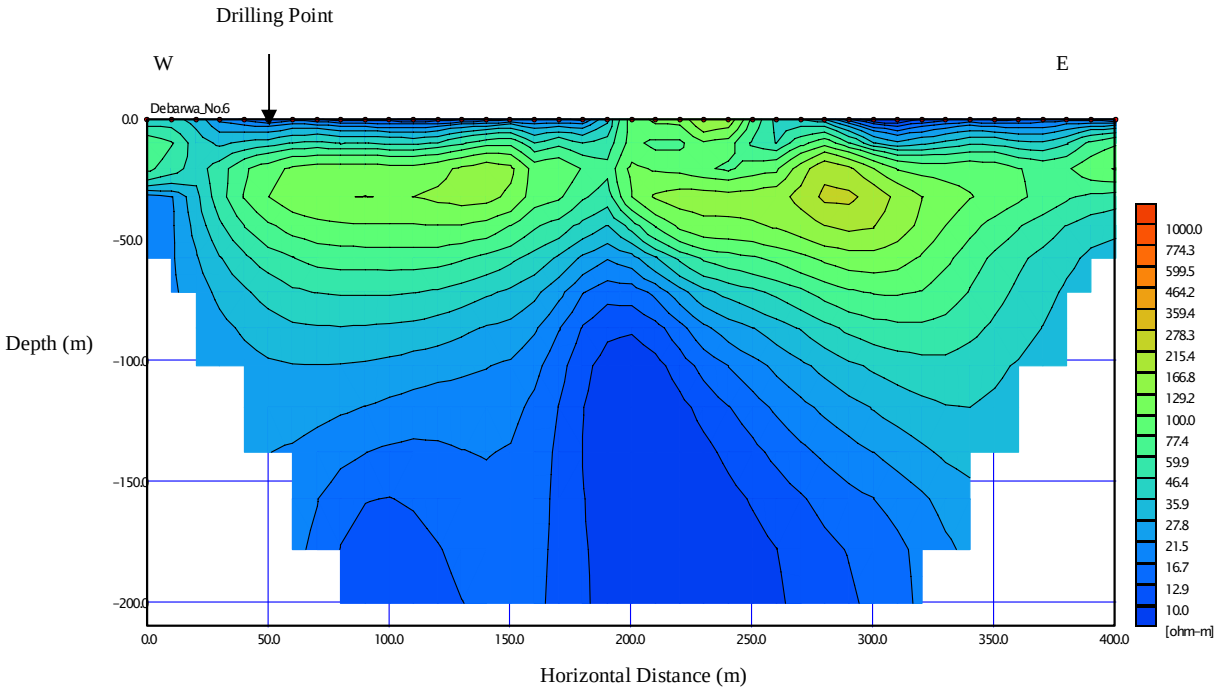
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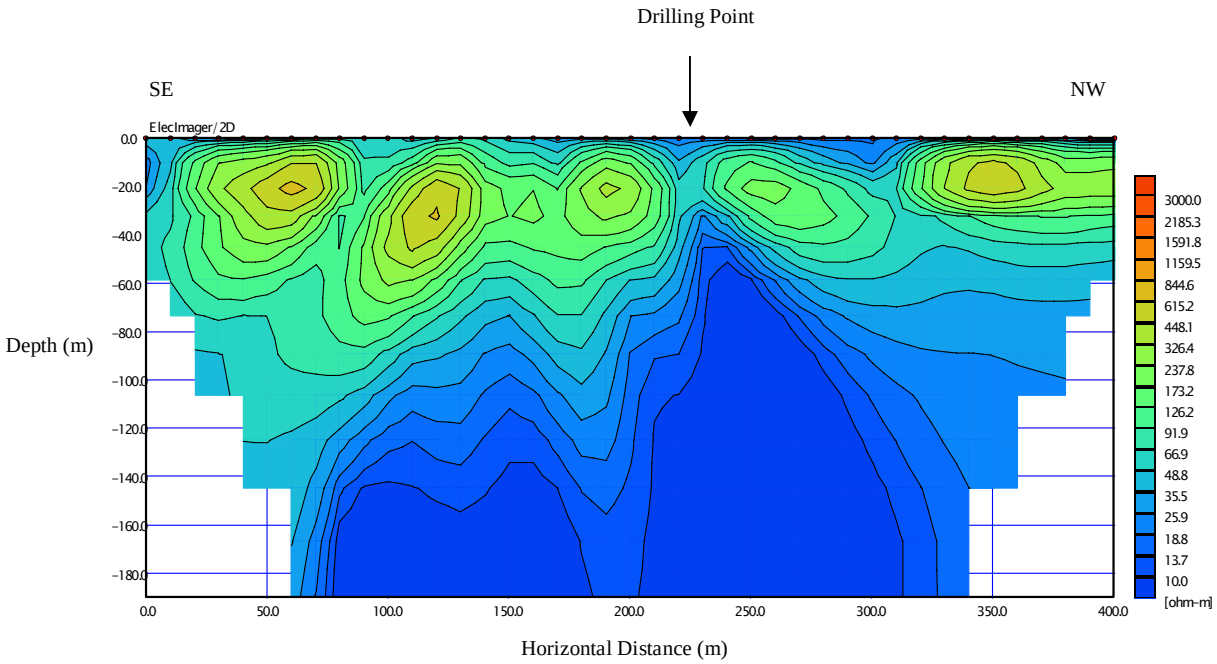
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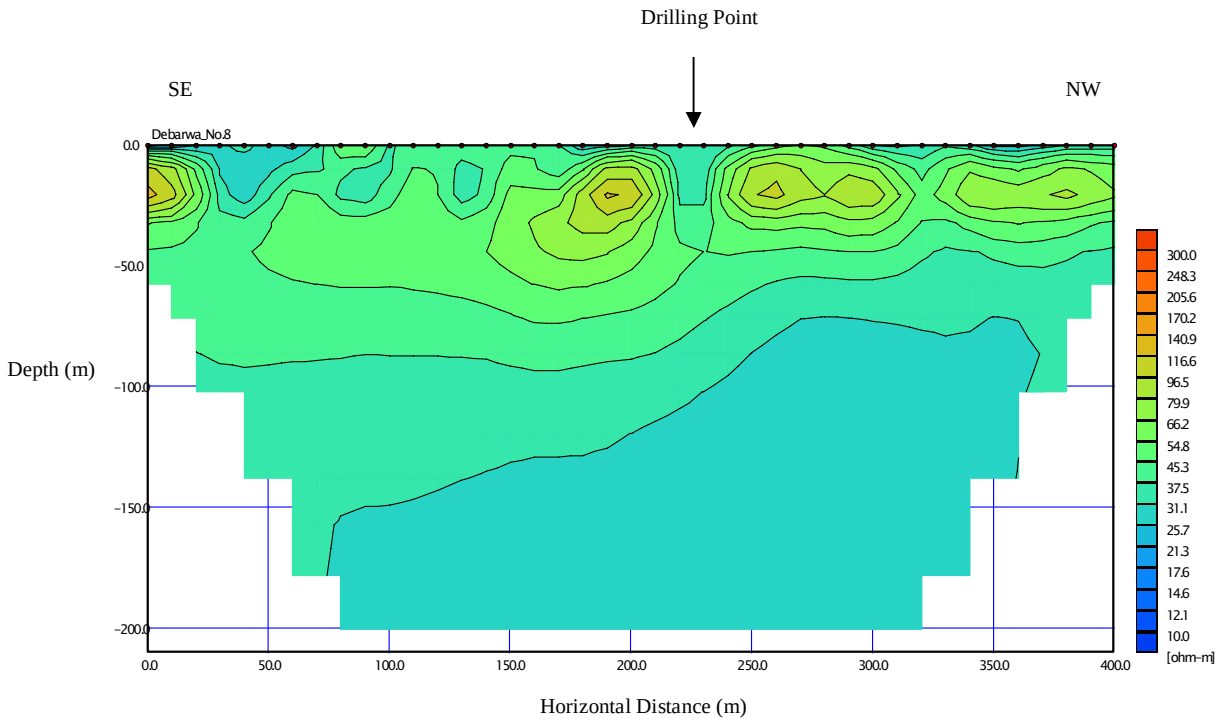
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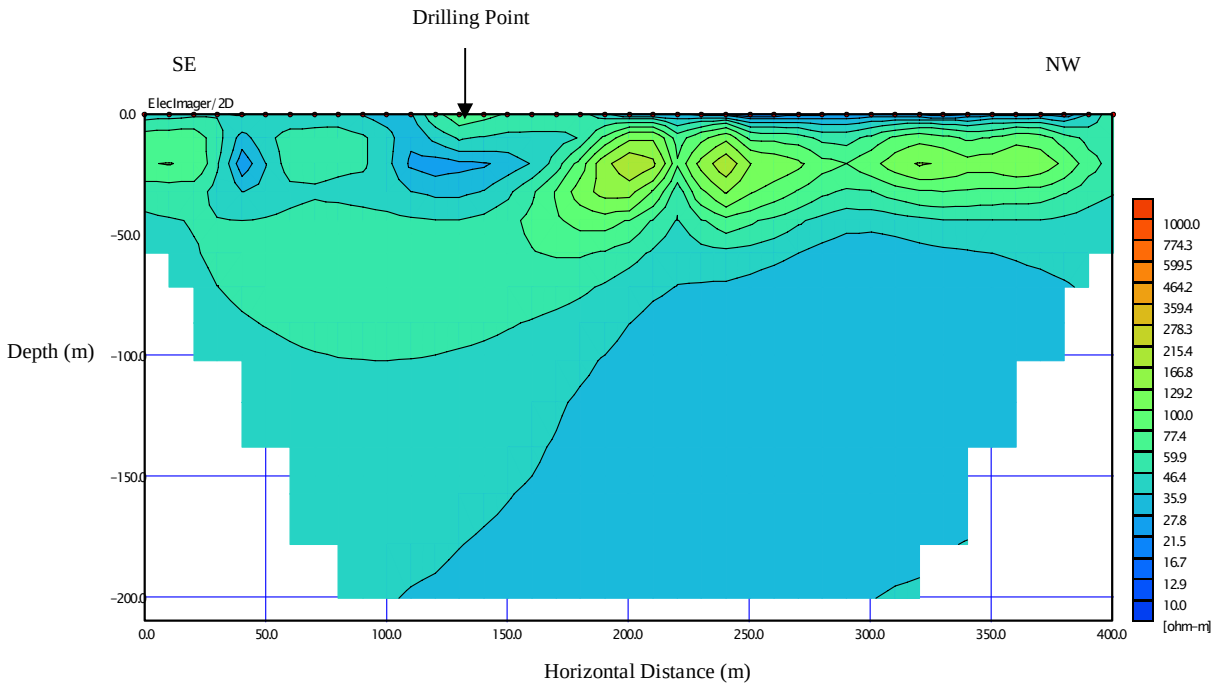
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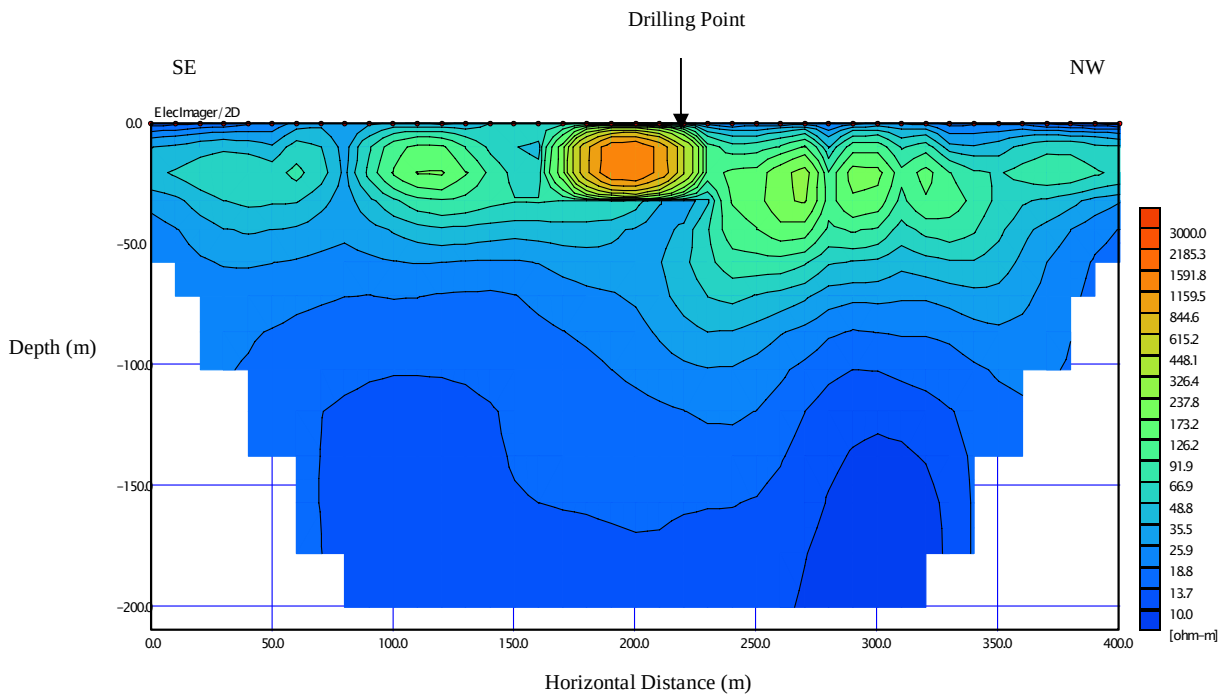
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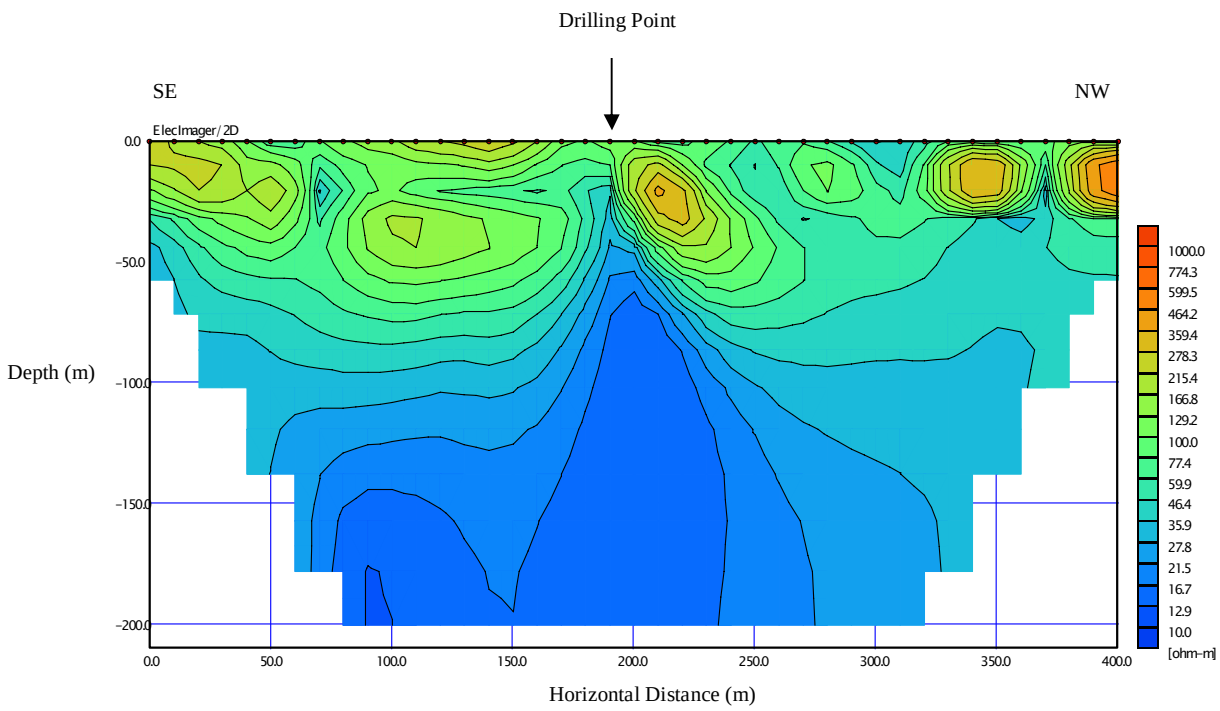
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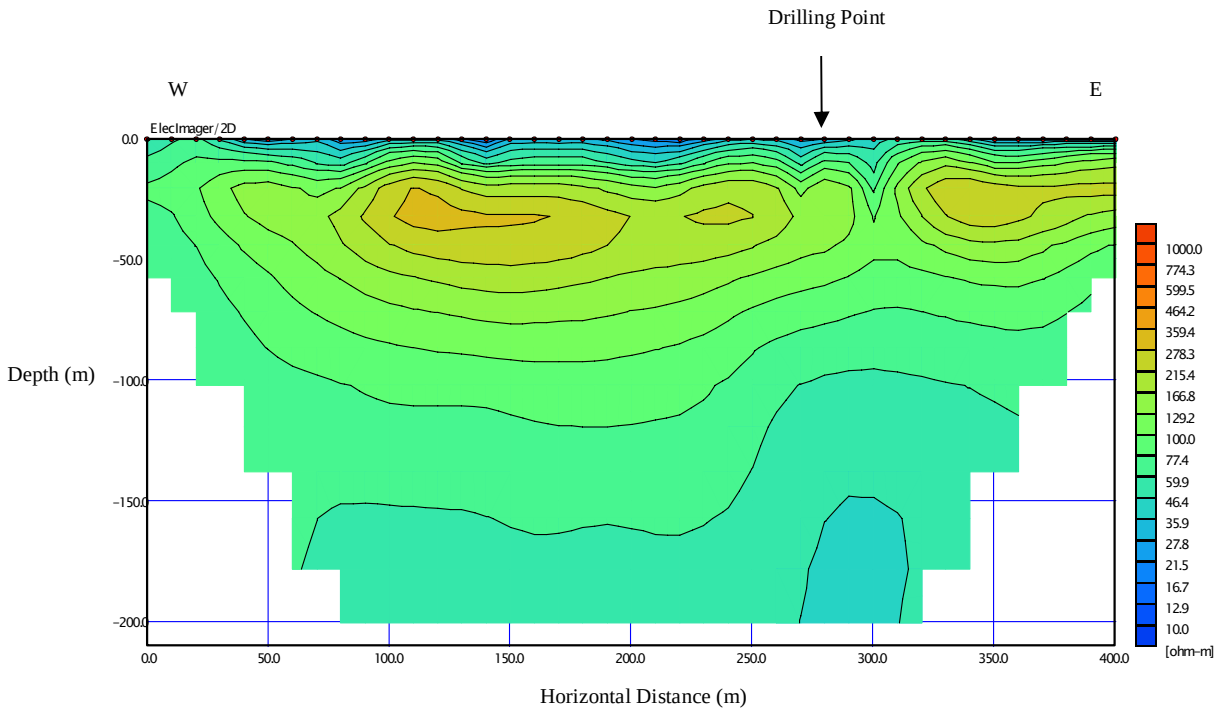
No.11-2

Two Dimensional Electric Resistivity Survey Result

Dekemhare 6Lines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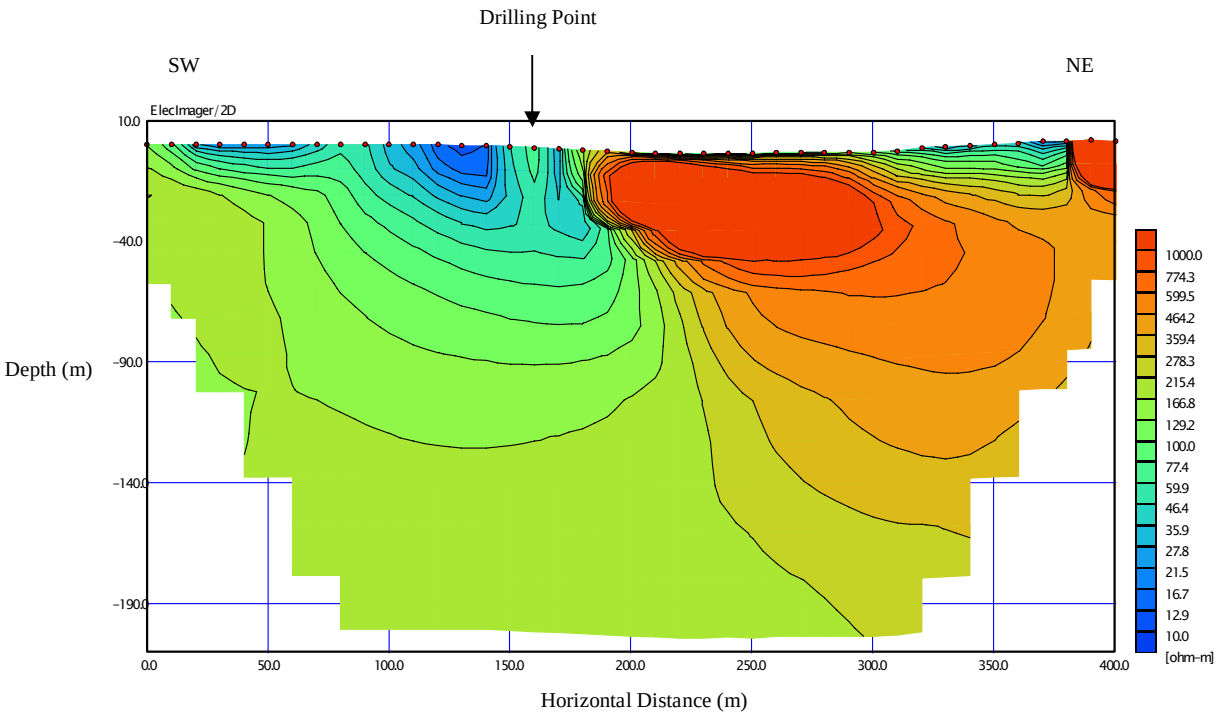
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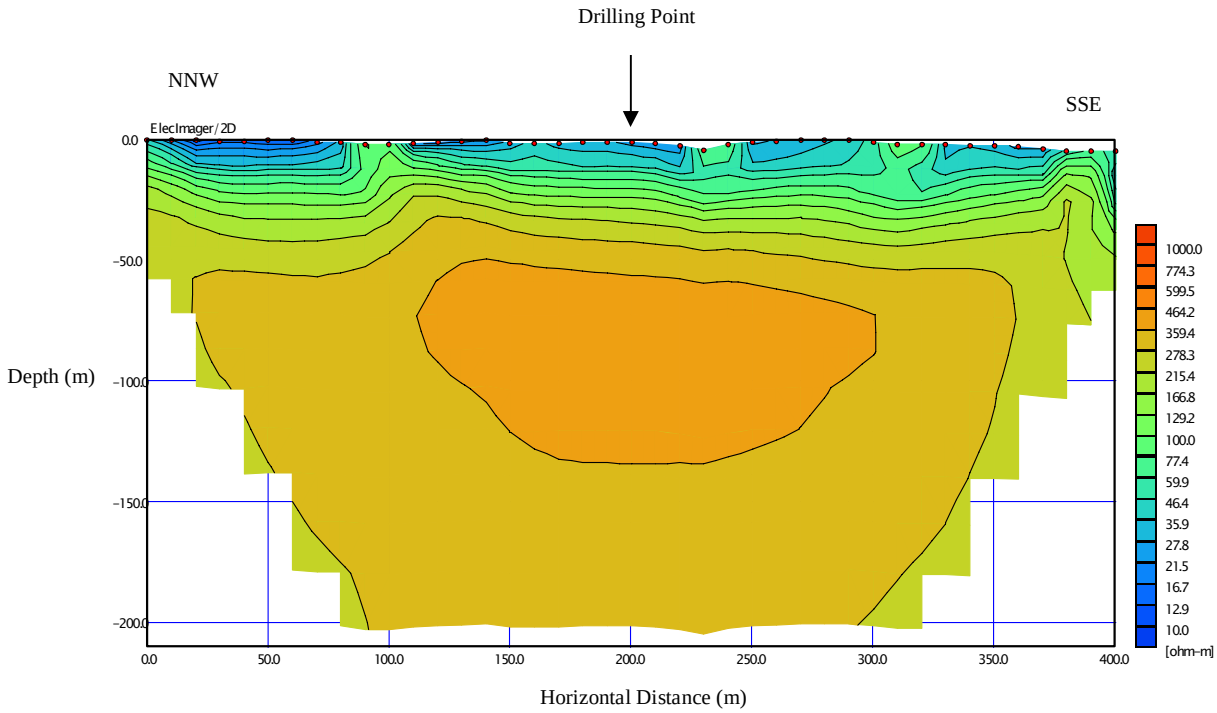
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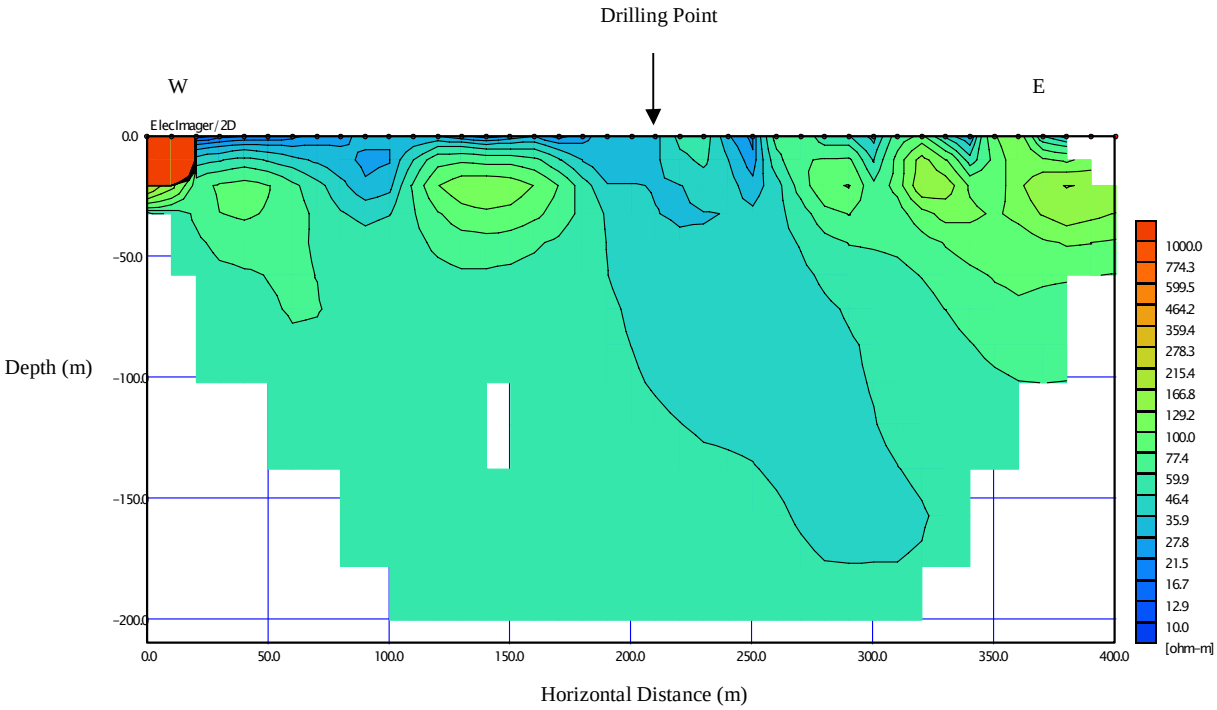
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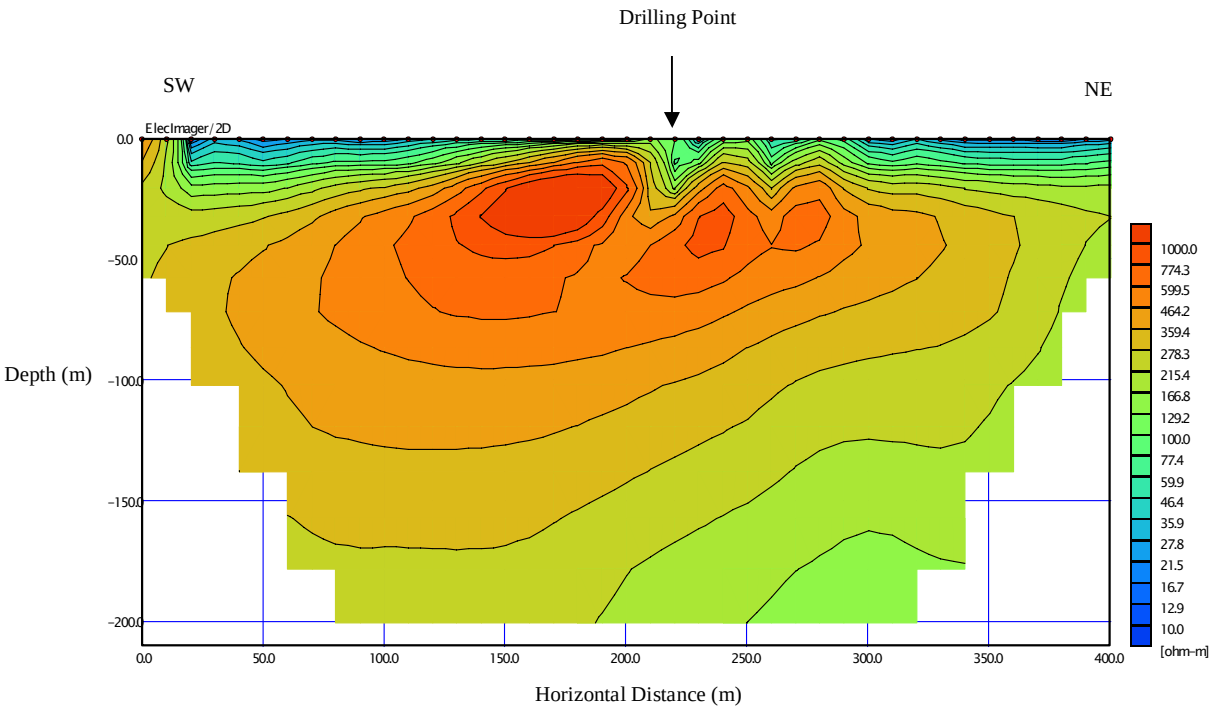
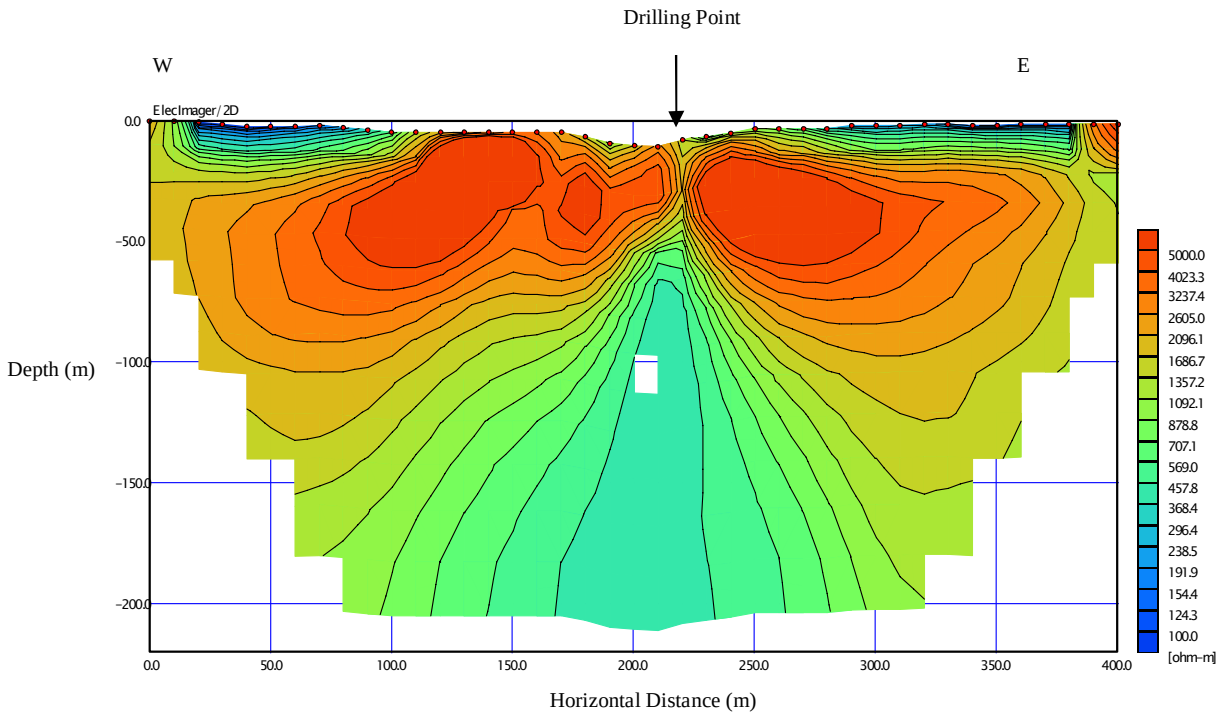
[ohm-m]

No.4


Drilling Point
SW
NE
ElecImager/2D
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
1000.0
774.3
599.5
464.2
359.4
278.3
215.4
166.8
129.2
100.0
77.4
59.9
46.4
35.9
27.8
21.5
16.7
12.9
10.0
[ohm-m]

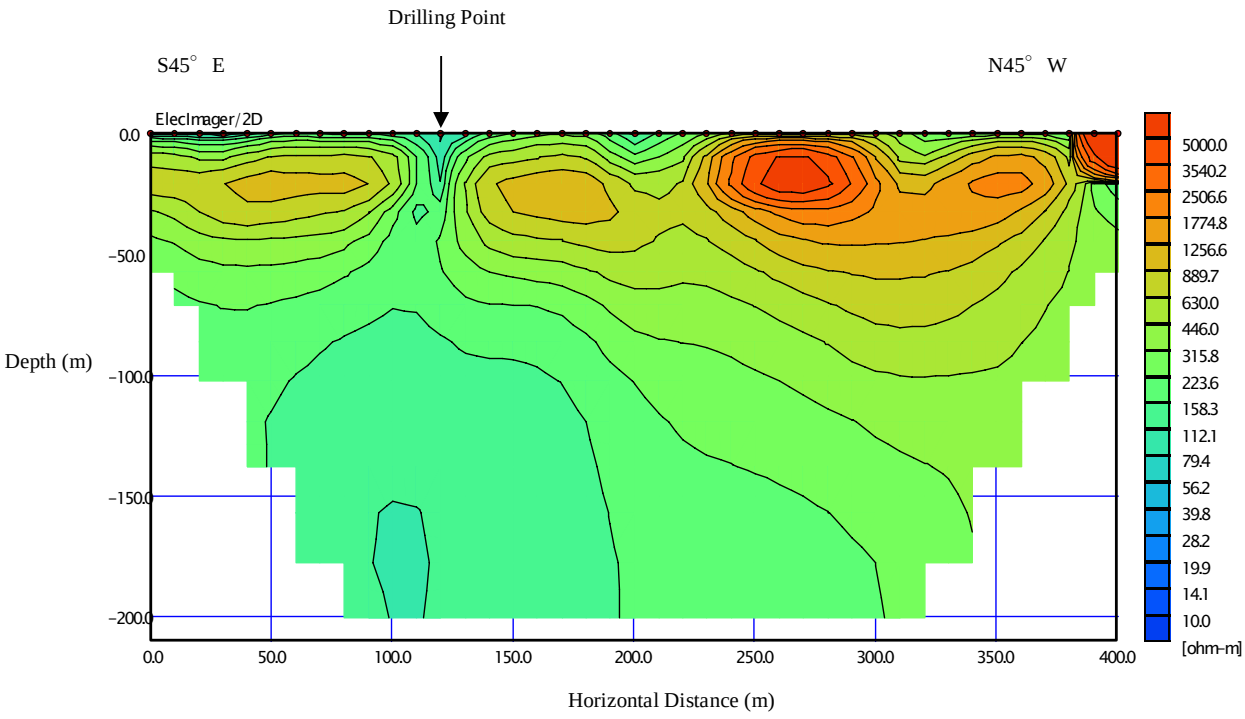
No.5


Drilling Point
W
E
ElecImager/2D
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
5000.0
4023.3
3237.4
2605.0
2096.1
1686.7
1357.2
1092.1
878.8
707.1
569.0
457.8
368.4
296.4
238.5
191.9
154.4
124.3
100.0
[ohm-m]

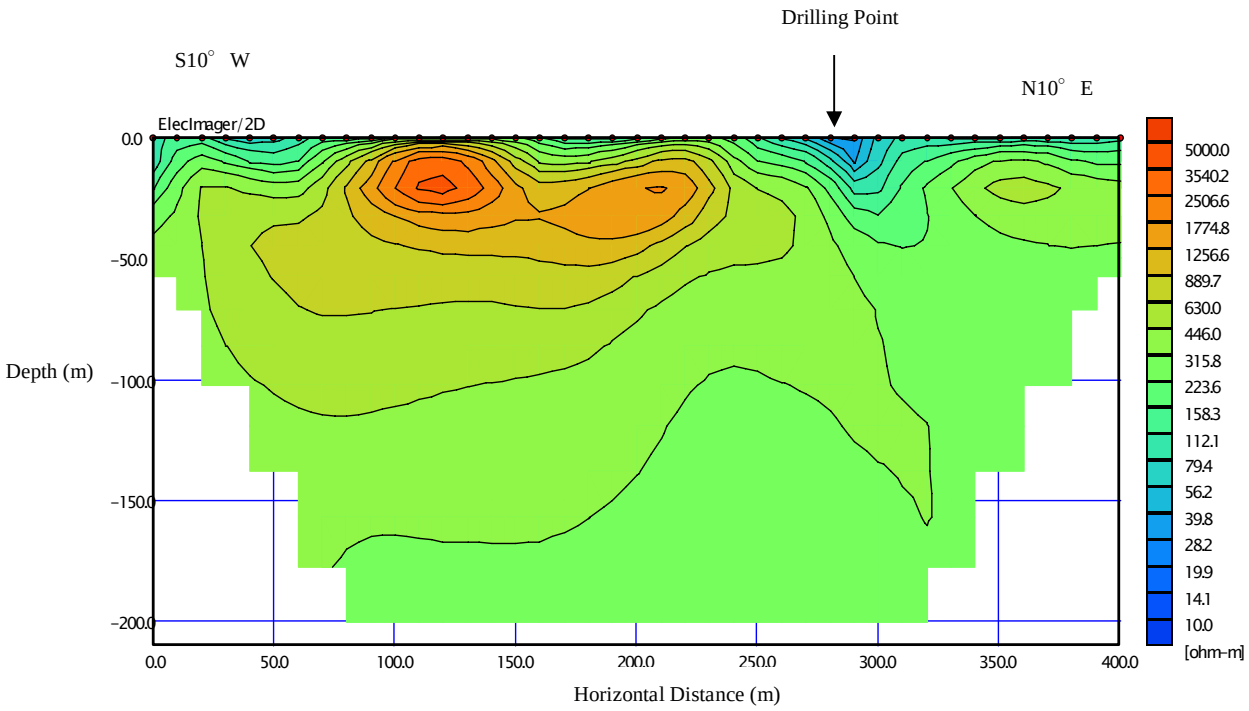
No.6

Two Dimensional Electric Resistivity Survey Result

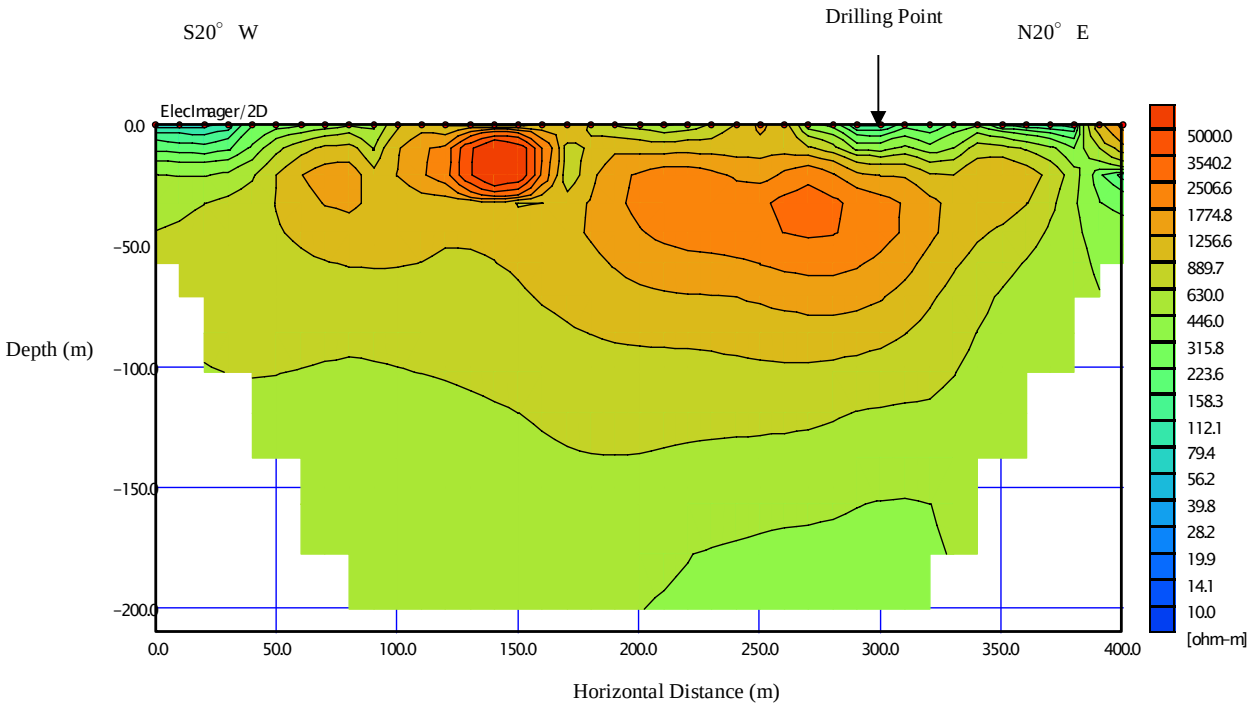
May-dima 12Lines


Drilling Point
S45° E
N45° W
ElecImager/2D
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
5000.0
3540.2
2506.6
1774.8
1256.6
889.7
630.0
446.0
315.8
223.6
158.3
112.1
79.4
56.2
39.8
28.2
19.9
14.1
10.0
[ohm-m]

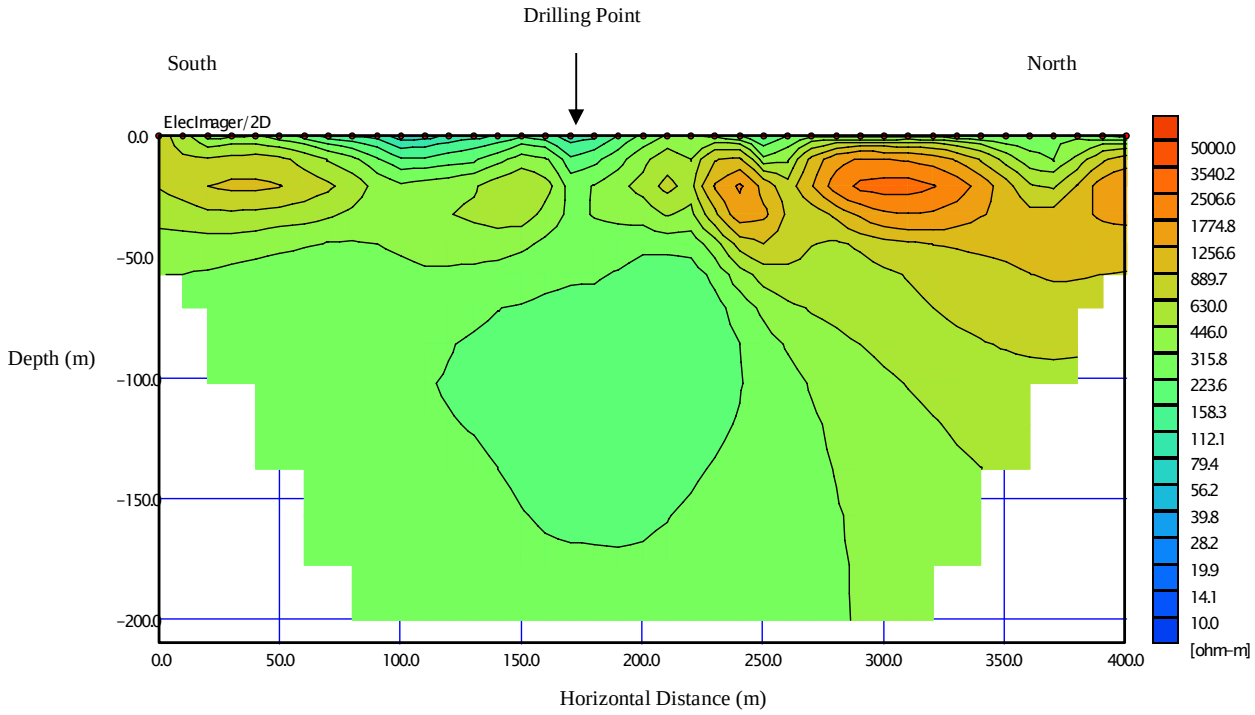
No.1


Drilling Point
S10° W
N10° E
ElecImager/2D
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
5000.0
3540.2
2506.6
1774.8
1256.6
889.7
630.0
446.0
315.8
223.6
158.3
112.1
79.4
56.2
39.8
28.2
19.9
14.1
10.0
[ohm-m]

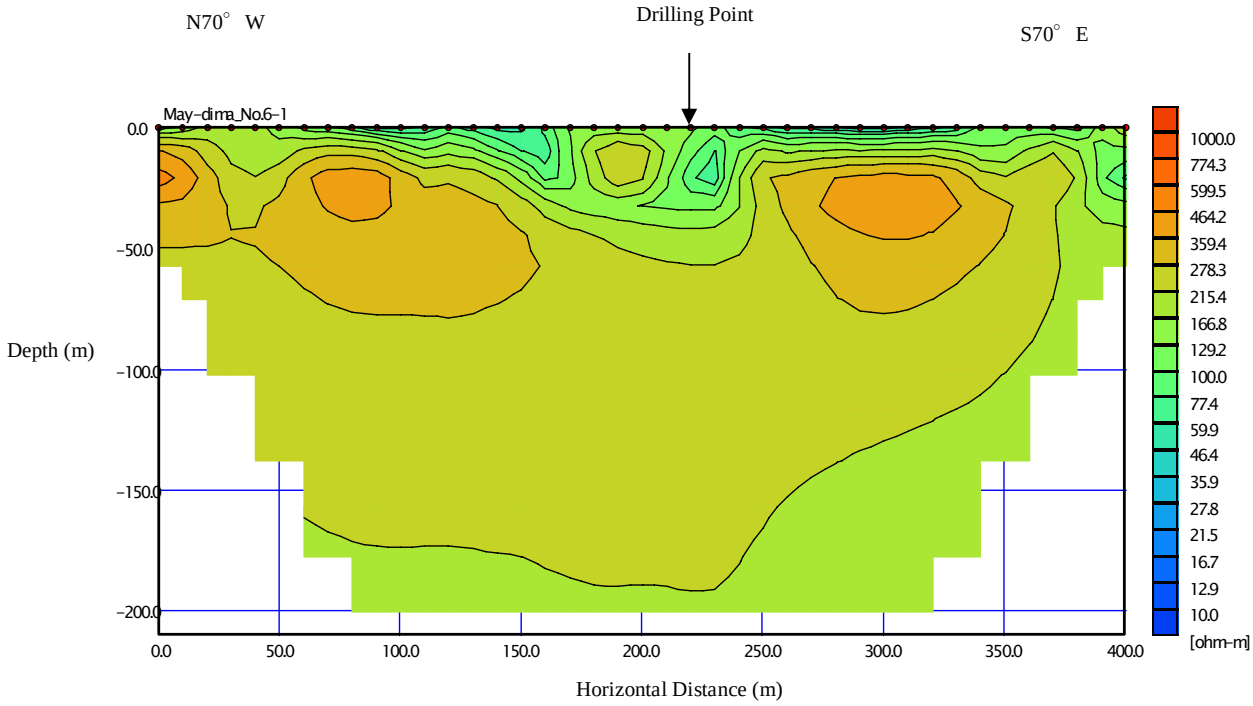
No.3


S20° W
Drilling Point
N20° E
ElecImager/2D
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
5000.0
3540.2
2506.6
1774.8
1256.6
889.7
630.0
446.0
315.8
223.6
158.3
112.1
79.4
56.2
39.8
28.2
19.9
14.1
10.0
[ohm-m]

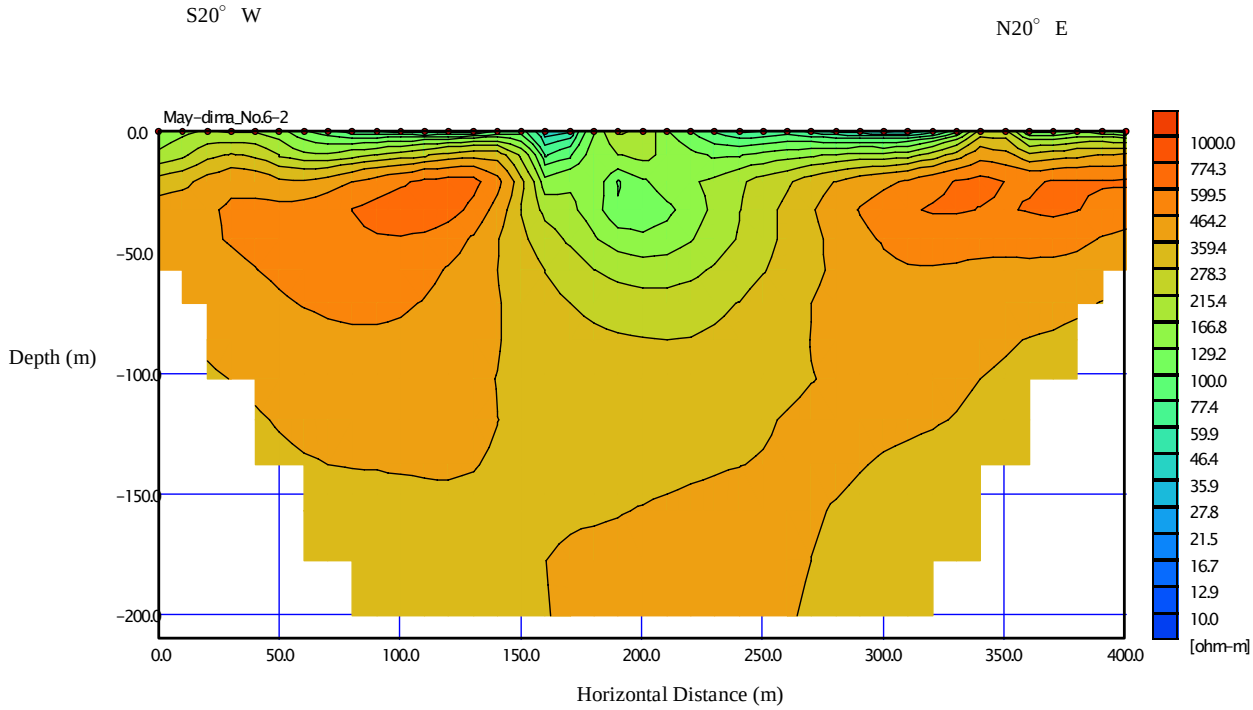
No.4


Drilling Point
South
North
ElecImager/2D
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
5000.0
3540.2
2506.6
1774.8
1256.6
889.7
630.0
446.0
315.8
223.6
158.3
112.1
79.4
56.2
39.8
28.2
19.9
14.1
10.0
[ohm-m]

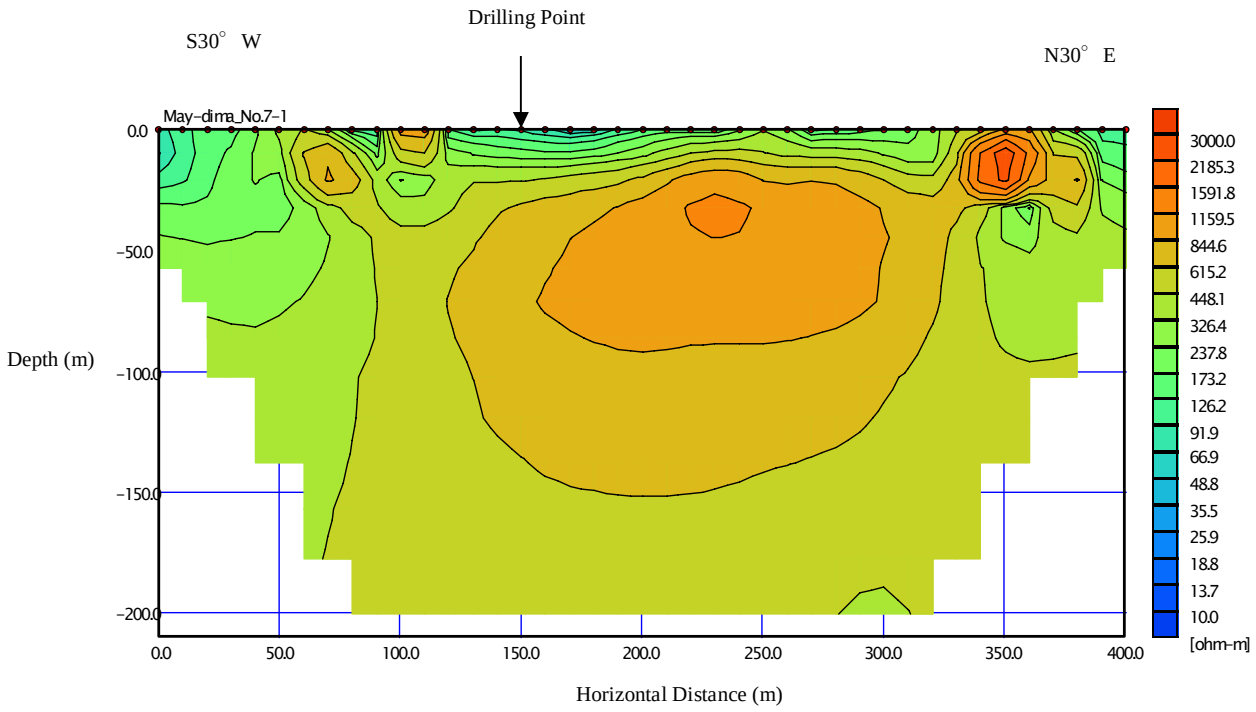
No.5


N70° W
Drilling Point
S70° E
May-dima_No.6-1
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
1000.0
774.3
599.5
464.2
359.4
278.3
215.4
166.8
129.2
100.0
77.4
59.9
46.4
35.9
27.8
21.5
16.7
12.9
10.0
[ohm-m]

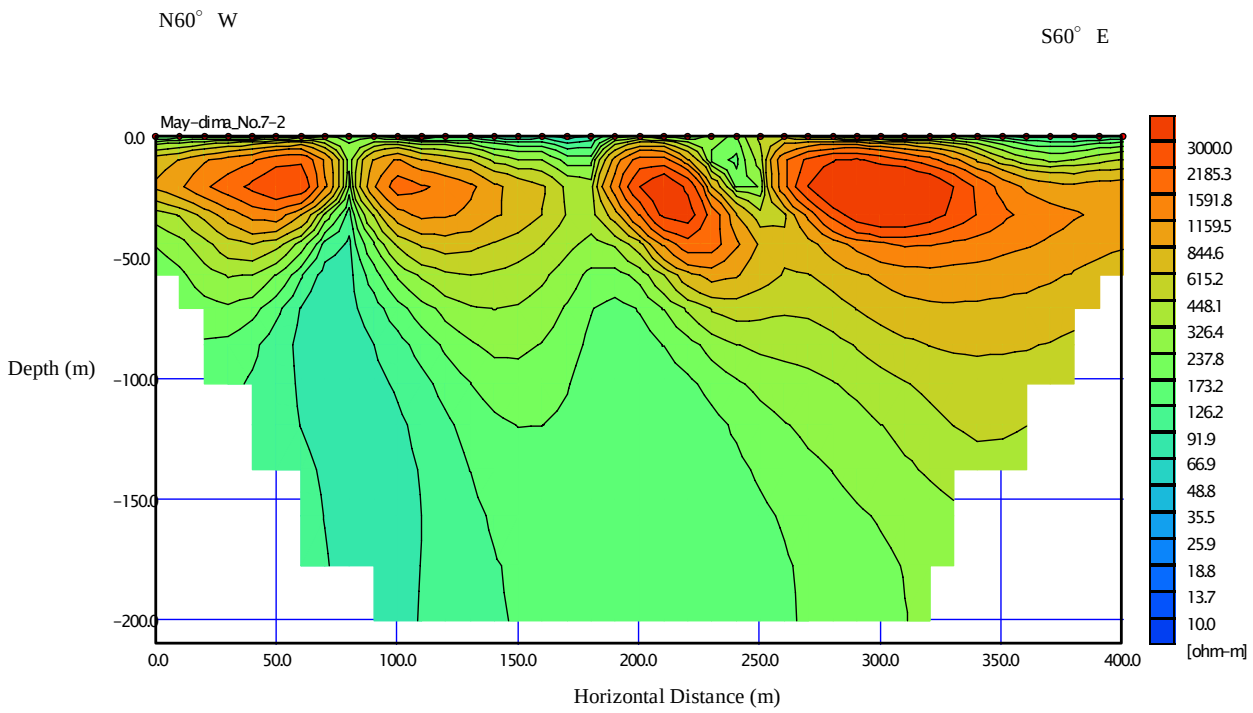
No.6-1


S20° W
N20° E
May-dima_No.6-2
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
1000.0
774.3
599.5
464.2
359.4
278.3
215.4
166.8
129.2
100.0
77.4
59.9
46.4
35.9
27.8
21.5
16.7
12.9
10.0
[ohm-m]

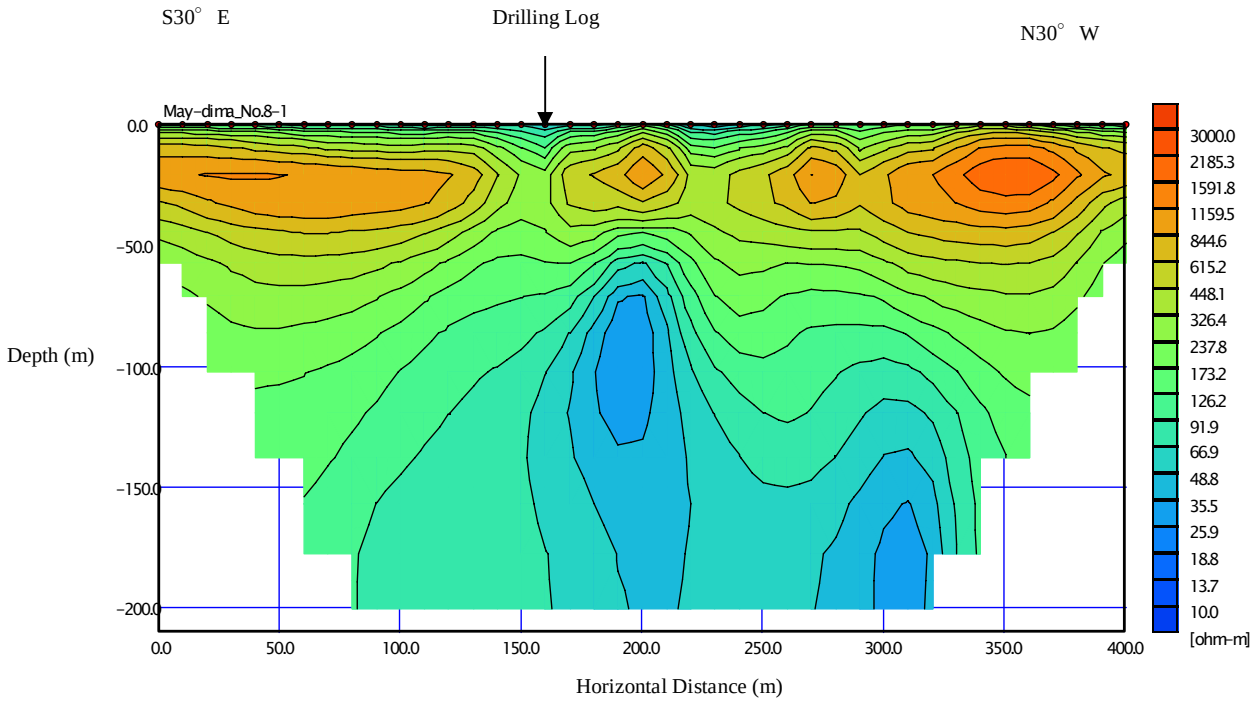
No.6-2


Drilling Point
S30° W
N30° E
May-dima_No.7-1
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

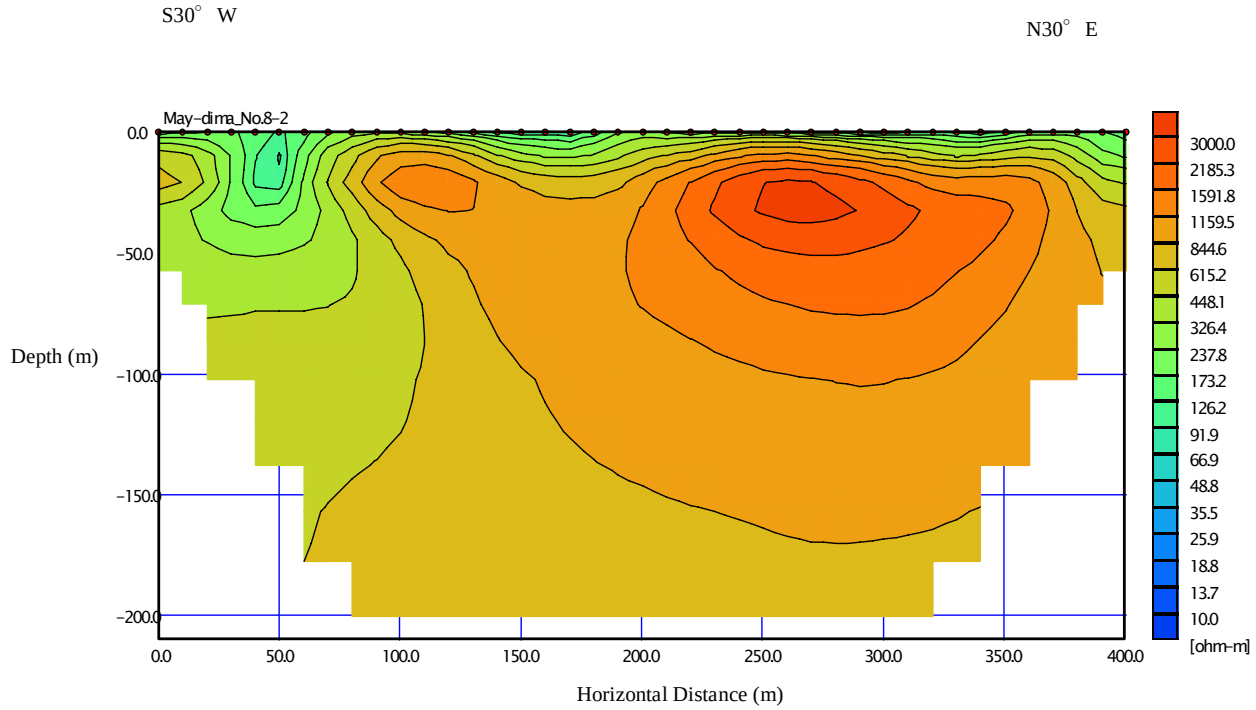
No.7-1


N60° W
S60° E
May-dima_No.7-2
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

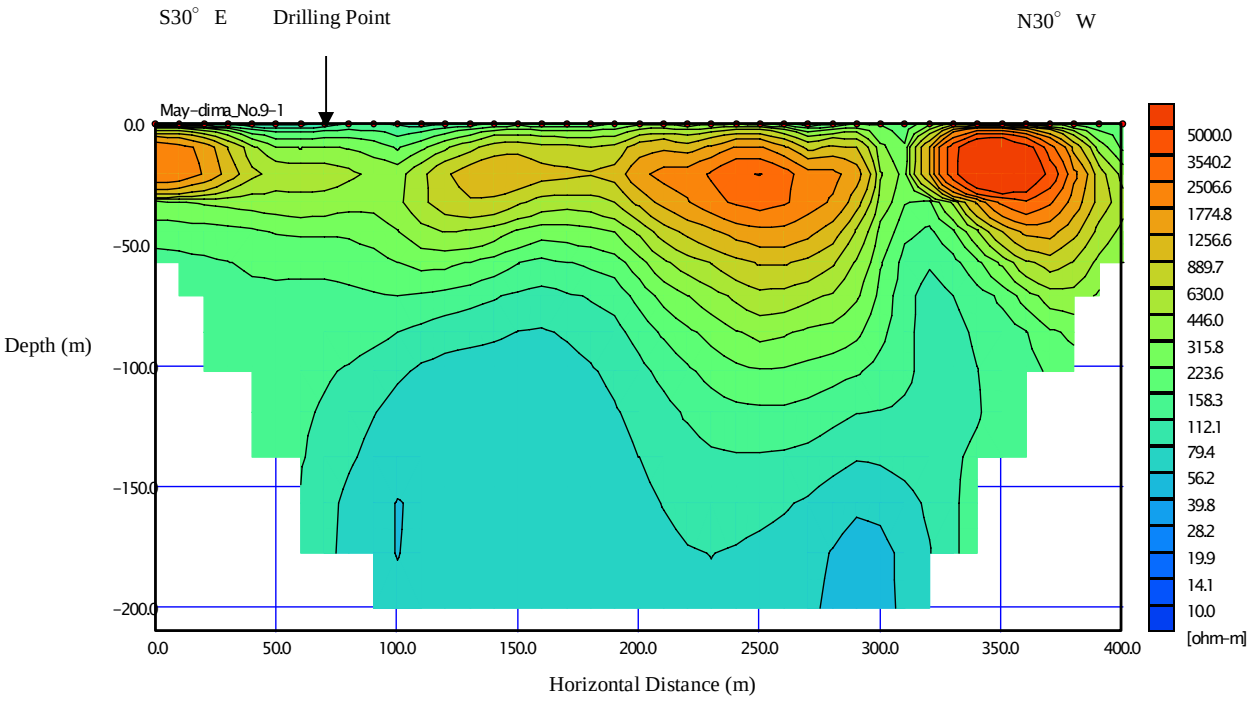
No.7-2


S30° E
Drilling Log
N30° W
May-dima_No.8-1
0.0
-50.0
-100.0
-150.0
-200.0
Depth (m)
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

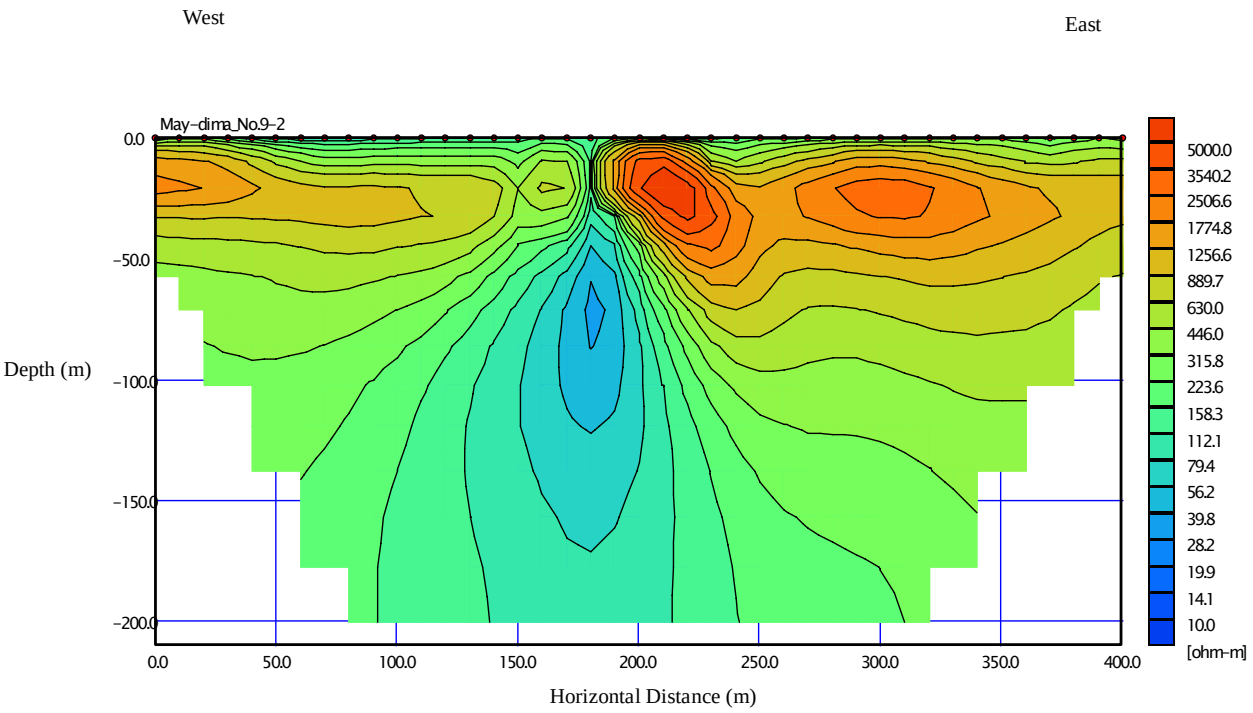
No.8-1


S30° W
N30° E
May-dima_No.8-2
0.0
-50.0
-100.0
-150.0
-200.0
Depth (m)
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

No.8-2


S30° E
Drilling Point
N30° W
May-dima_No.9-1
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
5000.0
3540.2
2506.6
1774.8
1256.6
889.7
630.0
446.0
315.8
223.6
158.3
112.1
79.4
56.2
39.8
28.2
19.9
14.1
10.0
[ohm-m]

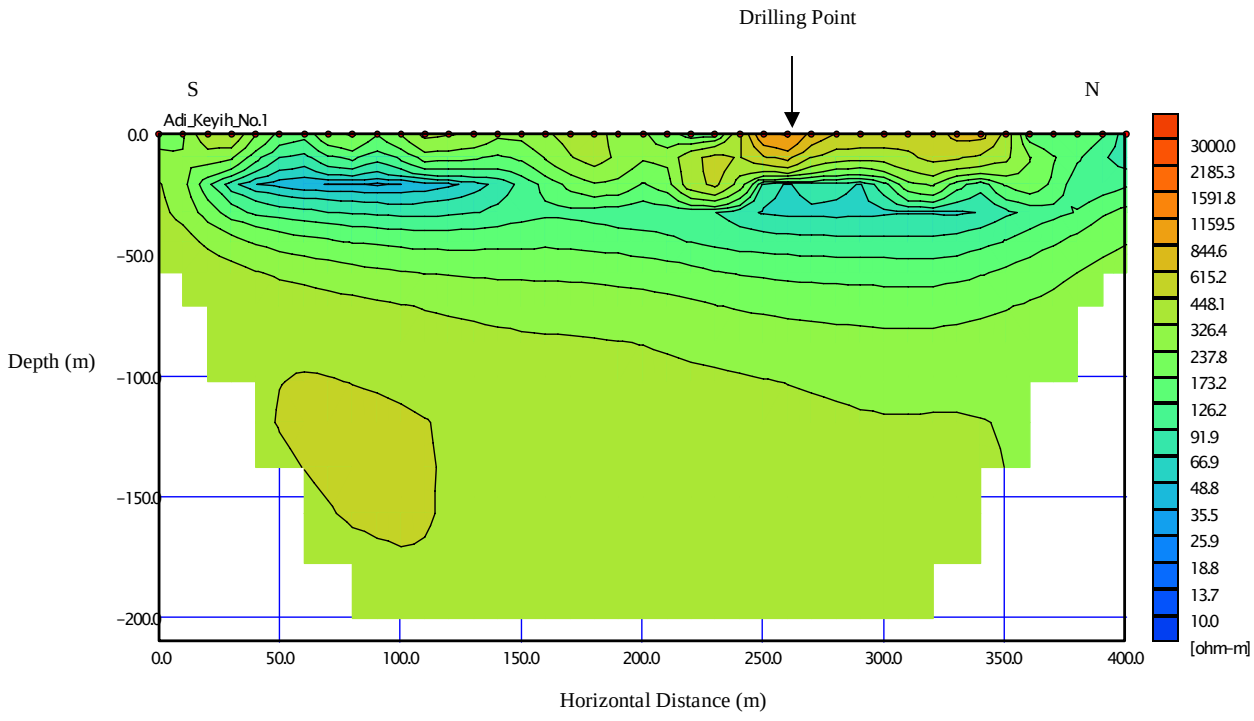
No.9-1


West
East
May-dima_No.9-2
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
5000.0
3540.2
2506.6
1774.8
1256.6
889.7
630.0
446.0
315.8
223.6
158.3
112.1
79.4
56.2
39.8
28.2
19.9
14.1
10.0
[ohm-m]

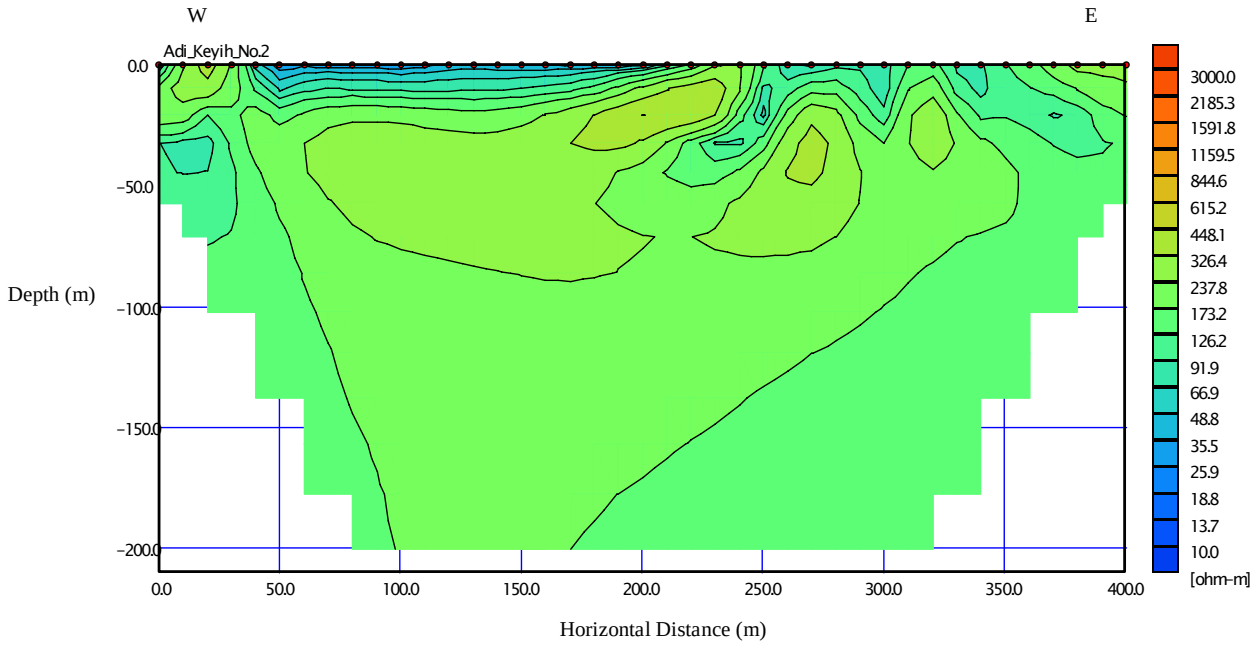
No.9-2

Two Dimensional Electric Resistivity Survey Result

Adi Keyih 20Lines

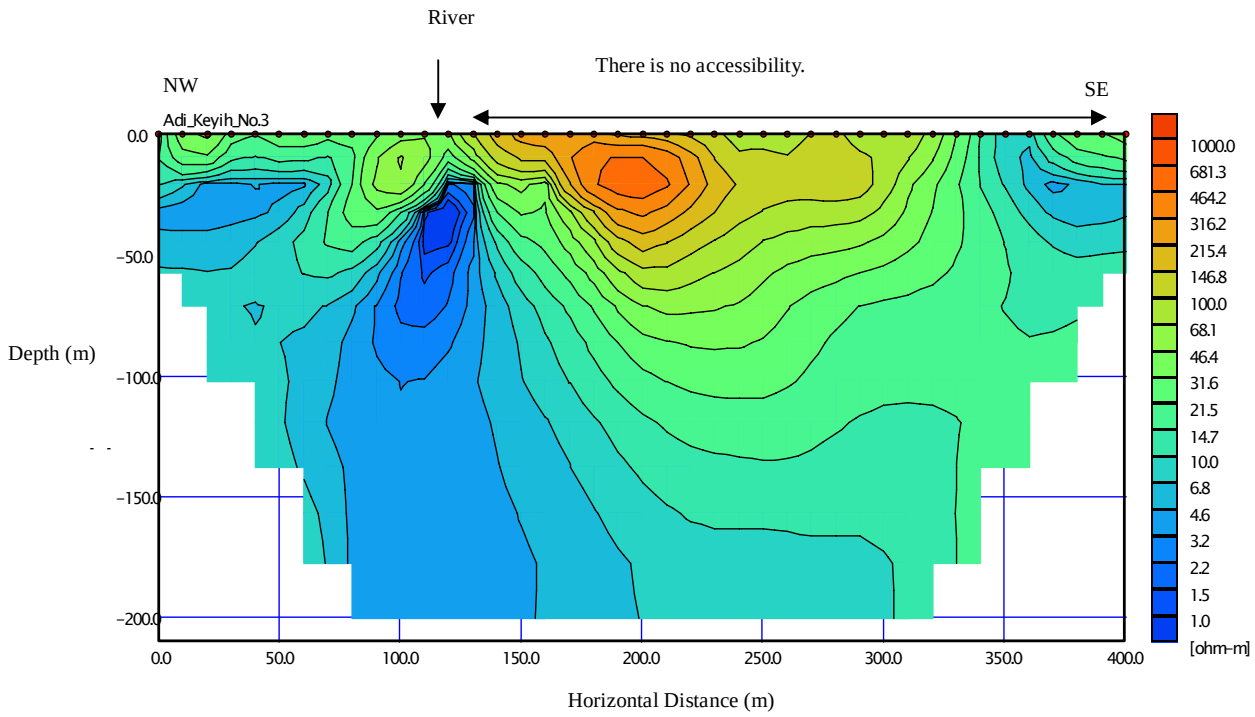


No.1



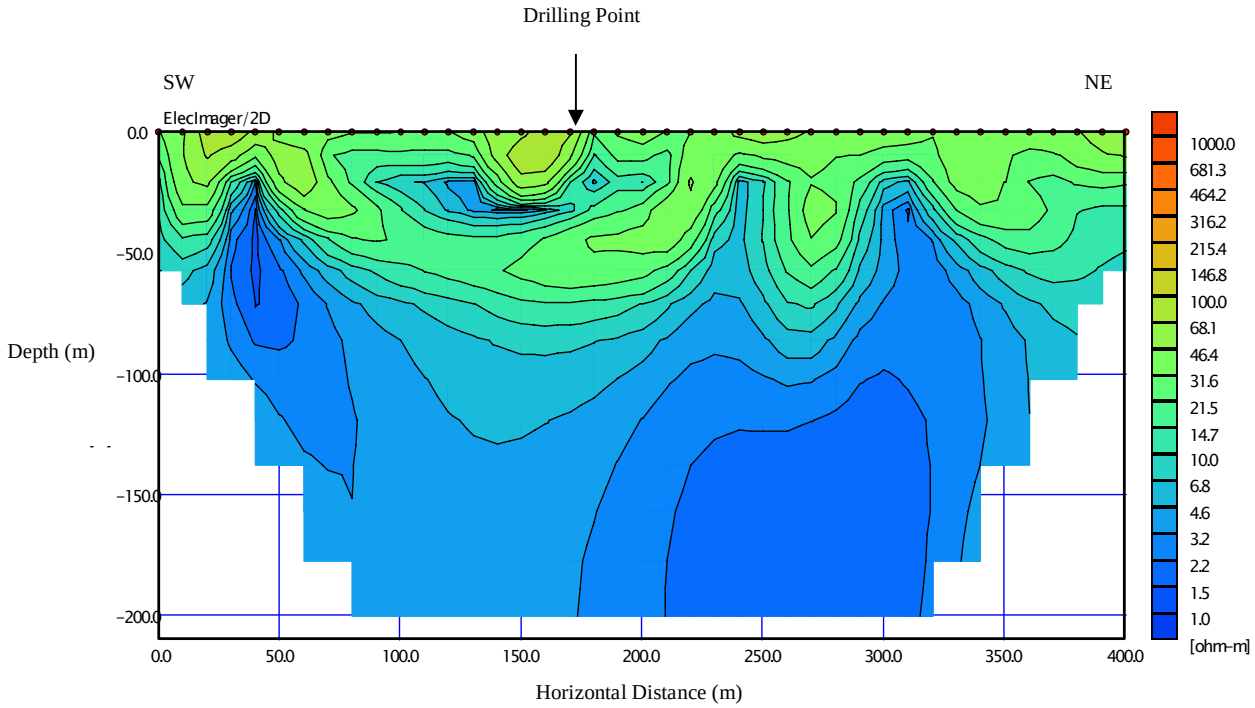
Cancel

No.2

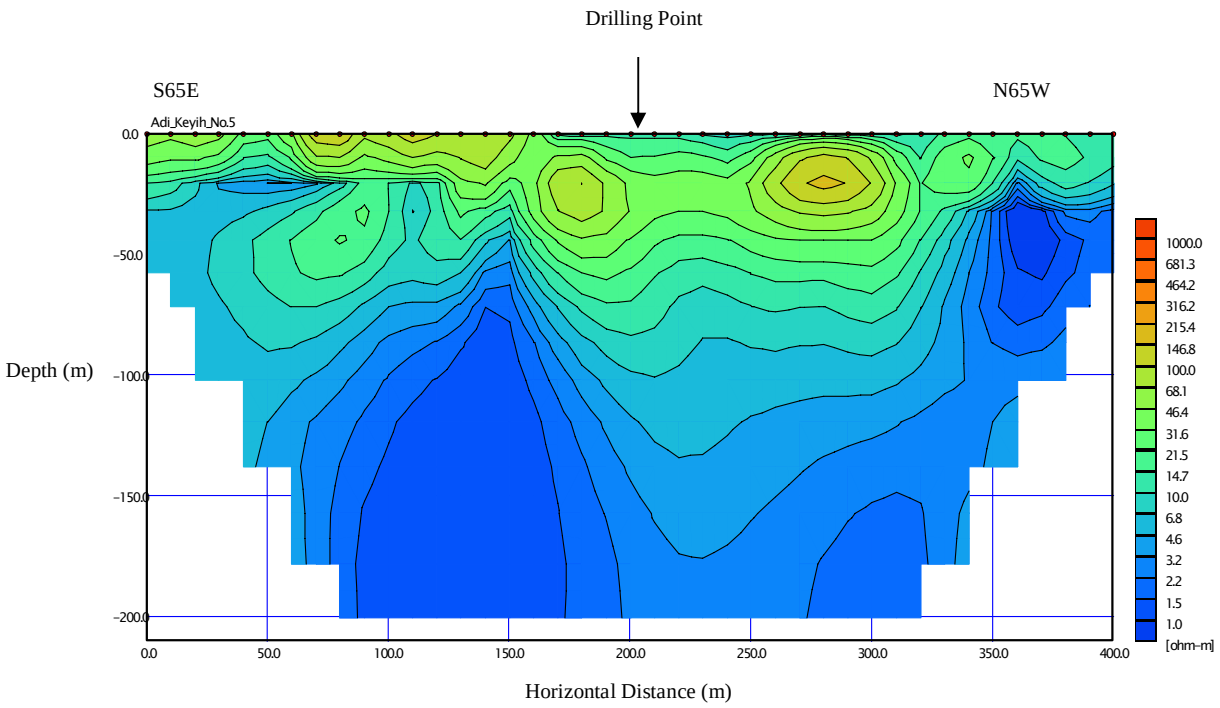


Cancel

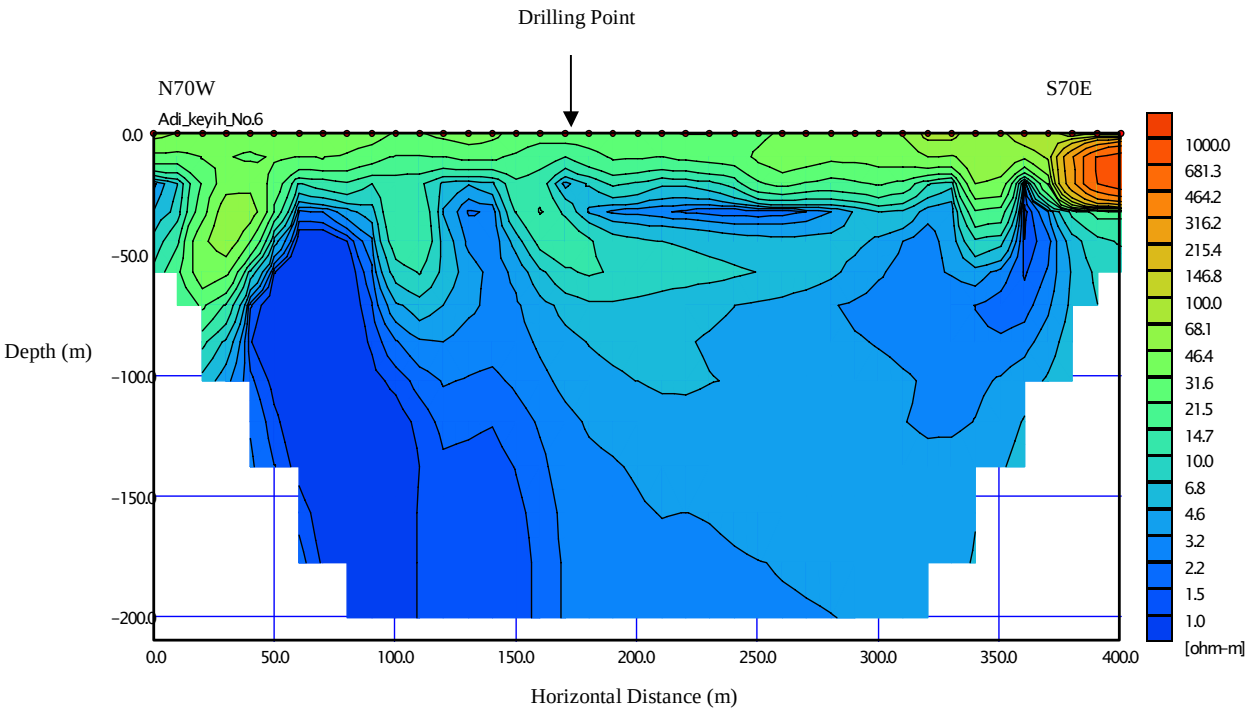
No.3



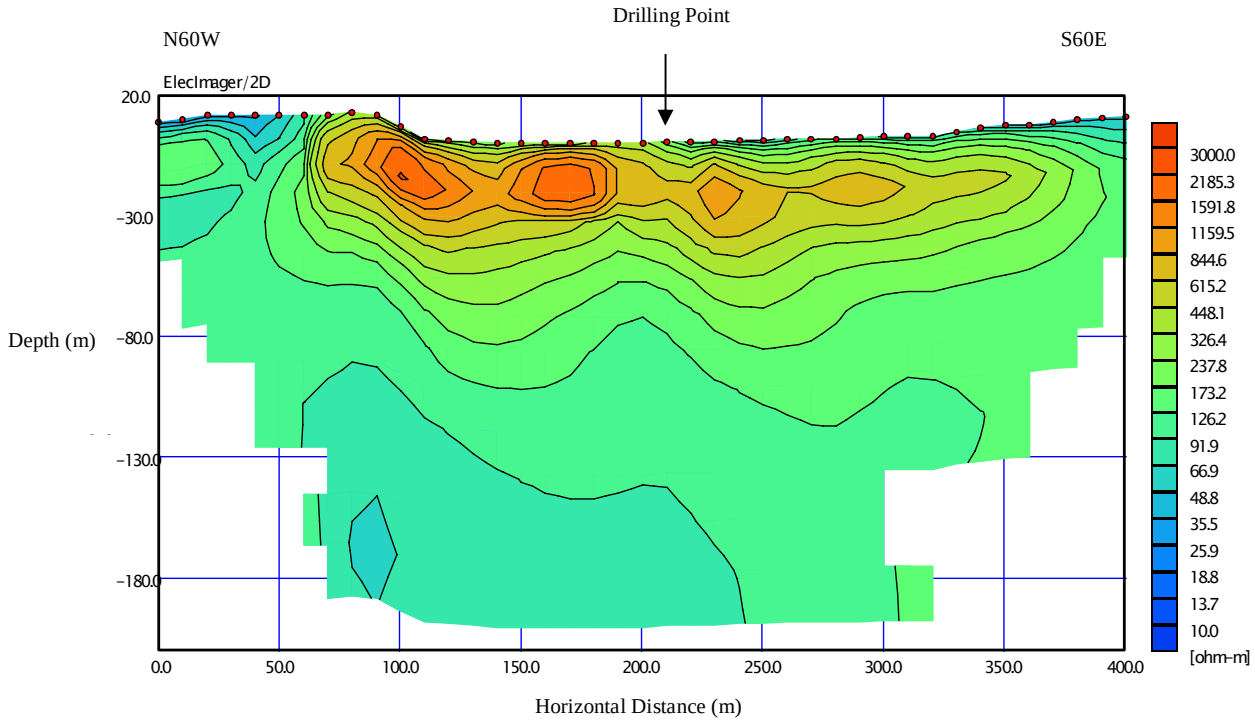
No.4


Drilling Point
S65E
N65W
Adi_Keyih_No.5
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
1000.0
681.3
464.2
316.2
215.4
146.8
100.0
68.1
46.4
31.6
21.5
14.7
10.0
6.8
4.6
3.2
2.2
1.5
1.0
[ohm-m]

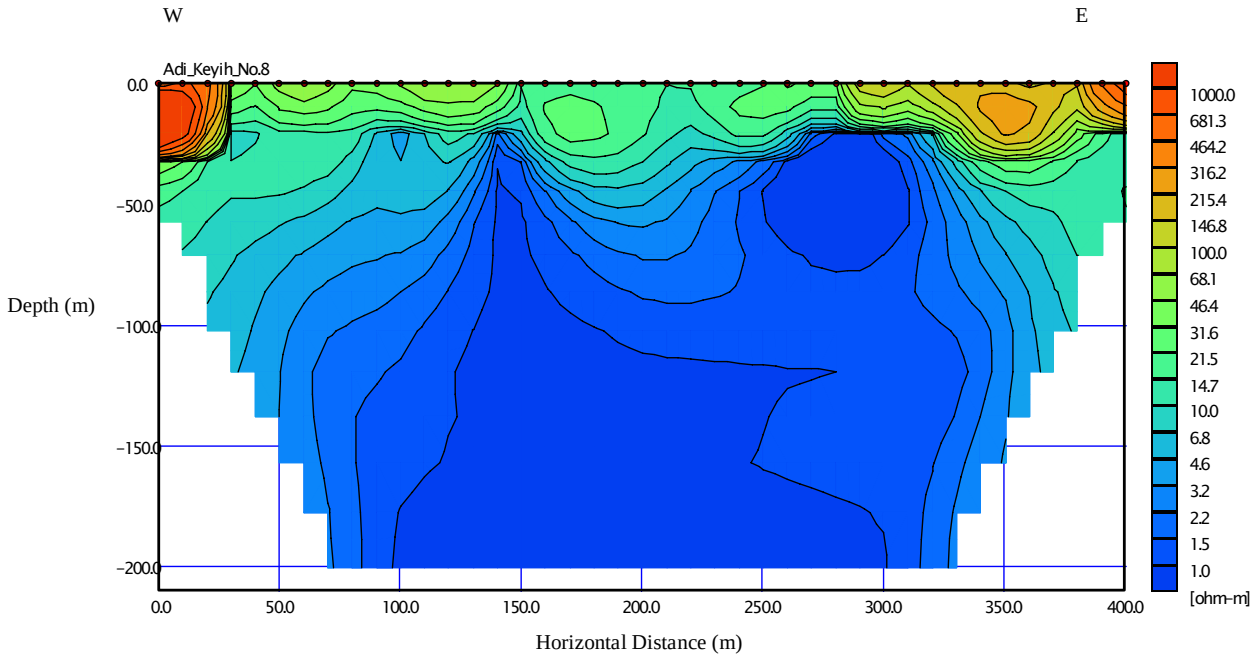
No.5


Drilling Point
N70W
S70E
Adi_keyih_No.6
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
1000.0
681.3
464.2
316.2
215.4
146.8
100.0
68.1
46.4
31.6
21.5
14.7
10.0
6.8
4.6
3.2
2.2
1.5
1.0
[ohm-m]

No.6

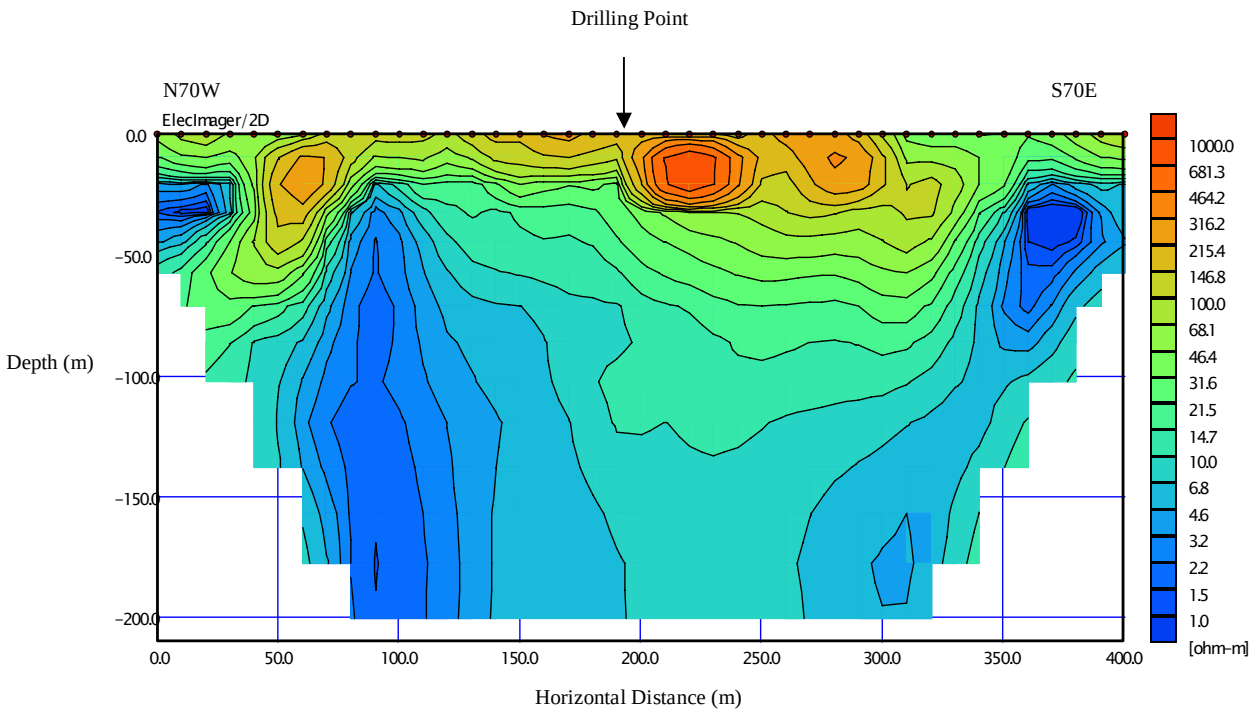


No.7

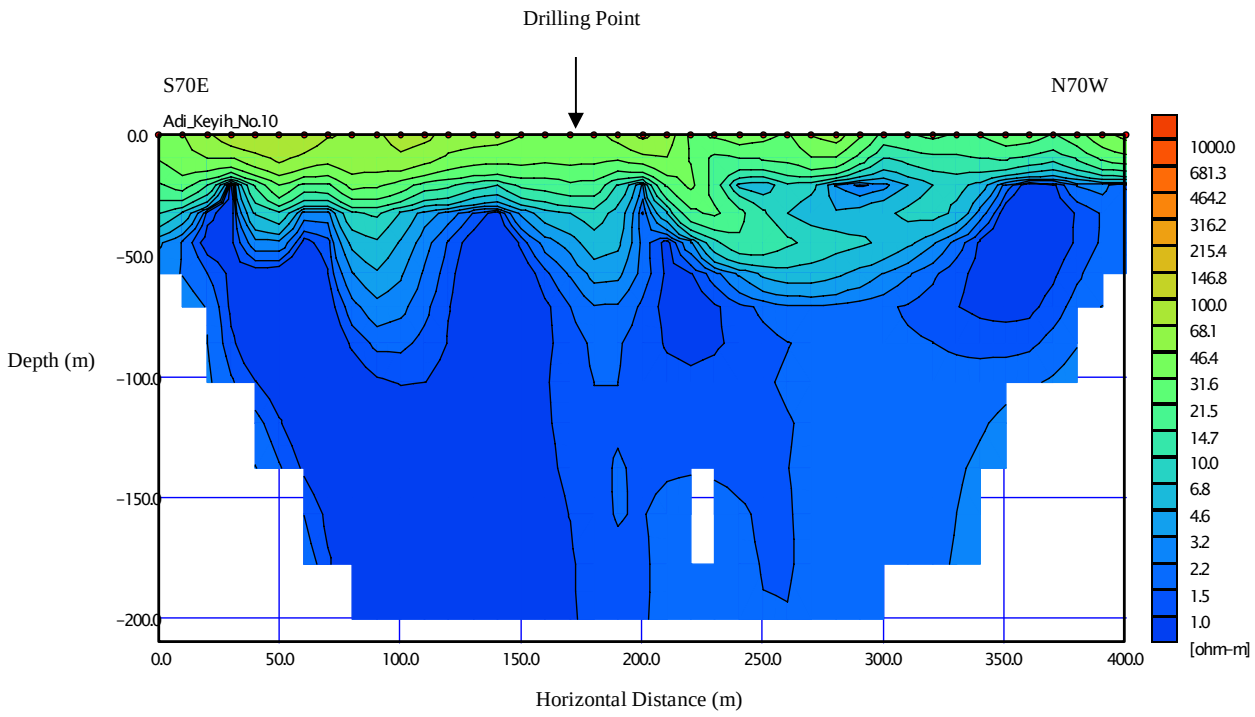


Cancel

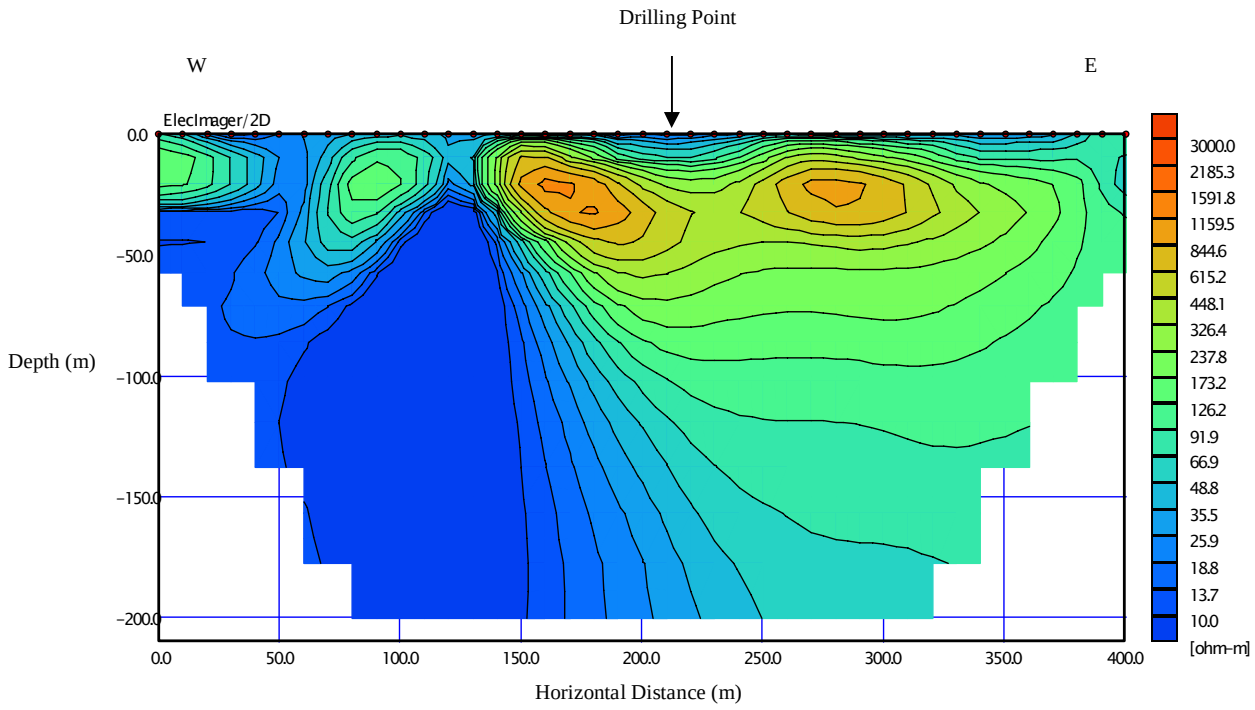
No.8


Drilling Point
N70W
S70E
ElecImager/2D
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
1000.0
681.3
464.2
316.2
215.4
146.8
100.0
68.1
46.4
31.6
21.5
14.7
10.0
6.8
4.6
3.2
2.2
1.5
1.0
[ohm-m]

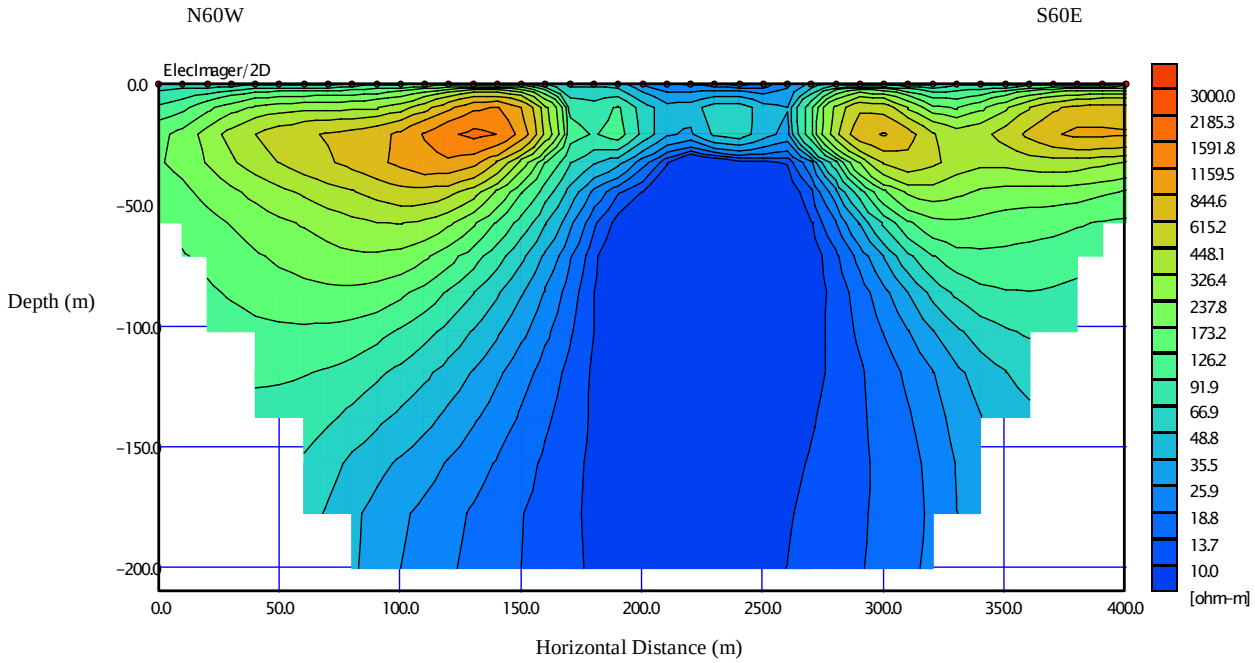
No.9


Drilling Point
S70E
N70W
Adi_Keyih_No.10
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
1000.0
681.3
464.2
316.2
215.4
146.8
100.0
68.1
46.4
31.6
21.5
14.7
10.0
6.8
4.6
3.2
2.2
1.5
1.0
[ohm-m]

No.10

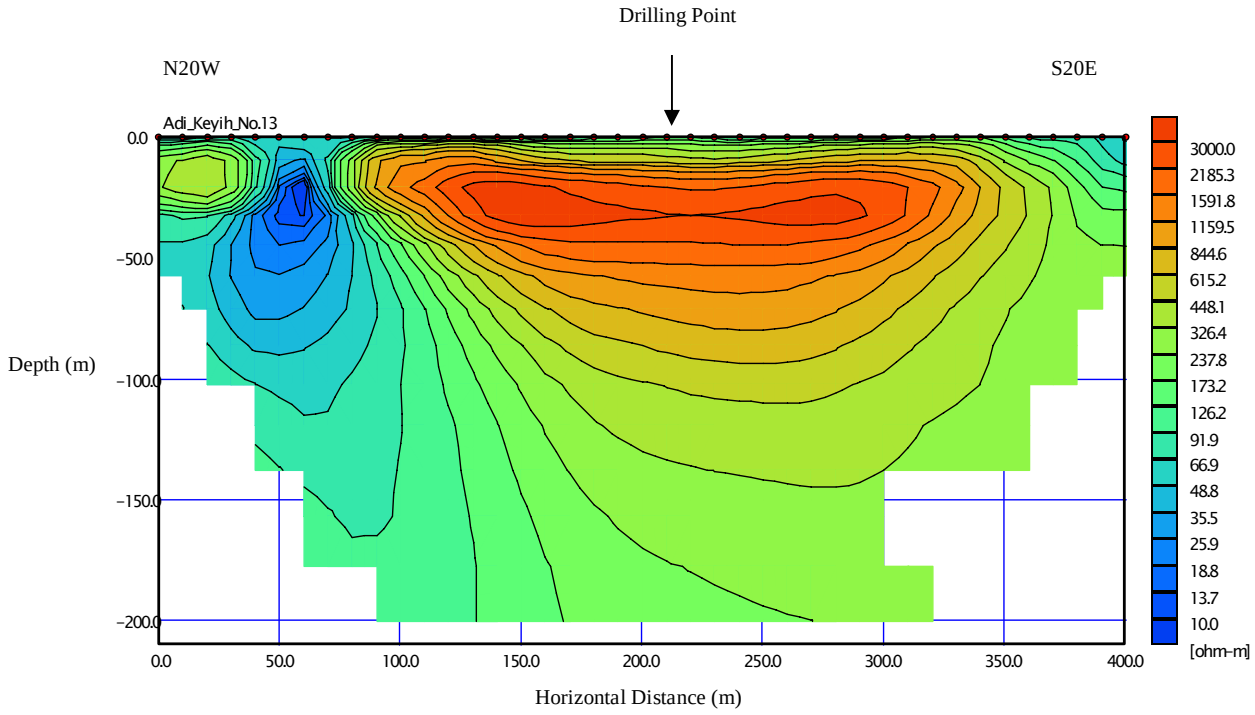


No.11

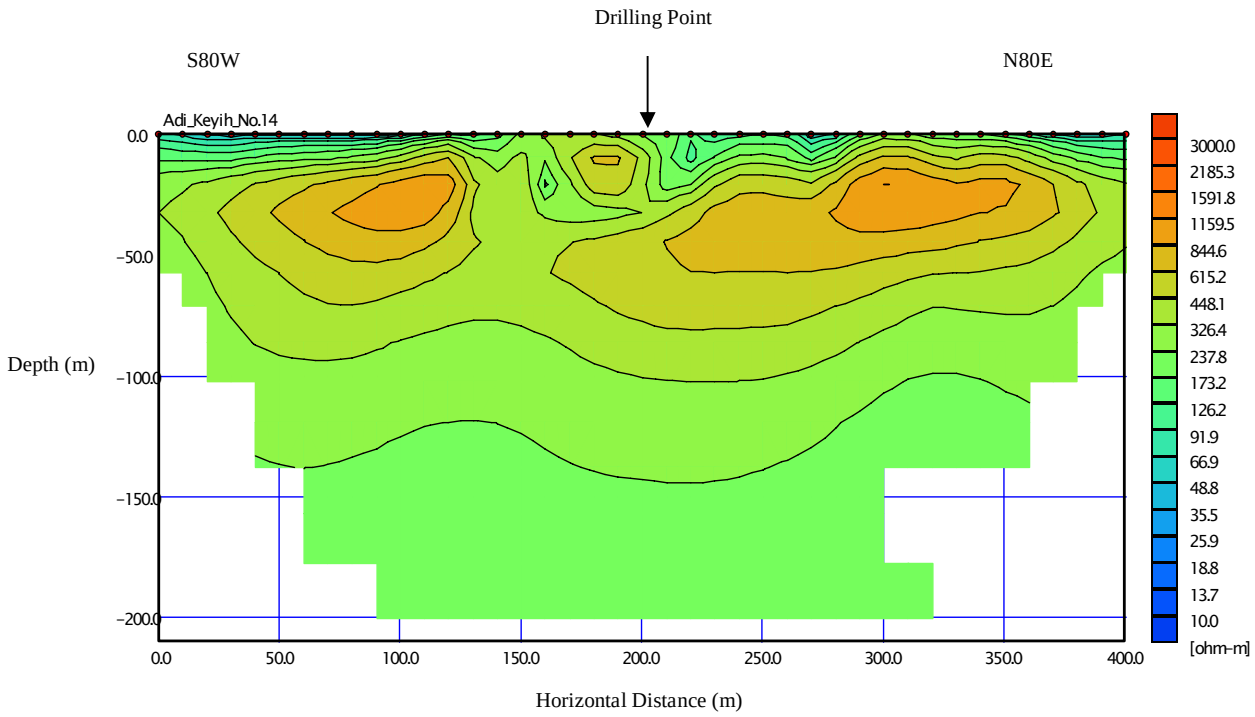


Cancel

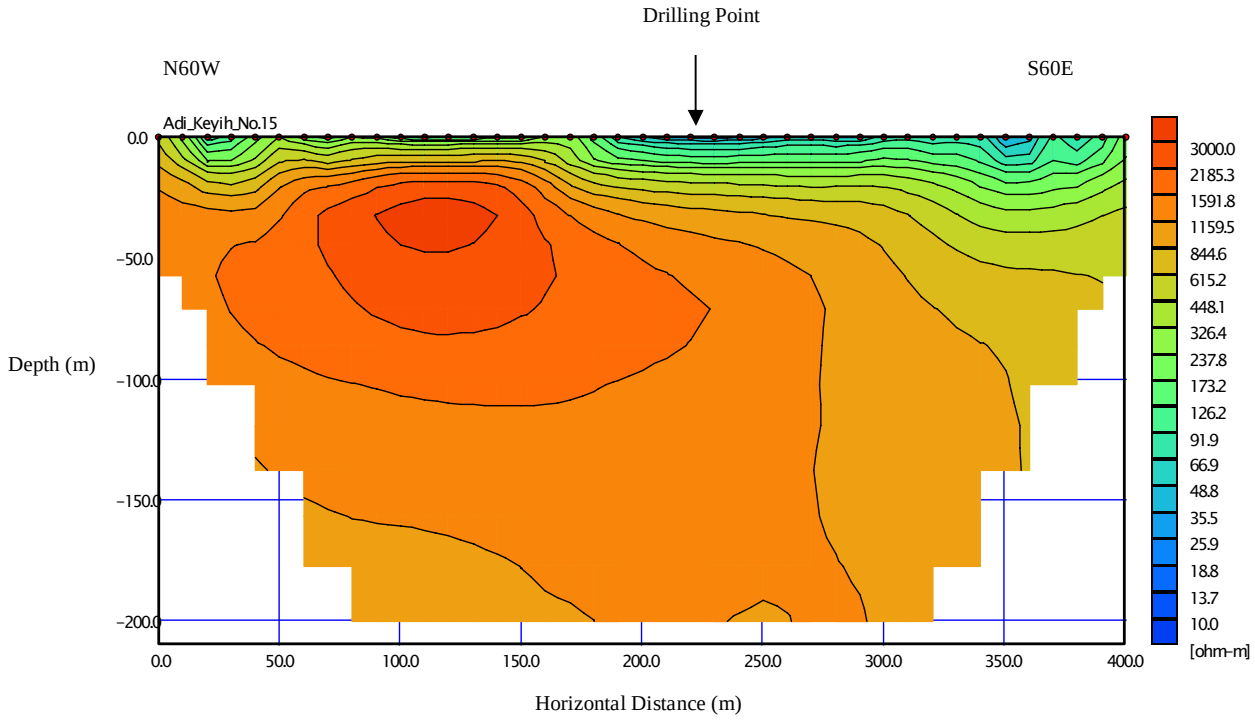
No.12


Drilling Point
N20W
S20E
Adi_Keyih_No.13
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

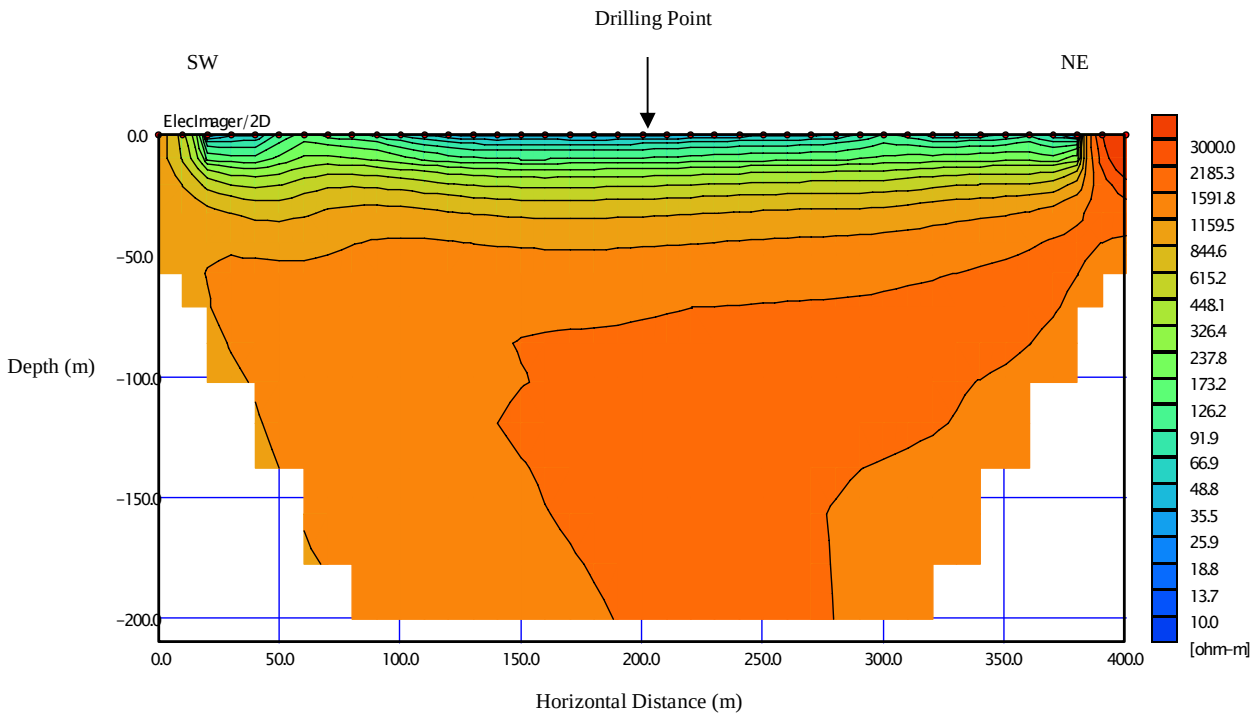
No.13


Drilling Point
S80W
N80E
Adi_Keyih_No.14
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

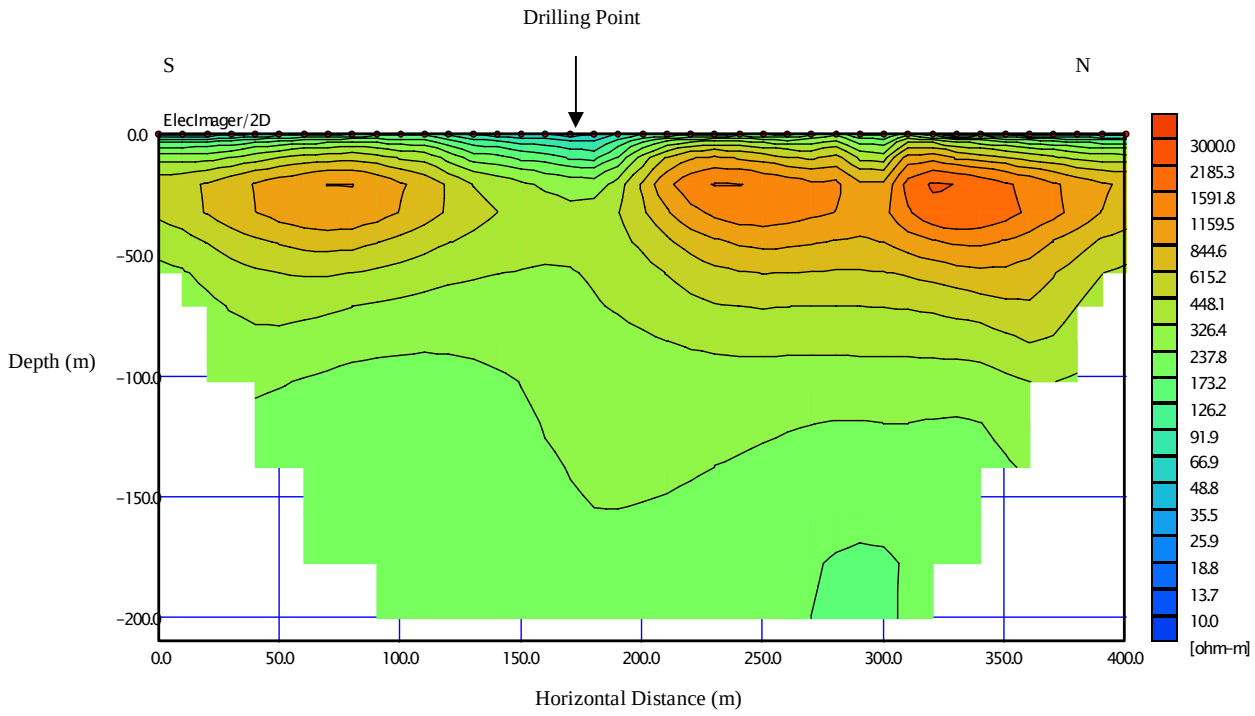
No.14


Drilling Point
N60W
S60E
Adi_Keyih_No.15
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

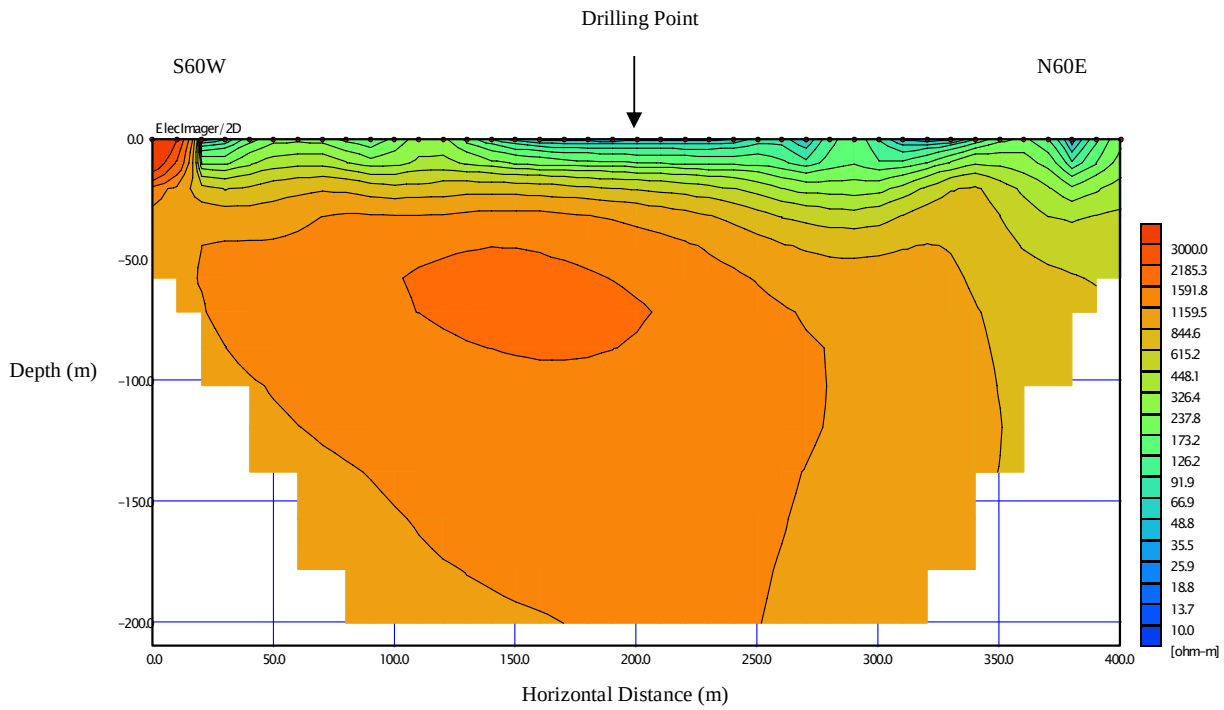
No.15


Drilling Point
SW
NE
ElecImager/2D
Depth (m)
0.0
-50.0
-100.0
-150.0
-200.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

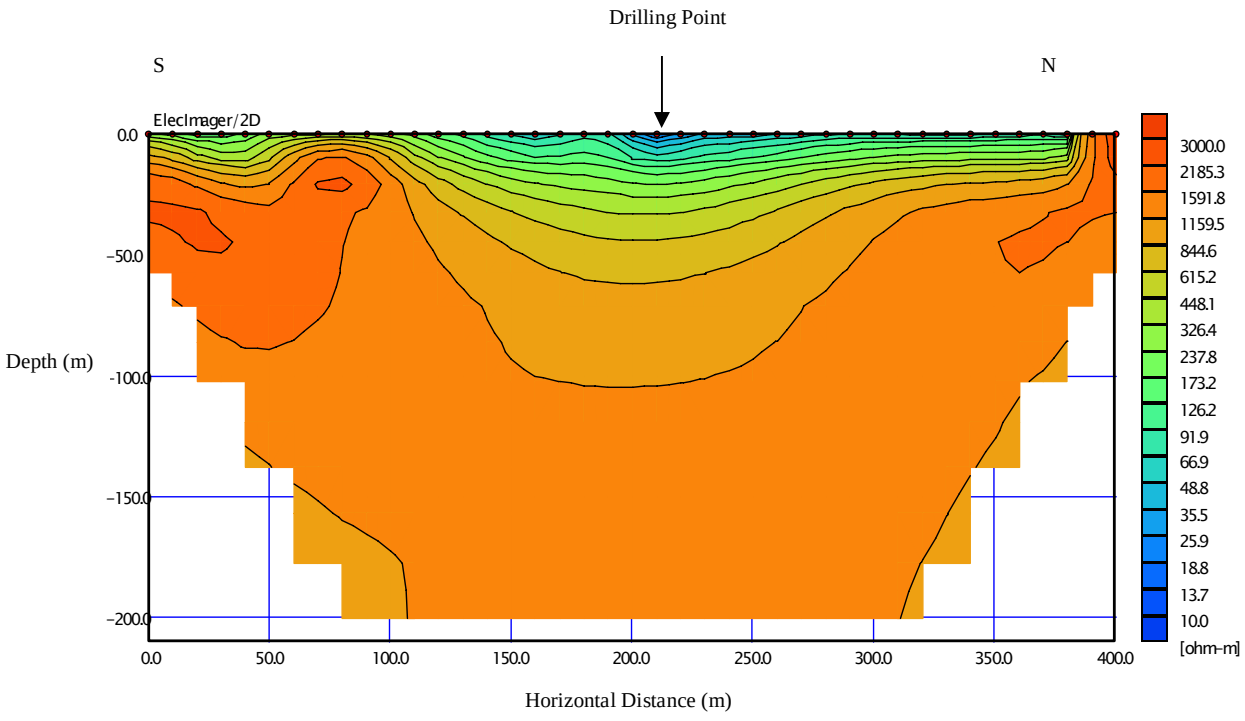
No.16


Drilling Point
S
N
ElecImager/2D
0.0
-50.0
-100.0
-150.0
-200.0
Depth (m)
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

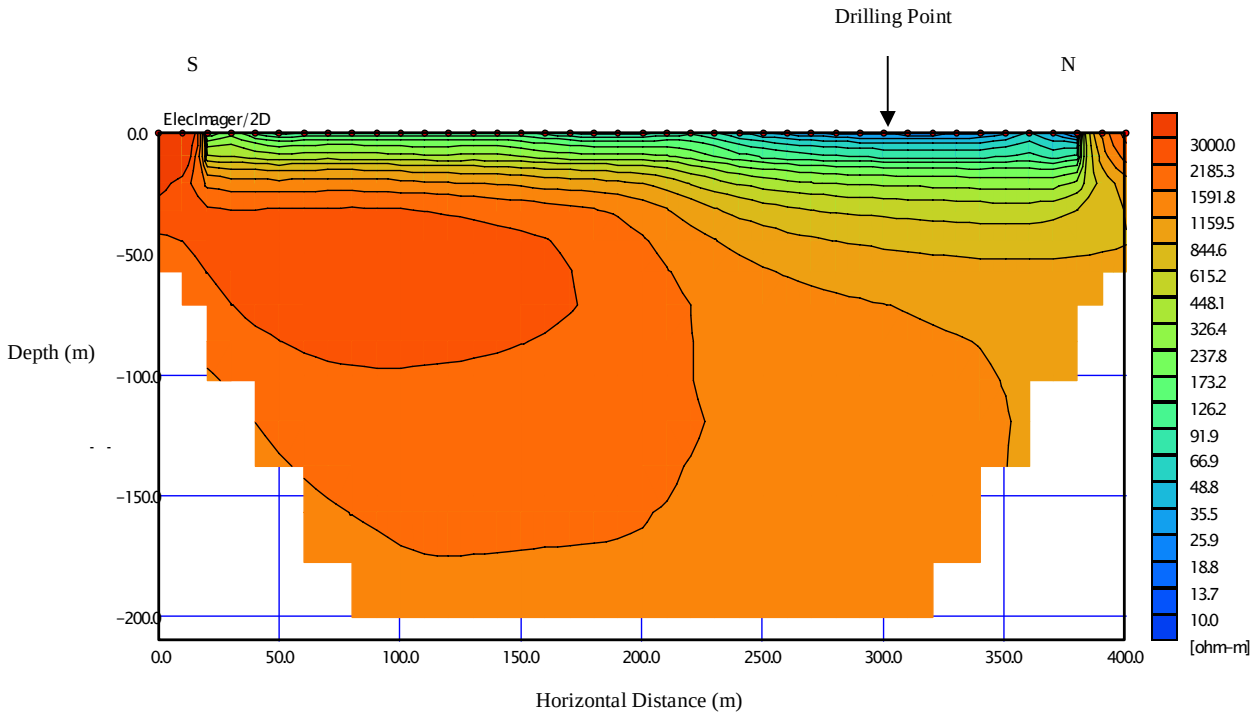
No.17


Drilling Point
S60W
N60E
ElecImager/2D
0.0
-50.0
-100.0
-150.0
-200.0
Depth (m)
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

No.18


Drilling Point
S
N
ElecImager/2D
0.0
-50.0
-100.0
-150.0
-200.0
Depth (m)
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

No.19


Drilling Point
S
N
ElecImager/2D
0.0
-50.0
-100.0
-150.0
-200.0
Depth (m)
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Horizontal Distance (m)
3000.0
2185.3
1591.8
1159.5
844.6
615.2
448.1
326.4
237.8
173.2
126.2
91.9
66.9
48.8
35.5
25.9
18.8
13.7
10.0
[ohm-m]

No.20