

25 years of Successful Joint Israeli-Jordanian Boundary Making and Boundary Maintenance – Part 1

Haim SREBRO, Israel

INTRODUCTION

In 1994 Israel and Jordan signed a Peace Treaty, which included an innovative boundary delimitation, making use for the first time of orthophoto maps. It included boundary making procedures, regarding demarcation, monument placement and surveying, boundary documentation and maintenance, as well as maritime boundary delimitation. For these tasks a Joint Team of Experts (JTE) was established as part of the Joint Boundary Commission.

The boundary line passes on land (Ha'Aravah/Wady Araba Valley), in the sea (The Red Sea), through a lake (The Dead Sea), and along rivers (The Jordan and Yarmouk Rivers). For the last 25 years the JTE has fulfilled successfully all its tasks, solving all the challenging boundary issues.

These issues included reconstruction and placement of boundary pillars because of natural causes like seasonal floods and sea water erosion, as well as reconstruction and re-placement of boundary pillars due to artificial works along the boundary. It included delimitation of the maritime boundary and the boundary in the Dead Sea which keeps shrinking fast as a result of lowering of the sea surface, including its northern coastline, that moves southwards enforcing the elongation of the Jordan River for hundreds of meters creating a new situation regarding the boundary line (A boundary line in a lake is transformed to a boundary in a river in a different location). Other cases referred to cases in rivers, including natural changes in the river course of a boundary river, both slow natural changes due to accretion and sudden natural changes due to floods and collapse of river banks. Other cases referred to changes in the course of rivers due artificial activities.

The joint active cooperation of the JTE competed continuously with all these issues, sometimes proactively in order to prevent or take measures before problems rise, and many times dealing with issues on the fly when problems are faced. The preparation of the JTE since 1994 to cope with the problems and its preparedness to react fast, to meet and to visit remote locations turned the JTE, which had been formed originally as a professional organ, into the main joint organ that takes care for the practical boundary issues.

In order to cope with the situation, the JTE, which acts as the right hand of the JBC, has prepared Standard Operating Procedures, it holds annual reconnaissance along the boundary line and annual meetings. In addition, it holds many other meetings according to requirements. The JTE members keep close relations with other ministries on each side, and especially the defense authorities, as well as legal advisers and the liaison organizations on both sides. The chairs of the JTE report to the chairs of the JBC. The JTE includes active members of national mapping organizations on both sides as their working force and thus make use of most advanced technologies in surveying mapping and geo-information.

Part 1 elaborates on the involvement of the JTE in the boundary making and in the boundary delimitation, demarcation and documentation.

Part 2 elaborates on the JTE activities on boundary maintenance during the last 25 years.

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GENERAL

The Israel-Jordan Joint Team of experts was established in July 1994 during the first session of the Joint Boundary Commission (JBC) as part of the stage of beginning intensive talks on site at the Aravah (Wadi Araba), in order to prepare an Israeli-Jordanian Peace Treaty. The main task of the JTE was to be the executive sub-committee of the JBC for all practical matters, including: the preparation of a professional annex to the peace agreement regarding the delineation of the international boundary line; delimiting the boundary line and marking it in the field; demarcating the boundary by boundary pillars; surveying the boundary pillars; documenting the boundary and maintaining it in the future.

The JTE has fulfilled these tasks successfully, and, in addition, has promoted the relationship between the two sides. The boundary making model developed and implemented by the JTE, was indicated in professional literature¹ as a model for international boundary making. Last year, the JTE has accomplished 25 years of successful cooperation of boundary making and boundary maintenance. The frequency of its meetings during least years is between five and ten meetings a year, being the most active joint committee of all committees established during the peace process, not to mention military cooperation.

The JTE operates along a boundary area 400 km long, through various landscapes, along the lowest valley on earth, including a land sector (The Aravah/Wadi Araba), a river sector (The Jordan and Yarmouk Rivers), a lake sector (The Dead Sea) and a maritime sector (The Gulf of Eilat/Aqaba). Part of the boundary follows (relatively²) stable land ground and part of it follows unstable ground along moving rivers and a shrinking lake.

The work of the JTE is characterized by close cooperation. It operates as one team chaired by two persons – one of each side. The JTE works as part of the JBC, by virtue of the authority granted to the JBC by the Peace Treaty.

THE ESTABLISHMENT OF THE JTE AND THE DEFINITION OF ITS TASKS

The Common Agenda document, signed at the White House on September 14, 1993 by the two leaders – Rabin and Hussein – and by President Clinton, included an agreement on a process leading to a Peace Treaty, and on principles and components referring to settlement of territorial matters.³ These matters included territorial subjects and the final delimitation and

¹ Adler R., 1995; Adler R., 2001; Srebro H. and Shoshany M., 2009; FIG, 2013;

² The Aravah area is influenced by winter floods and by wind erosion.

³ Article C of the Common Agenda

demarcation of the international boundary between Israel and Jordan with reference to the boundary under the British Mandate, without prejudice to the status of territories that came under Israeli military control in 1967.

Following this agreement, both sides signed on June 7, 1994 a detailed document on the subjects regarding borders and territorial matters.⁴ This document stated that the talks will move from Washington to the border area for the practical phase⁵. The main tasks stated in this document were as follows:

The following procedure is agreed, and is to be applied in the negotiations to be held in the region.

(a) Agreement to establish a joint mechanism (a boundary sub-commission of the Commission on security, boundaries, water, environment and other related issues), whose objectives will be to assist in arriving at a settlement of borders and territorial matters.

(b) The sub-commission will initially prescribe the modalities of preparing joint maps of the region of the boundary and any additional material, including, as appropriate, a joint survey for this purpose.

The joint maps shall be in English and shall reflect physical features of the areas along the boundaries between the two states.

(c) The sub-commission will further advise the respective parties on the ways to reach agreement as to the process set forth in Art. B(5) of the Common Agenda.

(d) Once agreement is reached the sub-commission will be responsible for the preparation of the procedures for delimitation and demarcation of the international boundary between Jordan and Israel, and will perform those tasks.

(e) The proposed mechanism will work in close conjunction with the security sub-commission in order to ensure that coordination takes place. This will facilitate more detailed discussions, taking place in parallel, on all issues pertaining to bilateral security arrangements on and in the areas close to the defined international boundary based on Art. B(5) of the Common Agenda.

(f) The negotiations on the mutually satisfactory solutions of the boundary issues will be finalized in a Treaty of Peace, as stipulated in Article C of the Common Agenda.

The first meeting of the joint boundary commission took place in a special tent constructed for the purpose of the bilateral peace negotiations, on July 8, 1994. The chairs of the committee were Major General Tahsin Shurdom from Jordan and Adv. Moshe Kochanovsky from Israel. The Israeli team offered on the first meeting to establish a joint team of experts, as a sub-committee. Col. Haim Srebro, the initiator of the offer, introduced the principles of the activity of the JTE, its missions, its modes of operation and its products.

⁴ The Jordan-Israeli COMMON Sub-Agenda Borders and Territorial matters

⁵ The chosen area was Ein Evrona at the south of the Aravah.

On July 19, 1994, following discussions in the boundary commission, the commission agreed on the following two documents. One document referred to the establishment of a sub-committee to be called the joint team of experts (JTE), that would be responsible for implementing the matters regarding the international boundary. The JTE should prepare a timetable for its activities in order to fulfil its tasks, working continuously along the boundary line, and reporting to the JBC as required. The second document elaborated on the way of mutual production of the required materials as well as the extent of use of the joint products.

19 JULY 94

**AGREED MEMORANDUM OF THE
JORDAN ISRAEL BOUNDARY SUB-COMMISSION**

In accordance with "the Jordan Israel Common Sub-Agenda Borders and Territorial Matters " of June 7 1994 and Article B(5) of the "Israel Jordan Common Agenda " of 14 September 1993,

The Israel Jordan boundary sub-commission met in the Wady Araba / Emek Ha'arava on the 18 and 19 July 1994 and reached agreement on the following methods for the continuation of its work.

In the first place joint maps and additional material will be prepared by a Joint Team of Experts (hereinafter JTE), as set out in detail in the agreed " Modalities of Production of Joint Maps and Additional Material in the Jordan Israel Boundary " ; annexed hereto , with a view to settling those problems as soon as possible.

The JTE will meet and work on a continuous basis and will report to the boundary sub-commission as necessary.

It is envisioned that the sub-commission will become " the boundary maintenance and administration commission " after the signing of a peace treaty. The JTE will submit within four weeks of its first meeting proposed timetable of its future work.

The JTE's work will cover the entire length of the boundary.

Initially, work will begin in the sector Aqaba / Eilat - Dead Sea area.

**MODALITIES OF PRODUCTION OF JOINT
MAPS AND ADDITIONAL MATERIAL ON THE
JORDAN ISRAEL BOUNDARY
Agreed On 19 JULY 1994**

In accordance with " the Jordan Israel Common Sub-Agenda Borders and Territorial Matters" of June 7 1994 and Article B (5) of the "Israel Jordan Common Agenda " of 14 September 1993,

The boundary sub-commission has reached agreement, in fulfillment of part of the role entrusted to it in the Sub-Agenda, on the following modalities for jointly preparing maps of the region of the boundary and any additional material as follows :

1. A joint Jordan-Israel Team of Experts, hereinafter the JTE, is hereby established by the boundary sub-commission.

The Head of the Israeli side is Col. Chaim Srebro. The Head of the Jordanian side is Mr. Nidal Sagarat.

The JTE will meet and work on a continuous basis and will report to the boundary sub-commission as needed.

The work of the JTE is subject to the authority and approval of the boundary sub-commission which shall settle problems, if any, arising in the JTE.

2. To enable work to progress expeditiously, the JTE shall begin and carry out the work at such times and in such sectors as the Heads of each side shall agree .

3. The JTE will act by the decision of both sides and will carry out its work jointly as set out in these Modalities.

4. The jointly prepared maps shall show current physical features of the area along the boundary between the two states for an area sufficient to include all the features which, in the view of either side, have a bearing on the delimitation or demarcation of the boundary.

5. The jointly prepared maps shall be in English. Each side shall be responsible for the transliteration of names and features on its own side.

6. The maps and additional material produced shall be entitled "Jordan Israel Boundary Sub-Commission" and be numbered with a "Map Number" or "Document Number" respectively.

7. The maps and additional material shall carry a note stating that they are "Prepared for the purposes of negotiations and delimitations on the Israel Jordan boundary, without prejudice to the final outcome".

8. The information which is to be shown on the maps or additional material, the map bases, the method of preparation, and the element for executing the work shall be as decided by the JTE.

9. The following maps and additional material to be jointly prepared shall include, on a reference system and on scales to be agreed upon by the JTE:

- (a) topographic maps,
- (b) orthophoto coverage,
- (c) a satellite photo map for the Dead Sea area and for other areas as decided by the JTE,
- (d) geodetic and photogrammetric support as and if required,

- (e) any other maps and additional material as required and agreed upon by the JTE.

10. The technical documents produced at the meeting of 18 and 19 July 1994, and any additional documents of both sides will be further discussed at the next meeting of the JTE/Boundary Sub-commission.

11. The JTE shall carry out a joint survey along the boundary area, or parts of it, as it considers necessary. Each side will issue the members of the JTE with any permit required for field work on its territory and will be responsible for the security of all members of the JTE there.

12. As the basis for the preparation of the joint work, the JTE shall use Jordanian and Israeli mapping material to the fullest extent possible.

13. The maps and additional material finally produced by the JTE shall be authenticated by the signature and titles of the Heads of each side.

14. The maps and additional material shall serve as essential tools and instruments to facilitate the work of the sub-commission in its negotiations on the delimitation and demarcation of the international boundary, without prejudice to the status of any territories that came under Israeli Military Government control in 1967.

JTE ACTIVITIES IN PREPARATION OF THE PEACE TREATY

The JTE worked intensively in full cooperation, and in three months the team had finished to achieve the required tasks, before October 26, 1994. The heads of the JTE signed the map album delineating the international boundary. This map album became Annex I(a) of the Peace Treaty. Their signatures accomplished the signatures of the Prime Ministers and those of the heads of the JBC. In addition, the heads of the JTE signed each one of the 27 map sheets of the Peace Treaty Map Album, as an approval of its authenticity.

The two main tasks of the JTE during this stage were important missions. Each one of them required creativity and innovation, as well as coping with unexpected situations under pressure of seniors, including the heads of the states. At the same time they had to cooperate with people that were considered a few months earlier as enemies, under un-dependent and uncertain conditions. Part of the field activities were in suspected hostile territories where part of the population may not have digested yet the political expected change. Most of these fears were taken care of by accompaniment of military staff.

The first main mission of the JTE was to support the political process of the statesmen regarding the agreement on an agreed international boundary between the two states. As realized later on, the political level expected the JBC to take care of this matter, and the JBC expected the JTE to take care of part of the negotiations regarding the agreement on a common boundary line, on the basis of the political guidelines, being expressed in the Common Agenda Agreement. A few additional factors added dimensions to the complexity of the mission. The boundary passed along 400 kilometers, through challenging environments. Along the land sector there were severe boundary disputes where Jordan objected Israeli military and civilian (agricultural farms) presence. Along the river sector the rivers are not stable and so is the boundary line. The Dead Sea is shrinking, and the maritime boundary in the Red Sea should be defined as well. In addition, Jordan does not recognize Israeli sovereignty along part of the boundary line, along the West Bank, a fact which makes the political status of the boundary line along this sector more complicated.

The second main mission of the JTE was to produce technical procedures and technical means to enable defining, delineating and signing an agreed international boundary in the Peace Treaty. In addition, the JTE had to prepare agreed procedures that should be specified in the Peace Treaty in order to enable accomplishment, after signing the Peace Treaty, of the process of defining, demarcating, documenting and maintaining the international boundary line.

Both missions had to be taken care of in parallel at the same time, though one of them was dependent on the other. In addition, there was a certain level of conflict between the tasks regarding the cooperation between the members of the JTE. The work on one mission was in cooperation with the statesmen of the same state in a conflict with the other side, especially regarding the political dispute regarding territories, while on the technical mission a full cooperation between the JTE members was required, working as one team.

The joint activity of the JTE members during that period proceeded in three channels. One of them was working within the JBC which defined its own targets, tasks, and its basic schedule, introducing positions regarding the international boundary, and negotiating these positions in order to reduce the range of differences between the two sides. The meetings of the JBC took place at the beginning in a tent in the Aravah, and later on in hotels in Eilat, Aqaba, at the Dead Sea, at the Sea of Galilee and near Deir Alla (in Jordan). These meetings took place in parallel to the meetings of other committees. This enabled coordination between the committees on mutual matters. The JBC used to coordinate issues with the security and water committees. In addition, the heads of the negotiation process were available for consultation and decisions.

The second channel of activity of the JTE included bilateral meetings of the JTE itself. Within this framework the JTE held professional "office" meetings in the tent, and later on in hotels, as well as field works. The last stage meetings regarding the delimitation of the international boundary in the Peace Treaty took place in the RJGC premises in Amman, and in Royal Palaces. The numerous field meetings included surveying campaigns, as well as field tours, using field vehicles and helicopters on both sides of the boundary line. This was necessary for establishing a common geodetic reference system, and for delineating lines in the areas of Israeli settlements in the Aravah. In the last stage the chairs of the JTE used an helicopter in order to decide on the main channel of rivers in cases where small islands divided the flow of the river.

The third common channel of activity of the heads of the JTE was the secret channel of talks that existed during the critical stage of the peace negotiations during the last month of negotiations before signing the Peace Treaty. This activity took place at the Royal Palaces in Aqaba. The main advance towards the settlement of an agreed international boundary was the result of this activity. This achievement enabled parallel progress in the formulation of the Peace Treaty. The main task of converging the different territorial positions to one agreed boundary line was taken care of by the chairs of the JTE personally. Since the main task was to compromise on lands that were occupied by Israel and claimed by Jordan, the main task fell on the shoulders of the Israeli head of the JTE. He introduced every day an updated version of an offer, taking into consideration preliminary understanding between the leaders of the two states – Prime Minister Rabin and King Hussein. The Jordanian head of the JTE used to copy/transfer the lines to his maps and to analyze them. The response was delivered directly on the highest level. The Israeli head of the JTE used to offer new adjustments to the lines with reference to the response until most of the line was agreed upon. The final decisions regarding the unsolved matters were taken by the leaders during a common night session in a Royal Palace in Amman. The Israeli head of the JTE had incorporated the decisions in the final line on the orthophoto. The Jordanian head of the JTE had prepared a copy of it, and in the following morning, on October 18, 1994, the two prime ministers signed the draft of the Peace Treaty by initials. At that time, only the land boundary line in the Aravah was delineated on the orthophoto maps, not including yet the boundary line in the rivers, in the Dead Sea and in the Gulf of Aqaba/Eilat.

The working channels of the JBC and the JTE worked in parallel, because of the requirement from the JBC to promote the achievement of an agreed international boundary line, and because of the requirement to formulate the chapter of the international boundary line in the Peace Treaty, following the principles and guidance of the Common Agenda Agreement. The JTE took an active part in fulfilling these tasks, but at the same time, the JTE had to promote technical tasks that were part of its exclusive responsibility. In this process, formally, only the heads of the JTE took part. But each one of them was supported by his professional staff for the production of technical aids, including orthophoto, updating the lines, transferring them between maps and computing areas.

The delimitation of the boundary line in the rivers and in the Dead Sea was accomplished in a few JBC and JTE meetings during the following week, before signing the Peace Treaty., Following the joint helicopter flight of the heads of the JTE along the rivers, the final boundary line in the rivers was delineated on 1:10,000 orthophoto sheets at a meeting in Aqaba. The line in the Dead Sea was delineated by the Israeli head of the JTE and approved by the Jordanians during a meeting at the RJGC premises in Amman. Three copies of the orthophoto showing the agreed boundary line, not including the maritime boundary⁶, were prepared during a JTE meeting in the RJGC one day before signing the Peace Treaty. In addition, the final format of the map album annex, including the opening pages with the signatures was agreed upon. The cover and the opening pages were prepared at the Survey of Israel on the night before signing the Peace Treaty in an international ceremony at the Aravah on 26 October 1994.⁷⁸

The technical activity of the JTE regarding the Peace Treaty included many discussions on the preparation of common maps for delineating the international boundary line in the treaty documents, preparation of various sample maps for that purpose, and the production of 27 large format (in a size around 1 meter) dedicated orthophoto sheets, on which the agreed international boundary line was delineated. This was achieved through continuous joint work until the last night before signing the treaty. In addition and in parallel, bearing in mind the requirement to demarcate the land boundary line on ground, and the need to define common agreed coordinates, and to prepare common documentation of the entire boundary line, the JTE has agreed on a common dedicated geodetic boundary reference. The JTE jointly established such a reference control network (for joint future use) along the two sides of the boundary line and surveyed it before the Peace Treaty.

⁶ Paragraph 6 of Article 3 (International Boundary) of the Treaty of Peace says: "The Parties shall, upon the signature of the Treaty, enter into negotiations to conclude, within 9 months, an agreement on the delimitation of their maritime boundary in the Gulf of Aqaba".

⁷ The three huge format map albums were brought to the ceremony by the Israeli head of the JTE on board a special air flight.

⁸ The Map Albums, designated as Annex I(a) to the Treaty of Peace, were signed at noon by the heads of the JBC and the heads of the JTE at the premises of the Jordanian South Command near Aqaba, and were signed an hour later by the leaders of the two states and by Bill Clinton, the President of the USA, as a witness.

At the beginning, the Jordanians suggested to use technical services of a foreign country or company but the Israelis didn't support the idea, being confident that the two sides have the skills and technical means to cope with the challenge. The arguments were the time and cost concerned for a task that was not defined yet, and, in addition, taking the opportunity of the challenge of joint professional work for a common interest. The decision on the mapping aids raised the issue of different use of coordinate systems, different languages, different names used for same places and geographical features, and even different political positions (like the attitude towards the status of the West Bank). The initial suggestion was to make use of 1:250,000 general maps, of 1:50,000 maps for the Aravah, and 1:20,000 maps for the river section, in addition to large scale maps for special cases. Even after the suggestion of the Israeli head of the JTE to remove the grids and the names from the maps this option was not accepted. Finally, due to the constraints mentioned above, the Israeli head of the JTE suggested to prepare orthophoto sheets made of recent aerial photographs, so that they could be used for measurements of distances between features that exist in the field, with no grids or names on the orthophoto. This idea was accepted by both sides. The Israeli side had prepared 10 1:20,000 orthophoto sheets along the Aravah for the delimitation of the land boundary; two 1:50,000 orthoimages (using satellite imagery in order to cover the entire width of the Dead Sea) for the delimitation of the boundary in the Dead Sea and Salt Pans; and 12 1:10,000 orthophoto sheets for the delimitation of the boundary in the rivers. A graphic index in the opening page of the map album, on which there is no indication of names including state names except 'Dead Sea', shows the coverage of the orthophoto sheets. A designated place for authentication of the orthophoto and of the delineated boundary line on it by the heads of the JTE is located on each sheet. In addition, a 1:50,000 orthoimage of the head of the Gulf of Eilat/Aqaba was attached as a reference of the coast line at the time of the Treaty for the future delimitation of the maritime boundary. Two additional orthophoto maps were attached to show the borders of the two special regime areas: Zofar and Naharayim.

The Israel Jordan Joint Boundary Datum 1994 (IJBD94) was established as a joint boundary geodetic network, consisted of 12 points in the field, six on the Israeli side and six on the Jordanian side, from Eilat/Aqaba in the south to Hamat Gader/Al Hamma in the north. The points were surveyed simultaneously by joint teams, using GPS surveying equipment. The joint team adopted the ellipsoid World Geodetic System WGS84 for the joint boundary datum IJBD94, defining one of the points of the network (IJBD09) as the reference point of the network. The JTE used the UTM grid as well. This network served later on, after the demarcation of the boundary pillars, for the joint definition of the coordinates of the boundary pillars, as well as for the coordinates of the maritime boundary and the boundary in the Dead Sea and Salt Pans and in the Yarmouk River, as agreed by the two sides.

Following the methodology that had been developed by Haim Srebro (The Israeli head of the JTE), following lessons learned from the Israel-Egypt boundary making process, it is recommended to define a priori an agreed boundary making process and to incorporate it in the wording of the peace agreement, in order to prevent most, if not all, of the potential future disputes during the implementation process (since most of the stages of the international

boundary process, except the boundary delimitation, are going to be implemented after signing the peace agreement). Both sides agreed to adopt this concept and implemented it in Annex I(a) of the Israel-Jordan Peace Treaty.

In addition to its activities in its main responsibility areas towards the Peace Treaty, the members of the JTE supported other bilateral activities, especially military matters. Such an example was the definition of a location for a boundary passage between the states in the Southern Aravah, near Eilat and Aqaba (A temporary passage place that became later on the main boundary passage terminal between the two states). This issue had at that time special importance regarding transportation, because of the intention to use this passage for an international road leading from Egypt to Jordan and eastwards. Since the matter had to be determined at a very early stage of the negotiations, before the boundary issues have been discussed and solved, the JTE recommended on a site where the positions of the two sides were very close, in comparison to other potential sites. On August 1, 1994 there was an agreement on the issue and on August 2 the point was marked on the ground, when the heads of the JTE marked and signed the point on an aerial photograph and the heads of the Joint Security Commission signed on minutes of understanding. Until August 8 the area had been prepared for a temporary passage with a very large pavement covered asphalt. On August 8, 1994 this passage was inaugurated in a big ceremony and speeches of the Israeli Prime Minister Rabin and His Royal Highness Prince Hassan of Jordan. This site is today an official international passage between Jordan and Israel, and the terminal is named after Yitzhak Rabin.

The JTE activity on the demarcation and documentation of the international boundary

THE DEMARCATION AND DOCUMENTATION OF THE LAND BOUNDARY

The first task of the JTE regarding the boundary after the Peace Treaty was to mark the international boundary on the ground. This process consisted of two stages: During the first stage the JTE agreed on specific locations along the land boundary in the Aravah where boundary pillars would be placed later on. The reference documents for that were the signed orthophoto sheets of the Map Album of the Peace Treaty. The JTE also had to agree on the density of the chosen points along the line for convenient use in the field. The preliminary requirement was to mark the points in the field by temporary markers, to be replaced later on, during the second stage, by permanent boundary pillars. The two stages of the boundary demarcation process were executed in 1995.

Stage A

For the purpose of the first stage the JTE had prepared copies of the 1:20,000 orthophoto sheets of the Peace Treaty, and enlargements to 1:10,000 of these sheets for easier practical interpretation in the field. Since each side had prepared his material from its original. There were minor differences between the versions. The JTE people overcame the differences between the two versions and came to agreed decisions on all the points, not leaving room for

future disputes. Wherever needed in special cases larger enlargements of the orthophoto were prepared (1:5,000 and larger).

In addition, the JTE members were equipped with surveying systems and markers (iron angles) for the preliminary marking and for marking witness points in the vicinity of the boundary points, in order to be able to restore the location of boundary markers in case they disappear or move from the place. The distances between the marked boundary point and the witness points were measured. The work was supported by close logistic support as well as security support.

For mined areas, or areas suspected of mines, the JTE members used special large anti-mine sandals. In such areas the way to the boundary pillar and the area around the location of the boundary pillar were paved by thick layers of soil (up to one meter) following instructions of an army engineering officer, in order to eliminate any risk. In a few places where there was a problem of accessibility the use of a helicopter was required.

All the points were marked continuously, except the points south of the border passage, down to the Red Sea. The locations of the last points – 0, 1, 2 – were agreed in a meeting on October 18, 1995, using a large scale orthophoto (1:5,000 and larger), during a meeting between Prince Hassan and the Israeli Foreign Minister Shimon Peres, due to the sensitivity of these points being close to the Royal Palaces in Aqaba.

Stage B

On the basis of the format of the Israel-Egypt boundary pillars, the Israelis suggested a similar plan to the Jordanians, who approved it. The construction of boundary pillars was based on a pyramid type pillar made of concrete, topped by a cylindrical iron pipe 3 meters high, painted red and white. The Jordanians took responsibility for producing the pillars, by a contractor under joint supervision. Before placing the pillars a balanced flat basement had been prepared.

The establishment of the 124 boundary pillars was shared by the two sides, each side having responsibility for 62 pillars. The military engineering corps of both sides were responsible for guiding and monitoring the contractors, accompanied by professional supervision of the JTE. The JTE used the temporary markers and the witness markers for that purpose.

Two standard boundary pillars were placed by helicopters because of limit of accessibility. Two locations did not fit for placement of standard heavy boundary pillars. One of them in mud area, the other one on a slope of brittle soil. In both locations a long pipe replaced the concrete pillar.

Following a Jordanian request, the 1946 boundary pillar, which was constructed by the British, remained in its place as boundary pillar number 1. The intersection between the Peace Treaty boundary line and the coast line remained the terminus point of the boundary, where boundary pillar number 0 was erected. The location of boundary pillar number 2 was shifted eastwards in order to compensate for leaving the old boundary pillar (No.1) in its place.

As mentioned earlier, the work in the Aravah was accompanied by military engineering officers who took care for the arrangements regarding the work in areas of mines or suspected mine areas.

The Israel-Jordan international boundary demarcation is considered very successful. It was implemented in a professional way, efficiently and in considerably low cost in comparison to other international boundaries over the world. In addition to the professional responsibility of the JTE, this success was a result of cooperation of many contributors, including the chairs of the JBC, the liaison officers, the military engineers, the military construction officers and the contractors, the local military units, and others. A special inspiration to the participants was given by the leaders of the two states and by the spirit of contribution to Peace in the region.

Documentation of the land boundary

Definition of the boundary line by coordinates is of utmost importance regarding the definitive requirement of the boundary for maintaining its stability. The JTE had decided to use GPS technology for that purpose. After the placement of the boundary pillars in the Aravah in 1995 the 124 boundary pillars were surveyed with reference to the joint boundary datum IJBD94 on the basis of the common network reference points.

The JTE adopted a traditional philosophy, processing the geodetic points in three stages. The relevant six IJBD94 points were considered first level, 15 selected boundary pillars were considered second level and a reference for the rest of the boundary pillars that were considered as third level. Ten surveying joint teams used ten GPS systems, measuring a few sets in each position, and the entire array moved forward in steps until they accomplished the mission during the period 10-18.12.1995. The computations were in two steps. First computing the selected 15 pillars, then computing the coordinates of the rest of the pillars. The accuracy of the final coordinates was in the level of centimeters. Following the coordinate definition, the JTE began a process of documenting jointly the boundary in all the sectors. On 19.9.1996 the heads of the JTE signed the documentation of the land boundary (the boundary pillars) in the Aravah/Wadi Araba.

THE DELIMITATION OF THE MARITIME BOUNDARY AND ITS DOCUMENTATION

After the signing of the Peace Treaty on 26.10.1994, the JTE started discussions regarding the delimitation of the maritime boundary in the Gulf of Aqaba/Eilat, as required by the Peace Treaty. The discussions continued for months but the parties didn't come to an agreement. On October 18, 1995, on the eve of the Amman Conference, The Jordanian Prince Hassan and the Israeli Foreign Minister Peres had a preparatory meeting in Amman. The first subject on the agenda was the settlement of the maritime boundary. Both sides have agreed to adopt the solution suggested by the Israeli head of the JTE, based on an innovative methodology regarding maritime boundary delimitation in a head of a gulf. The agreed principle was summed up in an Ad-Referendum Agreement. On January 18, 1996, the two sides signed a formal Maritime Boundary Agreement based on the Ad-Referendum Agreement.

During 1996 the JTE worked on translating this agreement, using technical methods, into a detailed precise definition of the maritime boundary line by coordinates. On September 19, 1996 the heads of the JTE signed a document showing the coordinates of the turning points along the maritime boundary line and a 1:25,000 chart showing the line.

The process of delimiting the line:

In the process of delimiting the maritime boundary line the JTE used as reference the following documents: Article 3 paragraph 7 of the Peace Treaty and Annex I(a) to the treaty; the 18.10.95 Ad-Referendum Agreement; the 18.1.96 Maritime Boundary Agreement.

The maritime boundary line was defined by four turning points: MB0, MB1, MB2, and MB3. The coordinate of the points were defined in UTM zone 36, on the joint datum IJBD94. From point MB3 southward the line follows the median line until the last point.

The arguments for defining these points are: Point MB0 is the point of origin of the line on the coast line. The maritime boundary line begins at the terminus point of the land boundary on the coast line, so that MB0=BP0. MB1 is located at a point which is equidistant from the western, northern and eastern coasts of the head of the gulf (The center of a circle tangent the three coasts). This point is the beginning point of the median line of the gulf southwards. This point was defined in the 18.10.95 and 18.1.96 agreements. The two straight lines - MB1-MB2 and MB2-MB3 – were defined in order to simplify the line by straight lines, so that the small areas on the two sides of the precise median line compensate each other. The last point on the line on the continuation of the line from MB3 southwards along the median line, has not been defined yet because it is a tripoint between Israel, Jordan and Egypt, and the maritime boundary line between Israel and Egypt has not been agreed upon yet.

Definition of the coordinates of the maritime boundary line:

The first stage regarding the process of delimiting the maritime boundary line was to define the median line in the Gulf of Aqaba/Eilat. The delimitation of the median line followed the following steps: 1) Choosing control points along the coasts of the two side that are recognized both on the orthoimage of the Peace Treaty and as natural or artificial features on the ground. Five such points were chosen on each side. 2) These control points were surveyed jointly with the relevant IJBD94 points and their agreed coordinates were fixed. 3) These control points were digitized on the orthoimage of the Peace Treaty together with numerous points along the coast lines on both sides. 4) The coordinates of the points along the coastlines were computed in reference with the coordinates of the control points which were computed in step 2. 5) The median line was computed as a line connecting the centers of the circles between the computed coastlines, that tangent the coastlines.

As mentioned earlier, the first point of the maritime boundary on the shore – MB0, was identical to the first boundary pillar – BP0, and it has received the same coordinates. The second point – MB1, was computed as the center of first circle, that tangent the three coasts at the head of the gulf – the western, the northern, and the eastern. Point MB3 was chosen on the

computed median line as the south most point agreed by the two sides, until a common tripoint will be agreed by Israel, Jordan and Egypt. Point MB2 was chosen artificially between points MB1 and MB3, for the sake of simplifying the median line by straight line sections, so that the residual small areas between the median line and the two straight lines MB1-MB2 and MB2-MB3 will be equal on both sides of the line, and not in favor of any state.

The final documentation of the maritime boundary line:

On September 19, 1996 the heads of the JTE signed on the agreed coordinates of the maritime boundary line and on a 1:25,000 chart showing the line. On January 26, 1998 they signed on the final comprehensive documentation of the maritime boundary.

DEFINITION OF THE INTERNATIONAL BOUNDARY IN THE DEAD SEA AREA AND ITS DOCUMENTATION

The boundary line in the Dead Sea and Salt Pans was delineated in the Peace Treaty Map Album (Annex I(a)) on a 1:50,000 orthoimage (rectified satellite image). In order to define the boundary line by coordinates. The JTE had to: 1) select control points that could be identified on the orthoimage and in the field (as natural or artificial features), 2) to set the coordinates of the control points in reference with the IJBD94 points, 3) to digitize the control points and the delineated boundary line on the orthoimage and 4) to set the coordinates of the boundary line.

The JTE jointly chose 18 control points on each side along the shores of the Dead Sea and Salt Pans. The 36 control points were jointly surveyed together with the relevant IJBD94 points, and agreed coordinates were set for the 36 control points. Then, after the digitization process on the orthoimage, the two sides agreed on the coordinates of the boundary line.

Following that, all the materials were assembled into comprehensive documentation. The Jordanians agreed to sign only the documentation regarding the south part which refers to the sector defined as international boundary between the two states, and not on the part which is located east of the West Bank, and is referred to in the Peace Treaty as "the territory which came under Israeli military control in 1967" and that any treatment of the line in this area "shall be without prejudice to the status of this territory".

The heads of the JTE signed on the comprehensive documentation of the boundary line in the south of the Dead Sea and Salt Pans on March 10, 1998.

DOCUMENTATION OF THE INTERNATIONAL BOUNDARY LINE IN THE YARMOUK RIVER

Before the construction of a dam (called also the Adassiya Dam) on the Yarmouk River on the Yarmouk division point, where significant amount of the Yarmouk water flow is diverted eastward to the Abdala canal in Jordan, and due to the impact of a new dam downstream and upstream, the JTE, following approval of the JBC, agreed to fix the boundary line in the

Yarmouk River according to the original delineation of the international boundary on the orthophoto of the Peace Treaty (Annex I(a)). The original delineation in this section was on sheet 12 of the 1:10,000 orthophoto in the river section. This sheet covered the sector of the boundary between Hamat Gader/Al Hamma and Naharayim/Baqura.

The JTE has implemented a similar process to the one used for defining the coordinates in the Dead Sea. In the first stage the JTE identified 12 control points on the orthophoto and in the field. These points were surveyed in the field in reference with relevant IJBD94 points, and the coordinates of the control points were set. In the second stage, the control points were digitized on the original orthophoto together with 460 points that were selected on the delineated boundary line on the original orthophoto. The 460 points on the boundary line were computed and the JTE agreed on their final coordinates. The coordinates were set in UTM in the joint datum IJBD94.

On July 4, 2000, the heads of the JTE signed on the comprehensive documentation of the international boundary in the Yarmouk River.

THE APPROVAL AND ADOPTION OF THE BOUNDARY COORDINATES AND BOUNDARY DOCUMENTATION

The Treaty of Peace says: "The boundary pillars shall be defined in a list of geographic and UTM coordinates based on a joint boundary datum (IJBD94) to be agreed upon by the Joint Team of Experts appointed by the two parties (herein after the JTE). The list of coordinates shall be prepared, signed and approved by both Parties..... and shall become part of this Annex." Further on it says that these coordinates "...shall be binding and shall take precedence over the maps as to the location of the boundary line..."

The Peace Treaty says that the Parties will establish a Joint Boundary Commission for the purpose of implementation of Annex I(a) regarding the international boundary.

The JBC formally approved and adopted the coordinates of the international boundary line agreed to by the JTE "as required by the Peace Treaty, and declared them as binding and taking precedence over the maps as to the location of the boundary line.

On December 29, 1998 the JBC approved the documentation of the JTE regarding the land boundary (of September 19, 1996), the documentation of the JTE regarding the boundary in the Dead Sea and Salt Pans (of March 10, 1998), and the documentation of the JTE regarding the maritime boundary (of January 26, 1998).

On August 27, 2000 the JBC approved the documentation of the JTE regarding the boundary in the Yarmouk River (of July 4, 2000).