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FEASIBILITY STUDY ON THE ESTABLISHMENT OF AN EXPORT PROCESSING ZONE IN THE PORT OF CALABAR CROSS RIVER STATE NIGERIA

FINAL REPORT

VOL. IV

TECHNICAL ASPECTS
FINANCIAL AND ECONOMIC ANALYSIS

CONTRACT No. 91/045
PROJECT No. DP/NIP/90/015

August 1991
REVISED November 1991

TEAM
Technics Engineering Architecture Marketing
(Nigeria) Ltd


ENUGU
ABAKALIKI
OGOJA
BOUEA
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INTRODUCTION

In the developing countries, the establishment of an Export Processing Zone is mainly to complement the nation's drive to attract external investment, with the aim of internationalizing the economy, moreover Export Processing Zone is conceived to capitalize the large offer of relatively inexpensive labour available in the country.

The term Export Processing Zone refers to an assembly, manufacturing or service plant, operating in a relatively small territory under special customs treatment and liberal foreign investment regulations.

Specifically, an Export Processing Zone allow imports, in duty-free and on a temporary "in bond" basis, of machinery, equipment, parts, raw materials and other components used in the assembly, or manufacture of semi-finished or finished product to be exported back to the country of origin or to a third country.

Regardless of differences in objectives and in sizes, location of an Export Processing Zone is determined largely by transportation and communications considerations, infact short distance, from sea-port, major airport, expressways and rail lines are essential conditions to facilitate full achievement of the selected objectives.

Moreover to attract foreign investor, the Export Processing Zone should be provided with wide range of adequate infrastructural facilities at limited cost, including standard factory buildings, supply of electricity and water, suitable roads network, efficient sewage system with relevant treatment plant, supporting services located in the Administration area such as banking, postal, shipping, police, fire telephone, telex, etc.

In addition, the establishment of a foreign enterprise within the zone, is mainly incentivated by a package of privileges normally offered by Government Authorities ranking from exemption of customs duty, relief from income and taxes, repatriation of dividends, export loans, subsidized rates for facilities and services.

Expansion of international trade, stimulation of local economy, availability of new employment and earning of foreign exchange are, for the promoting Countries some of the benefits to be derived from the development of an export processing zone.

FOREWORD

In view of the importance and urgency accorded by Nigerian Government for a prompt implementation of export promotion programmes United Nations Industrial Development Organisation (UNIDO) with the aim to determine the feasibility of establishing an Export Processing Zone at the port of Calabar, commissioned, in March 1991, to Team Nigeria Ltd a study including physical planning, development work and financial analysis.
The first purpose of the study is to make an overall plan for the development of the proposed site by providing fundamental design of civil structures, infrastructure requirements and relevant development cost estimates.
The second purpose of the project is to provide, on the basis of overall capital requirements and operating and maintenance costs, a financial analysis to determine, from the economic point of view, the feasibility of the establishing an Export Processing Zone at the port of Calabar.

This financial study is one of the components of an ongoing feasibility study for the establishment of an EPZ in Calabar. This feasibility study started in November 1990 with the preparation of a detailed work programme, based on the findings of a previous pre-feasibility study mission. Its terms of reference include the following aspects:

a. Study of the port of Calabar in view of the improvement of port facilities and shipping services.

b. Study of the Calabar EPZ:
   (i) Marketing and investment promotion
   (ii) Physical planning and development
   (iii) Financial and Economic analysis.

The physical planning report is made up of three parts:

(i) An introductory chapter showing essential evidence on project feasibility, based on international experience, Government policies, required pre-conditions for EPZ establishment, available funding sources, etc.
This chapter is based on a survey of existing information and direct contacts with concerned agencies and Government officials. This survey provided a basis for the determination of the main assumptions underlying the financial study, which otherwise would have been arbitrary.

(ii) A technical chapter, consisting essentially of the analysis of the different components of EPZ cost: construction, operating and maintenance costs.

(iii) Financial and economic analysis of the project.

PART 1 - KEY ISSUES OF EPZ FEASIBILITY

1.1 International experience

A UNIDO general paper on EPZ's in developing countries (1) presents a comprehensive survey of the main issues concerning EPZ establishment: their prevalent features in developing countries, expected benefits and possible drawbacks, required policies, etc.

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(1) See: "Export Processing Zones in Developing Countries". UNIDO Working Papers on Structural Changes, n.19, August 1980.

The main aspects of the study that appear to be relevant for the launching and early stages of the EPZ being studied concern complementary measures required to insure success in attracting foreign investment, to enhance benefits and to reduce social and economic costs of an EPZ to the host country:

1.1.1 Profitability of investment in the zones. Commercial rates of return of EPZ investment vary between countries and locations. Projects submitted to the World Bank for lending appraisals show internal rates of return around 13 - 15%, but ranging up to 30% depending on the assumptions used. Following discussions with World Bank and ADB representatives in Lagos, it appears that, on account of the decentralized location of Calabar EPZ, lower returns might be acceptable, on account of strategical and social benefits of industrial re-location and of the need to attract potential investors through relatively low charges.

EPZ projects submitted to lending agencies should be self-supporting and provide some commercial return, in addition to long-term benefits expected from increased industrialization, and charges to industries and other participating organisations should be fixed accordingly.

1.1.2 Linkages between EPZ industrial activities and domestic economy:

a. Forward linkages - i.e. processing of products from the zone in the host country - can only be realized when part of the output is sold within the country.

Unlike most existing zones, in the Calabar EPZ, in accordance with proposed regulations, up to 50% of EPZ's industrial production may be sold in the internal market in Nigeria.

b. Backward linkages - i.e. purchase of domestic raw materials and intermediate goods. In some type of manufacturing activities the set up of industries in an EPZ can increase the proportion of domestic inputs to the value of exports. Domestic suppliers might be in a better position to provide the required goods and meet production standards of zone companies, which, on account of the competitive pressure of world market, are generally high.

It also appears that - on the whole - the main backward linkage benefits of EPZ's accrue to local firms like wholesalers, agents, retailers, mechanics, transport companies, construction industries, etc., i.e. to activities having an indirect production linkage with EPZ firms.

In general, participation of domestic companies in and around the zone would enhance the integration of an EPZ with the remainder of the economy and favour the acquisition of technology and labour skills. These long-term advantages are likely to offset possible short-term reduction of foreign exchange earnings resulting from increased domestic participation in EPZ's.

1.1.3 The likely impact of the Calabar EPZ on domestic economy will thus depend to a certain extent on the types of its industries, since the propensity to sell on the internal market and to purchase domestic materials and intermediate products can vary widely according to the nature of their production. The possibility of establishment of domestic firms in the EPZ would also depend on the kinds of production.

A preliminary exploration of potential types of industries suitable for the Calabar EPZ has already been carried out (see para 1.5). More detailed studies might be carried out at a later stage in order to pinpoint the more attractive ones for the national economic viewpoint.

1.1.4 Trade and industrial policies of the host government. The most successful EPZ's are located in countries with outward-looking policies favouring manufactured exports.

These policies include low or moderate tariff protection; a realistic or undervalued exchange rate; and a favourable attitude to foreign investment and participation; access to financial and capital markets. In these countries, the structure of incentives encourages all industries, both whether located within or outside the zones, to take advantage of the country's endowment of labour and resources.
As shown in paragraph 1.3, Nigeria has gone a long way in this direction, and it appears that its industrial policies - which are fully committed to the promotion of private sector development, increasing exports and attracting foreign capital - are adequate to support successful EPZ development.

1.1.5 Social and regional consequences.
EPZ's tend to create employment opportunities especially for young women. In many cases workers enter factory directly from rural communities , surrounding regions or as migrants from adjoining countries. The rate of turnover is high and labour force can be dismissed after a few years without significant upgrading or skills.

Thus, concentration of employment in the zones can create resettlement problems, needs for social infrastructure and possibly social tensions of different nature.

In the case of Calabar EPZ, its decentralized location - i.e. away from main industrial centres - is likely to reduce the dangers of negative social fallout. Preliminary investigations (see para 1.6) also showed that labour demand from EPZ industries will in principle be met by local population and therefore substantial immigration from surrounding areas are not expected.

However, an early study on the required strengthening of social infrastructure and educational/training facilities might provide useful directions on required action in support of EPZ establishment.

1.2 EPZ's in Nigeria

1.2.1 As shown in a pre-feasibility study on the Calabar EPZ (1), there are two favourable conditions in Nigeria for the establishment of an EPZ that generally are lacking in countries where Export processing zones have been developed successfully: the size of the home market and the availability of raw materials. On account of its large population (around 109 million people) and of a GDP of 70 billion dollars, Nigerian market accounts for around one half of total West African Market. Its natural resources are abundant and include - in addition to oil: leather, coal, iron ore, lead, limestone, natural gas, zinc, as well as a number of agricultural products, like cocoa, palm oil and palm kernels, peanuts, rubber, cotton, corn, cassava, millet and rice.

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(1) See: "UNIDO - Export Processing Zone in the Port of Calabar - An Investigation. January 1990".

Another favourable condition is access to ECOWAS market and preferential market access to E.C.

1.3 Industrial policies and the 1990 - 1992 Rolling Plan.

1.3.1 A document on industrial policies in Nigeria issued in 1988 shows the main Country's industrial development strategies for the next decade.(1)

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(1) Federal Ministry of Industries - Industrial Policy of Nigeria - Abuja,1988.

Some aspects of these policies concern industrial development as a whole, while other measures are more specifically addressed to export development and decentralization of industrial activities, and are therefore directly relevant for the setting up of an EPZ in Calabar.

1.3.2 General strategies and measures to sponsor increased private sector activity and to attract foreign capital:

a. liberalization of access to foreign exchange for individuals and companies;

b. increased private sector participation through the privatisation and commercialization of public sector enterprises;

c. easier capital and dividend repatriation through regulation changes;

d. opening up of a range of industrial activities to foreign ownership;

e. establishment of an Industrial Development Co-ordination Committee to streamline procedures for the setting up of new industries;

f. setting up of industrial development banks at both Federal and State levels to provide in particular soft loans to industries on concessionary terms.

1.3.3 Strategies and measures directly concerning export and industrial decentralization:

a. Allowing a market-determined exchange rate for the Naira (substantial devaluation of the Country's currency).

b. Increased exports of manufactured goods through the promotion of free zones and fiscal and financial incentives to industrial production.

c. Promotion of nation-wide industrial development through industrial dispersal. Measures for the attainment of this objective include incentives to promote industrial investments in less or least industrially and economically developed areas and to discourage over-concentration of industries in a few industrial centres.

1.3.4 Proposed incentives to promote export and decentralization include:

a. Taxation. Tax holidays on corporate income are granted to industries located in economically disadvantaged areas and for export-oriented activities.

b. Export promotion. Measures to promote export-oriented industries include in particular: (i) repayment of import duty paid for material used in producing export goods; (ii) financial assistance to private exporting companies to cover part of their initial expenses, to support expansion of activities, to compensate exporters for high costs of production arising from industrial deficiencies, high cost of inputs, or other factors beyond the control of the exporters; (iii) easy access to foreign exchange for manufacturers; (iv) granting of special permit on companies with non-resident investment in order to facilitate repatriation of capital or remittances; (v) availability of bank accounts denominated in foreign currency for exporters, for external transactions.

1.3.5 The Guidelines for the 1990 - 92 Rolling Plan for the Manufacturing Sector confirm the foregoing strategies for industrial development.

In particular, the promotion of export-oriented industries - including the setting up of Export Processing Zones - is to be pursued vigorously, and the selection of locations and industries will be based on the availability of raw materials that can support identified export industries.

The creation of a free market for the pricing and allocation of foreign exchange and other measures, already had an impact on manufacturing output, capacity utilization and shift towards local raw material-based production, which however have been accompanied by a strong increase of manufacturing production costs.

In addition to high production cost, the main constraints experienced are the following:

- Shortage of machinery and spare parts, due to the limited capacity for local fabrication of these parts.

- Inadequate links among industrial sub-sectors and between the industrial sector and other sectors, which apparently is due to the low stage of development of basic industries (like iron and steel, petrochemicals, pulp and paper, machine tools, etc.) capable of promoting the growth of secondary or tertiary industries.

- Inadequate infrastructural facilities, including electricity, water supply, telecommunication services, etc.

1.4 Draft Decree on incentives for EPZ's

A draft decree under examination by the Government concerns a package of incentives for investors interested in establishing industries in EPZs.

The proposed measures include the following·

a. legislative provisions pertaining to taxes, levies duties and foreign exchange obligations shall not apply within the zones.

b. repatriation of foreign capital investment in the zone at any time with capital appreciation of investment.

c. remittance of profits and dividends earned by foreign investors in the zone.

d. no import or export licenses required.

e. up to 50% of production may be sold in the customs territory against a valid permit, and on payment of appropriate duties.

f. rent-free land at construction stage; thereafter rent shall be as determined by the authority.

g. up to 100% foreign ownership of business in the zone allowable.

h. foreign managers and qualified personnel may be employed by firms operating in the zones.

1.5 Marketing and investment promotion

1.5.1 One of the components of this feasibility study is research that was carried out for:-

(i) the identification of the most suited types of industries for the EPZ,
(ii) to ascertain the views of potential investors
(iii) to identify incentives and other measures to attract such investors.

Growth opportunities for export industries appear to be more favourable in the following sectors:

- Textile industry, a traditionally leading sector, whose expansion might help developing garment industry.

- Food processing: a large domestic industry that has considerable scope for expansion.

- Leather products: one of the oldest industries in Nigeria, which has good potential for development.

- Pharmaceutical industry: several large multinational companies are manufacturing pharmaceuticals for the domestic market and could take advantage of EPZ establishment to develop exports to ECOWAS and other African countries.

- Wood products: there is a plentiful supply of timber in the Country, a number of small wood processing industries already exist and there is potential for development for selected wood products.

- Electrical and electronic consumer products: TVs, radios, fridges and many other consumer products could be produced in an EPZ for sale on the domestic and ECOWAS markets.

1.5.2 In order to determine possible interest in the Calabar EPZ, potential investors in U.K., Germany, Asian Countries and U.S.A., as well as private entrepreneurs in Nigeria were interviewed.

The general feeling of businessmen towards the idea of investing in an EPZ in Nigeria was positive, on account of its large domestic market, its central location in Africa, access by sea and air, low wage structure, availability of raw materials, its membership of ECOWAS and being an English-speaking country.

In practice, the main possibilities in the short run appeared to exist among investors in U.K. and in Nigeria:

- United Kingdom. People interviewed felt that Nigeria offered good possibilities of success to manufacturing industries, provided proper environment and conditions for export were created, in particular a guaranteed competitive incentive package, stable government and a dynamic EPZ Authority free from bureaucratic interference.

- Interviewed businessmen in Nigeria also felt that a properly run EPZ could attract a great interest from Nigerian investors if essential conditions for success were met.

Most investors in the United Kingdom and within Nigeria felt that Lagos would be a more suitable location for an EPZ than Calabar.

This reaction is understandable, since an EPZ in Calabar will present for investors both the difficulties and hazards of industrial decentralization and those of export development.

Responses from other countries were less promising:

- German interest might arise only in the medium or long-term future on account of existing outward processing activities in Southern Europe and North Africa, as well as possible investment perspectives in East Germany.

- Asian investors appeared to hold a negative view of the operating environment in Nigeria, and especially: lack of foreign exchange, poor infrastructure and services, concerning in particular telecommunications; frequent disruptions of power supply; lack of confidence in government bureaucracy.

Distance of Asian markets and existence of successful EPZ's in Asia were another negative factor.

In spite of this, it appeared that small or medium size companies might be willing to expand their activities in the African market and take advantage of existence of an EPZ in Nigeria, if essential pre-conditions were met.

- Significant investment from the United States appears to be unlikely in the foreseeable future, essentially because of intense competition for investment from Latin America, E.C., Eastern Europe, as well as domestic pressure to attract investment within the U.S.A.

1.6 Local facilities and EPZ integration with urban environment.

On 3.5.1991 a meeting was held at the Ministry of Commerce and Industry, Calabar, with the participation of the Commissioner of Social Affairs, in order to highlight possible problem areas in EPZ development, concerning in particular its linkages with local infrastructure and facilities, as well as with urban environment in general.

The main issues that were explored are the following:

a. Relocation of the village of Massarawa. This small village (around 300 persons) is inhabited by cattle-raising nomads, who were previously living within the town of Calabar and were resettled in this area before the construction of the port. The creation of an EPZ makes it necessary to resettle them again and a proper area, with sufficient grazing land is being identified. Both the existing abattoir and nomadic school will be relocated accordingly.

b. Employment. Total EPZ employment cannot be estimated at this stage, since it will depend - in particular - on types of industries and technologies employed. However, total employment in this phase should not exceed ten thousand workers.

It is expected that most of the zone employees will come from the town of Calabar and the surronding area.

However some skilled workers and experienced supervisory personnel may be recruited from major industrial centres like Lagos and Port Harcourt. In order to attract such people (who are essential for the successful development of the zone) suitable housing accommodation will need to be provided.

The NPA has housing facilities in Calabar which may not be fully utilized in view of the NPA's major retrenchment programme. These house could be used to accommodate key workers. The NEPZA should enter into an agreement with NPA on a mutually acceptable basis whereby half of the NPA housing is transferred to NEPZA.

Adequate provided town transport services (shuttle buses) will have to be provided for EPZ workers and the required funds will be allocated by local authorities.

c. Training. The College of Technology in Calabar appears to be one of the most comprehensive in the Country. Education and training range from University level to carpenters' or masons' training. Programmes and volume of training imparted can apparently be adjusted to meet new demands.

In any case, it seems likely that most industries might prefer to impart directly whatever specialized training is needed in accordance with their specific technological requirements. The creation of a specialized training centre within the EPZ might also be studied.

d. Housing for expatriate experts. Under the Federal State Housing scheme, land for housing is available and it is likely that numbers of existing houses of relatively good level, will be made available for leasing to foreigners.

Temporary accommodation can be provided through Government guest houses and hotels.

e. Hotels. For the time being there are no hotels of international standard in Calabar. Most existing ones are of small size and standards of service are medium or low.

The possibility of construction of a 5-star hotel is being explored by private investors. On account of the importance of this facility for EPZ establishment, this matter should be followed closely and - if necessary - adequate incentives should be provided for hotel development.

f. Educational facilities for foreigners. Two institutions are available for education of expatriate experts' children: the Kadana International School and the Montessori International School.

Staffing and programmes will have to be adjusted in accordance with new requirements. Detailed planning should be carried out as soon as the forthcoming influx of foreigners of different nationalities is assessed.

g. Port facilities. The new port in Calabar is underutilized and fully capable of meeting EPZ transport requirements.

Depth of access channel is 9 metres and improvements are planned. 800 metres of berthage are available. Other infrastructure, like sheds, warehouses, cargo handling equipment, etc., are adequate. Present traffic is extremely low and shipping companies should be contacted to determine possible specific requirement

to insure regular shipping services once the EPZ is established.

h. Airport. Calabar airport, of recent construction, is also adequate. Direct linkages within West Africa already exist. An extension of runway to accommodate large jet planes is planned.

Nigerian Airways domestic services are far from regular, long delays are a normal occurrence. Some essential improvements should be negotiated, to insure connections with international flights.

i. Roads. Good tar roads connect the EPZ location with Calabar and the national network. Links between Calabar and to North Eastern States are not good and will need to be further developed.

j. Rail. Calabar is not ar present serviced by rail. The nearest rail link is about (2) 70 km distant.

PART 2. TECHNICAL ASPECTS

2.1 EPZ Location

The area assigned for the development of the EPZ is situated about seven Kilometres north of the city of Calabar (See DRWG No 1). It is connected to the city by the Murtala Muhammed Highway which is considered one of the most important thoroughfares linking the city with the rest of the surrounding territory.
The area covers about 106 hectares and has an L-shaped form. The western side runs for about 1500 m along the bank of Calabar River, part of the eastern side borders on the access road to the village of Nassarawa, and the southern side with the area occupied by the Plywood Factory. On the remaining sides the land borders on uncultivated fields without evidence of any relevant pre-existing elements (See DRWG No 2).

To provide a more economical site design and layout, the possibility of extending the site on the eastern side across the road should be considered. An additional 200 hectares of land would allow the EPZ Authority to cater for projects requiring very large areas of land.

2.2 Factors affecting the Land Use Proposals

The Site Appraisal represents the analytical route necessary to find all of the conditioning elements which directly or indirectly influence the Project choices of the "General Land Use Plan". These conditioning elements fall into either of the following two types:

A) those derived from the "Natural and Environmental Features" of the Project Area;

B) those derived from human intervention already carried out or previously planned in the Project Area (Man-made Constraints).

Regarding Point A), the "Natural and Environmental Features" have been identified by means of a series of analyses and successive elaborations that pivot on two fundamental themes:

- Geology

- Morphology

Each of the above items has been investigated through numerous visits to the site permitting the designers to acquire a specific knowledge of the characteristics of the area under examination.
This has made it possible to identify, for every type of study, those areas most suitable to be developed, and those less likely to be.
Regarding the "Man-made Constraints", they have been singled out through direct surveys by TEAM during the Site visits.
Finally, all the planning constraints have been synthesized in the "Comprehensive Plan of Natural and Man-made Constraints", with the aim of identifying the "key" to the results of the analyses executed and, even more, the way of using them in the following stages of the design (See DRWG No 3).

2.2.1 Natural Features

a. Geology

The area of the new industrial complex is situated near the port of Calabar and its western side runs for 1500 m along the bank of the River.

The plateau occurs as a slight but continuous slope toward the river starting from the upper road (about 50 m a.s.l).

The plateau is interrupted along the river with a steep drop of about 45 m, with unstable, strongly eroded slopes, very steep in a number of points, and with a constant presence of small and large niches, rockfalls combined with collapse and landslips.

This strong instability is linked to the geological, geomorphological and hydrological situation of the whole upper area which runs along the River Calabar, determining its stabilization at the foot of the slopes.

b. General Geology

The study area lies on the ancient alluvials transported by the River Calabar.
The whole of the river mouth area, but also the coastal shores and the islets facing them consist of ancient river deposits left by the River Calabar in the alluvial sedimentation basin as from the Plio-Pleistocene and until more recent times.

The study area contains two main alluvial formations outcropping in the area: an older base formation consisting of coastal plain sands of medium-coarse particles, sometimes cemented, and a more recent formation constituted by the alluvials properly speaking of the ancient River Calabar. These consist mainly of an alternation, sometimes with considerable thicknesses (over 20 m), of fine silty sands with sandy clays and levels of organic plastic clays.
This sedimentation is typical of river mouth areas where the nature of the materials reflects the original river basin.
The materials stem mainly from weathering and disgregation of the older granite, quartzite and schist complex formations.
The area in question is characterized by a surface layer of silty sands overlying levels of sandy silts and clay.
The strata are always subhorizontal.

c. General Geomorphology and Hydrogeology

In view of the distribution of the sediments, the grading of the materials and the morphological situation, it may be stated that the ancient course of the Calabar was not the present one, but was situated further to the south.

In the site there are thus two types of instability, a general instability and a local instability.

i) The general instability is linked to the stratigraphic sequence of the soils, where there is a shallower top layer of everagely cemented silty sands, and a number of lower layers of clayey silts and silty clays, representing the possible slip plane if the area is not drained.

ii) The local instability is easily identified along the scarps skirting the river. These in fact collapse and slide because the materials have low cohesion (silty sands), but above all due to the advancing erosion at the foot caused by the river, and the total absence of surface water and stormwater drainage.

To make the whole area stable, surface drainage must mainly be created, to prevent the rainwater from infiltrating into the easily erodible silty sands, as well as deep subhorizontal drains on the scarp front to drain the contact interface between the silty sands and the sandy clays, and drainage diaphragms or walls duly distributed on the excavation front.
Given the large amounts of rainfall in a short period, it is always necessary to prevent unchecked runoff, as the water very quickly acquires a strong power of erosion and disgregation. This has to be done once the whole area has been appropriately drained and excavated and has been stabilized.

Local instability, developing in a well-identified landfall area, is linked to the erosion at the foot by the river and flood waters.
The lack of a resisting moment at the foot, together with the free circulation of water along the slopes, fosters the creation of rotational cycloids (Felleniu's circular arc failure) and subsequent relaxation.

d. Stratigraphy

The stratigraphic situation has been surveyed from the excavation sections of the scarp front and may be summarized as follows:

Formations

i) 0.00 - 6.00 Silty sands, fine grained, medium dense, with oxidations and some sandy silt levels

ii) 6.00 - 12.00 Medium sands, evenly graded with few fines, strong oxidation, averagely cemented.

iii) 12.00 - 18.00 Clayey and sandy silts, with strongly plastic clay levels.

iv) 18.00 - 30.00 Medium-fine sands, silty, fairly cemented, with pseudo-cohesion, with clayey silt levels

e. Typologies of foundations

Throughout the industrial complex to be constructed near the port of Calabar, various typologies of foundations may be foreseen according to the work and the support height of the foundation.

- Continuous foundations or footings
  Minor structures not discharging more than Ps = 1.0 kg/sq.m onto the ground can have continuous footings supported directly on the improvement layer.
  P_{ult} = cNc = 0.6 x 7 = 4.2 kg/sq.cm
  And so, using a factor of safety η = 3.0, there will be an admissible pressure of: $P_{adm} = \frac{P_{ult}}{\eta} = \frac{4.2}{3}$ = 1.4 kg/sq.cm
- Strip foundation
  These foundation will be used for those civil works up to 4 floors in height which discharge onto the ground a pressure greater than 1,0 kg/sq.m.
  Strip foundations (grade beams) will be used, width B = 1.5 m and going down into the cemented silty sandy soil of formation B for D = 1.5 m.

  From Terzaghi and Meyerhof, the following ultimate pressure is obtained:
  $P_{ult} = cNc + \gamma DNq + 0.5 \gamma BN\gamma$

  From the SPTs, we obtain 0 = 36o and C' = 0. There are thus the following bearing capacities: Nq = 25 and $N\gamma$ = 22.

  Neglecting the term of cohesion we obtain:
  P_{ult} = 1.45 x 1.5 x 25 + 0.5 x 1.45 x 1.5 x 22 = 79.1 t/sq.m and for a factor of safety η = 3.5 there is the following admissible pressure:
  $P_{adm} = \frac{79.1}{3}$ = 22.6 t/sq.m = 2.3 kg/sq.cm
- Pile foundations
  Deep pile foundations are foreseen for retaining walls and major civil structures. The piles have

an average length of 20 m and diameter of 800 m, and will be embedded in the fine cemented sands. The capacity load of the pile is given by the contribution of the base resistance and the lateral resistance.

$Q_{ult} = Q_b + Q_l$

The base resistance is obtained by:

$Q_b = \gamma \cdot DNq \pi \frac{B^2}{4} = 1.7 \times 20 \times 60 \times 0.502 = 1024t$

The lateral resistance is obtained by:

$Q_l = \alpha C_u \pi B D_L = 0.5 \times 5 \times 3.14 \times 0.80 \times 20 = 175$ t

Using a factor of safety $\eta = 3.5$, we obtain the following admissible load of the pile:

$Q_{adm} = \frac{Qb+Ql}{\eta} = \frac{1024+125}{3.5} = \frac{1149}{3.5} = 328$ t

In the final design phase the various foundation typologies will be used on the basis of the earthworks elevation of the outcropping soils.

f. Site stability

- Site stabilization and feasibility

In view of the geological, geomorphological, hydrogeological and geotechnical situation of the soils in the study area, it is possible to establish new industrial activity provided the general geomorphological stabilization and upgrading works set out schematically below are carried out.

- Excavations

The whole area will be lowered and excavated to a thickness of min. 1.0 m and max. 3.0 m, and filled in the areas of depression. The fill materials can come from the excavations, provided the soils belong to group A-2 of the AASHO classification system.
In the end there will be a complete, well-defined plain with a mean slope towards the river of 1.5 - 2.00.
This slope favours the general runoff of the surface and rain waters.

- Improvement

A bearing and draining improvement layer 1.0 m in thickness will be laid on the excavation and subfoundation level. This layer will consist of well-compacted selected granular material and quarry tout-venant with Md = 500 kg/sq.m.

- Slope stabilization (upstream)

Before making the retaining walls at the foot of the slope, this foot must be modelled, including in the plain zones, in successive steps or terraces (see drawings), the actual step being not less than 3.0 m, and with a slope of 1.5%.

The steps will subsequently be covered with A1-A2 granulometrically stabilized material, in successive layers of 50 cm, which after compaction should give an Md = 800 kg/sq.m. These compacted materials will act as a berm or apron with counter pressure to the slopes.
At the base of all the steps there will always be a draining gravel layer.

- Slope stabilization (downstream)

Downstream and at the foot of the reformed slope, a retaining wall will be constructed on piles, its height following the morphological variation of the slope.

There will always be a draining layer of broken rock elements backing the wall, and at its internal base a collecting ditch for drainage waters and drain holes.
The wall will be founded on 20 m deep piles with a diameter of Ø 800 = 328 tons.

- Gabions (downstream slope)

The slope between the average level of the river and the foot of the retaining wall will be protected against erosion by means of gabions, and at the points of greatest erosion and of landslide by Larsen sheet piling at river surface level.
The slopes will always be morphologically connected, with a mean gradient of 1/2, and lined with turf.

- Side drains

For the whole length of the slope following the upper edge, drainage diaphragms or walls (with drainage trenches) will be made, with a terrace configuration, the steps being subsequently filled with medium-to-coarse gravel.
The spacing of the walls will be denser in the landslide niche zones, with one drain every 10 m. The walls will be at least 1.5 m long.
All the drainage diaphragms will have a ditch at their base for collecting the water.
At the base of the terrace steps of the drainage diaphragms there must be draining material of nonwoven "Drenotex" type fabric.

- Deep drains

This type of more sophisticated measure serves to stabilize the whole area at depth, and to improve the physical-mechanical features of the soils, by means of removing the water.
The slightly inclined subhorizontal drains will start from the base of the terrace steps and will always have a fanlike disposition.
The length is linked to the depth of the clay beds, the average length being between 30 and 50 m.

The draining tubes (of SIPEG type) will terminate in the ditch for collecting water of the drainage diaphragms.
The geomorphological upgrading works and the stabilization measures already described will serve to stabilize the whole area and will make the industrial complex a feasible proposition.

2.2.2 Morphology

The morphological characteristics are one of the main factors influencing the LAND USE design. In this chapter the most important aspects of the landform have been taken into consideration, such as:

- Altimetry
- Clinometry
- Suitability of land for development.

To perform all of these studies, TEAM's experts have visited the site many times to check and examine more closely the results emerging from the analysis of the available maps.
The main goals of these investigations have been to:
- acquire a wide knowledge of the morphological features of the Project Area;
- identify, by means of slope analysis, those areas not suitable for development, due to the steepness of the ground;
- deal with all morphological constraints that will affect the planning process.

The existing slopes in the Project Area vary between 0 and 30% with a majority of areas where the slope trend is between 3 and 15%.
Such a land situation will not jeopardize the planning process, but will require more accurate care in the choice of the land uses.
The part of the Project Area which runs parallel to the river appears to be fairly level with a medium gradient of about 3%, except near to the river where the land becomes uneven and falls steeply to the level of the water with a very pronounced slope.
In this area there is evidence of landslides which compromise the stability of a large stretch of land bordering on the river.
Instead, the area which stretches ortogonally (east-west) to the river's course does not appear to have stability problems, but seems to be very uneven with variable gradients between 15 and 30%.

2.2.3 Man-Made Constraints

Inside the area there is already a village, a market, an abattoir and a car park. The possible relocation of the market and the abattoir, being productive activities which are not in line with the vocation of the EPZ, will be efficiently studied during the final design and implementation stages. The car park will be inserted into the area assigned to the EPZ services (See DRWG No 3).
The following pre-existing infrastructures are to be preserved:

- a paved access road to the village, two unpaved secondary roads connecting the abattoir to the market;
- an overhead electric cable near the junction between the access road to the port and the access road to the village.

Among the pre-existing external elements, important for both the industrial and economic development of the area, the port of Calabar, will certainly give an active impetus to the industrial activities to be carried out in the future EPZ.
The same access road to the port will allow the EPZ to be connected to the surrounding road and motorway network (Murtala Mohammed Highway).

2.3 E.P.Z Planning Concept

The basic concepts adopted by the Consultant in the preparation of the General Land Use Plan originated from the contents of the previous chapter "Factors Affecting the Land Use Proposals".

On the basis of the planning concept the area assigned to the EPZ will be developed in two phases:-

	Hectares	
- Area of the assigned site		106
- Area developed in phase 1	54	
- Area developed in phase 2	24	
- Area left undeveloped (part of the bank of the river, E.P.Z. surrounding territory)	28	
	106	106

From the land use pattern, the measurements of the areas devoted to the various structures and infrastructures, are as follows:-

	Hectares		
	1st phase	2nd phase	Total
- Area covered by road	14.7	4.6	19.3
- Directional area	6.0	1.5	7.5
- Green area	2.6	--	2.6
- Area for industrial sites	24.2	17.9	42.1
- Area devoted to existing structures	6.5	--	6.5
	54	24	78

2.3.1 Distribution of Basic Functions

The basic function of the EPZ area is that of accommodating industrial development. Remaining functions must be allocated following a number of principles.
Given the L-shaped form of the area, two principal axes, along which the industrial area and related services develop, have been identified. (See DRWG No 4).

Another directrix links the meeting point of the above axes with the main entrance to the EPZ.
Other secondary and service entrances to the EPZ are foreseen, located corresponding to the two principal axes.

a. Road System
The access points and the main axes previously identified, determine the final configuration of the main road system which serves both as an internal connection between the various foreseen industries and services and as the principal entrance to the entire industrial zone.(See DRWG No 5 and 6).
The secondary road network branches out from the main network thus guaranteeing access to all the developed land within the industrial area.
The main road network (width 28.50 m) is foreseen with 6 lanes (3 each way) of which two are intended as parking lanes with a central traffic divide and lateral footway.(See DRWG No 27).
The secondary roads (width 22.80 m) are also designed to have four lanes, two each way, with central traffic divides and lateral footways. (See DRWG No 28).

b. Directional Area
Most of the basic services in the Industrial Area have been located within the Directional Area.
This is located near the main entrance to the EPZ and is almost barycentric to the development of the entire industrial area.
In this area buildings are assigned exclusively to administrative operations and to service, control and protection of the area and the workers in the EPZ.
Furthermore internal roads and private and public car parks are included in the directional area. (See DRWG No 7).
The buildings planned are:
- Bank and Administration building
- Mess Hall
- Post Office and Forwarding Agency
- Customs Building
- First Aid Building
- Police Station
- Fire Station
- Petrol Filling Station
- Maintenance Workshop

c. Bank and Administration building
The building is planned on two levels for a total of 1914 sq.m and 8610 cu.m. (See DRWGS No 8, 9, 10).
The offices that have direct contact with the public, both inside and outside EPZ, are to be found on the ground floor. These include the bank, telecommunications Offices and Information Office.

On the first floor private offices of the bank and all the EPZ administrative offices, including manager's offices, filing offices and Toilets, are located.
The area intended for the bank, apart from having a private entrance, will be separate from that intended for the EPZ offices.

The Administration Building can be entered either from inside the EPZ or from the public car park through two diametrically opposed entrances, with one reception area.

d. Mess Hall
This is a one-storey building of about 862 sq.m (4310 cu.m).
The internal space is divided up as follows: an entrance hall leading to the dining-room of which one part is intended for the distribution of meals. This area is in direct contact with the kitchen where the meals are prepared and leads to the store rooms and cold store. (See DRWGS No 11,12).
The wash-rooms are divided for men and women and are entered from the dining-room. Outside, there will be an open-air covered rest area.
The entrances to the building will be separate. The main entrance directly connects the exterior to the dining-room by way of an entrance hall. The other secondary entrances are connected to the side of the building intended for the services.

e. Post Office and Forwarding Agency
This is a two-storey building with a total area of about 1116 sq.m (3905 cu.m). It has one entrance, but both the first and second floors are divided into two administrative areas. One part is intended for the post office and the other for the shipping agents; both of these have their own offices, wash-rooms and areas for the public. There is only one entrance for the public while the service entrances are completely separate because of the loading/unloading operations. A special area at the side of the building has been put aside for these operations.
The area on the ground floor is intended for the public's use and the top floor for the administration and telecommunications offices.
The internal stairway is used by all the offices. (See DRWGS No 16,17,18,19)

f. Customs
This is a single-storey building of 169 sq.m (676 cu.m) and is positioned at the entrance to the EPZ. It consists of a waiting-room, reception, five administration offices, a filing room and wash-rooms for the staff. (See DRWGS No 20,21).

g. First Aid

This is a single-storey building of 25 sq.m (100 cu.m). It is part of a complex of buildings which include the Police Station and Customs Buildings and is composed of a single hall with relevant W.Cs. (See DRWGS No 20,21).

h. Police Station

This is a single storey building of 108 sq.m (432 cu.m). It is composed of a Reception area, three offices, a filing room and relevant Toilets. This, also, is situated at the entrance to the EPZ to facilitate control of the area. (See DRWGS No 20,21).

i. Fire Station

This is a two-storey building of 530 sq.m (2680 cu.m). Connected to the building is a parking area (417 sq.m) for the Tank Trucks, covered by a cantilever roof. (See DRWGS 13,14,15).

On the ground floor are located the main office, secretary's office, radio room and the dressing room with relevant toilets.

On the first floor are provided a common rest area and the dormitories with relevant toilets.

The building, to provide greater freedom of movement to the tank trucks, is located slightly away from the Administrative Area.

j. Petrol Filling Station

The Petrol Filling Station consists of two blocks of buildings: the Mechanical Workshop and the Petrol Pump with the Snack Bar and the Shopping Store. The total area occupied by the buildings is 345 sq.m (2,155 cu.m). (See DRWGS No 22,23).

The Workshop (259 sq.m) contains three rooms: one for machine repair, one for truck repair and a smaller room for an office and staff toilets.

The Filling Station (86 sq.m) also has three rooms: one for the Bar and the Store, one for the Shopping Store and toilets, and a smaller one for an office.

The Petrol Filling Station lies outside of the EPZ near the main entrance and covers a total area of 3,000 sq.m.

k. Maintenance Workshop

For practical reasons and to give greater freedom of movement to the maintenance workers, the building has been positioned outside of the Directional Area, in an area specifically earmarked for it. (See DRWGS No 24)

The covered area measures 1,100 sq.m on a single level subdivided into:

100 sq.m for the Services (changing Rooms and Toilets)
400 sq.m for the Workshops
600 sq.m for the Main Repair and Maintenance Bay.

Three entrances have been foreseen: two for the passage of persons and vehicles, and just one pedestrian entrance for staff.

2.3.2 Industrial Areas

The various types of industries foreseen in the EPZ are:
Textile garments, food processing, pharmaceuticals, engineering assembly (water pumps, generators), wood processing, white goods, oil industry related activities (mixing chemicals, coating pipes, rigging construction).
Naturally, other types of industries could be included according to the types of industries, requesting to set up in the EPZ.
Any new proposal should be approved by the Authority and a careful analysis made to check both its suitability and its feasibility in the area context.

The industries provided in the EPZ have been subdivided into two classes (small and medium scale industries) on the basis of three parameters: Traffic, Number of Workers and Space.
The criteria adopted in locating the 2 types of industry are as follows:

a. Small Scale Industry
The peculiar characteristics of this class is represented by the small amount of traffic and also by the small space required, while the number of workers is not very large.
The result is that Small Scale Industry will be located closer to the directional area (excluding only those few polluting Industries comprised in this class) and not necessarily along the main axes of the transportation system.

The area of the sites for Small Scale Industrial units varies from a minimum of 2,500 sq.m to a maximum of 6,500 sq.m. In the event of particular need, the sites could be merged or further subdivided, to make the use of the areas more flexible.
The total area earmarked for the Small Scale Industries is about 160.000 sq.m.

The maximum covered area is approximately 50% of the factory site.
The primary infrastructures (electricity, water and sewage network) have been dimensioned assuming the maximum covered area.
The buildings intended to accommodate Small Scale Industry have been designed of modular type.

The basic module has a width of 30 m and is 75 m in length, the internal height is 6 m. It is self-sufficient from the standpoint of services, with 100 sq.m for Toilets and Changing Rooms, 100 sq.m for Stores and Deposits and 350 sq.m for Offices.
This module will allow considerable flexibility of design depending on the requirements of each unit.
In particular, close to the Directional Area, where the majority of sites intended for Small Scale Industry are concentrated, there can be single buildings of variable length formed by a number of basic modules, suitable to accommodate more than one industrial unit. (See DRWG No 25)

b. Medium Scale industry
The peculiar characteristics of this class is the alternative increase either of the traffic or of the space parameter.
The result is that the Medium Industries will be located on the larger sites along the main road axes, in the peripheral parts of the Industrial Area and close to the secondary entrances and exits so as to avoid the transit of heavy vehicles near the Directional Area and on the secondary roads.
The area of the sites intended for the Medium Industries varies from a minimum of 6,500 sq.m to a maximum of 15,000 sq.m.
In this case, too, the maximum covered area has been foreseen as 50% of the factory site. As specified for the Small Scale Factory, the possibility is foreseen of merging a number of sites or of subdividing them in a different way.

The total area earmarked for Medium Industries is about 260,000 sq.m.
The buildings to accommodate these industrial units follow the same design concept of modular type as for the Small Scale Industries. In this case the basic module has a width of 40 m and a length of 80 m. The internal distribution of the services and the formal aspect are identical to those of the Small Scale units. In this way, apart from simplifying the construction of the buildings, there will be a formal and volumetric uniformity of the whole Industrial Area.

c. Existing Industries
Part of the area intended for the EPZ is occupied by existing industrial activities, namely a Market and an Abattoir. During the final design and project implementation these will be relocated outside the EPZ.

2.3.3 Services and Utilities

Inside the area intended for the development of the EPZ four Parking Lots have been planned, three in the Industrial Area and one outside of it near the Directional Area.
The three internal Parking Lots are to serve the Industrial Area for the containers and Trucks. They have an aggregate area of approximately 35,000 sq.m and are located near the accesses to the EPZ. The external Parking Lot near the Directional Area is for public use, for the cars used by the staff and the operators outside of the Industrial Area, and has an area of 5,000 sq.m. It adjoins the area of the future Directional Area development. (See DRWG No 6)

2.3.4 Green Areas

Landscaped green areas are provided near the Directional Area and around the outside of the Industrial Areas. Their purpose is to create a visual screen vis-à-vis the surrounding areas and to screen particular general services, such as the Sewage Treatment Plant, intentionally located in peripheral areas.
As far as the undeveloped green areas are concerned, no upkeep is envisaged apart from a periodic cleaning. (See DRWG No 5)

2.4 Infrastructures Concept Plan

2.4.1 Water Supply System

The Free Zone water supply system consists of the following basic Installations:

- Two drilled deep wells with submersible pumps
- Ground-level water tank (GLT)
- Elevated water tank (WT)
- Main distribution pipeline
- Service lines to buildings, factories and hydrants
- Interior building service lines and facilities.

The submersible deep-well pumps lift the groundwater directly into the elevated water tank (WT) and the ground-level tank (GLT) if the latter is not already full. Two level switches in the WT signal the well pumps for automatic start-up and shut-off.
Another two level switches located below the previous ones signal the ground-level water pumps for their automatic start-up and switch-off. The GLT is equipped with a float-operated valve for automatic opening and closing of the supply (from the wells) and with a low-level switch which stops the GLT pump before dry running.
The two wells are set up for singular operation with manual switch-over from one pump to the other, located in the pump house at the GLT. They are also equipped with automatic dry-running stop switches, with simultaneous alarm to the Fire Station.
The GLT pumps are set up for singular operation with manual switch-over. The following water-level conditions, if occurring, would alarm the Fire Station:

- Level in the WT higher than normal (overflowing)
- Level in the GLT higher than normal (overflowing)
- Level in the GLT lower than normal (empty)
- Level in the well lower than normal (dry)

The outlet pipe for normal consumption is placed one-third of the way up the WT, while a separate outlet is placed at the bottom of the tank for fire-fighting reserve. The manually operated valve for the latter is placed below the WT low enough to be reached from the ground. The WT also has a separate outlet for emptying the tank.
This outlet, and the overflow pipes lead to the storm-water drainage system. A chlorination plant (tank and pumps) is provided in the chlorination cabin next to the GLT.

Physical Properties of each well

- Well diameter Ø 300 mm
- Power rating submersible pump 60 kw
- Rated well capacity 80 cu.m /h

a. Water Tanks

Water storage is provided by two tanks, namely:

- A ground-level tank (GLT) of 1000 cu.m capacity, made of reinforced concrete, constructed below ground level, with an adjoining pumping chamber
- An elevated steel-plate tank (WT) of 500 cu.m capacity placed on a 15 m high structural steel tower with concrete foundation
- A chlorination plant is located between the GLT and the WT.

b. Water distribution network

The networks consist of pipes of diameter varying between 250 mm and 90 mm.

The main distribution pipes and the secondary branches will be of high density polyethylene (HDPE) and will supply all the users in the zone. (See DRWG No 31)

c. Fire fighting network

An independent network is foreseen for the firefighting system with routes similar to the water distribution network. The pipe diameter will vary between 200 mm and 90 mm.

The fire hydrants are situated at the boundary of each lot and close to the civil buildings. The discharge of each hydrant is 7 l/s. (See DRWG No 32)

In buildings, a system of hose reels and portable extinguishers is provided. The extinguishers apply a mixture of water, dry powder and CO_2 and are wall-mounted in strategic positions. High capacity CO_2 extinguishers mounted on trolleys are place in the Main Sub-station/Power Plant.

d. Design data

Water requirements:

-	Administration building	3	cu.m/day
-	Mess	45	" / "
-	Post office	1	" / "
-	Fire Station	2	" / "
-	Police Station, first aid, customs	2	" / "
-	Maintenance	10	" / "
-	Petrol filling station	2	" / "
-	Factories	1150	" / "
	total	1217	cu.m/day
-	Firefighting plant 10%	~150	" / "
	TOTAL WATER REQUIREMENT	1367	cu.m/day

2.4.2 Drainage system

The Drainage System is fed by the waters from the roofs of the civil and industrial buildings and from the roads and parking lots.
Stormwater drainage is foreseen via open channels made of reinforced concrete at the edges of the roads, with a slope of 0.5%, converging on the lowest point of the Industrial Area and discharging into the river.
Reinforced concrete drains with grating covers will be constructed at the road crossings.
The position of the channels, the drains and the discharge points are shown on the project drawings. (See DRWG No 29)
The drainage network has been calculated according to the formula

$$Q = C \times i \times A$$

where
Q = discharge in l/s/sq.m
C = reduction coefficient (0.8)
i = rainfall intensity (0.041 l/s/sq.m)
A = area of single drainage areas in sq.m
The reduction coefficient has been assigned a value of 0.8 applicable to paved road areas, parking lots and building roofs.
The rainfall intensity has been obtained from the Calabar Rainfall Intensity Duration Map based on the available documents of 1956-1964.
The calculation has been based on an intensity of 150 mm/hr with a return period of 10 years.

2.4.3 Sewage Network

a. General
The sewage network consists of:
- Sewers
- Sewage Treatment Plant.

Only discharges of a civil type have been considered, since it is not possible to establish a priori the type of pollution produced by each single industrial unit. For this reason it has been considered that each industrial unit will have its own treatment plant making its effluent suitable for the channels and civil treatment plants.

b. Sewers
The Sewers consist of inspection manholes and PVC pipes. They collect the discharges of each civil and industrial building and with slopes varying between 3 and 5 per mille convey them to the treatment plant.

The position of the pipes, the manholes and the discharge points from the buildings are shown on the project drawings. (See DRWG No 33)
The following are foreseen:

- PVC pipes of considerable thickness, suitable for laying at depths of up to 6 m
- Traps of precast type in vibrated reinforced concrete, 60 x 60 x 50 cm, located at the boundary of each site and near the civil buildings
- Inspection manholes, sized 60 x 60 x150 cm and 100 x 100 x 150 cm, to be constructed in loco in reinforced concrete with electrowelded mesh and a load-bearing cover, with a minimum spacing of 30 m and maximum spacing of 40 m.

c. Sewage treatment plant

The sewage treatment is provided located at a central point of the EPZ area.
The treatment provided is of the Biological process type.
The sewage is broken down by the action of micro-oranisms such as bacteria, fungi and protozoa which feed on soluble organic material in the sewage. These organisms depend on an ample supply of oxygen for their metabolism. In the biological treatment plant, oxygen is supplied by mechanical aeration and mixing of the sewage. The end products are sludge, minerals and dissolved chemicals.

2.4.4 Power Supply System

a. Power demand

The Calabar EPZ complex foresees, in its first construction phase, a built area for industrial use of 105.000 sq.m. divided into 23 plots of various size. Electrical power will be supplied by NEPA from a local transformer substation, at a voltage of 11 kV. by means of two 33/11 kV transformers each with an apparent power of 7.5 MVA. Of this power, about 1.5 MVA is used for the General Services (Administration, Police and Finance Offices, Post Office, Fire Station, Mess, Maintenance Workshop, Public Lighting and other minor items) and the remainder, equal to 13.5 MVA, is available for the 23 plots, with an average power input of approximately 129 VA/sq.m. This availability is able to meet the demand of a vast range of industrial and handicraft activities.
To cater for possible out-of-operation periods of the NEPA supply network, a generating set is envisaged for emergency running, of the gas turbine-alternator (high pressure steam type) supplying 5 MVA. This will guarantee a power reserve equal to 33% of the total installed power in the transformer substation.

Said generating set will be installed near the NEPA transformer substation and will have a system of busbars to which all or some of the 11 kV distribution lines from the substation can be connected.
In the subsequent phases two other generating sets of the same type and the same potential could be installed, thereby making a power reserve equal to 100% of that installed in the substation.

b. Medium Voltage Distribution Network
From the 33/11 kV transformer substation the energy is distributed to the whole of the EPZ through an 11 kV network which feeds the nine transformer stations located in various parts of the area (See DRWG No 34). The supply network therefore consists of four feeders which may be interconnected to form two rings. In the transformer substation each line is protected by a circuit breaker (of the reduced oil volume or sulphur hexafluoride type). Feeders are three-phase copper cables, with rubber insulation, of armoured type, with a section of 3 x 150 sq.mm. buried to a depth of 1.00 - 1.20 m. At road crossings and in the stretches linking up with the transformer stations the cable will be contained in a PVC sheath or in concrete having a diameter of 20 cm. The abovementioned four feeders shall supply the following stations:
- Line I : feeds transformer stations 1-3-5
- Line II : feeds stations 2 and 4

By closing the couplers of stations 1 and 2 lines I & II can be connected to form a single ring.
- Line III : feeds stations 6 and 7
- Line IV : feeds stations 8 and 9

By closing the couplers of stations 7 and 8 Lines III & IV can be connected to form a single ring.
The foreseen plant extensions in the second development phase of the EPZ entail the installation of five more transformer stations in addition to the nine in the first phase (See DRWG No 35).
Of these five new stations. One will be fed by line II, one by line IV and three by a new line which will be able to combine with line III or line IV, according to need, to form a ring.

c. MV/LV Transformer Stations
The electrical power taken off at 11 kV - 50 Hz shall be transformed at tensions of 380 - 220 V - 50 Hz - at nine transformer stations located at baricentrically with respect to the foreseen loads (See DRWG No 36). Each station will be equipped with 3 transformer units each of 630 kVA. The stations foreseen are of the prefabricated, modular type suitable for tropical climates (See DRWG No 37).

- Station 1 feeds Plots 1 and 3, for both of which a power of over 700 kW will be made available. In view of the amount of this power, the station will be located on the boundaries of the two plots, to make the power available directly on the LV panel of the station itself, according to the actual plot demands.
- Station 2 feeds Plots 2 and 4 according to the same criteria as stated for Station 1. The supply of the Water Reservoir Pumps (120 kW) also comes from this station via a cable having a section of (3x95+1/2) sq.mm.
- Station 3 feeds Plots 5 and 7 and part of the lighting of the external fencing.
- Station 4 feeds Plots 6, 8, 10 and 11, for which the supply of 350 kW of power each is foreseen. While the interior of Plot 8 is directly connectable to the L.V. panel of the stations. Plots 6, 10 and 11 are each fed through a pair of cables, with a section of (3x150+1/2) sq.mm. which convey the power to the Plot distribution panel. It also feeds part of the lighting of the external fencing, and acts as a reserve supply for the street lighting in Zone A.
- Station 5 feeds Plot 9 (700 kW) directly from the L.V. panel, and Plots 12 and 13 (350 kW each), each with a pair of (3x150+1/2) sq.mm. cables to the distribution panels of the plots. It feeds the street lighting of Zone A.
- Station 6 feeds:
    - the Maintenance Workshop (350 kW) through two (3x150+1/2) sq.mm. cables;
    - the Administration Offices (300 kW9 through two (3x95+1/29 sq.mm. cables;
    - the Mess (200 kW) through one cable (3x150+1/s) sq.mm. the Post Office /100 kW) and Fire Station (50 kW) through one cable of (3x95+1/s) sq.mm.
    - the Police Station (100 kW), Vehicle Workshop and other users with one cable (3x95+1/2) sq.mm.
    - the Street Lighting of Zone B.
- Station 7 feeds Plots 14, 15, 16, 17, 18 and 19, each for a power of (200 kW) by means of a cable of (3x95+1/2) sq.mm. and part of the lighting for the external fencing, and it acts as reserve supply for the street lighting of Zones B and C.
- Station 8 feeds Plots 20 and 21 (700 kW each). Street lighting for Zone C. Reserve supply for street lighting of Zone D. Part of the lighting for the external fencing.
- Station 9 feeds Plots 22 and 23 (700 kW each). Street lighting of Zone D.

d. Fence and Street Lighting

The street lighting of the whole EPZ complex is subdivided into four zones:

- Zone A is fed by transformer station 5 and, alternatively, by no. 4;
- Zone B is fed by station 6 and, alternatively, by no. 7;
- Zone C is fed by station 8 and, alternatively, by no. 7;
- Zone D is fed by station 9 and, alternatively, by no. 8.

Lighting of the main roads has been studied so as to have an average illumination of 20 lux. and therefore armatures have been foreseen equipped with HPL mercury vapour lamps of 250 W mounted in pairs on "double pastoral" type posts, at a height of 10 m over ground level, installed along the midway line of the roads at intervals of approximately 20 m (See DRWG No 38).

On the secondary roads, an average illumination level of 10-12 lux has been adopted. Therefore the same lighting arrangements as for the primary roads have been followed, with 30 m intervals.

On the parking lots, in the market area and at the entrance to the area, the light posts envisaged are of the "large space" type, consisting of an armature equipped with six mercury vapour lamps of 400 W, mounted on poles 20 m above ground level. The electrical supply of the light points takes place with 4-pole copper cables, insulated in rubber, inside pipes running longitudinally under the road surface along the middle. At the base of each pole a suitable manhole must be foreseen for the cable connection.

The external fence of the EPZ will be provided with lighting so as to permit the control of the area. For this purpose a line of lamp posts will be arranged parallel to the external fence, guaranteeing illumination of not less than 4 lux. The light points consist of mercury vapour lamps of 125 W, mounted on street armatures on simple "pastoral" type lamp posts at a height of 10 m, installed at no more than 5-8 m from the fence, at 30 m intervals.

As an alternative to the abovementioned use of mercury vapour lamps, the use may be proposed of high pressure sodium vapour lamps. Naturally, in this case the spacing of the lights would be modified.

2.4.5 Telecommunications system

The proposed EPZ Telecommunications System is composed of:

a) a completely containerised Digital Exchange 1,000 internal users, for transmission of data and telephone messages.
b) Peripheral Concentrators with related optical fibre connections.
c) External telephone network and accessories.

d) "L" Band Coast Earth Station

The DIGITAL EXCHANGE UNIT will be linked to the national telephone network by optical fibre connections. This exchange will be interfaced with an TX/TR system via satellite through the allocation of the appropriate telephonic channels (frequencies).
The external telephone network at EPZ will be an underground system and will run along the pavements. 15 cm diameter PVC pipes have been provided along the pavements, grouped together in bundles of six tubes each.
Connecting pits will be provided every 100 m into which the cables will be inserted.

2.5 Implementation Strategy

Once engineering design and preparation of tender documents are completed, once evaluation of bids and recommendations to the client are made, once construction contract has been awarded, implementation of the project, on the basis of a master chart prepared by the Consultant, will start.

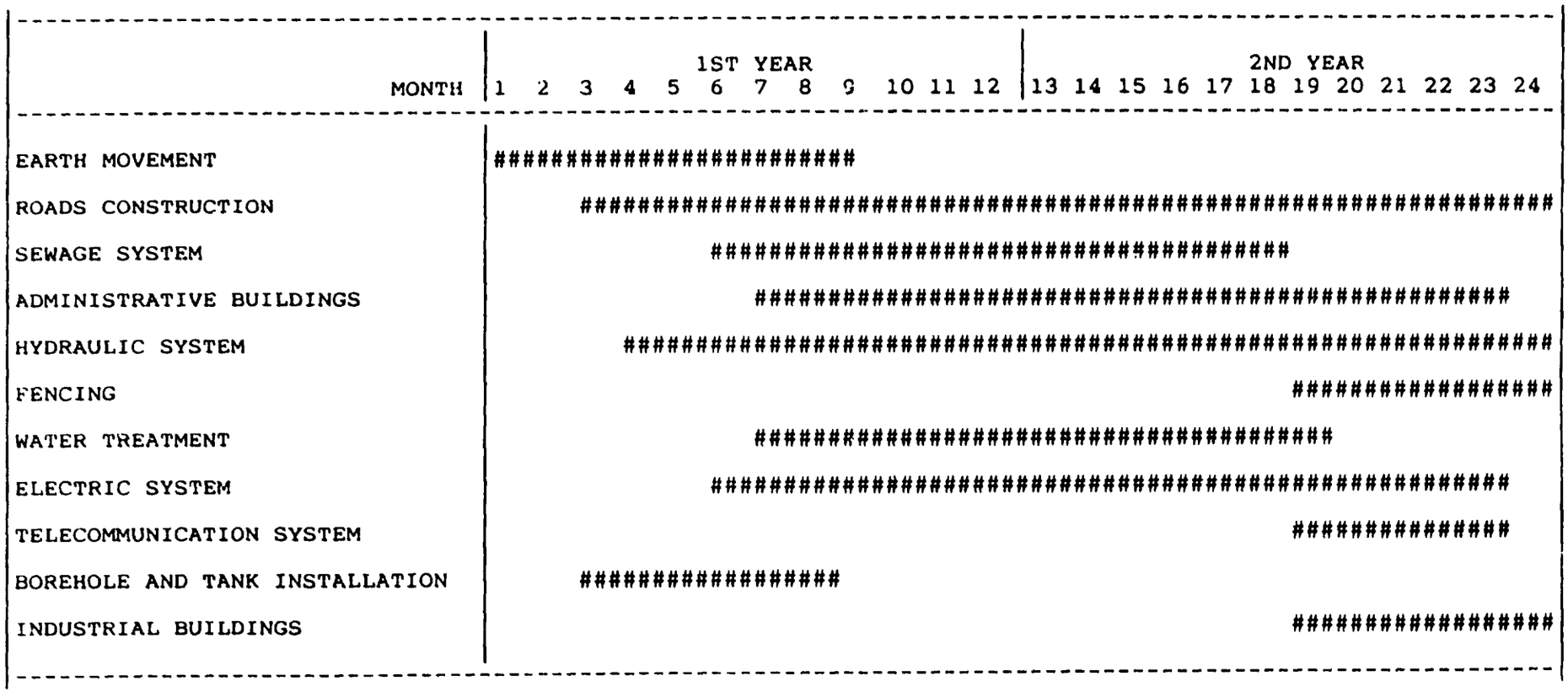
Time schedule for construction works should not be part of a feasibility study, but with the aim of giving to the reader all possible information for a better evaluation of the project, a preliminary development plan has been prepared.

It has been estimated that civil works, including in frastructures, will be implemented in a pericd not exceeding 24 months; moreover once urbanisation has been completed and the first lot of 20.000 sq.m of industrial building erected in the subsequent years (4) the total foreseen area of 100.000 sq.m will be built and continuous electric supply assured by the installation of two additional power generating units.

TABLE 1.A

PROJECT IMPLEMENTATION

TIME SCHEDULE



2.6 Overall Capital Requirements

The size of the investment is determined by four major factors:-

- Construction cost
- Annual depreciation
- Operating cost
- Maintenance cost

Construction cost, subdivided in two phases, includes the civil works for the urbanisation of the area and the infrastructure facilities with relevant plant and machinery.

The summary of the various cost items is shown in Table 1.B while a detailed computation, with quantity and unit rate, is integral part of the present chapter.

The financial analysis has been elaborated on the basis of investment over a period of 20 years.
Table 1.C shows the size of investment, subdivided in years, considering above mentioned time frame.

CONSTRUCTION COST

DETAILED COMPUTATION (PHASE 1)

ITEM	DESCRIPTION OF WORKS	QUANTITY	UNIT	RATE	NIGERIAN NAIRA
	1. EARTHWORKS				
1.01	Cleaning up of area with removal of bushes, trees + topsoil to a depth of 30 cm	417,325	sq.m	8	3,338,600
1.02	Earthworks	1,582,000	cu.m	20	31,640,000
	Carried to Summary A				34,978,600
	2. ROAD CONSTRUCTION				
2.01	Road formation including: Sub-base, bituminous concrete and wearing layer to a total thickness of 30 cm	225,000	sq.m	250	56,250,000
	Carried to Summary A				56,250,000
	3. SEWAGE SYSTEM				
3.01	Trench excavation to 2.00m for discharge of sewage and drainage	11,350	cu.m	33	374,550
3.02	Backfill with excavated materials	6,000	cu.m	15	90,000
3.03	Reinforced concrete class D	2,900	cu.m	1,905	5,524,500
3.04	High yield steel reinforcement of all site	351,045	kgs	10	3,510,450
	Carried to Summary A				9,499,500

ITEM	DESCRIPTION OF WORKS	QUANTITY	UNIT	RATE	NIGERIAN NAIRA
	4. BUILDINGS				
4.01	Construction of building calculated per cross cu.m	24,685	cu.m	1,250	30,856,250
	Carried to Summary A				30,856,250
	5. HYDRAULIC SYSTEM				
	5.1 FIRE FIGHTING				
5.01	Supply + lay PVC tubes for the fire fighting network including: excavation, pipes, wells + hydrants				732,000
	5.2 DRINKING WATER				
5.02	Supply + laying PVC pipes for drinking water including: excavation, pipes + wells				1,250,000
	Carried to Summary A				1,982,000
	6. FENCING				
6.02	Metal fencing consisting of concrete foundation footing of iron uprights with galvanized metal mesh h=3.00m including entrance/exit gates	5,100	m	600	3,060,000
	Csrried to Summary A				3,060,000
	7. WATER TREATMENT PLANT				
7.01	Supply and installation of treatment plant for industrial and civil waste waters		L.S.		38,500,000
	Carried to Summary A				38,500,000

ITEM	DESCRIPTION OF WORKS	QUANTITY	UNIT	RATE	NIGERIAN NAIRA
	8. ELECTRIC SYSTEM				
8.01	Supply and installation of transformer station, electrical network and civil works		L.S.		42,300,000
8.02	Generator		L.S.		38,500,000
	Carried to Summary A				80,800,000
	9. BOREHOLE AND TANK INSTALLATION				
9.01	Drilling of a 300mm diameter borehole to an aquifer with a good yield and installation of stainless steel screen	1	No.	280,000	280,000
9.02	Purchase and installation of a 60 KW submersible pump, 150mm diameter	1	No.	192,000	192,000
9.03	Construction of 1000 m3 clear water tank in reinforced concrete	1	No.	500,000	500,000
9.04	Stilling basin (sedimentation tanks)	1	No.	450,000	450,000
9.05	Rapid sand filters	1	No.	200,000	200,000
9.06	Erection of 500 m3 elevated water tower using pressed steel plates	1	No.	1,200,000	1,200,000
	Carried to Summary A				2,822,000
	10. TELECOMMUNICATION SYSTEM				
10.1	Supply and installation of telecommunication plant		L.S.		46,153,000
	Carried to Summary A				46,153,000

ITEM	DESCRIPTION OF WORKS	QUANTITY	UNIT	RATE	NIGERIAN NAIRA
	11. INDUSTRIAL BUILDINGS				
11.1	Supply and installation of sheds complete with foundation, external curtain panels, generating plants and works on area aroundd shed	20,000	sq.m	2,500	50,000,000
	Carried to Summary A				50,000,000

Unit Rates adopted are based on average current construction costs in Cross River State

CONSTRUCTION COST

DETAILED COMPUTATION (PHASE 2)

ITEM	DESCRIPTION OF WORKS	QUANTITY	UNIT	RATE	NIGERIAN NAIRA
	1. EARTHWORKS				
1.01	Cleaning up of area with removal of bushes, trees and topsoil to a depth of 30 cm	240,000	sq.m	8	1,920,000
1.02	Earthworks	1,225,000	cu.m	20	24,500,000
	Carried to Summary B				26,420,000
	2. ROAD CONSTRUCTION				
2.01	Road formation including sub-base, bituminous and wearing layer to a total thickness of 30 cm	61,000	sq.m	250	15,250,000
	Carried to Summary B				15,250,000
	3. SEWAGE SYSTEM				
3.01	Trench excavation to 2.00m for discharge and drainage waters	6,700	cu.m	33	221,100
3.02	Backfill with excavated material	3,530	cu.m	15	52,950
3.03	Reinforced concrete class D	1,700	cu.m	1,750	2,975,000
3.04	High yield steel reinforcement of all size	205,095	kgs	10	2,050,950
	Carried to Summary B				5,300,000

ITEM	DESCRIPTION OF WORKS	QUANTITY	UNIT	RATE	AMOUNT N
	4. BUILDINGS				
4.01	Construction of buildings calculated per gross cu.m	11,300	cu.m	1,250	14,125,000
	Carried to Summary B				14,125,000
	5. HYDRAULIC SYSTEM				
	5.1 FIRE FIGHTING				
5.01	Supply + laying PVC tubes for the fire firghting network including: excavations, pipes, wells + hydrants				385,000
	5.2 DRINKING WATER				
5.02	Supply + laying PVC pipes for drinking water including: excavations, pipes + wells				800,000
	Carried to Summary B				1,185,000
	6. FENCING				
6.02	Metal fencing consisting of concrete foundation footing of iron uprightswith galvanised metal mesh h = 3.00 m including entrance gates	2,000	m	600	1,200,000
	Carried to Summary B				1,200,000

ITEM	DESCRIPTION OF WORKS	QUANTITY	UNIT	RATE	AMOUNT N
	7. RAILWAY YARD				
7.01	Supply and installation of track complete with prestr. concrete sleepers rails, minor items and ballast under tracks	850	m	6,000	5,100,000
7.02	Complete points	2	N	305,000	610,000
7.03	Raiway yard including foundation, concrete mix and wearing layer	8,500	sq.m	250	2,125,000
	Carried to Summary B				7,835,000
	8. ELECTRIC SYSTEM				
8.01	Electrical network and connection, generators		L.S.		61,540,000
	Carried to Summary B				61,540,000
	9. SLOPE PROTECTION				
9.01	Earthworks	117,750	cu.m	20	2,355,000
9.02	Plain concrete class F as blinding under foundations	2,025	cu.m	1,200	2,430,000
9.03	Reinforced concrete class C for foundation	6,375	cu.m	1,300	8,287,500
9.04	Reinforced concrete class B for elevation	9,900	cu.m	1,500	14,850,000
9.05	High yield steel reinforcement	984,000	kgs	10	9,840,000
9.06	Formwork	30,555	sq.m	80	2,444,400

ITEM	DESCRIPTION OF WORKS	QUANTITY	UNIT	RATE	AMOUNT N
9.07	Crushed stone for drains	54,500	cu.m	115	6,267,500
9.08	DN 800 mm driven piles including reinforced, lining concrete	20,000	m	4,000	80,000,000
9.09	Fill with excavated materials	150,000	cu.m	10	1,500,000
9.10	Supply and installation of ''Maccaferri'' type gabions	51,000	kgs	20	1,020,000
	Carried to Summary B				128,994,400

Unit Rates adopted are based on average current construction costs in Cross River State

TABLE 1.B

CONSTRUCTION COST

SUMMARY

	Nigerian Naira	U.S. $
A) PHASE 1		
1. Earthworks	34,978,600	3,637,774
2. Road construction	56,250,000	5,850,000
3. Sewage system	9,499,500	988,000
4. Buildings	30,856,250	3,209,050
5. Hydraulic system	1,982,000	206,128
6. Fencing	3,060,000	318,240
7. Water treatment plant	38,500,000	4,004,000
8. Electric system	80,800,000	8,403,200
9. Borehole and tank installation	2,822,000	293,488
10. Telecommunications system	46,153,000	4,799,912
11. Industrial buildings (20.000 sq.m)	50,000,000	5,200,000
TOTAL A	354,901,350	36,909,792
B) PHASE 2		
01 Earthworks	26,420,000	2,747,680
02 Road construction	15,250,000	1,586,000
03 Sewage system	5,300,000	551,200
04 Buildings	14,125,000	1,469,000
05 Hydraulic system	1,185,000	123,240
06 Fencing	1,200,000	124,800
07 Railway yard	7,835,000	814,840
08 Electric system	61,540,000	6,400,160
09 Slope protection	128,994,400	13,415,418
TOTAL B	261,849,400	27,232,338
TOTAL A+B	616,750,750	64,142,130

TABLE 1.C

INVESTMENT (20 YEARS TIME HORIZON)

	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR	6 YEAR	7 YEAR	8 YEAR	9 YEAR	10 YEAR	11 YEAR	12 YE
EARTH MOVEMENT	3,638											
ROADS CONSTRUCTION	3,200	2,650										
SEWAGE SYSTEM	388	600										
BUILDINGS	1,100	2,109										
HYDRAULIC SYSTEM	90	116										
FENCING		318							318			
WATER TREATMENT PLANT	1,000	3,004										
ELECTRIC SYSTEM	2,000	2,403									2,000	2,0
GENERATORS		4,000	4,000		4,000					4,000	4,000	
TELECOMMUNICATION SYSTEM	600	4,000				800	4,000				800	4,0
BOREHOLE AND TANK INSTALLATION	200	93										
INDUSTRIAL BUILDINGS		5,200	5,200	5,200	5,200	5,200						
TOTAL	12,416	24,493	9,200	5,200	9,200	6,000	4,000		318	4,000	6,800	6.1

Phase 1 of the project has been estimated to be implemented in the first two years.

TABLE 1.C

ENT (20 YEARS TIME HORIZON) (000 U.S.$)

9 YEAR	10 YEAR	11 YEAR	12 YEAR	13 YEAR	14 YEAR	15 YEAR	16 YEAR	17 YEAR	18 YEAR	19 YEAR	20 YEAR	TOTALS
												3,638
												5,850
												988
												3,209
												206
318							318					954
												4,004
		2,000	2,403									8,806
	4,000	4,000		4,000					4,000	4,000		32,000
		800	4,000				800	4,000				19,200
												293
												26,000
318	4,000	6,800	6,403	4,000			1,118	4,000	4,000	4,000		105,148

SECTION 2

2.7 Estimate of Operating and Maintenance Cost

It has been assumed that once the EPZ in Calabar will start its operation the total staff requirement will be of 80 persons subdivided as follows:

		Emoluments per annum. Nigerian Naira	
1	Zone Director	25.000 x 1	25.000
4	Managers	20.500 x 4	82.000
5	Senior staff	15.000 x 5	75.000
40	Staff employees	11.000 x 40	440.000
30	Workers	6.600 x 30	198.000

The computation to determine wages of senior and junior staff has been made on the base of salary structure used in public sector.

In the subsequent years (from 3rd to 6th), due to the constant implementation of industrial building constructions, an increase of staff in a percentage of 10-11% per annum has been assumed.

A provision for a purchase of 7 vehicles, to be used by members of staff of the Export Processing Authority, has been made and it includes:-

		U.S. $	
5	saloon cars	5 x 15.000	75.000
1	shuttle bus	1 x 25.000	25.000
1	light truck	1 x 35.000	35.000
			135.000

The purchase of the vehicles is foreseen in the second year, and due to the 25% yearly depreciation, it will recur every four years.

Other operating cost including stationery, stamps, cleaning materials, maintenance services for office machinery, have been considered and yearly subdivided as shown in Table 1.D

Operating expenses for essential services, related to the directional area only, including electricity supply, telecommunication, water consumption, have been estimated in a percentage of 3% of their construction cost and subject to yearly increase of 8%.

As far as the cost of repair and maintenance is concern it is assumed to be made up on the base of construction cost, but at different percentages varying from type of buildings, infrastructures, plants and machinery.

The table 1.E shows for each structure and infrastructure of the EPZ the estimated cost of maintenance per annum which increase inconstantly over the subsequent years.

This, in principal, is due to the normal use and wear of the assets, but it is also related to the various type of maintenance required for each structure, over the years.

TABLE 1.D

OPERATING COST U.S.$

	1st year	2nd year	3rd year	4th year	5th year	6th year
Salaries & Wages		12,000	102,000	113,000	124,000	140,000
Consumable supplies		9,000	132,000	155,000	181,000	203,000
Utilities (electricity,telephone,water)			406,000	438,000	473,000	510,000
Vehicles		135,000				135,000
TOTALS OPERATING COSTS		156,000	640,000	706,000	778,000	988,000

TABLE 1.E

MAINTENANCE COST U.S.$

	1st year	2nd year	3rd year	4th year	5th year	6th year
Roads			73,000	80,000	90,000	115,000
Sewage system			5,000	5,000	6,000	7,000
Buildings			26,000	26,000	30,000	35,000
Hyadraulic system			83,000	91,000	100,000	110,000
Fencing			2,000	3,000	3,000	4,000
Water treatment unit			112,000	120,000	132,000	143,000
Electric network and generator units			215,000	255,000	270,000	320,000
Telecommunication			72,000	75,000	80,000	88,000
Borehol, water tank			3,000	3,000	3,000	4,000
Industrial buildings			62,000	130,000	200,000	280,000
TOTAL MAINTENANCE COSTS			653,000	788,000	914,000	1,106,000

2.8 Residential annexed area

Shortage of residential houses is a serious and recurrent problem common to most of the Nigerian cities.

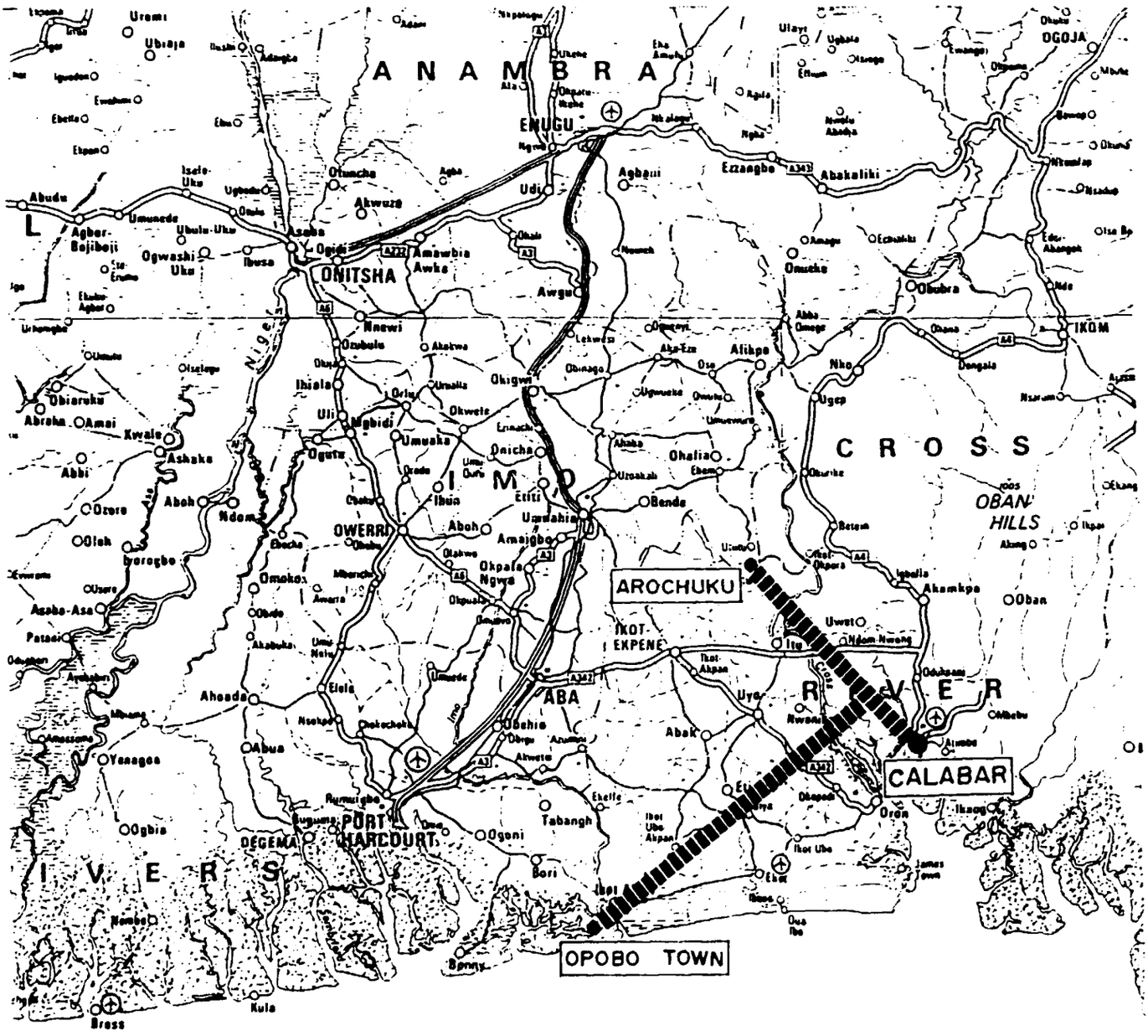
Mainly, this is due to the continuous migration movement of the population from rural areas to the urban centres.

On this context, our opinion is that, the establishment of the EPZ in Calabar would probably increase the housing shortage for both local and expatriate staff.

Even tough, the construction of residential area is not in the planning concept of the EPZ we are in the opinion that to this problem due consideration should be given.

We recommend Nigerian Authorities to allocate, within a walking distance from the EPZ, an area, suitable for construction of a minimum housing requirements of different typology and with modern facilities.

Specifically our recommendation is for block of small flats and 2 or 3 bedroom bungalows with necessary infrastructures.

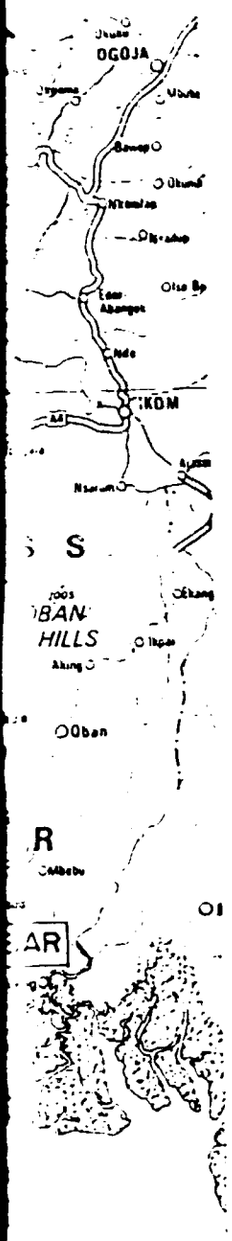


■■■■■■■■■■ - PROPOSED RAILWAY LINK

Scale - 1 : 1500 000

SECTION 1

2.9 Railway Siding and Link



In the area assigned to the EPZ, in view of future development and to facilitate smooth operations of the industrial activities, a provision for a railway goods station has been made.

The surface occupied by the railway yard is about 8500 sq.m and length of track lines has been estimated in 850 m.
The railway siding, as conceived in the planning, will be in operation when a link to the existing Nigeria Railway network will be implemented.

To link EPZ with the Nigerian road network, adequate provisions with simple and wide roads, have been made, nevertheless, all possible effort aimed to the construction of a railways line linking existing network, should be made.

The recommendation is for two alternative routes which are worth mentioning:-

- Works in progress for the Aluminium Smelter plant in Opobo town, in the area south west of Calabar would justify the construction of about 85 km link.

- The north-western part and particularly Arochuku area, where large natural resources of coal are located, could be linked. In this case a railway line of approximately 63 km will be necessary.

With a view to the future industrial development in Cross River State and to the full utilization of Calabar sea port, a link with existing Nigeria Railways network, to improve and fulfil the high demand of transport for bulky goods, could be considered as priority project.

1 : 1500 000

SECTION 2

PART 3. FINANCIAL ASPECTS

3.1 Funding sources and financial charges

Contacts with concerned officials at the Federal Ministry of Trade and Tourism, with World Bank and African Development Bank, provided guidelines and information on possible funding sources for the project and type of funding to be sought:

3.1.1. It was felt that because of the strategic importance of this scheme the project should be wholly owned and managed by the Government. Private equity funding is not considered desirable.
Two possible sources of funding are therefore considered - a federal government grant and/or a loan.

3.1.2 If loan financement is sought, the most appropriate funding source appears to be the World Bank Small and Medium Scale Enterprises Loan (SME 2).

Under this scheme, a total amount of 270 million dollars are available - through the Federal Ministry of Finance - for industrial development projects, including small ones. The loan is untied and therefore its coverage can be extended without difficulty to new projects.

The infrastructural nature of this EPZ project would not prevent it from being funded through this loan, since it is directly concerned with industrial development. (As a matter of fact, every industrial project necessarily includes an infrastructural component).

Financial charges for SME 2 loans consist of:

(i) a variable interest rate, which at present amounts to 7.73% p.a.

(ii) commitment charges of 0.25% p.a. on undrawn balances.

Taking into account possible short-term fluctuations of interest rate and commitment charges, it is assumed that an overall interest rate of 8% on drawn sums would cover the totality of financial costs.

This estimate has been used in EPZ financial analysis (paragraph 3.6).

Loan repayment would take place in 20 years, including a moratorium of 5 years, during which interest would accrue, but would not be paid.

Bank rate fluctuations - both concerning drawn sums and undrawn balances - do not apply to already committed loans - i.e. the initial rate of interest remains the same throughout the whole duration of the loan (until loan is fully repaid).

3.1.3 World Bank infrastructural development funds are also available, but they are already tied to identified and appraised projects, and an amendment would be required to make room for new schemes. Financial charges and other loan conditions would be the same as those applied under SME 2.

3.1.4 Another possible source of loan might be the African Development Bank in spite of the relatively small size of the project (ADB loans in Nigeria are generally large: the smallest loan since 1969 amounted to 88 million dollars).

Present rate of interest for ADB loans is 7.93% plus 1% commitment charge. Loan repayment: 25 years, including a grace period up to 5 years.

3.2 Revenue

A range of revenue sources will be available to EPZ Authority. They are as follows:

- Development levy on FOB value of exports from the zone to the domestic market.
- Rent from lease of factory space, office space and plots.
- Charges paid by service organisations operating in the EPZ.
- Operating licences fees for EPZ industries.
- Company employment card fees for workers.
- Water charges.
- Charges for stand by generators and electricity supplied.

The appropriate level of each type of charge should be determined by the Authority at the start of EPZ operation, taking into account on one hand project financial feasibility requirements and on the other the need to attract potential investors.

3.3 Financial assumptions

3.3.1 Three financial alternatives have been adopted in this study. They concern essentially the degree of financial self-reliance of the project: (i) Two grant alternatives (A and B), in which it is assumed that EPZ Authority will have to charge relatively low rents and fees in order to attract investors, and therefore that it will require financial support from the Federal Government. (ii) A loan alternative, assuming that project revenue will be sufficient to cover all project costs in 20 years.

3.3.2 The main assumptions underlying each alternative are the following:

a. All alternatives:

(i) Construction works will be completed in two years. During the first year infrastructural works will be completed, apart from buildings. 20% of EPZ plants and machinery pertaining to factories and infrastructure facilities, will be installed during the first year and 80% during the second year.

(ii) Available surface will be progressively leased to industries in five years, starting from the second year. This assumption implies that required pre-conditions are met before or during the construction phase.

(iii) All cost and revenue estimates are made at constant prices, since this appears to provide a clearer picture of project financial viability throughout its economic life.

(iv) A 20-year time horizon has been adopted in all alternatives.

b. Grant alternative A:

(i) Project revenue covers operating and maintenance costs, plus 20% in order to meet possible requirements to carry out complementary works or to cover possible cost increases in real terms.

(ii) Construction costs and renewal of equipment are met through a Federal Government grant.

c. Grant alternative B:

Project revenue covers all project costs (construction, operating and maintenance) in 20 years. An initial Federal Government grant of 57 Million of U.S $ is recovered through EPZ revenue, and it becomes available to fund a second phase of EPZ development or other projects.

d. Loan alternative:

(i) Project funding at the initial stage is insured through a World Bank loan (SME 2):

- financial charges: 8% interest rate on drawn sums;

- loan repayment: 20 years, including a moratorium of five years, during which interest will accrue but will not be paid;

(ii) EPZ revenue covers all project costs including debt amortization within the 20-year repayment period.

3.4 Grant alternative A

3.4.1 Cash flow (Table 3.A).

Total grant (110 million US dollars) includes construction costs plus some provisions for cost increase in real terms or possible complementary works.

EPZ revenue - 2.676.000 US dollars per annum when cruising speed is reached (from the 7th year) - covers operating and maintenance costs plus 20%. Annual revenue per square metre of industrial buildings amounts to about 27 U.S. $. This parameter gives an idea of the overall financial pressure to be exerted on EPZ industries, service organisations, etc., in order to ensure the financial feasibility of this alternative.

3.4.2 Depreciation schedule

Depreciation of assets has been calculated using the straight-line method. As shown in Table 3.B, different annual rates of depreciation have been applied to the various categories of assets, and each column concerns all assets having the same rate of depreciation.

3.4.3 Net income statement (Table 3.C)

Revenue covers operating and maintenance costs but not depreciation, and therefore net EPZ income is negative: -64.492.000 US dollars during the 20-year period.

3.4.4 Time study of expenditure and revenue (Table 3.D).

This statement shows actual project costs and revenues, year by year.

3.5 Grant alternative B

3.5.1 Cash flow (Table 3.E)

Total grant (57 million US dollars) meets initial investment requirements. EPZ revenue (141 million dollars in 20 years) covers all project costs (US $ 140.828.000 in the same period - see also Table 3.F). Thus, total cash surplus at the end of the period is approximately the same as total initial grant.

3.5.2 Net income statement (Table 3.G)

In this alternative, net EPZ income in the 20-year period is positive (US $ 33.700.000). This profit results from the fact that some categories of EPZ assets (in particular buildings, earthworks, industrial buildings) will be only partly depreciated during the 20-year period (see Table 3.B, Depreciation) and will be available for subsequent EPZ phases.

Annual EPZ revenue when cruising speed is reached: US $ 8,813,000. Annual revenue per square metre of industrial buildings: about US $ 88.

3.6 Loan alternative

3.6.1 Cash flow (Table 3.H)

Total loan amounts to 57 million US dollars.

Project revenue (14 million US dollars per year when the project reaches cruising speed) covers all project and financial expenses, and at the end of the 20-year period a cash surplus is available. This surplus could be used in particular to repay short-term commercial bank loans to cover temporary cash deficits. The relationship between costs (project and financial costs) and revenue is also shown in Table 3.I.

3.6.2 Loan amortization schedule (Table 3.J)

Annual payments for loan servicing start at the end of the five-year moratorium period. Interest accrued and not paid during moratorium is amortized separately (column 7).

These financial calculations tend to overestimate financial charges. As already mentioned (paragraph 3.1), under World Bank SME 2 loan the annual rate of interest covering all financial charges (8%) is not subject to adjustments after loan commitment. It includes a variable rate of inflation and therefore interest rate in real terms is lower.

3.6.3 Net income statement (Table 3.K)

As in the case of Grant alternative B, positive net EPZ income (US $ 37.947.000) results essentially from residual value of assets at the end of the 20-year period (construction cost less depreciation: US $ 33.491.000).

Annual revenue per square metre of industrial buildings: US $ 140. As shown in the foregoing paragraph, actual financial requirements would be lower, since financial charges are overestimated.

3.7 Income per sq.m

A total income of 90 U.S. $ per sq.mt. is about the limit of what is possible at present in Calabar. This is made up as follows:

rent	50 $
levy	10 $
Stand by generators charge	10 $
water charge	10 $
Maintenance charge	10 $
Total	90 $

Other charges such as application fees and identity cards for workers are of minor signification.

The rental charge is based on a review of rental charges in similar EPZ elsewhere. The levy is 1% and is based on 100 Million U.S. $ per annum of sales and on 100.000 sq.mt. of factory space.

3.8 Conclusions

The EPZ revenue, assuming the investor target are achieved, will be very much higher than the 27 $ per sq.mt. required under alternative A. It is unlikely that 140 $ per sq.mt. necessary to fund the project exclusively with loans will be achieved. A revenue stream, along the lines projected under grant alternative B, is the most likely outcome. Accordingly, a grant in the order of 57 M $, as suggested in alternative B, will be necessary if the project is to be viable.

The principal economic impact of the proposed EPZ at Calabar will be on employment and foreign exchange earnings. Any projection of what this impact might be in future must at this stage be considered highly speculative. Thus the projections set out in the following table are more in the nature of a statement on what is possible rather than a forecast of what will happen.

I have assumed for these calculations that the site will be 50 ha and that 67 % of the site (or 34 ha) will be available for commercial letting. This issue will be clarified when TEAM have completed their work. The projections are made on the basis that the 34 ha will be leased in 5 years.

Output per employee is projected at 10,000 $ p.a. In free zones where garment activity predominates output per head is around 6,000 $ p.a. The Calabar EPZ is likely to include food processing, pharmaceuticals, timber processing and engineering thus the output per employee will be higher.

It is assumed that 75% of output will be exported. In some zones all of the output is exported. However in Calabar sales of up to 50% of output of firms may be sold in the domestic market. Some firms may be granted such a concession, others may export all the output.

It is assumed that raw materials will account for 70% of final output. Some of these raw materials will be sourced locally. A conservative view would be that about 30% of raw materials will be sourced locally and 70% imported i.e. 50% of gross output will be represented by imported materials.

A conservative multiplier affect in terms of job creation would be 1.0. Every EPZ job will lend to another job in Calabar. Thus with 10.200 jobs in the surrounding area the EPZ could generate a total of 20,400 direct and indirect jobs.

The employment density in the Calabar EPZ at 800 jobs per ha is lower than in many traditional EPZ's dominated by garment activity where up to 800 jobs per ha could be created.
Because the industry mix in Calabar will include a wide range of industry many of which are low density employees in terms of jobs per ha a figure of 300 workers per ha of leased land is used.

TABLE 2.A

Assumption: Build up of activity over (i) 5 years

Employment - 300 people per ha leased
34 ha leased or 67% of site approx.)
Output - 10,000 $ per employee
Exports - 75% of output
Imports - 50% of output - includes profit repatriation

YEAR	0	1	2	3	4	5	6	7	8	9	10
Land leased		7.00	7.00	7.00	7.00	6.00					
Comulative		7.00	14.00	21.00	28.00	34.00	34.00	34.00	34.00	34.00	34.00
Employment			1050.00	3150.00	5250.00	7350.00	9300.00	10200.00	10200.00	10200.00	10200.00
Output in M $				10.50	31.50	73.50	93.00	102.00	102.00	102.00	102.00
Exports in M $				7.90	23.60	55.10	69.80	76.50	76.50	76.50	76.50
Imports in M $				5.25	15.75	36.75	46.50	51.00	51.00	51.00	51.00
Net foreign Exchange Earnings in M $				2.65	7.85	18.35	23.30	25.50	25.50	25.50	25.50

Note: This table is for discussion and illustrative purposes only

Site development begins year 0

Sites leased from year 1 onwards

Recruitment of employees begins in year 2

Sales begin in year 3

TABLE 3.A

(000 US $)

GRANT ALTERNATIVE A - CASH FLOW

		Cash inflow			Cash outflow				
(1) Year	(2) Balance b/f	(3) Grants	(4) Revenue	(5) Total	(6) Constr. cost	(7) Operat. cost	(8) Maint. cost	(9) Total	(19) Cash surplus deficit
0	-	+15000	-	+15000	-	-	-	-	+15000
1	+15000	+25000	-	+40000	-12416	-	-	-12416	+27584
2	+27584	+25000	-	+52584	-24493	-156	-	-24649	+27935
3	+27935	-	+535	+28470	-9200	-640	-653	-10493	+17977
4	+17977	-	+1070	+19047	-5200	-706	-788	-6694	+12353
5	+12353	+30000	+1606	+43959	-9200	-778	-914	-10892	+33067
6	+33067	-	+2141	+35208	-6000	-988	-1106	-8094	+27114
7	+27114	-	+2676	+29790	-4000	-853	-1186	-6039	+23751
8	+23751	-	+2676	+26427	-	-853	-1186	-2039	+24388
9	+24388	-	+2676	+27064	-318	-853	-1186	-2357	+24707
10	+24707	-	+2676	+27383	-4000	-988	-1186	-6174	+21209
11	+21209	-	+2676	+23885	-6800	-853	-1186	-8839	+15046
12	+15046	+15000	+2676	+32722	-6403	-853	-1186	-8442	+24280
13	+24280	-	+2676	+26956	-4000	-853	-1186	-6039	+20917
14	+20917	-	+2676	+23593	-	-988	-1186	-2174	+21419
15	+21419	-	+2676	+24095	-	-853	-1186	-2039	+22056
16	+22056	-	+2676	+24732	-1118	-853	-1186	-3157	+21575
17	+21575	-	+2676	+24251	-4000	-853	-1186	-6039	+18212
18	+18212	-	+2676	+20888	-4000	-988	-1186	-6174	+14714
19	+14714	-	+2676	+17390	-4000	-853	-1186	-6039	+11351
20	+11351	-	+2676	+14027	-	-853	-1186	-2039	+11988
		+110000	+42816		-105148	-15615	-20065	-140828	

TABLE 3.B

(000 US $)

DEPRECIATION SCHEDULE

	Annual depreciation								
Year	a	b	c	d	e	f	g	h	Total
0	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-
2	36	-	33	244	200	-	-	160	673
3	36	104	96	567	440	480	48	960	2732
4	36	208	96	567	440	960	48	960	3315
5	36	312	96	567	440	960	48	960	3420
6	36	416	96	567	440	1440	48	960	4004
7	36	520	96	567	440	1440	48	960	4108
.....									
.....									
20	36	520	96	567	440	1440	48	960	4108

a. earth works: 1% p.a.
b. industrial buildings: 2% p.a.
c. office buildings: 3% p.a.
d. roads, sewage system, hydraulic system, water treatment plant, borehole and tanks: 5% p.a.
e. electric system: 10% p.a.
f. electric generators: 12% p.a.
g. fencing: 15% p.a.
h. telecommunication system: 20% p.a.

TABLE 3.C

GRANT ALTERNATIVE A - NET INCOME STATEMENT

(000 US $)

(1) Year	(2) Revenue	(3) Operating cost (a)	(4) Maintenance cost	(5) Operating profit/loss	(6) Depreciation	(7) Net EPZ income
0	-	-	-	-	-	-
1	-	-	-	-	-	-
2	-	-55	-	-55	-673	-728
3	+535	-674	-653	-792	-2732	-3524
4	+1070	-740	-788	-458	-3316	-3774
5	+1606	-812	-914	-120	-3420	-3540
6	+2141	-887	-1106	+148	-4004	-3856
7	+2676	-887	-1186	+603	-4108	-3505
.....						
.....						
20	+2676	-887	-1186	+603	-4108	-3505
	+42816	-15586	-20065	+7165	-71657	-64492

(a) Including depreciation of EPZ Authority vehicles (25% p.a.).

TABLE 3.D

(000 US $)

GRANT ALTERNATIVE A - TIME-STUDY OF EXPENDITURE AND REVENUE

(1) Year	(2) Construction cost	(3) Operating cost	(4) Maintenance cost	(5) Total cost	(6) Revenue	(7) Total
0	-	-	-	-	-	-
1	-12416	-	-	-12416	-	-12416
2	-24493	-156	-	-24649	-	-24649
3	-9200	-640	-653	-10493	+535	-9958
4	-5200	-706	-788	-6694	+1070	-5624
5	-9200	-778	-914	-10892	+1606	-9286
6	-6000	-988	-1106	-8094	+2141	-5953
7	-4000	-853	-1186	-6039	+2676	-3363
8	-	-853	-1186	-2039	+2676	+637
9	-318	-853	-1186	-2357	+2676	+319
10	-4000	-988	-1186	-6174	+2676	-3498
11	-6800	-853	-1186	-8839	+2676	-6163
12	-6403	-853	-1186	-8442	+2676	-5766
13	-4000	-853	-1186	-6039	+2676	-3363
14	-	-988	-1186	-2174	+2676	+502
15	-	-853	-1186	-2039	+2676	+637
16	-1118	-853	-1186	-3157	+2676	-481
17	-4000	-853	-1186	-6039	+2676	-3363
18	-4000	-988	-1186	-6174	+2676	-3498
19	-4000	-853	-1186	-6039	+2676	-3363
20	-	-853	-1186	-2039	+2676	+637
	-105148	-15615	-20065	-140828	+42816	-98012

TABLE 3.E

(000 US $)

GRANT ALTERNATIVE B - CASH FLOW

(1) Year	(2) Balance b/f	Cash inflow (3) Grants	(4) Revenue	(5) Total	Cash outflow (6) Constr. cost	(7) Operat. cost	(8) Maint. cost	(9) Total	(10) Cash surplus/ deficit
0	-	+15000	-	+15000	-	-	-	-	+15000
1	+15000	+25000	-	+40000	-12416	-	-	-12416	+27584
2	+27584	+17000	-	+44584	-24493	-156	-	-24649	+19935
3	+19935	-	+1763	+21698	-9200	-640	-653	-10493	+11205
4	+11205	-	+3525	+14730	-5200	-706	-788	-6694	+8036
5	+8036	-	+5288	+13324	-9200	-778	-914	-10892	+2432
6	+2432	-	+7050	+9482	-6000	-988	-1106	-8094	+1388
7	+1388	-	+8813	+10201	-4000	-853	-1186	-6039	+4162
8	+4162	-	+8813	+12975	-	-853	-1186	-2039	+10936
9	+10936	-	+8813	+19749	-318	-853	-1186	-2357	+17392
10	+17392	-	+8813	+26205	-4000	-988	-1186	-6174	+20031
11	+20031	-	+8813	+28844	-6800	-853	-1186	-8839	+20005
12	+20005	-	+8813	+28818	-6403	-853	-1186	-8442	+20376
13	+20376	-	+8813	+29189	-4000	-853	-1186	-6039	+23150
14	+23150	-	+8813	+31963	-	-988	-1186	-2174	+29789
15	+29789	-	+8813	+38602	-	-853	-1186	-2039	+36563
16	+36563	-	+8813	+45376	-1118	-853	-1186	-3157	+42219
17	+42219	-	+8813	+51032	-4000	-853	-1186	-6039	+44993
18	+44993	-	+8813	+53806	-4000	-988	-1186	-6174	+47632
19	+47632	-	+8813	+56445	-4000	-853	-1186	-6039	+50406
20	+50406	-	+8813	+59219	-	-853	-1186	-2039	+57180
		+57000	+141008		-105148	-15615	-20065	-140828	

TABLE 3.F

(000 US $)

GRANT ALTERNATIVE B - TIME-STUDY OF EXPENDITURE AND REVENUE

(1) Year	(2) Construction cost	(3) Operating cost	(4) Maintenance cost	(5) Total cost	(6) Revenue	(7) Total
0	-	-	-	-	-	-
1	-12416	-	-	-12416	-	-12416
2	-24493	-156	-	-24649	-	-24649
3	-9200	-640	-653	-10493	+1763	-8730
4	-5200	-706	-788	-6694	+3525	-3169
5	-9200	-778	-914	-10892	+5288	-5604
6	-6000	-988	-1106	-8094	+7050	-1044
7	-4000	-853	-1186	-6039	+8813	+2774
8	-	-853	-1186	-2039	+8813	+6774
9	-318	-853	-1186	-2357	+8813	+6456
10	-4000	-988	-1186	-6174	+8813	+2639
11	-6800	-853	-1186	-8839	+8813	-26
12	-6403	-853	-1186	-8442	+8813	+371
13	-4000	-853	-1186	-6039	+8813	+2774
14	-	-988	-1186	-2174	+8813	+6639
15	-	-853	-1186	-2039	+8813	+6774
16	-1118	-853	-1186	-3157	+8813	+5656
17	-4000	-853	-1186	-6039	+8813	+2774
18	-4000	-988	-1186	-6174	+8813	+2639
19	-4000	-853	-1186	-6039	+8813	+2774
20	-	-853	-1186	-2039	+8813	+6774
	-105148	-15615	-20065	-140828	+141008	+180

TABLE 3.G

(000 US $)

GRANT ALTERNATIVE B - NET INCOME STATEMENT

(1) Year	(2) Revenue	(3) Operating cost (a)	(4) Maintenance cost	(5) Operating profit/loss	(6) Depreciation	(7) Net EPZ income
0	-	-	-	-	-	-
1	-	-	-	-	-	-
2	-	-55	-	-55	-673	-728
3	+1763	-674	-653	+436	-2732	-2296
4	+3525	-740	-788	+1997	-3316	-1319
5	+5288	-812	-914	+3562	-3420	+142
6	+7050	-887	-1106	+5057	-4004	+1053
7	+8813	-887	-1186	+6740	-4108	+2632
20	+8813	-887	-1186	+6740	-4108	+2632
	+141008	-15586	-20065	+105357	-71657	+33700

(a) Including depreciation of EPZ Authority vehicles (25% p.a.).

TABLE 3.H

(000 US $)

LOAN ALTERNATIVE - CASH FLOW

1 Y.	(2) Bal.	Cash inflow (3) Loans	(4) Revenue	(5) Total	Cash outflow (6) Constr. cost	(7) Oper. cost	(8) Maint. cost	(9) Loan Serv.	(10) Total	(11) Cash surpl/ def.
0	-	+15000	-	+15000	-	-	-	-	-	+15000
1	+15000	+25000	-	+40000	-12416	-	-	-	-12416	+27584
2	+27584	+17000	-	+44584	-24493	-156	-	-	-24649	+19935
3	+19935	-	+2800	+22735	-9200	-640	-653	-	-10483	+12252
4	+12252	-	+5600	+17852	-5200	-706	-788	-	-6694	+11158
5	+11158	-	+8400	+19558	-9200	-778	-914	-	-10892	+8666
6	+8666	-	+11200	+19866	-6000	-988	-1106	-9050	-17144	+2722
7	+2722	-	+14000	+16722	-4000	-853	-1186	-9050	-15089	+1633
8	+1633	-	+14000	+15633	-	-853	-1186	-9050	-11089	+4544
9	+4544	-	+14000	+18544	-318	-853	-1186	-9050	-11407	+7137
10	+7137	-	+14000	+21137	-4000	-988	-1186	-9050	-15224	+5913
11	+5913	-	+14000	+19913	-6800	-853	-1186	-9050	-17889	+2024
12	+2024	-	+14000	+16024	-5403	-853	-1186	-9050	-17492	-1468
13	-1468	-	+14000	+12532	-4000	-853	-1186	-9050	-15089	-2557
14	-2557	-	+14000	+11443	-	-988	-1186	-9050	-11224	+219
15	+219	-	+14000	+14219	-	-853	-1186	-9050	-11089	+3130
16	+3130	-	+14000	+17130	-1118	-853	-1186	-9050	-12207	+4923
17	+4923	-	+14000	+18923	-4000	-853	-1186	-9050	-15089	+3834
18	+3834	-	+14000	+17834	-4000	-988	-1186	-9050	-15224	+2610
19	+2610	-	+14000	+16610	-4000	-853	-1186	-9050	-15089	+1521
20	+1521	-	+14000	+15521	-	-853	-1186	-9050	-11089	+4432
		+57000	+224000		-105148	-15615	-20065	-135750	-276568	

TABLE 3.I

(000 US $)

LOAN ALTERNATIVE - TIME-STUDY OF EXPENDITURE AND REVENUE

(1) Year	(2) Construct. cost	(3) Operating cost	(4) Maintenance cost	(5) Annual interest	(6) Total	(7) Revenue	(8) Total
0	-	-	-	-	-	-	-
1	-12416	-	-	-	-12416	-	-12416
2	-24493	-156	-	-	-24649	-	-24649
3	-9200	-640	-653	-	-10493	+2800	-7693
4	-5200	-706	-788	-	-6694	+5600	-1094
5	-9200	-778	-914	-	-10892	+8400	-2492
6	-6000	-988	-1106	-6951	-15045	+11200	-3845
7	-4000	-853	-1186	-6783	-12822	+14000	+1178
8	-	-853	-1186	-6602	-8641	+14000	+5359
9	-318	-853	-1186	-6406	-8763	+14000	+5237
10	-4000	-988	-1186	-6194	-12368	+14000	+1632
11	-6800	-853	-1186	-5966	-14805	+14000	-805
12	-6403	-853	-1186	-5719	-14161	+14000	-161
13	-4000	-853	-1186	-5452	-11491	+14000	+2509
14	-	-988	-1186	-5165	-7339	+14000	+6661
15	-	-853	-1186	-4854	-6893	+14000	+7107
16	-1118	-853	-1186	-4518	-7675	+14000	+6325
17	-4000	-853	-1186	-4156	-10195	+14000	+3805
18	-4000	-988	-1186	-3754	-9928	+14000	+4072
19	-4000	-853	-1186	-3341	-9380	+14000	+4620
20	-	-853	-1186	-2884	-4923	+14000	+9077
	-105148	-15615	-20065	-78745	-219573	+224000	+4427

TABLE 3.J

(000 US $)

LOAN AMORTIZATION SCHEDULE

(1) Year	(2) Loans	Annual payments for loan amortization (3) Interest	(4) Principal	(5) Total	(6) Residual debt	(7) Annual paym.of morat. inter.	(8) Total annual paymts	(9) Total annual inter.
0	+15000	-	-	-	-	-	-	-
1	+25000	-	-	-	-	-	-	-
2	+17000	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-
5	-	-	-	-	-57000	(a)	-	-
6	-	-4560	-2099	-6659	-54901	-2391	-9050	-6951
7	-	-4392	-2267	-6659	-52633	-2391	-9050	-6783
8	-	-4211	-2449	-6659	-50185	-2391	-9050	-6602
9	-	-4015	-2644	-6659	-47540	-2391	-9050	-6406
10	-	-3803	-2856	-6659	-44684	-2391	-9050	-6194
11	-	-3575	-3085	-6659	-41560	-2391	-9050	-5966
12	-	-3328	-3331	-6659	-38269	-2391	-9050	-5719
13	-	-3061	-3598	-6659	-34670	-2391	-9050	-5452
14	-	-2774	-3886	-6659	-30785	-2391	-9050	-5165
15	-	-2463	-4196	-6659	-26589	-2391	-9050	-4854
16	-	-2127	-4532	-6659	-22056	-2391	-9050	-4518
17	-	-1765	-4895	-6659	-17162	-2391	-9050	-4156
18	-	-1373	-5286	-6659	-11875	-2391	-9050	-3754
19	-	-950	-5709	-6659	-6166	-2391	-9050	-3341
20	-	-493	-6166	-6659	-	-2391	-9050	-2884
			-57000					

(a) Total amount of interest accrued during moratorium period: 20,467

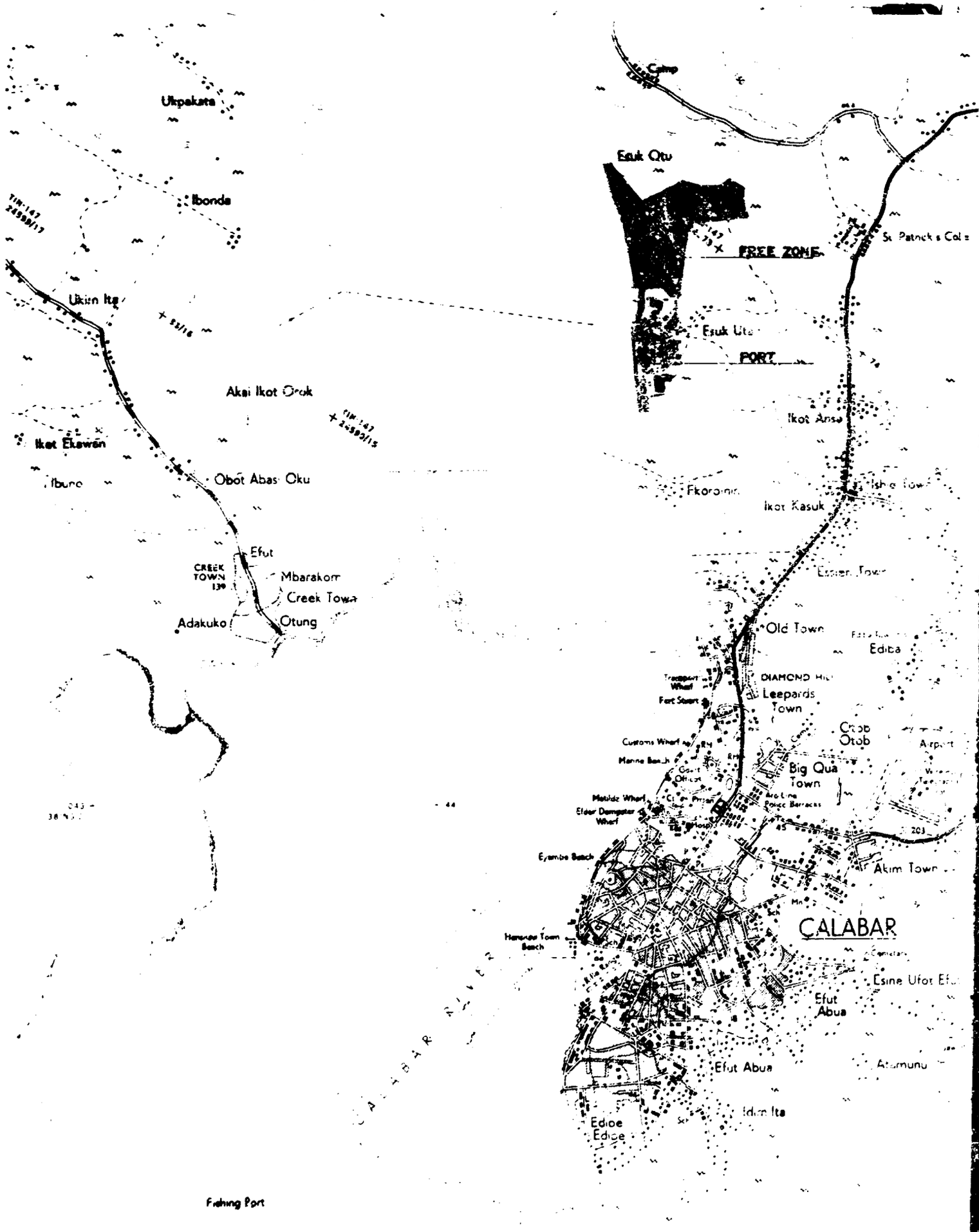
TABLE 3.K

(000 US $)

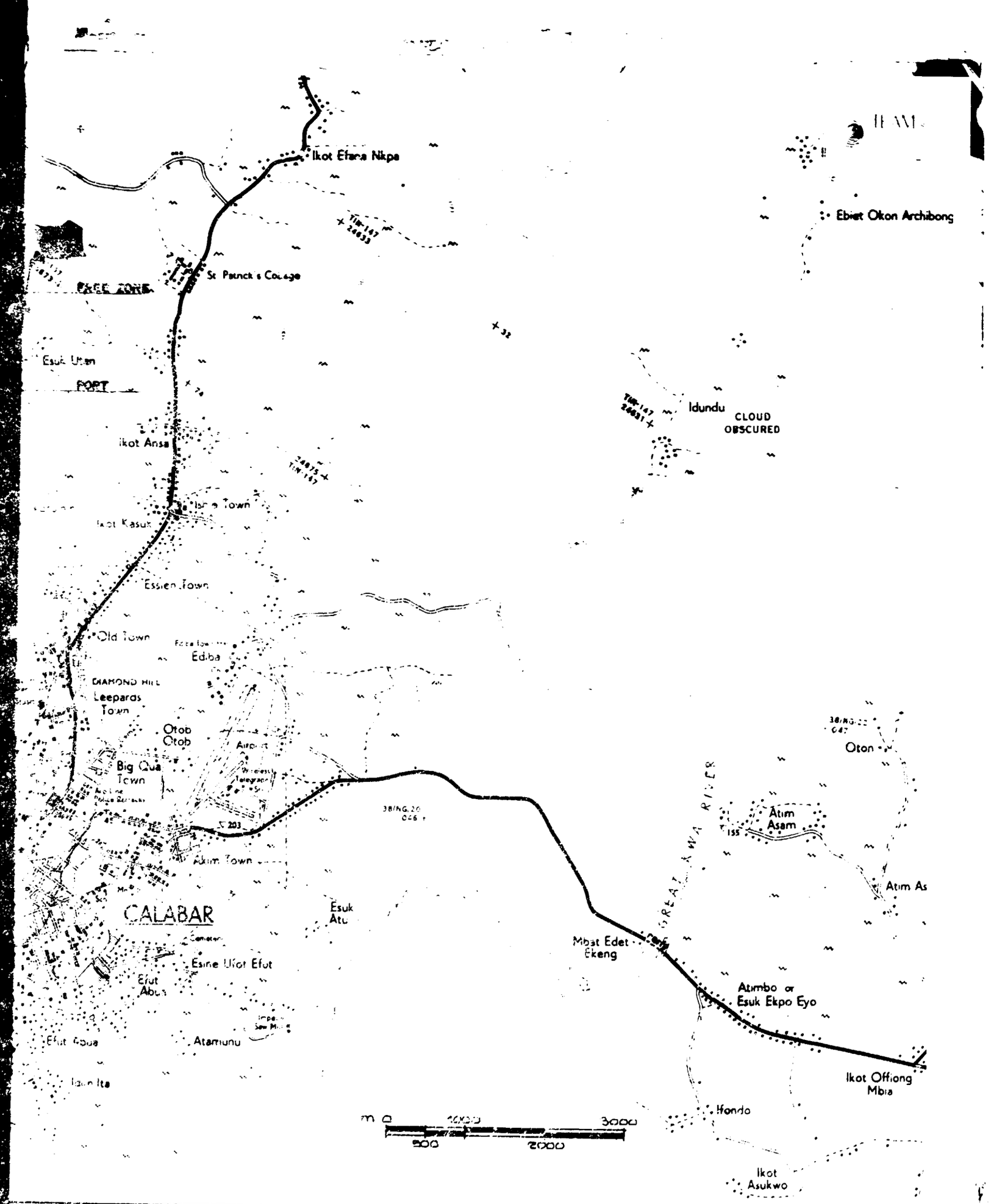
LOAN ALTERNATIVE - NET INCOME STATEMENT

(1) Year	(2) Revenue	(3) Operat. cost (a)	(4) Maint. cost	(5) Operat. profit /loss	(6) Deprec.	(7) Project profit/ loss	(8) Annual inter.	(9) Net EPZ income
0	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-
2	-	-55	-	-55	-673	-728	-	-728
3	+2800	-674	-653	+1473	-2732	-1259	-	-1259
4	+5600	-740	-788	+4072	-3316	+756	-	+756
5	+8400	-812	-914	+6674	-3420	+3254	-	+3254
6	+11200	-887	-1106	+9207	-4004	+5203	-6951	-1748
7	+14000	-887	-1186	+11927	-4108	+7819	-6783	+1036
8	+14000	-887	-1186	+11927	-4108	+7819	-6602	+1217
9	+14000	-887	-1186	+11927	-4108	+7819	-6406	+1413
10	+14000	-887	-1186	+11927	-4108	+7819	-6194	+1625
11	+14000	-887	-1186	+11927	-4108	+7819	-5966	+1853
12	+14000	-887	-1186	+11927	-4108	+7819	-5719	+2100
13	+14000	-887	-1186	+11927	-4108	+7819	-5452	+2367
14	+14000	-887	-1186	+11927	-4108	+7819	-5165	+2654
15	+14000	-887	-1186	+11927	-4108	+7819	-4854	+2965
16	+14000	-887	-1186	+11927	-4108	+7819	-4518	+3301
17	+14000	-887	-1186	+11927	-4108	+7819	-4156	+3663
18	+14000	-887	-1186	+11927	-4108	+7819	-3754	+4065
19	+14000	-887	-1186	+11927	-4108	+7819	-3341	+4478
20	+14000	-887	-1186	+11927	-4108	+7819	-2884	+4935
	+224000	-15586	-20065		-71657		-78745	+37947

(a) Including depreciation of EPZ Authority vehicles (25% p.a.).


Ukpakata
Iborida
Ukim Ita
Akai Ikot Orok
Iket Ekawon
Ibuno
Obot Abas Oku
Efut
CREEK TOWN 139
Mbarakom
Creek Town
Adakuko
Otung
Esuk Otu
FREE ZONE
Esuk Uta
PORT
Ikot Ansa
Ikot Kasuk
Old Town
Edida
Leepards Town
Customs Wharf
Marine Beach
Big Qua Town
Eyambo Beach
Akim Town
CALABAR
Efut Abua
Idim Ita
Edioe Edioe
Fishing Port

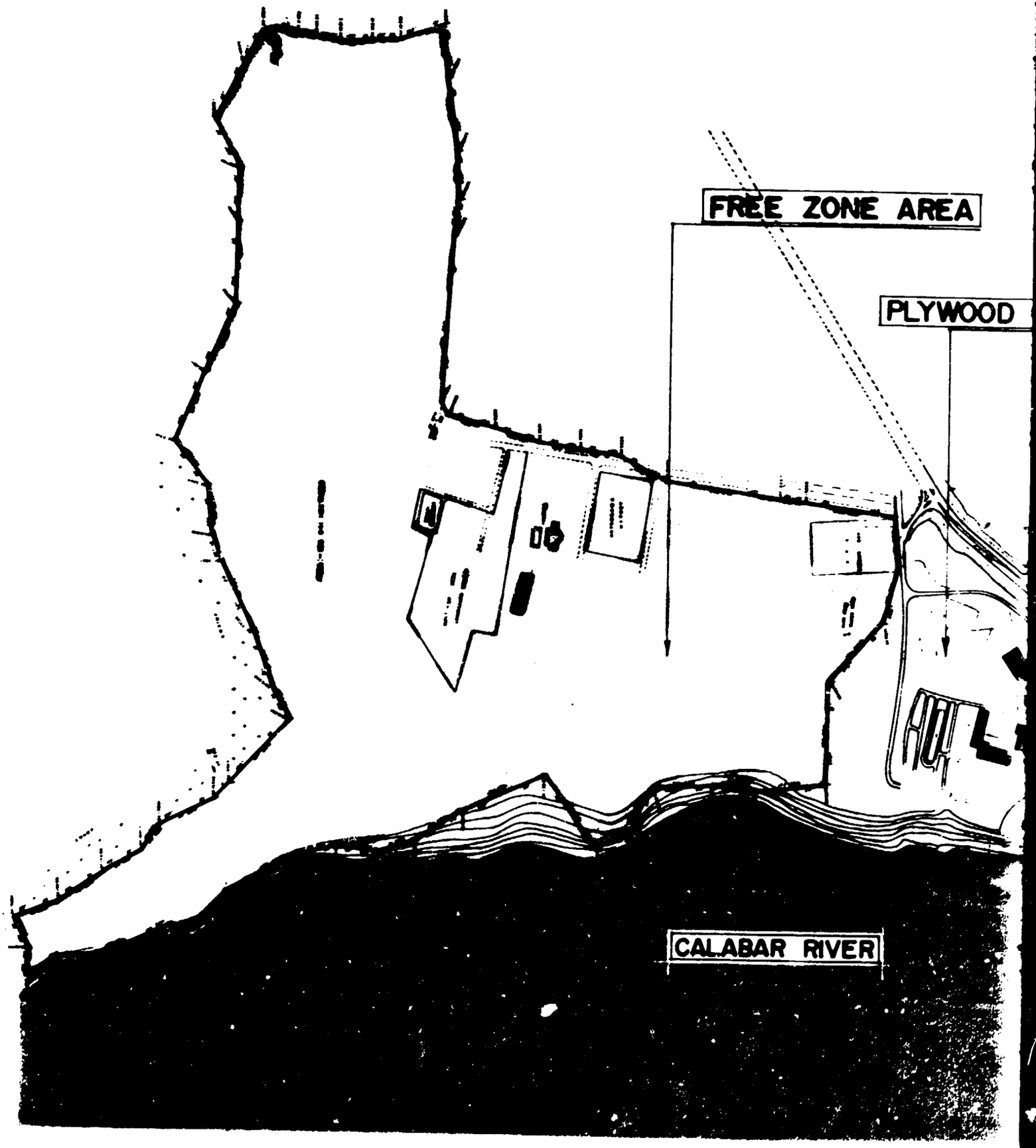
SECTION 1



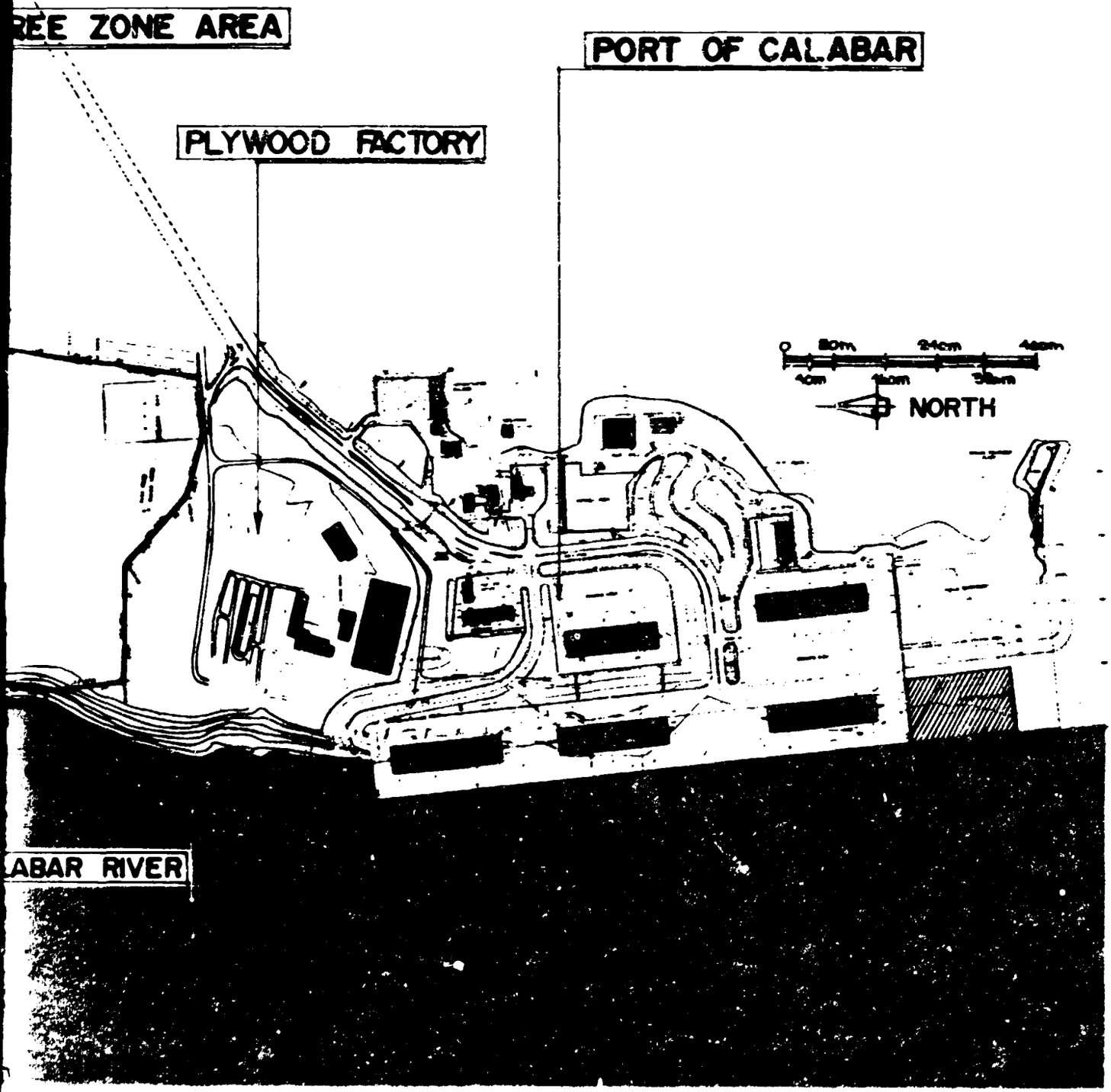
SECTION 2

LOCATION PLAN

1



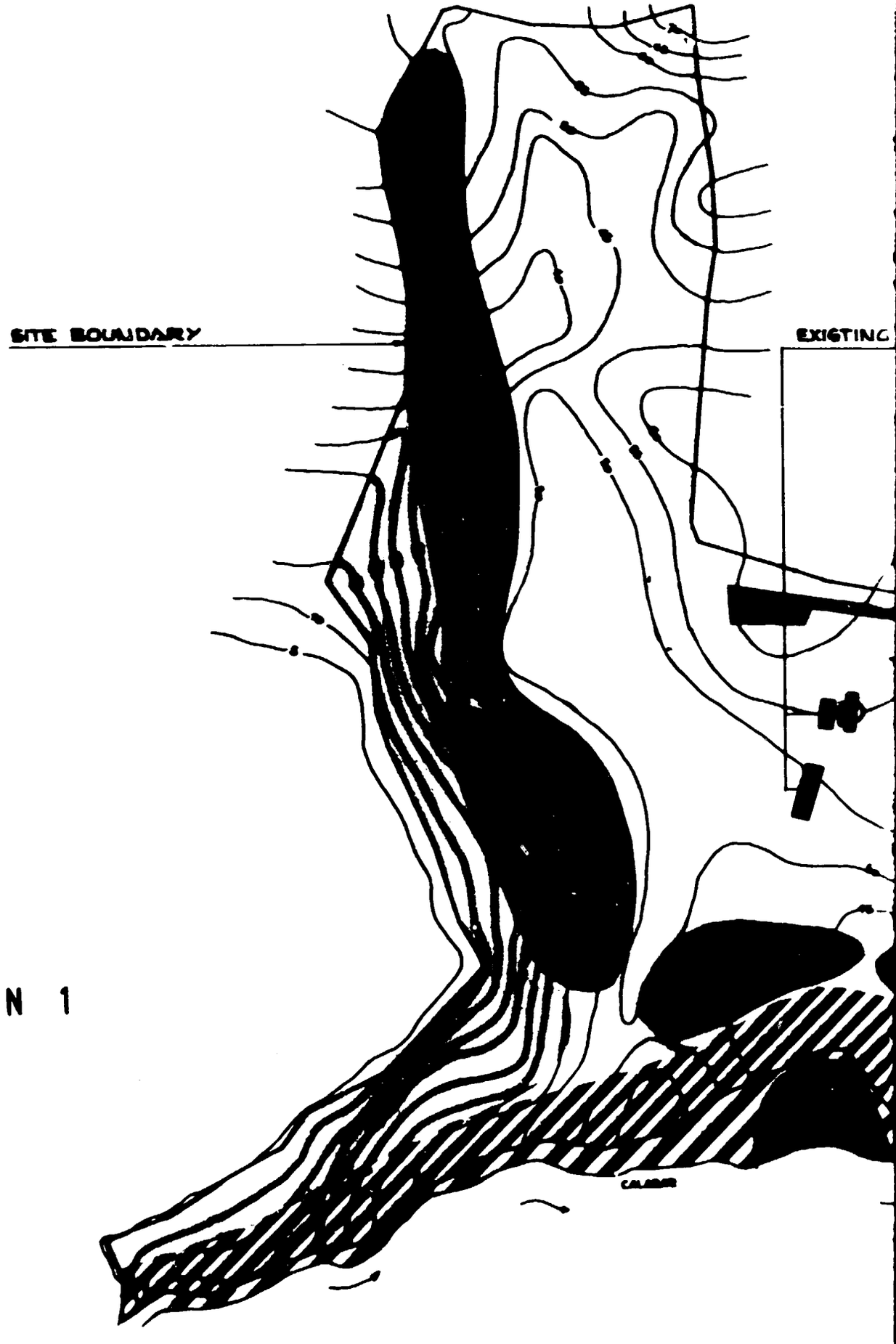
SECTION 1



SECTION 2

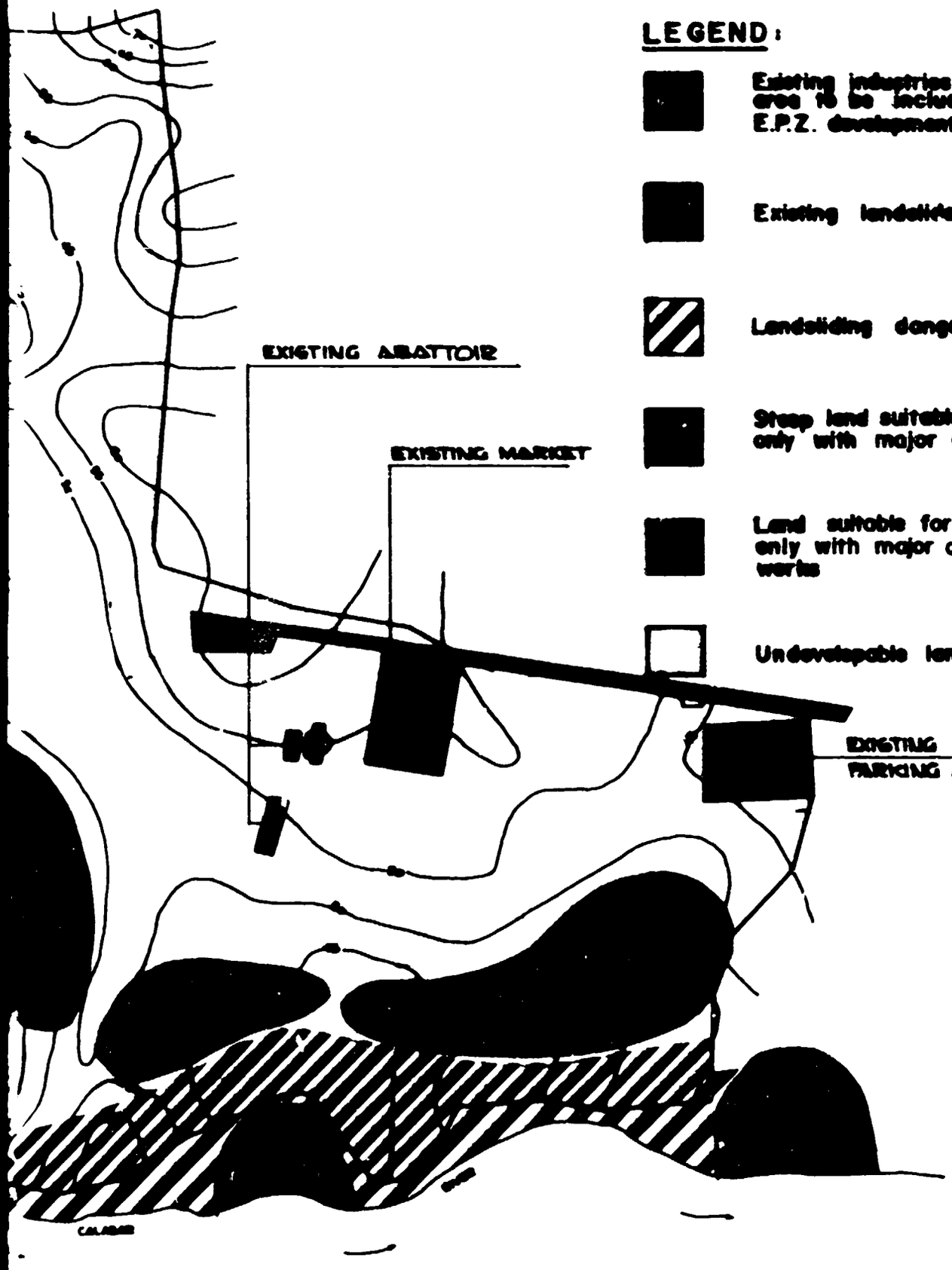
GENERAL SITE PLAN

2



SECTION 1

COMPREHENSIVE PLAN OF NATURAL A



LEGEND:

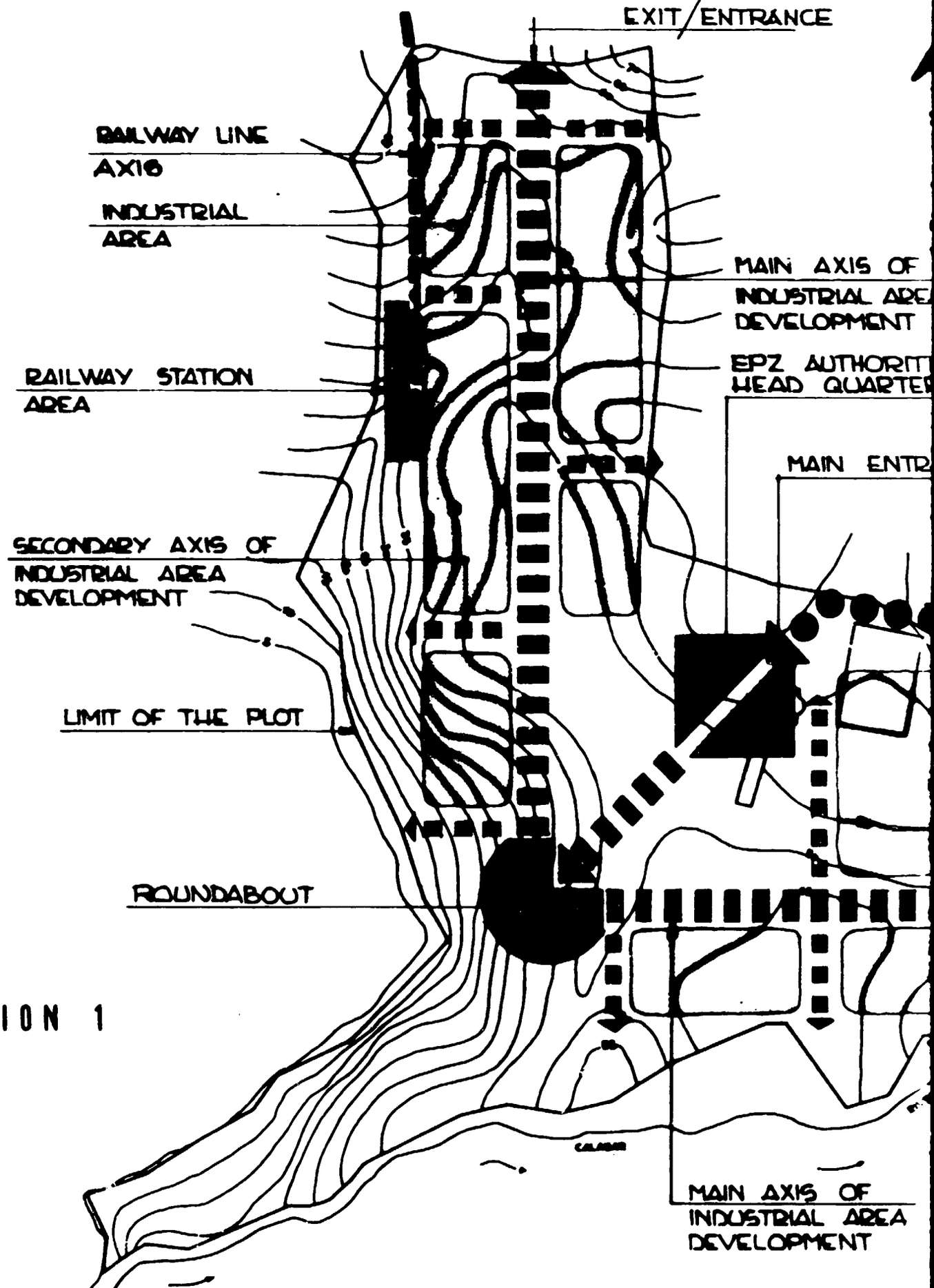
- Existing industries and parking area to be included in the E.P.Z. development
- Existing landslide
- Landsliding danger area
- Steep land suitable for development only with major earthworks
- Land suitable for development only with major consolidation works
- Undevelopable land

TEAM Sri

NORTH

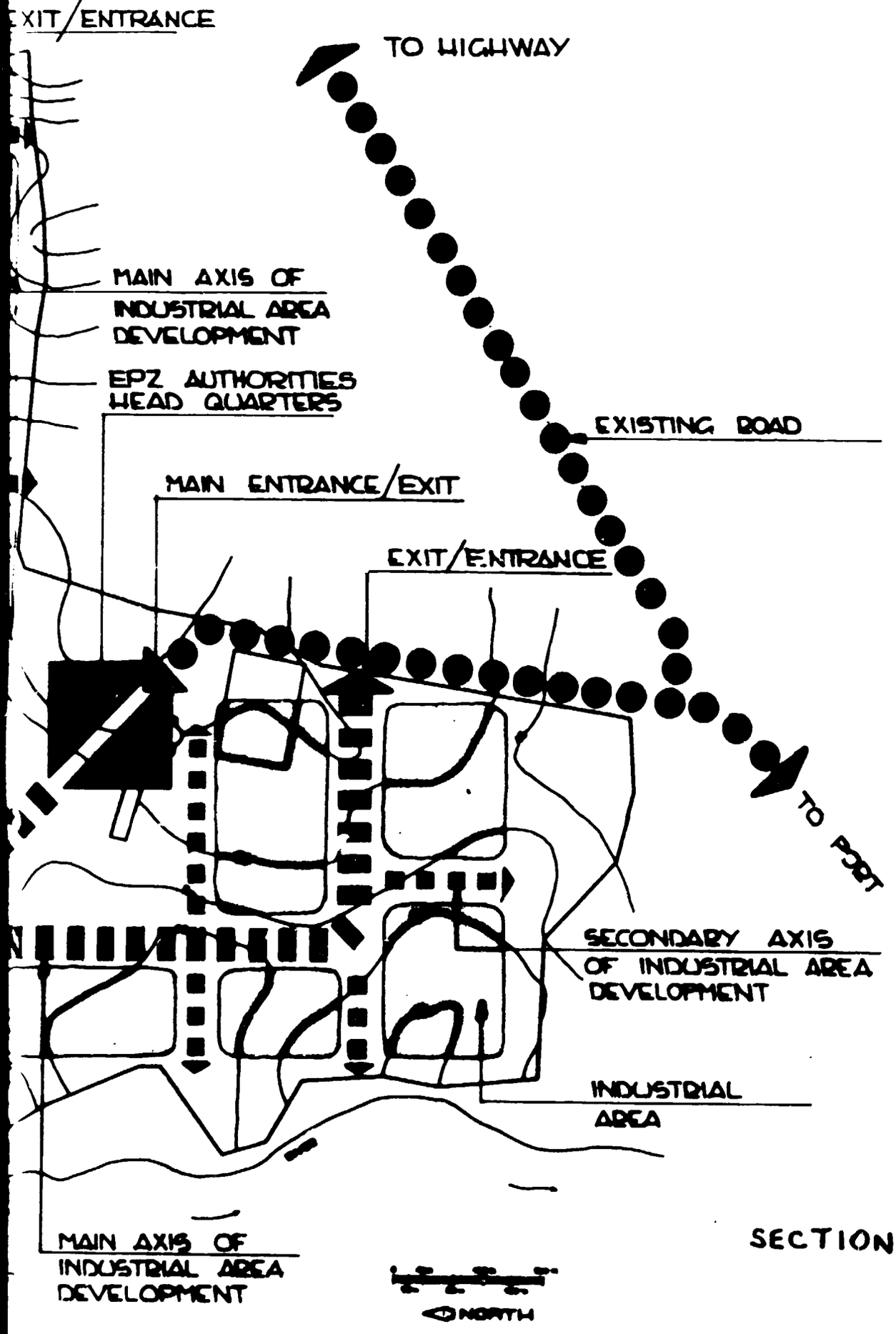
SECTION 2

OF NATURAL AND MAN-MADE CONSTRAINTS


EXIT/ENTRANCE
RAILWAY LINE
AXIS
INDUSTRIAL
AREA
MAIN AXIS OF
INDUSTRIAL ARE
DEVELOPMENT
EPZ AUTHORIT
HEAD QUARTER
RAILWAY STATION
AREA
MAIN ENTR
SECONDARY AXIS OF
INDUSTRIAL AREA
DEVELOPMENT
LIMIT OF THE PLOT
ROUNDABOUT
MAIN AXIS OF
INDUSTRIAL AREA
DEVELOPMENT

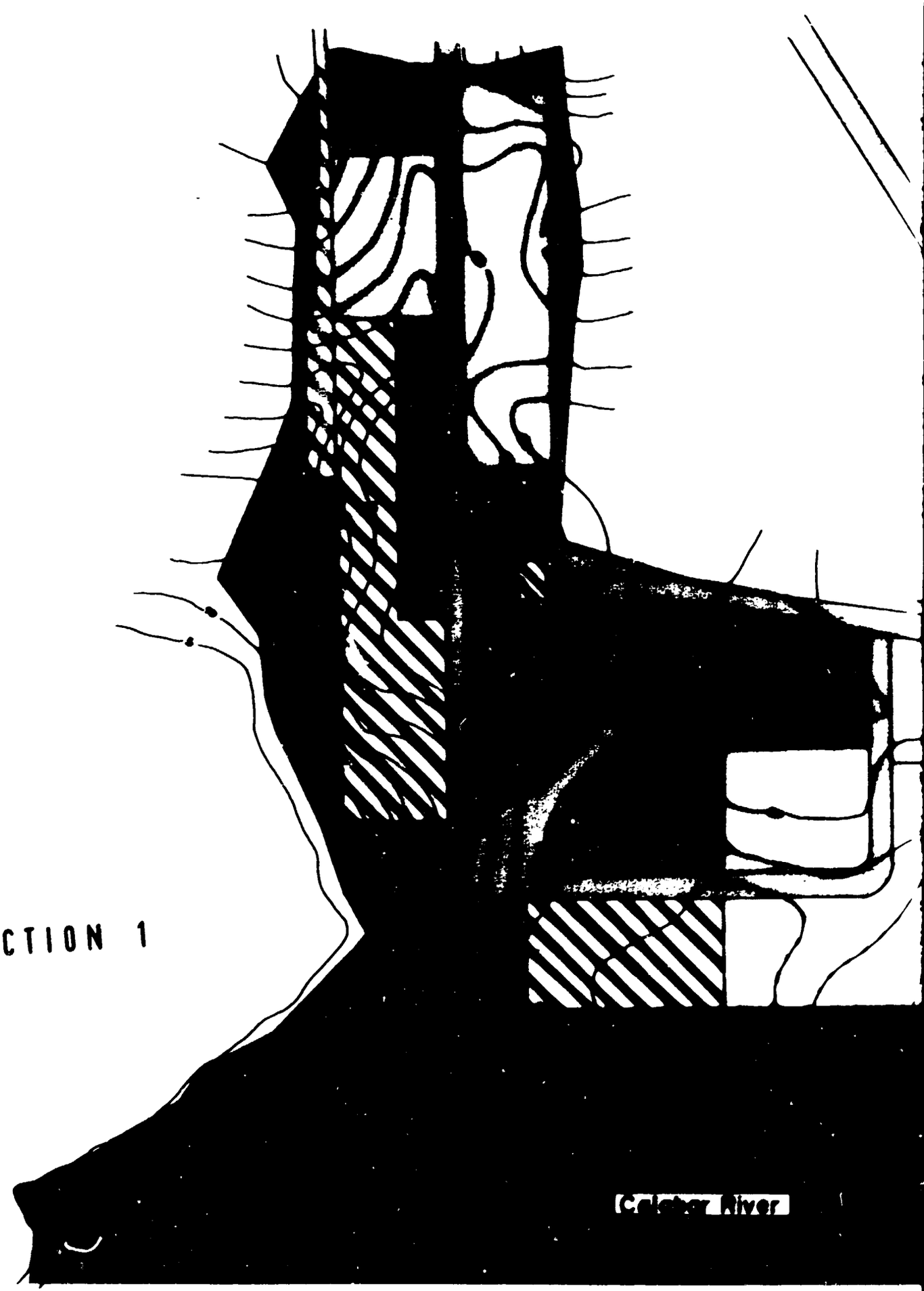
SECTION 1

PR

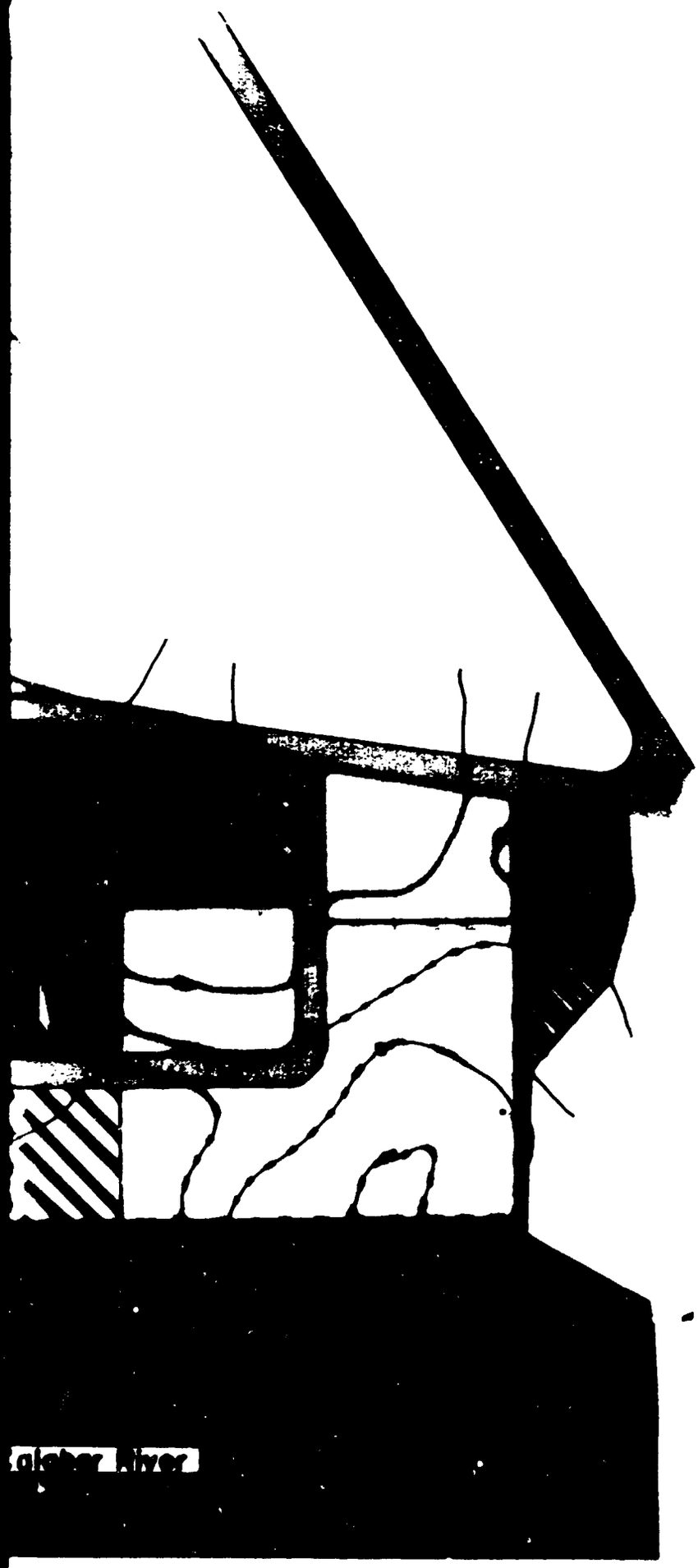


SECTION 2

PRELIMINARY LAND USE PATTERN



SECTION 1



TEAM s.

LEGEND

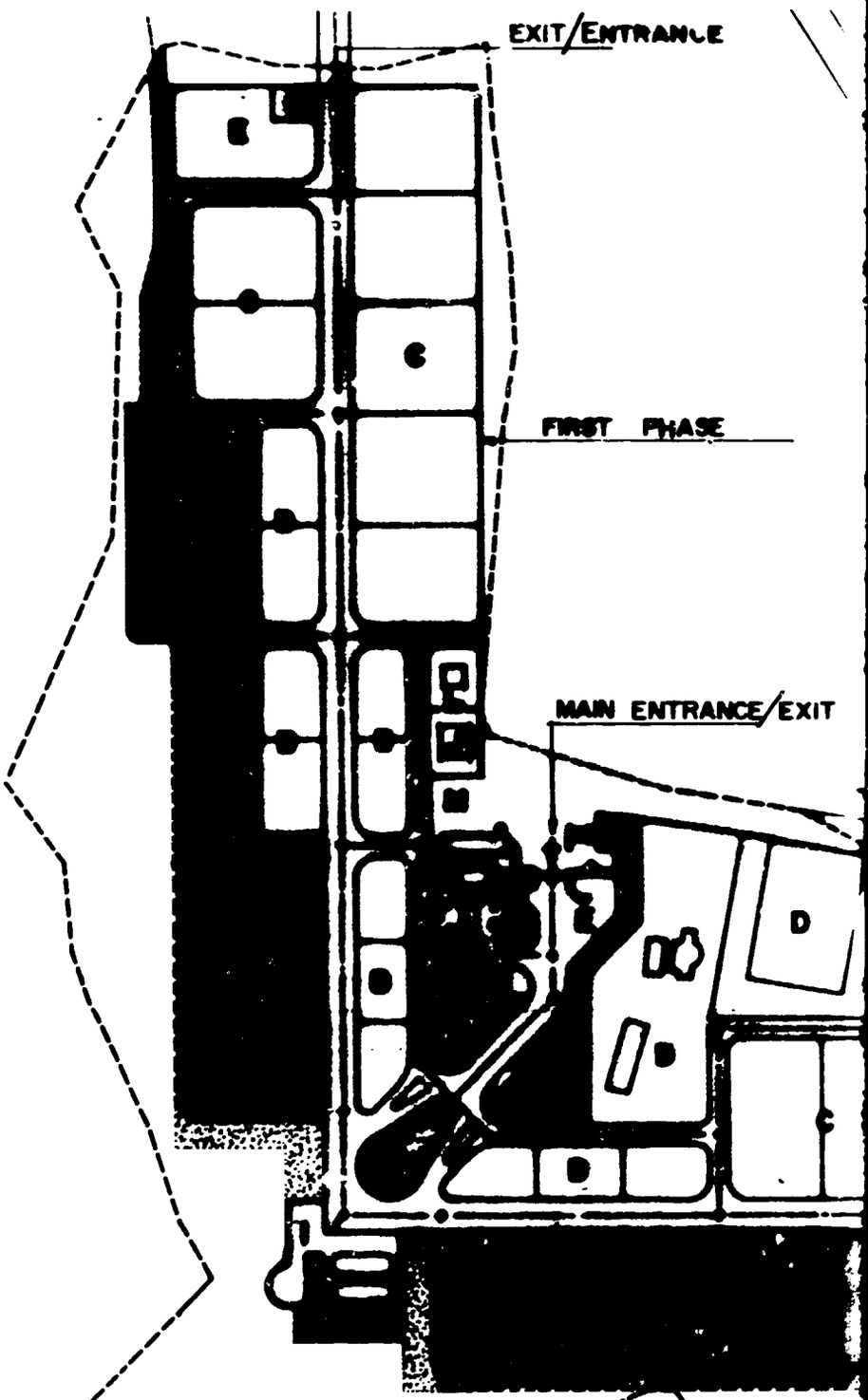
- -Small scale industries
- -Medium " "
- -Future extension of small scale industries
- -Future extension of medium scale industries
- -Existing industries area to be included
- -Free zone headquarters and service of E.P.Z. facilities
- -Future extension headquarters
- -Future reserving area for railway line and station
- -Sewage treatment plant area
- -Future extension of services facilities
- -Landscaped green area
- -Undeveloped green area
- -Main road network

NORTH

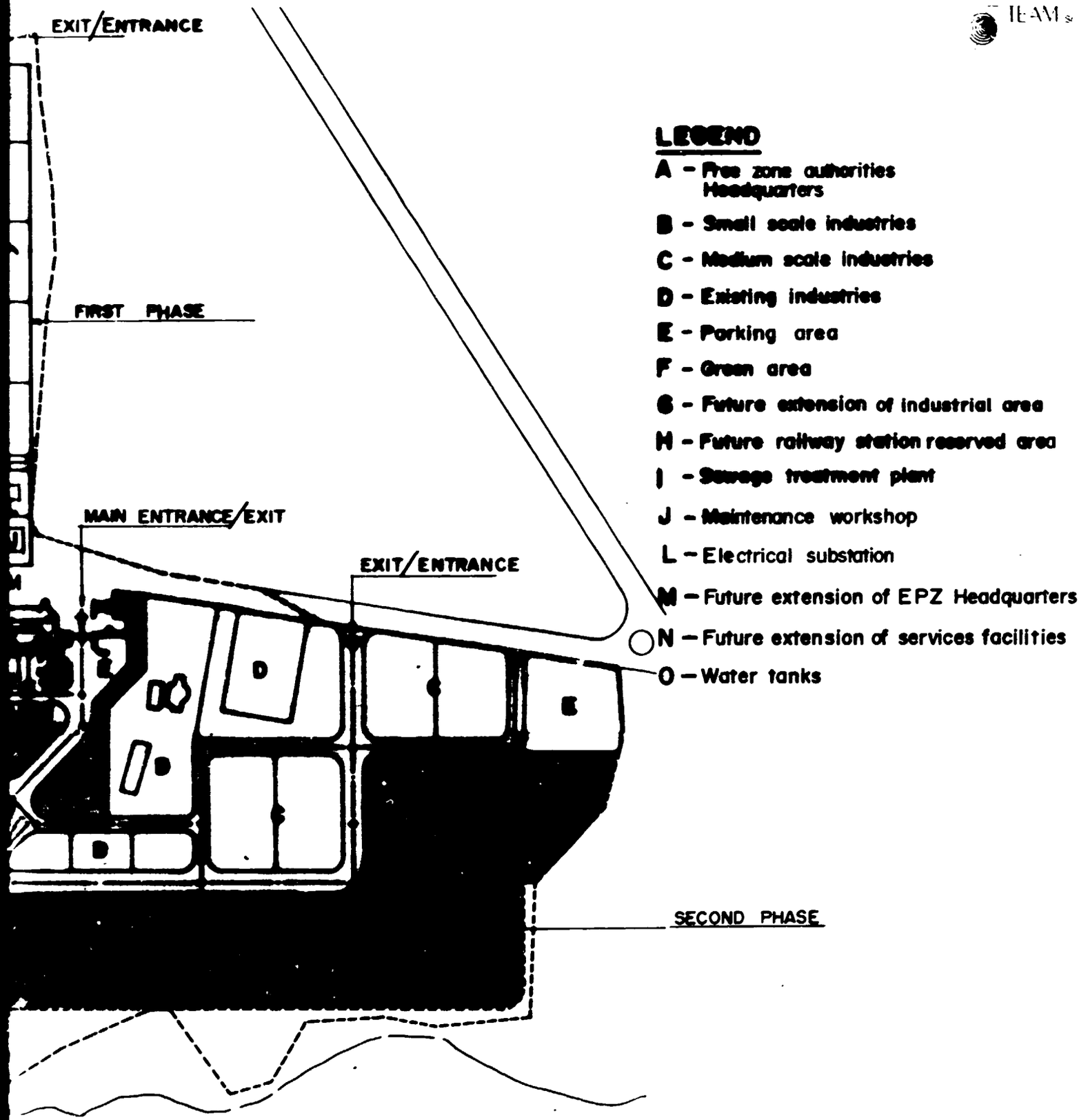
SECTION 2

LAND USE PLAN

5



SECTION 1



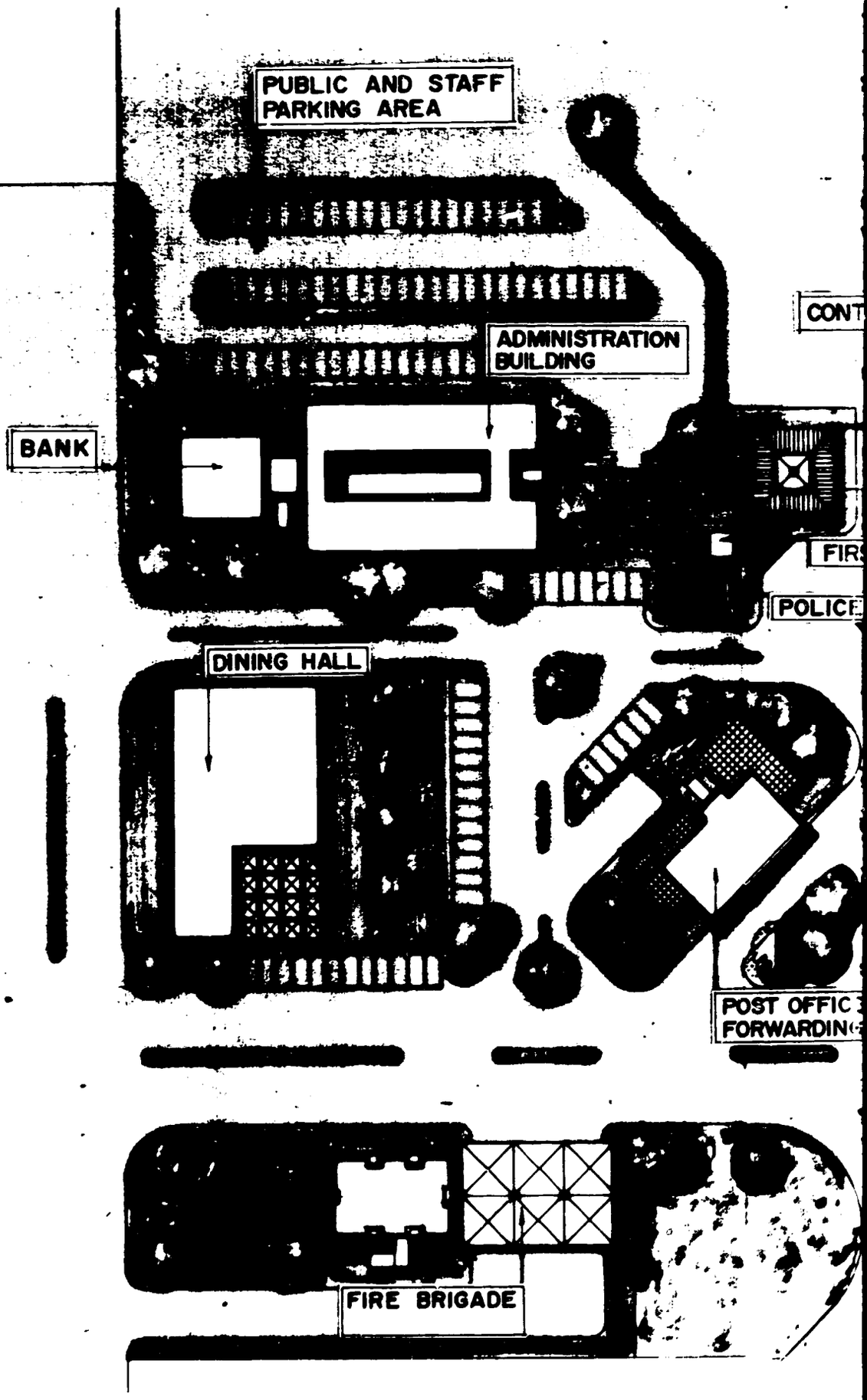
LEGEND

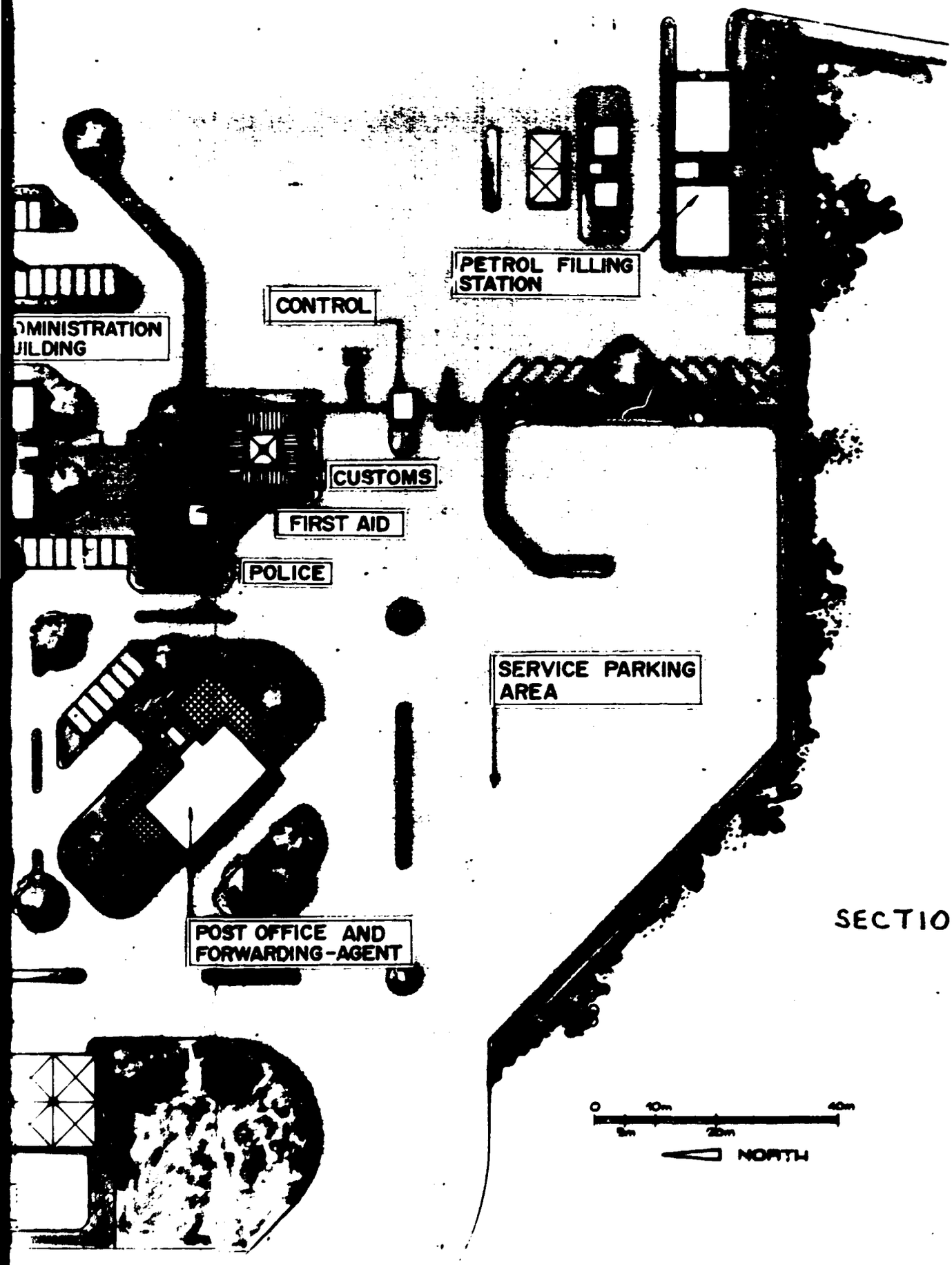
- A – Free zone authorities Headquarters
- B – Small scale industries
- C – Medium scale industries
- D – Existing industries
- E – Parking area
- F – Green area
- G – Future extension of industrial area
- H – Future railway station reserved area
- I – Sewage treatment plant
- J – Maintenance workshop
- L – Electrical substation
- M – Future extension of EPZ Headquarters
- N – Future extension of services facilities
- O – Water tanks

SECTION 2

NORTH

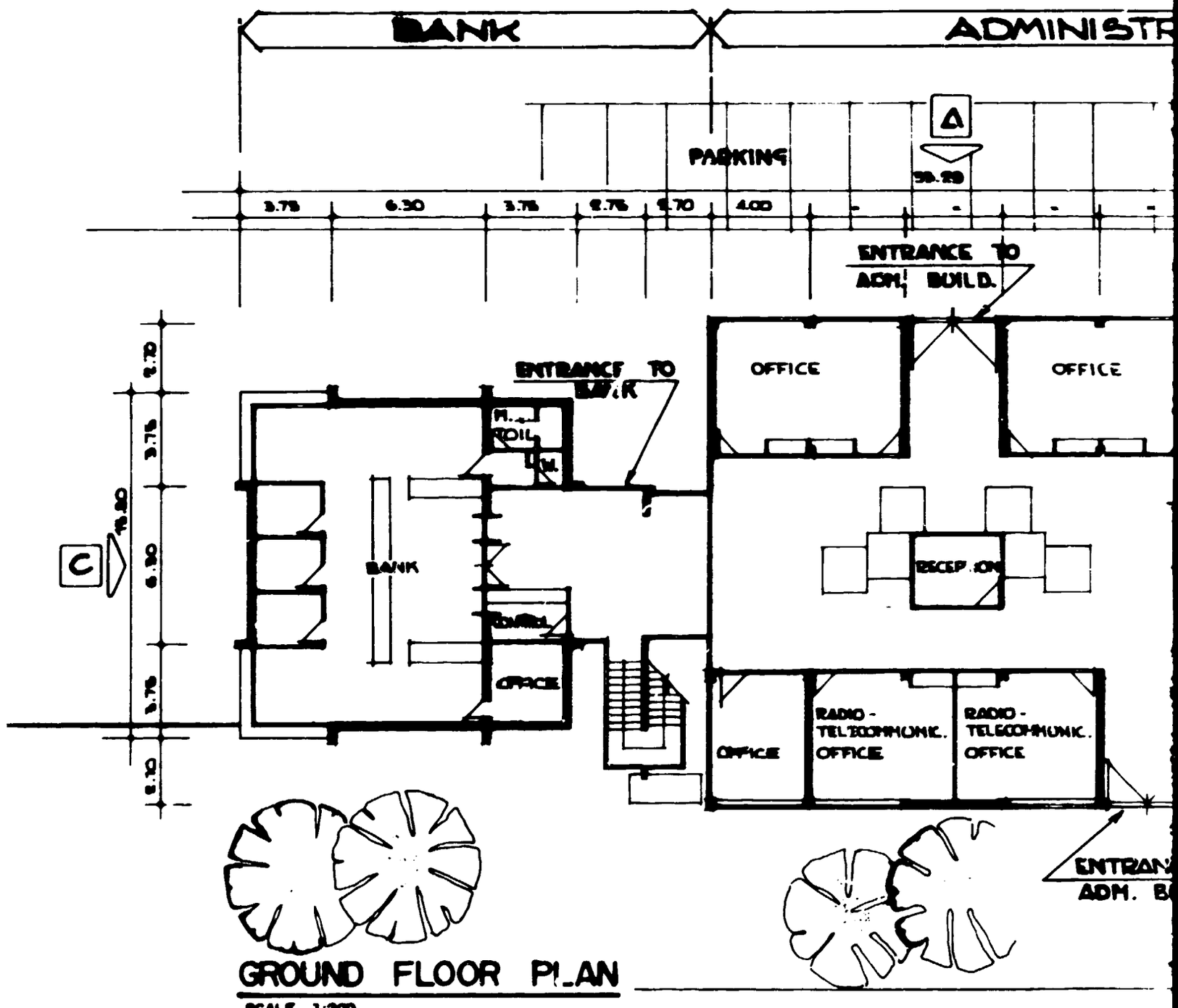
SITE DEVELOPMENT PLAN


PUBLIC AND STAFF
PARKING AREA
ADMINISTRATION
BUILDING
BANK
DINING HALL
FIRE BRIGADE



SECTION 2

E.P.Z. AUTHORITIES HEADQUARTERS PLAN

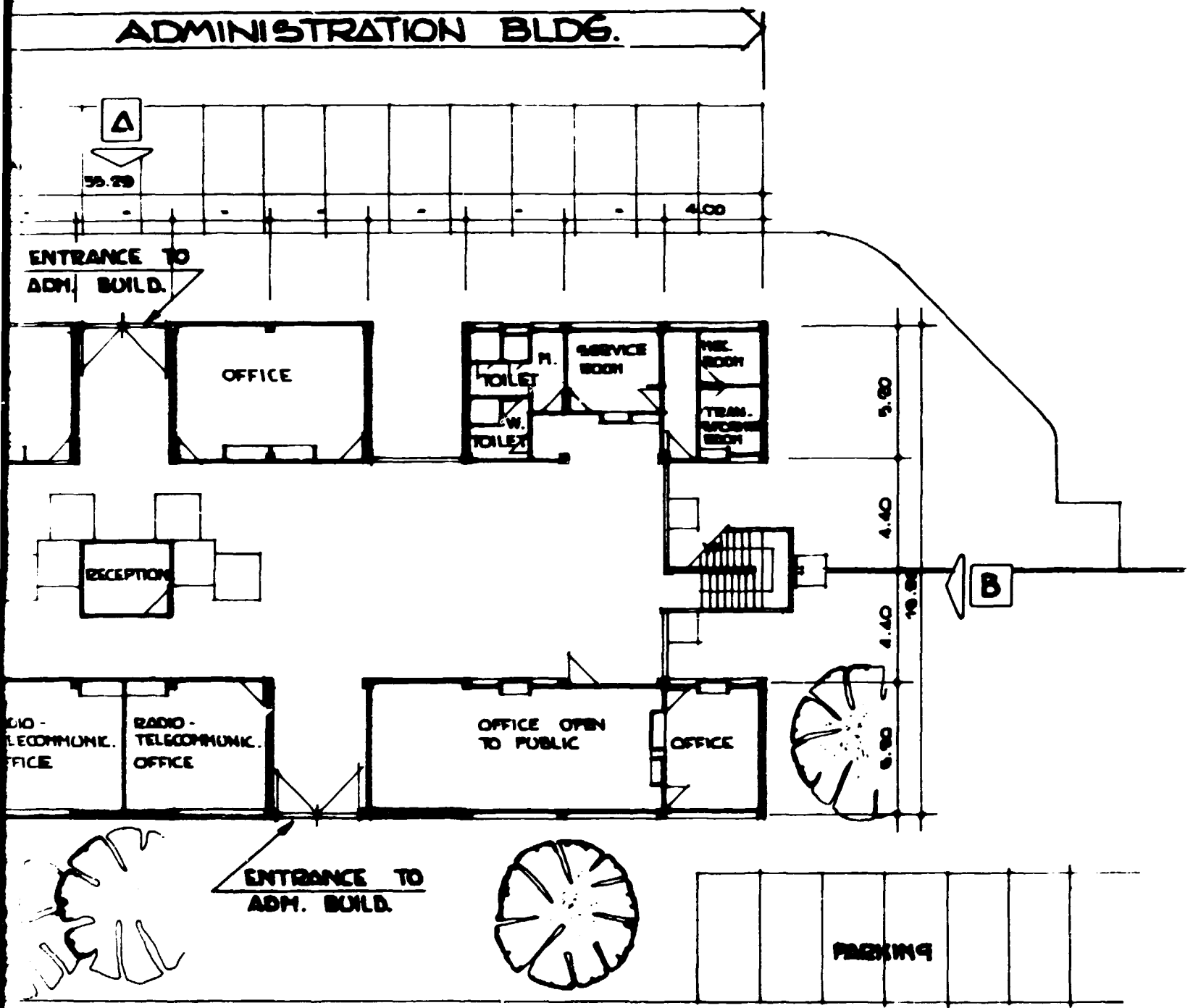


GROUND FLOOR PLAN

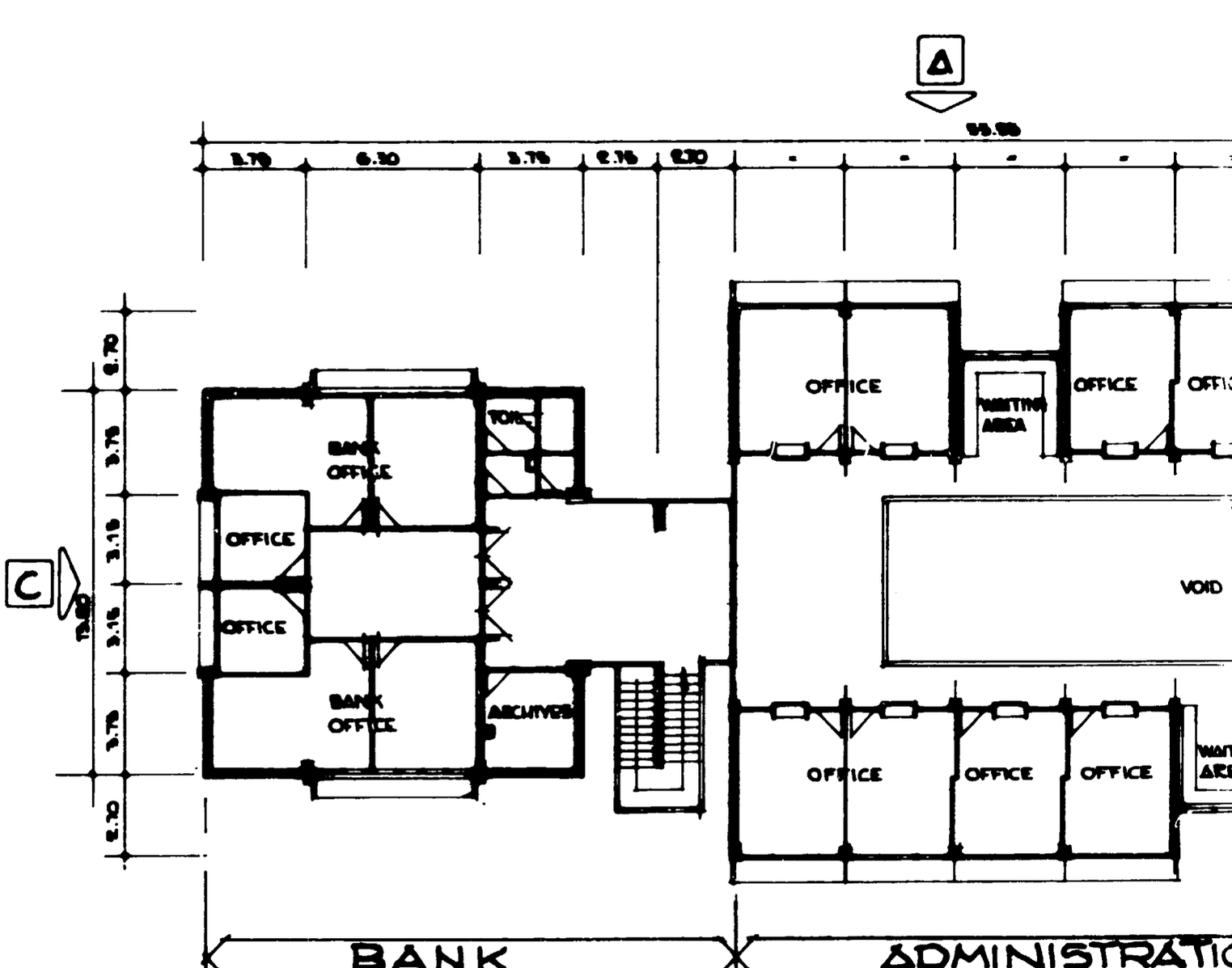
SCALE 1:200

SECTION 1

BANK AN


ADMINISTRATION BLDG.
A
55.29
4.00
ENTRANCE TO ADM. BUILD.
OFFICE
M. TOILET
W. TOILET
SERVICE ROOM
TRANSFORMER ROOM
5.80
4.40
4.40
5.80
B
RECEPTION
RADIO - TELECOMMUNIC. OFFICE
OFFICE OPEN TO PUBLIC
OFFICE
ENTRANCE TO ADM. BUILD.
PARKING

SECTION 2

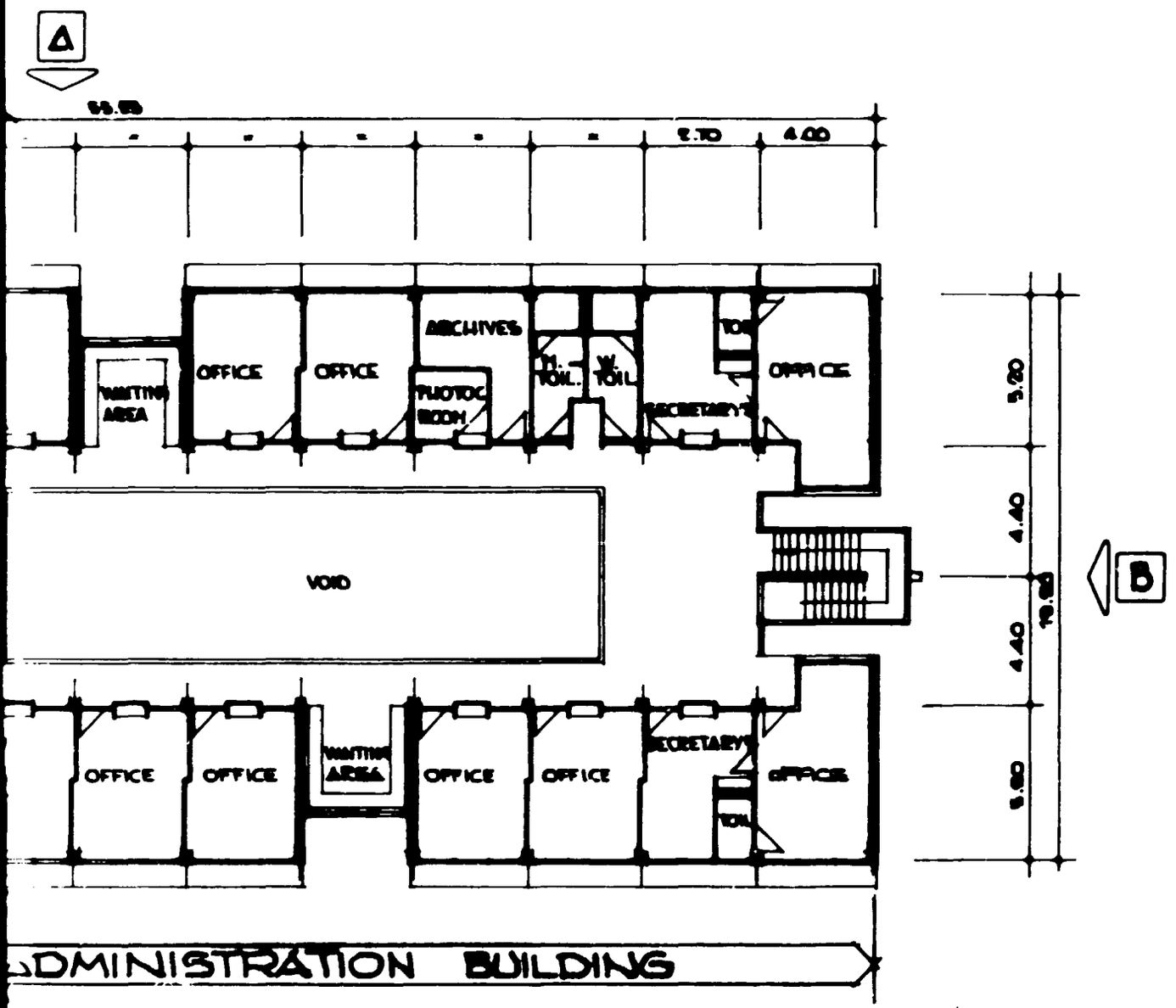


FIRST FLOOR PLAN

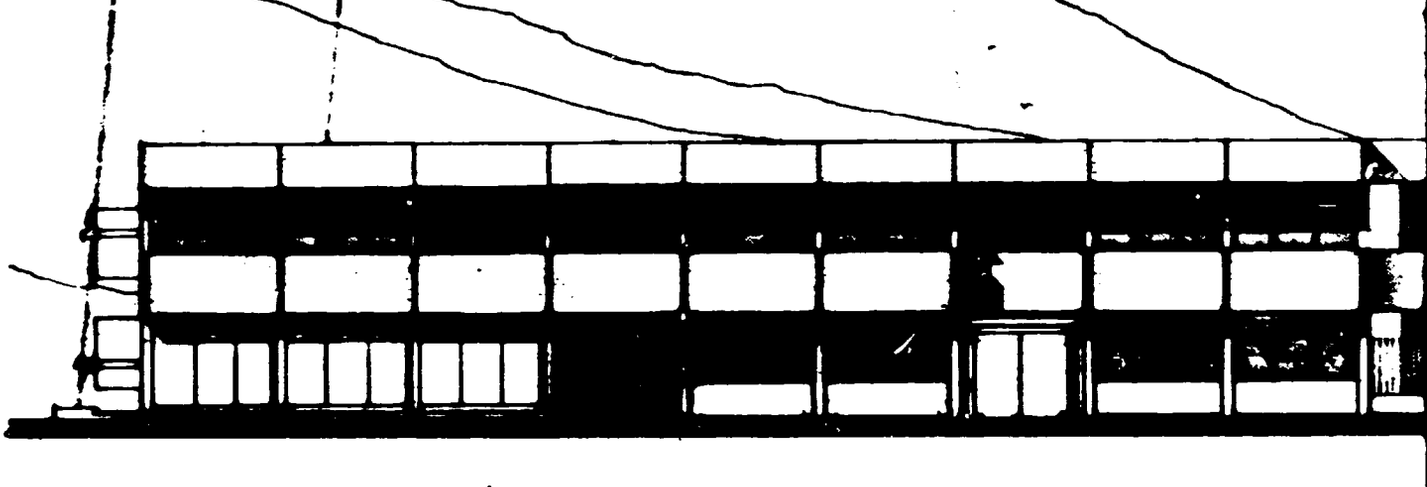
SCALE 1:200

SECTION 1

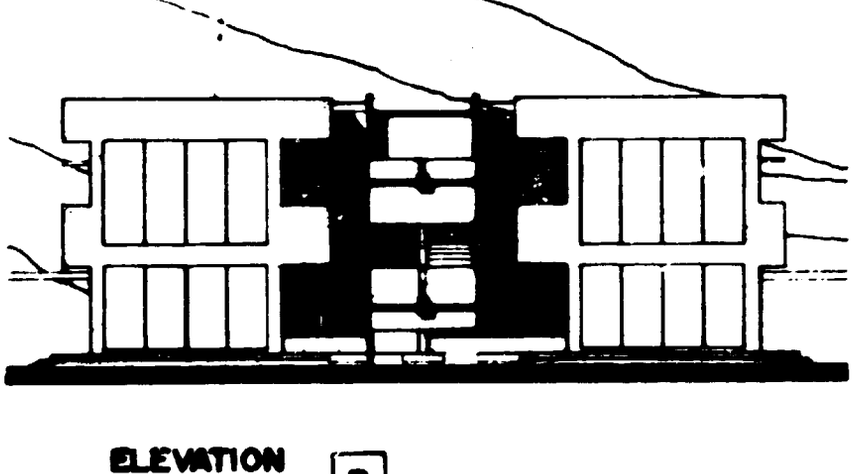
BANK A


A
55.55
2.70
4.00
WAITING AREA
OFFICE
OFFICE
ARCHIVES
PHOTOC ROOM
M. TOIL.
W. TOIL.
SECRETARY'S
OFFICE
VOID
B
5.20
4.40
4.40
5.80
OFFICE
OFFICE
WAITING AREA
OFFICE
OFFICE
SECRETARY'S
OFFICE
TOIL.
ADMINISTRATION BUILDING

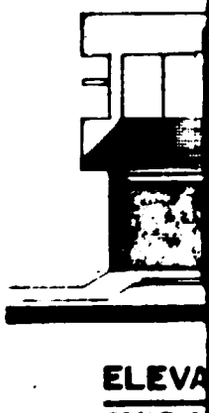
SECTION 2



ELEVATION A
SCALE 1:200



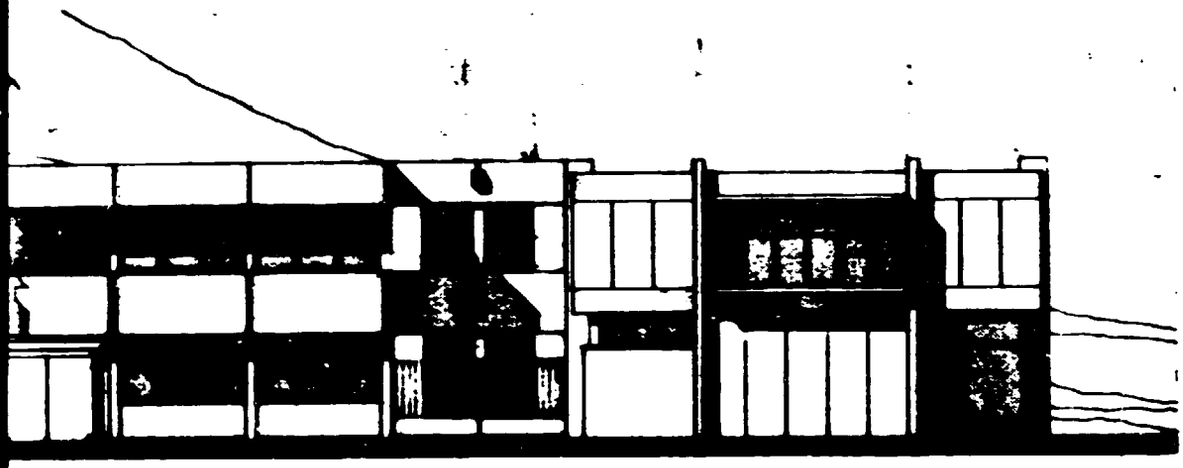
ELEVATION B
SCALE 1:200



ELEVA
SCALE

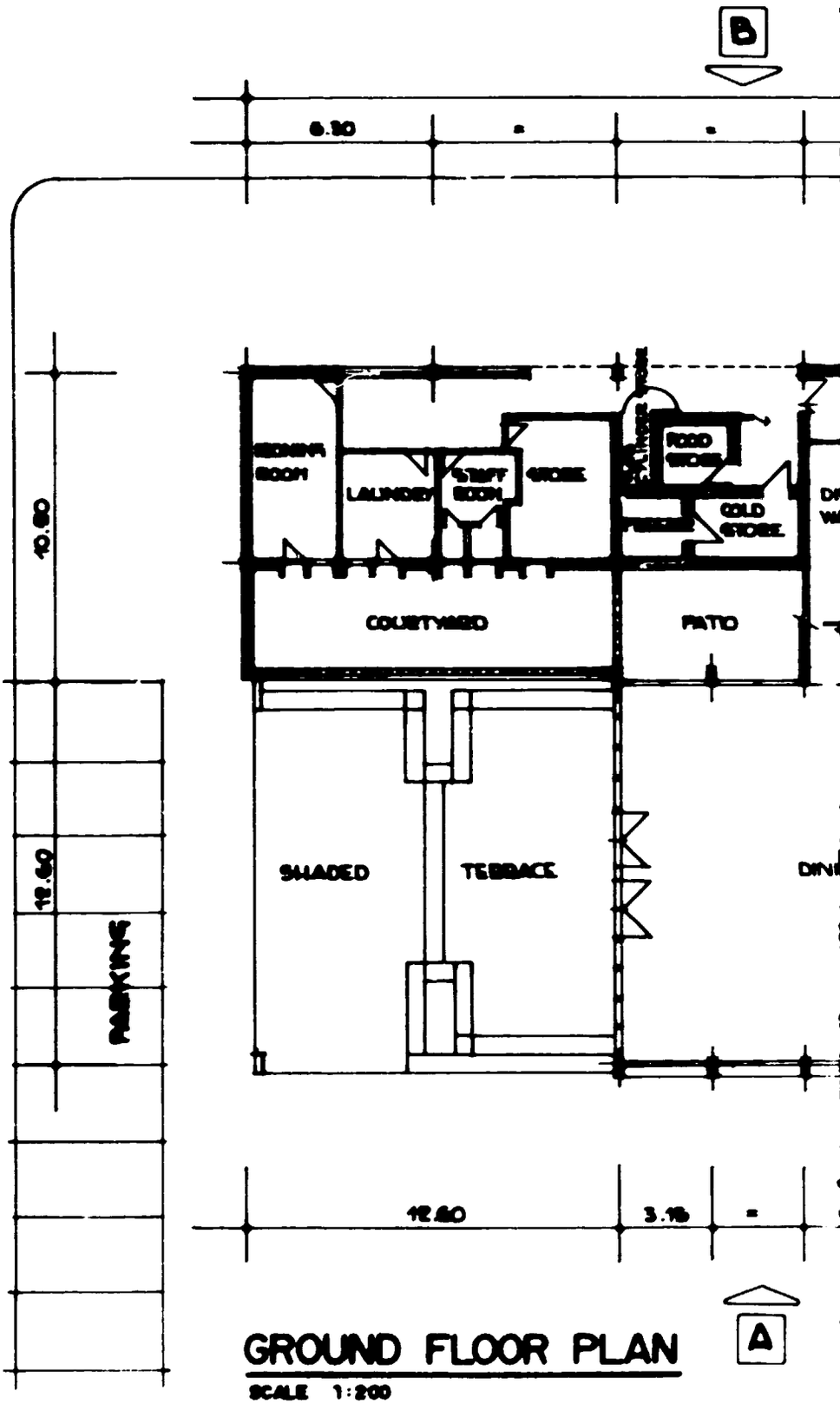
SECTION 1

BANK A



ELEVATION C
SCALE- 1:[illegible]

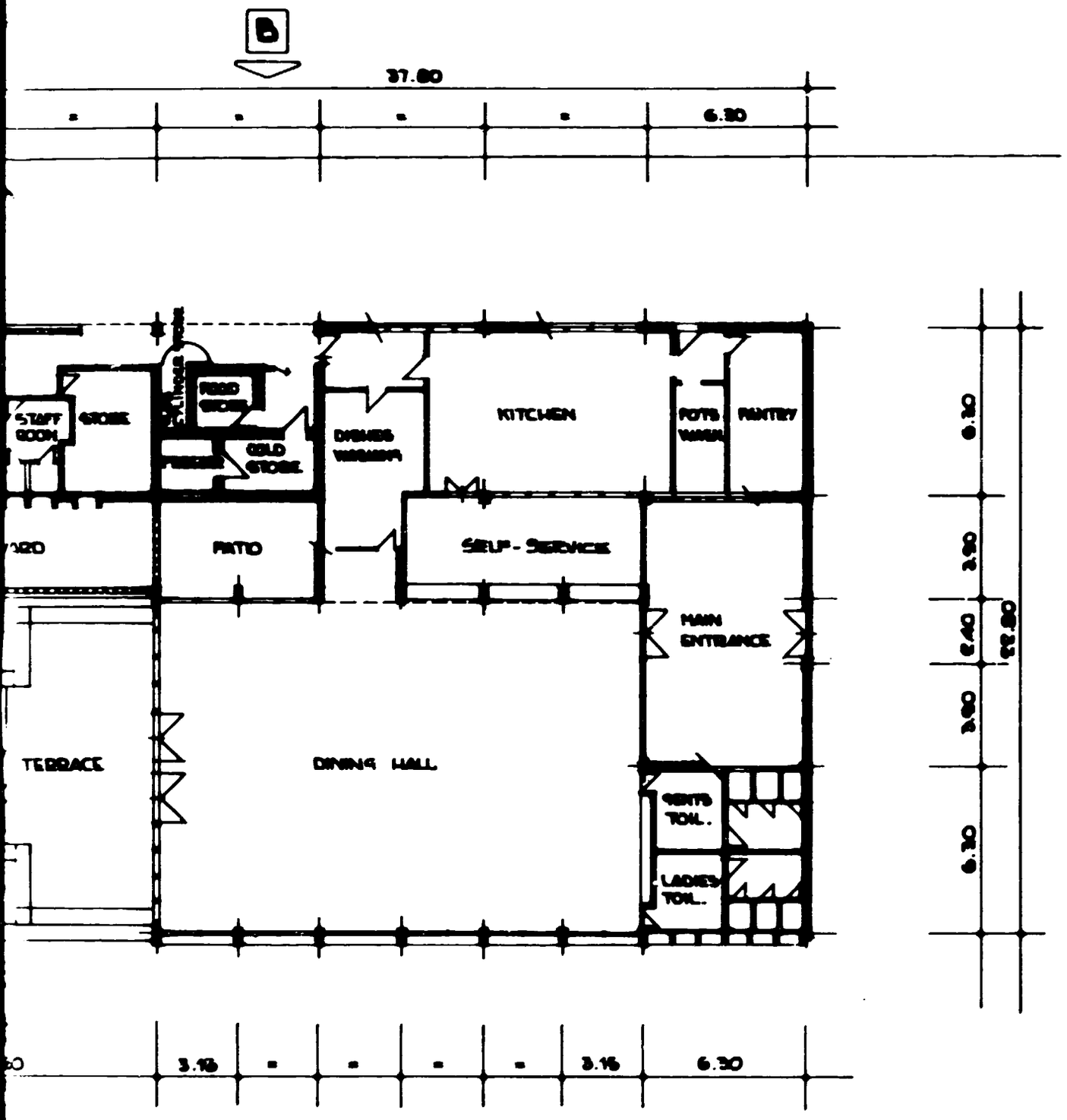
SECTION 2



SECTION 1

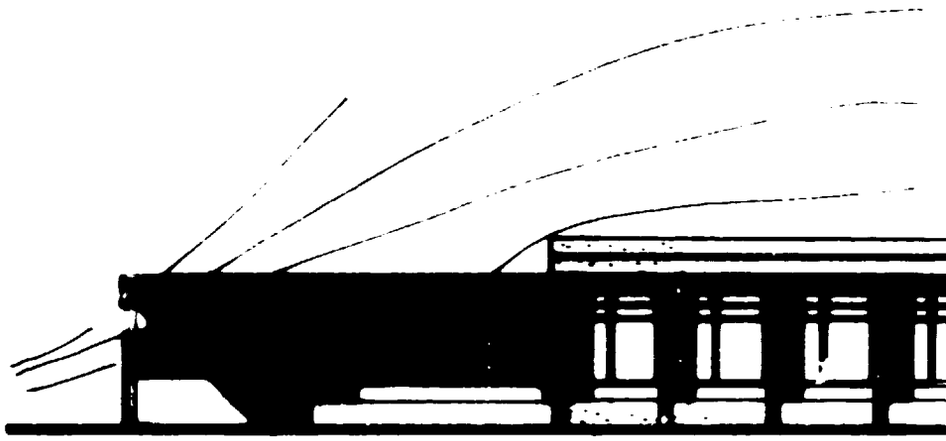
GROUND FLOOR PLAN

SCALE 1:200

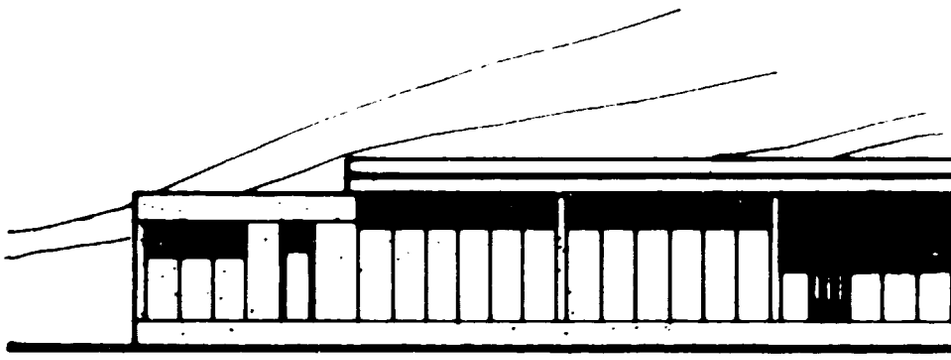


LOOR PLAN

SECTION 2

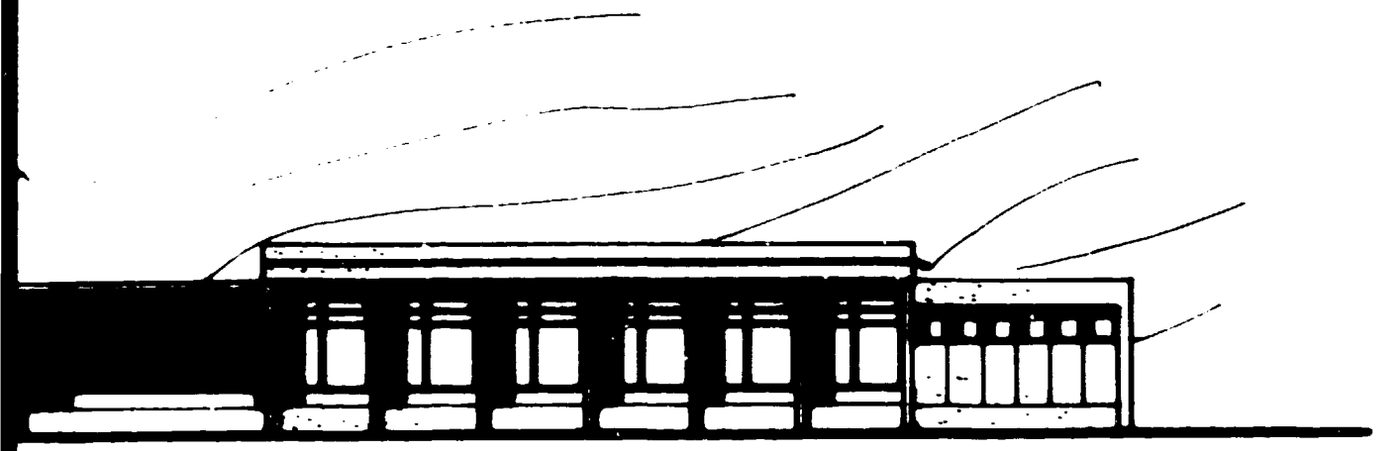


ELEVATION A
SCALE 1:200

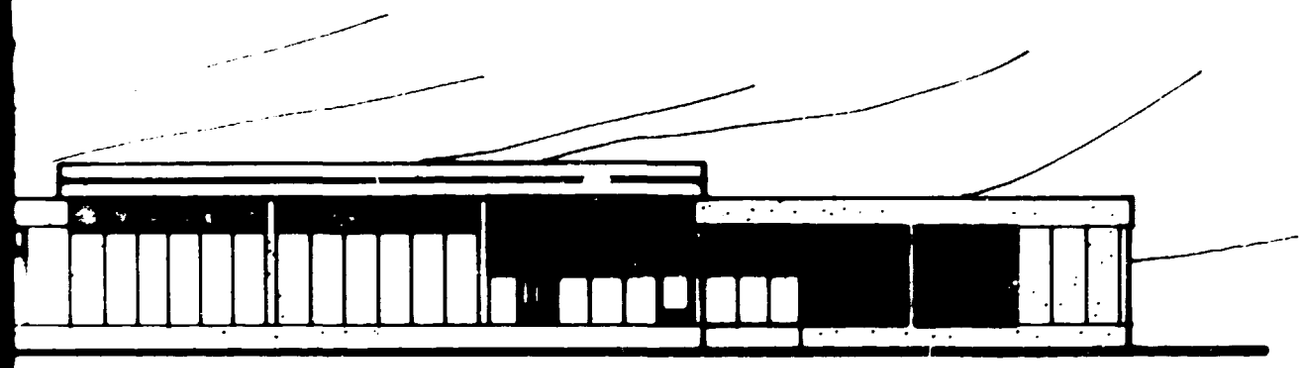


ELEVATION B
SCALE 1:200

TEAM

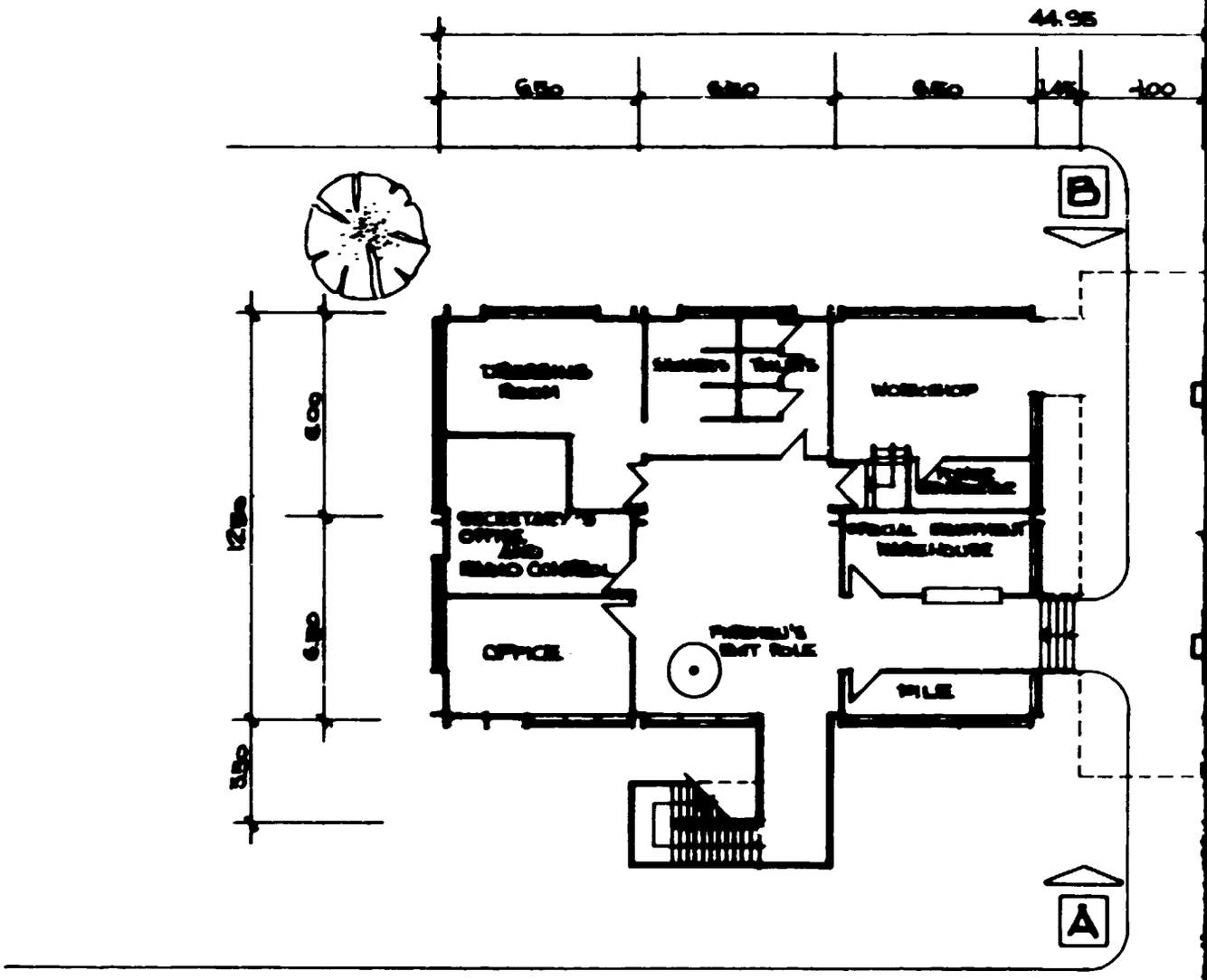


A



B

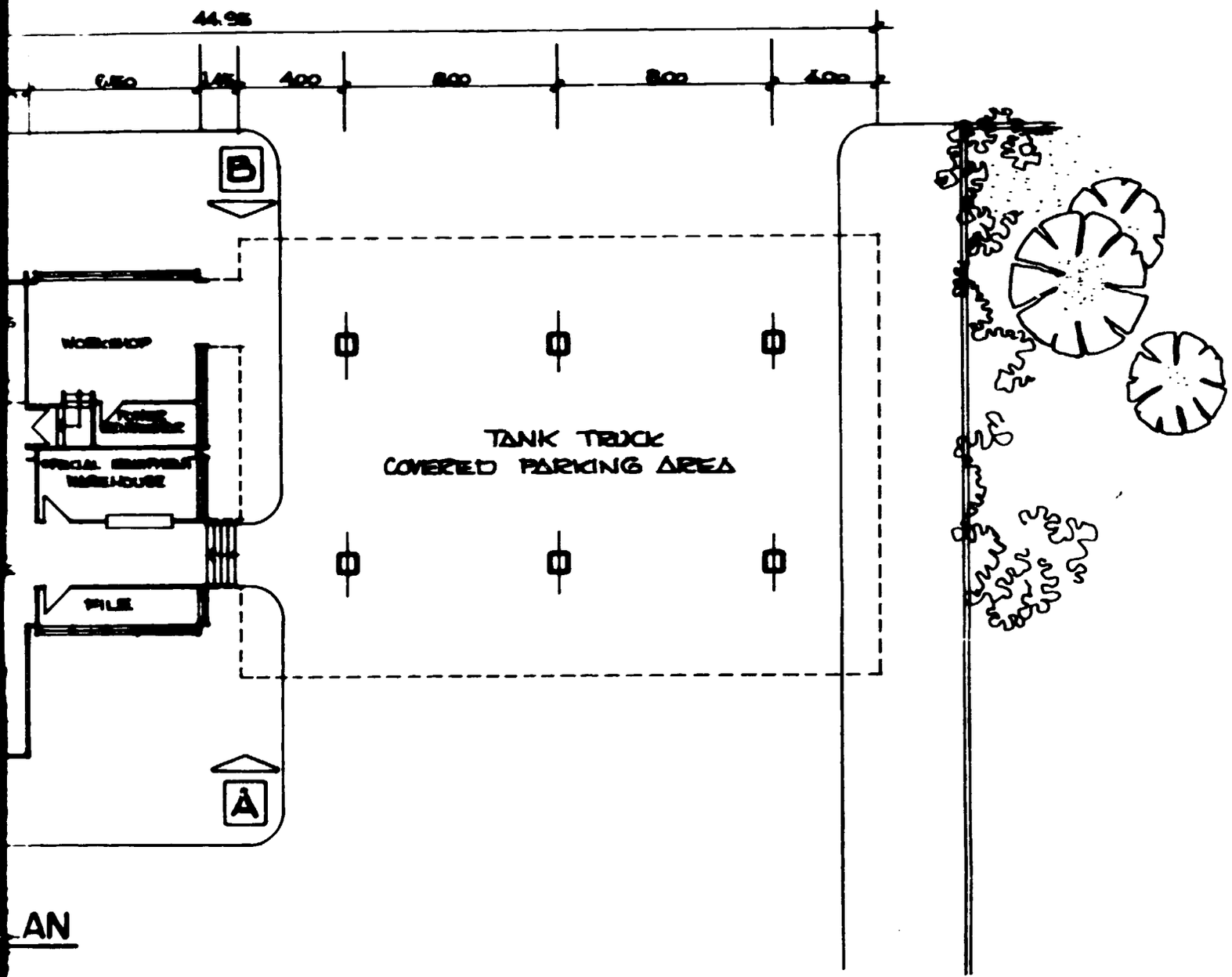
SECTION 2



GROUND FLOOR PLAN

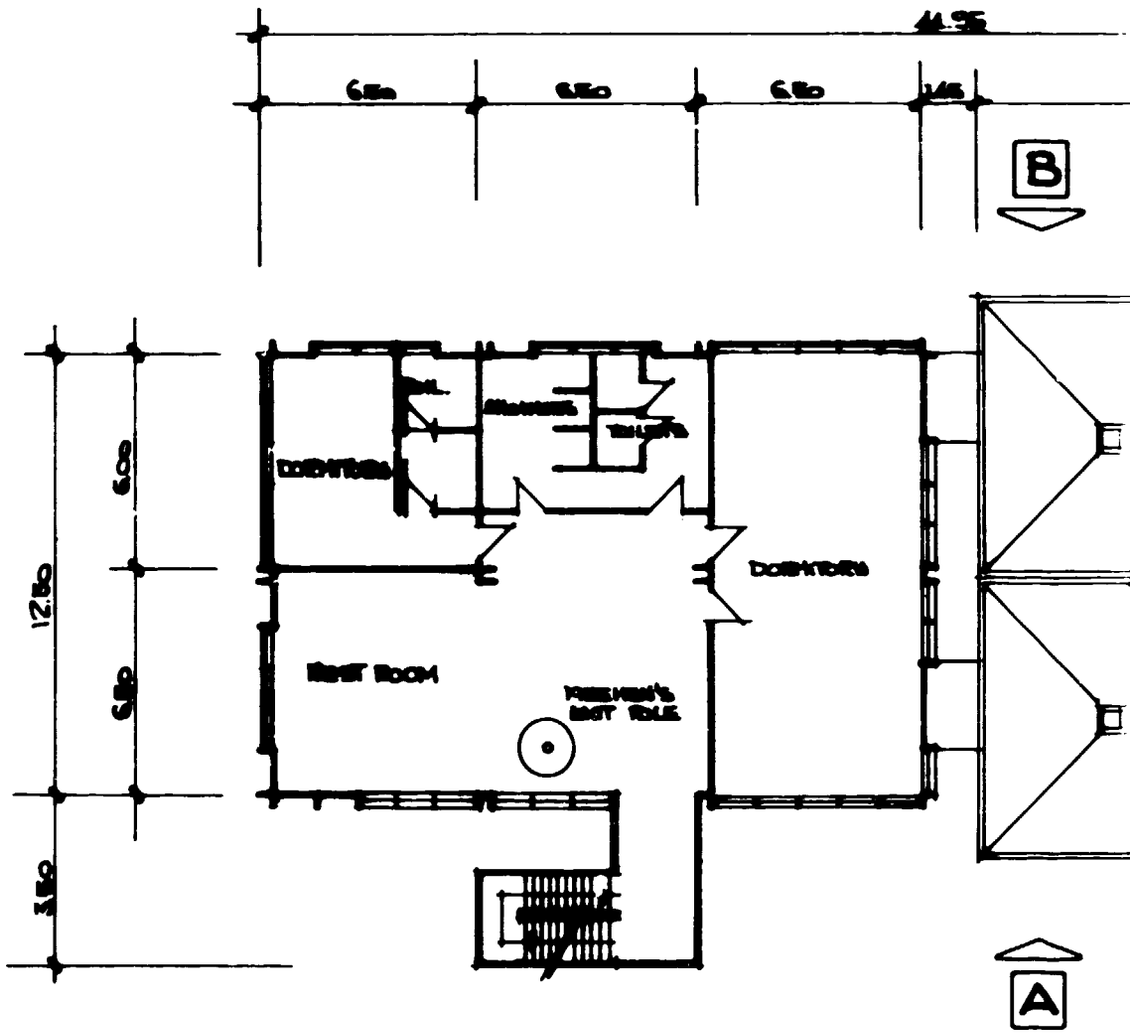
SCALE 1:200

SECTION 1



AN

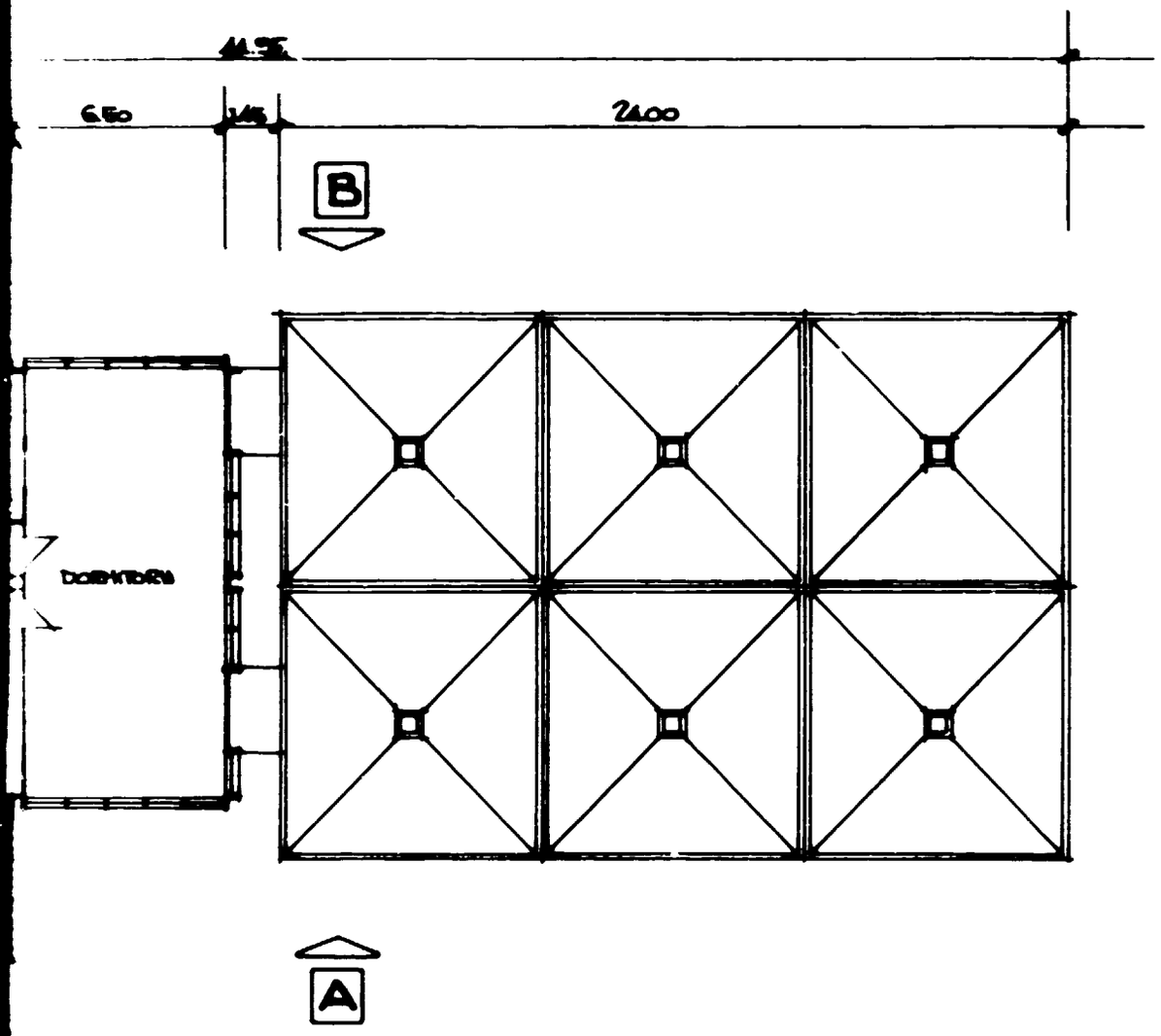
SECTION 2



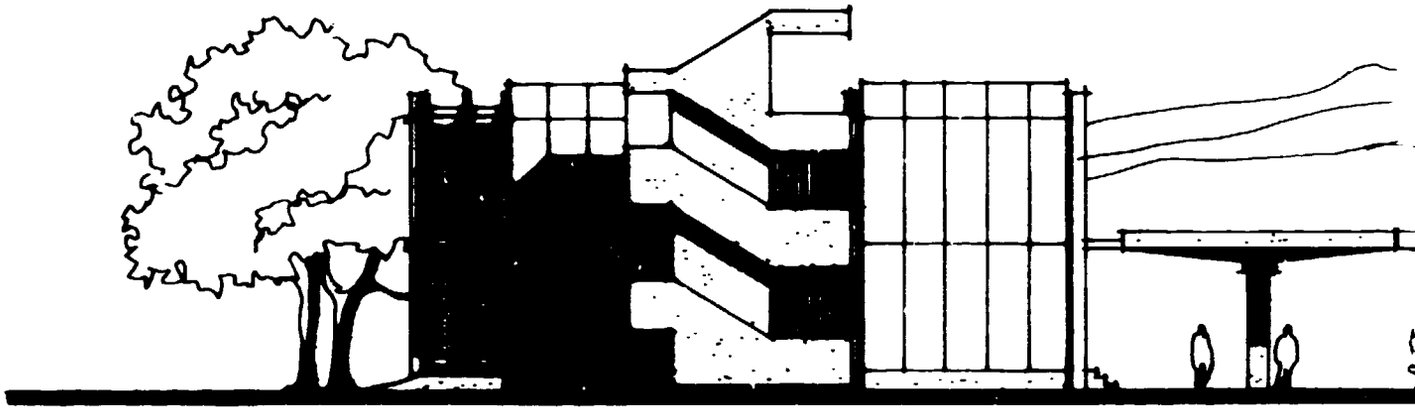
FIRST FLOOR PLAN

SCALE 1:200

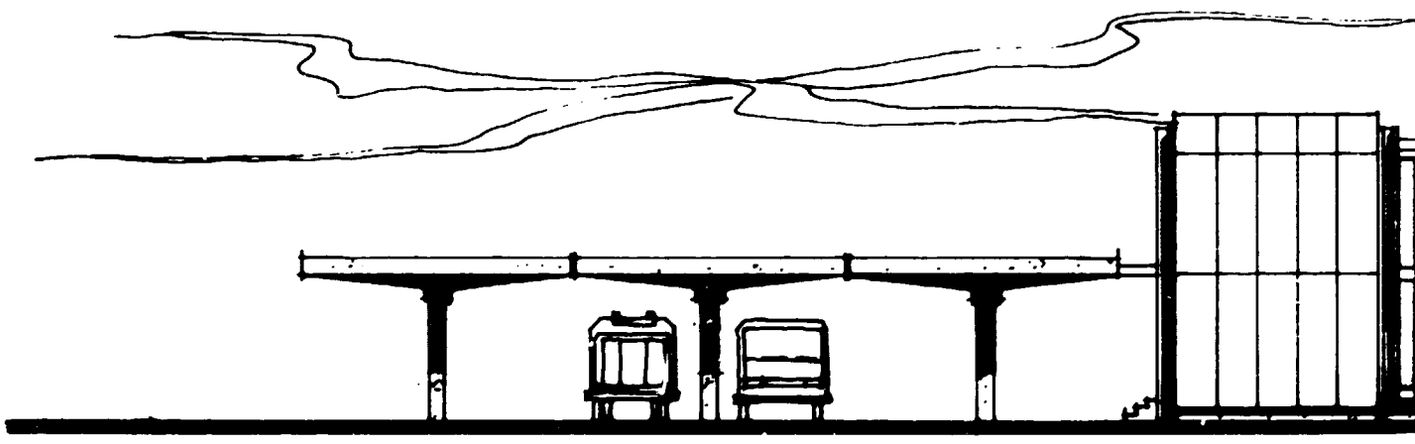
SECTION 1



SECTION 2

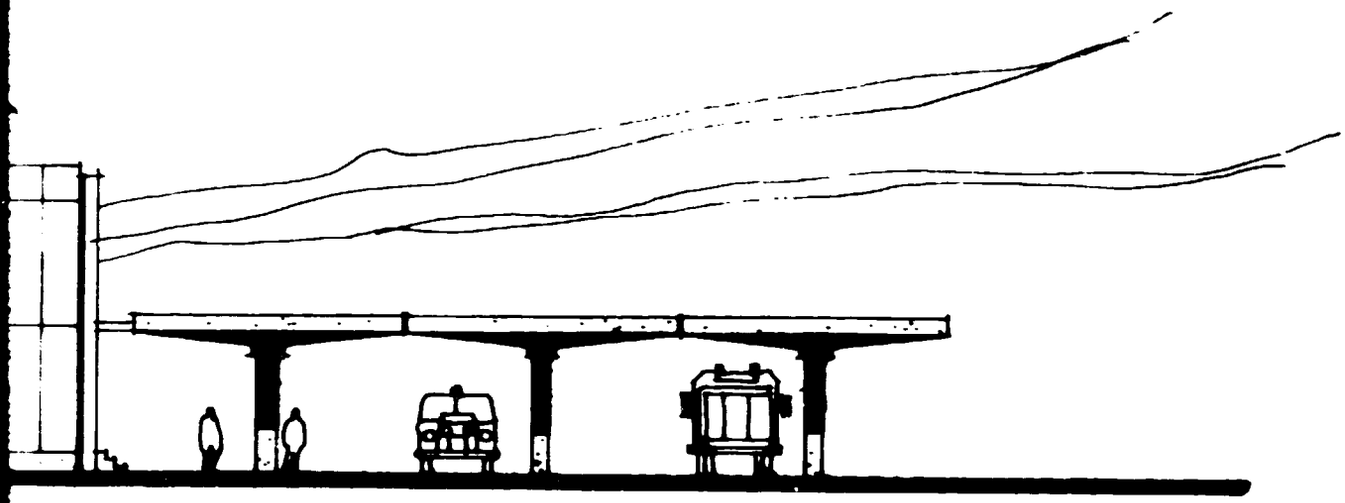


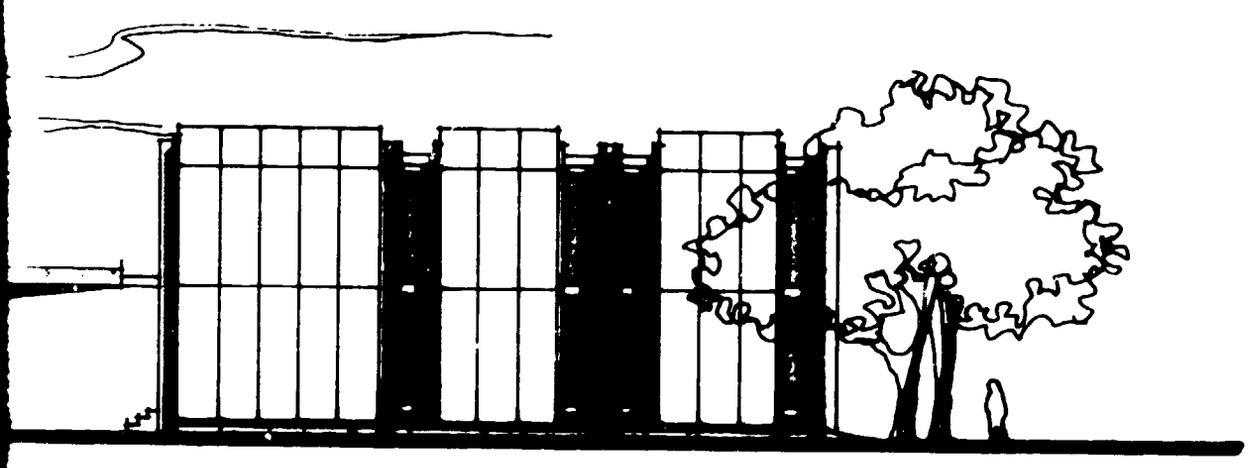
ELEVATION A
SCALE 1:200



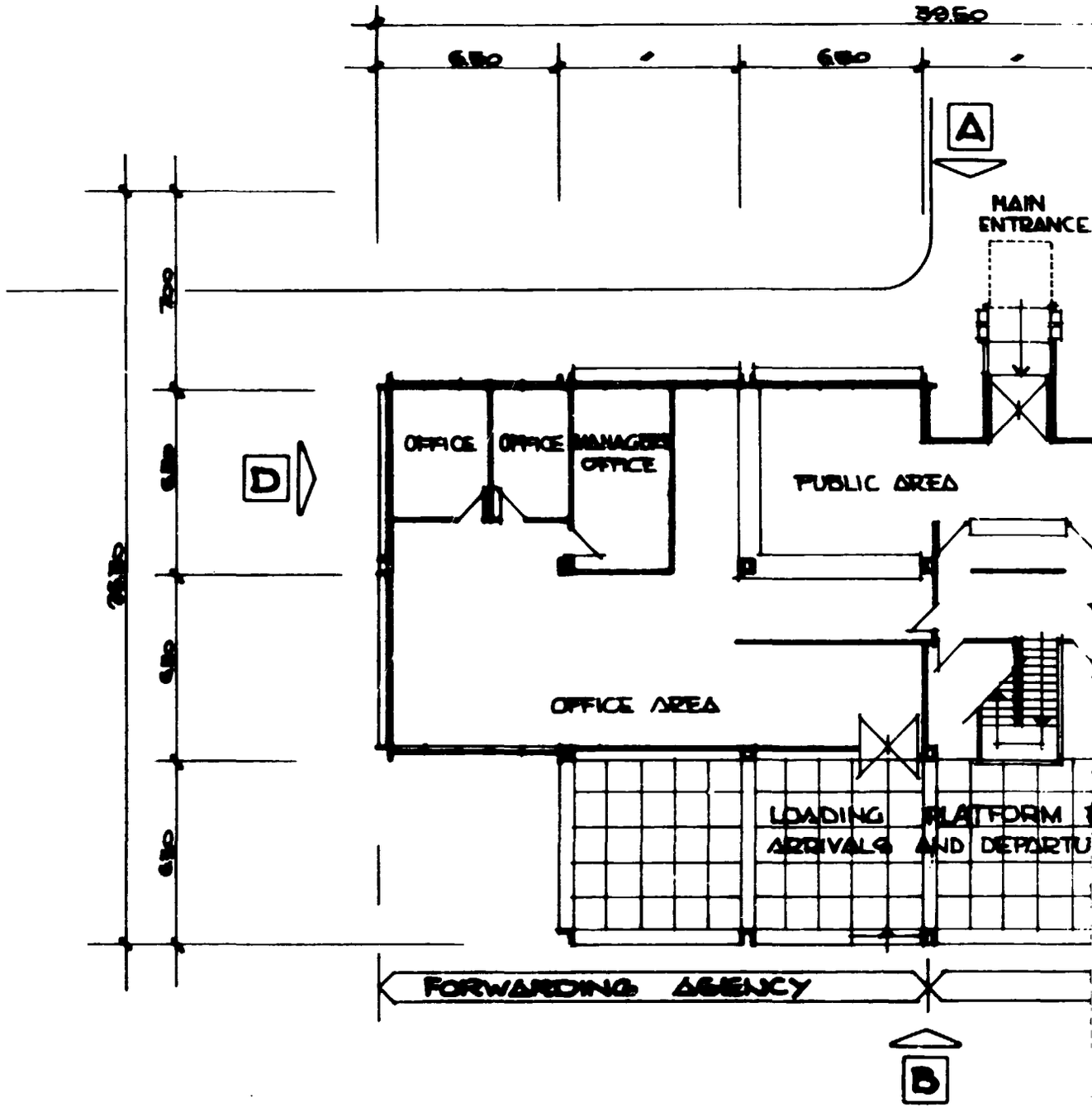
ELEVATION B
SCALE 1:200

SECTION 1





SECTION 2

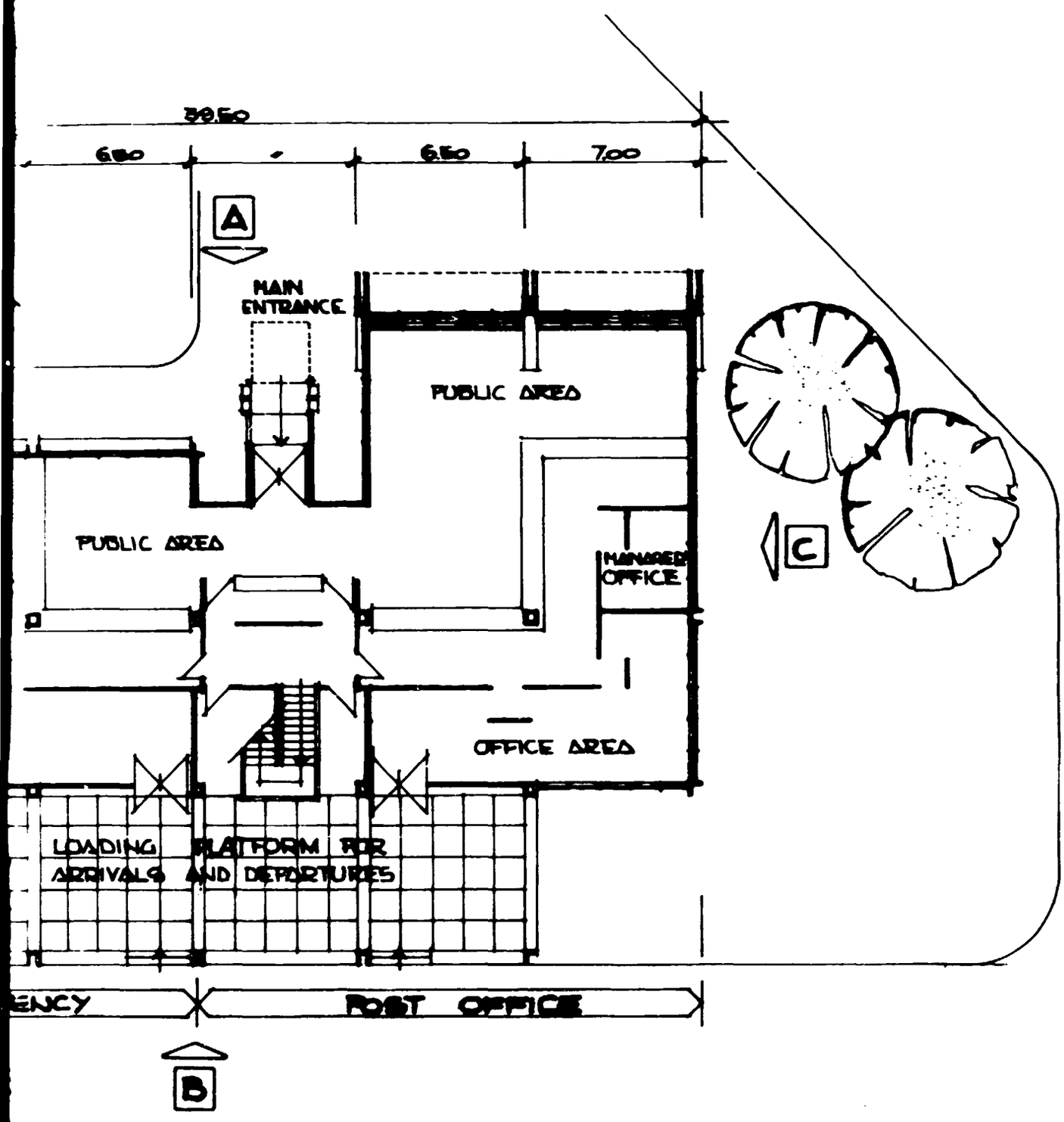


GROUND FLOOR PLAN

SCALE 1:200

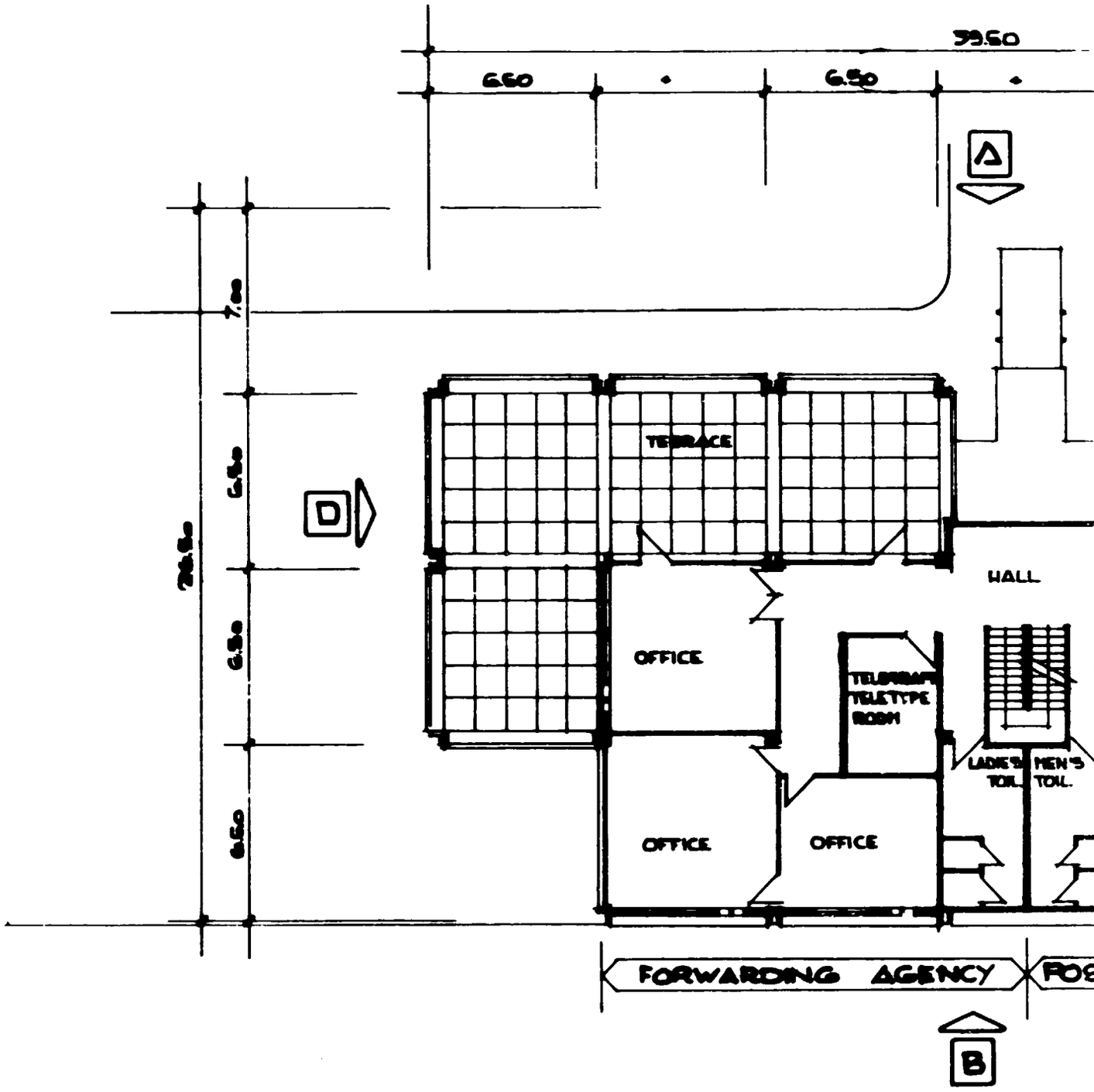
SECTION 1

POST OFFICE



LAN

SECTION 2

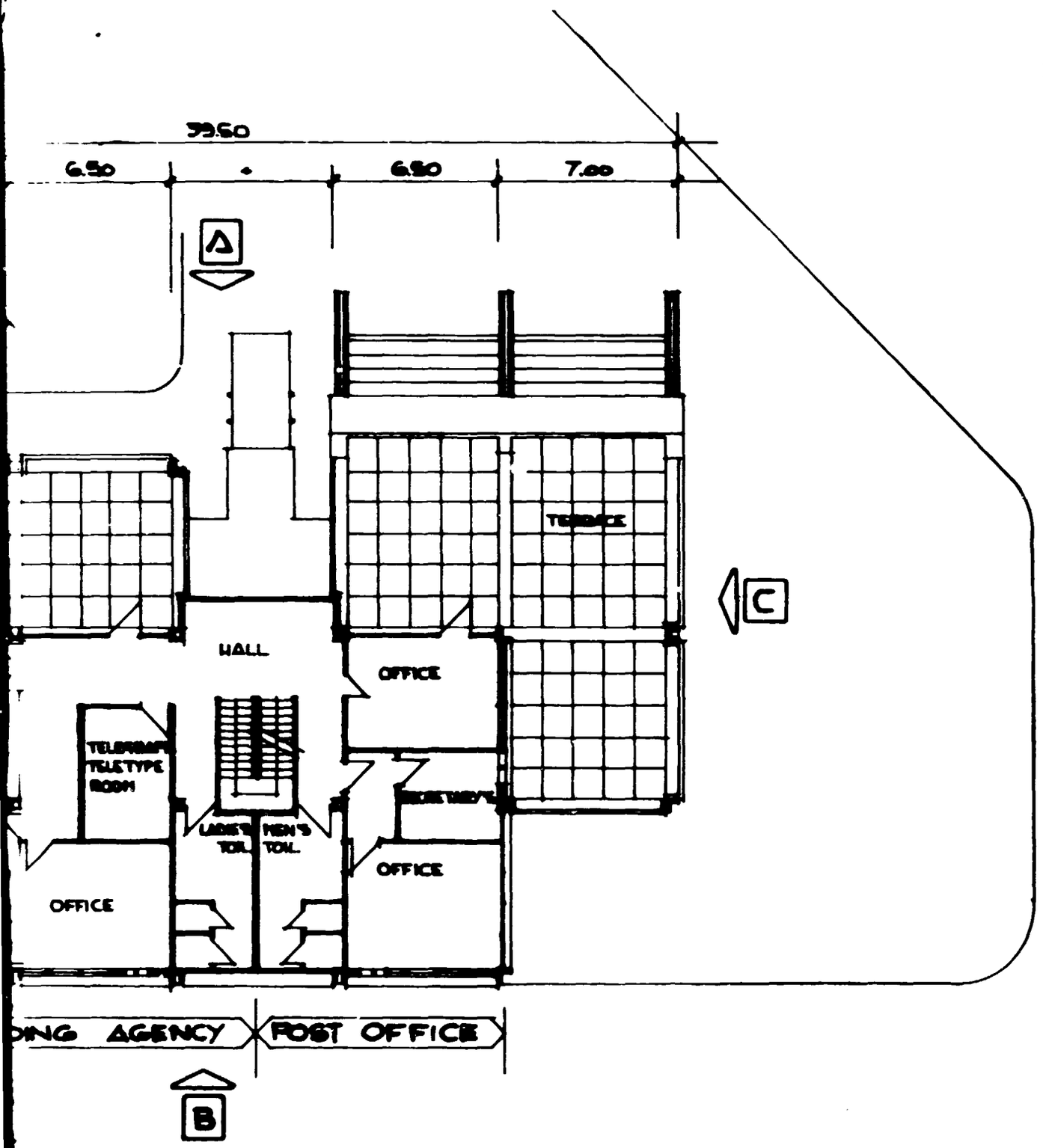


FIRST FLOOR PLAN

SCALE 1:200

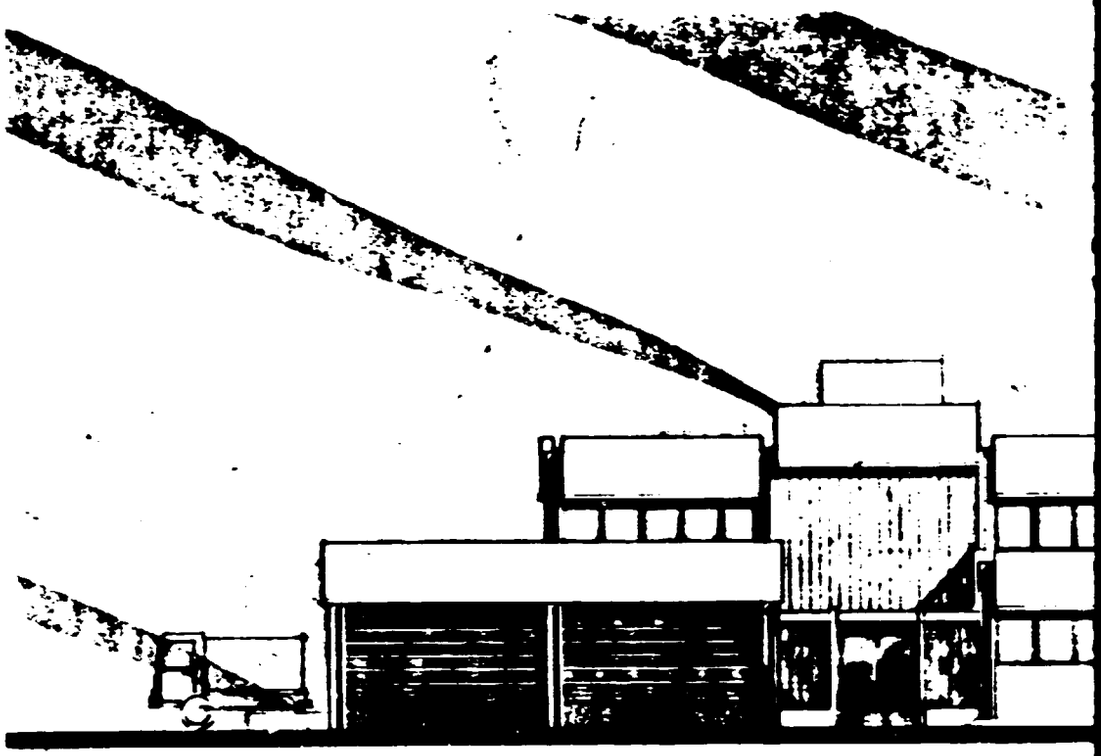
SECTION 1

POST OFFICE

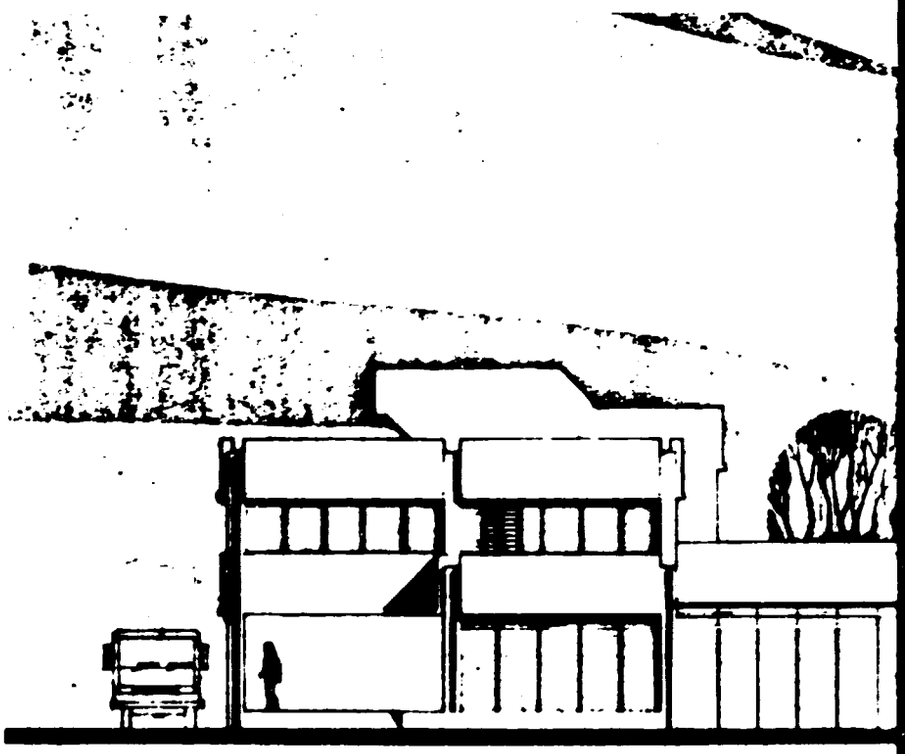

TEAM
39.50
6.50
6.50
7.00
A
TERRACE
C
HALL
OFFICE
TELEGRAPH TELETYPE ROOM
LADIES' TOIL.
MEN'S TOIL.
OFFICE
OFFICE
DING AGENCY
POST OFFICE
B

N

SECTION 2



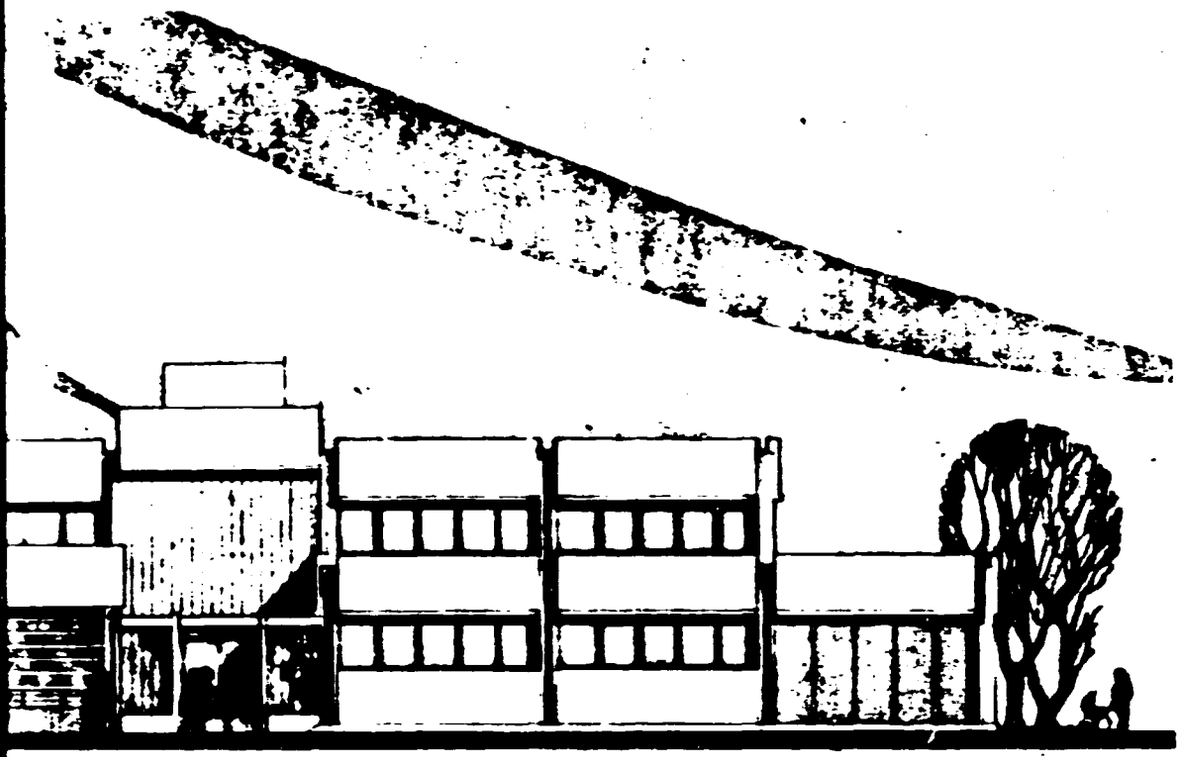
ELEVATION A
SCALE 1:200

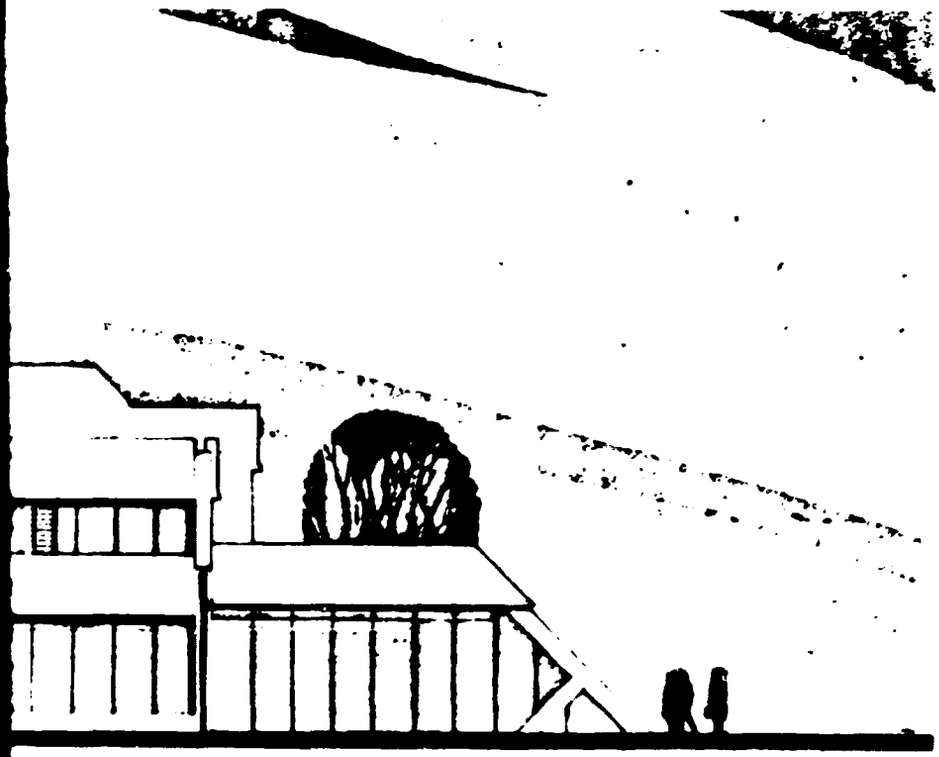


ELEVATION C
SCALE 1:200

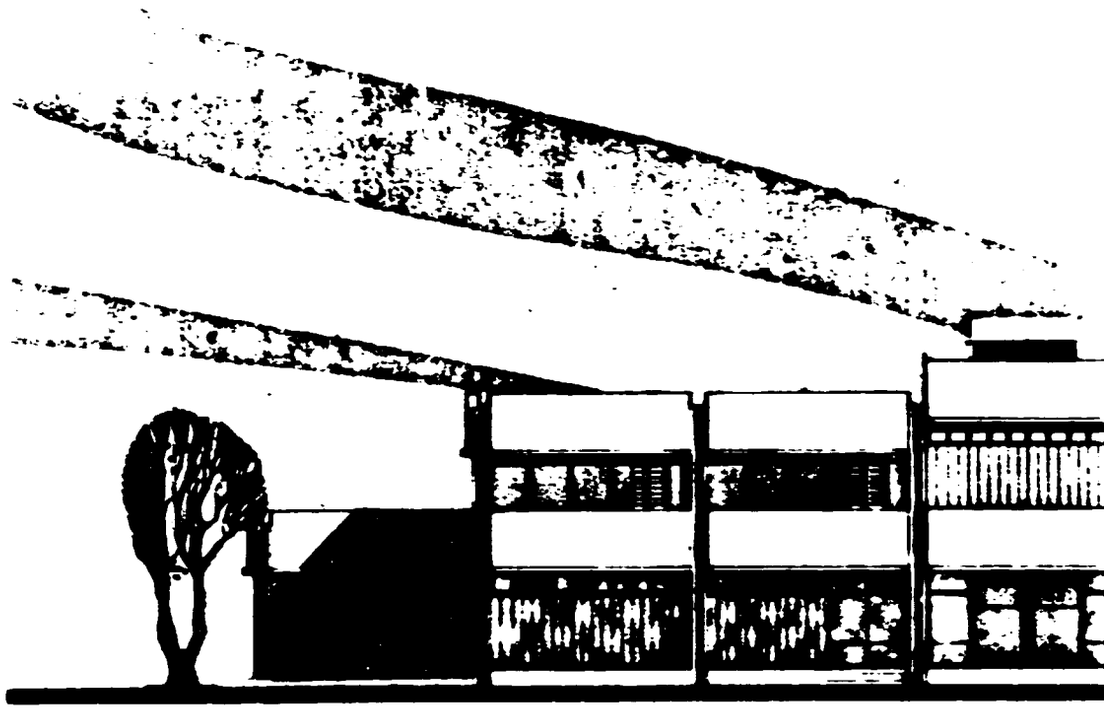
SECTION 1

POST OFFICE



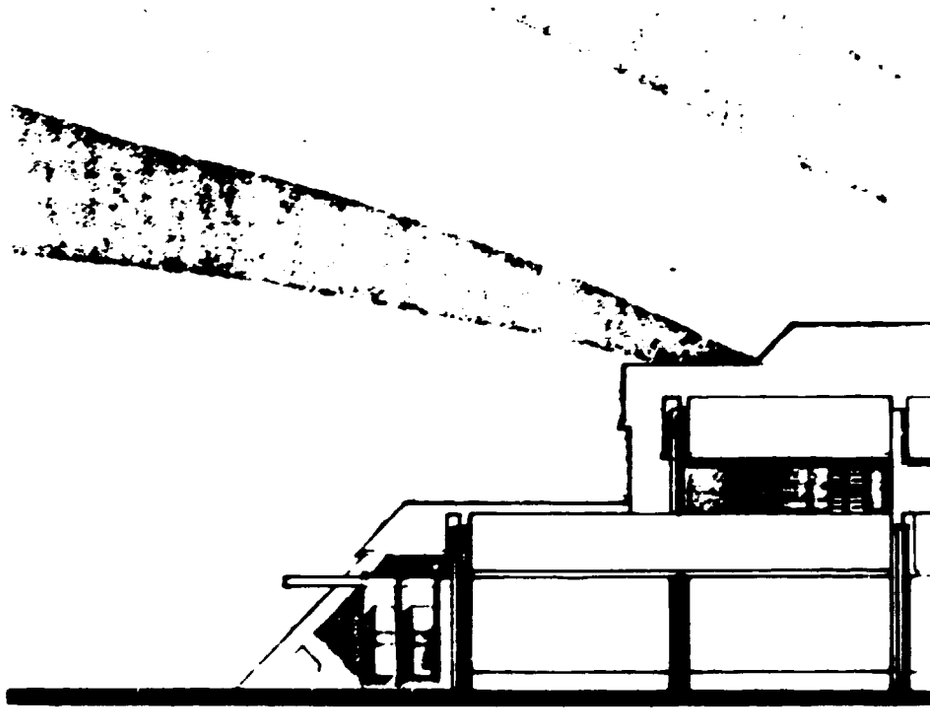


SECTION 2



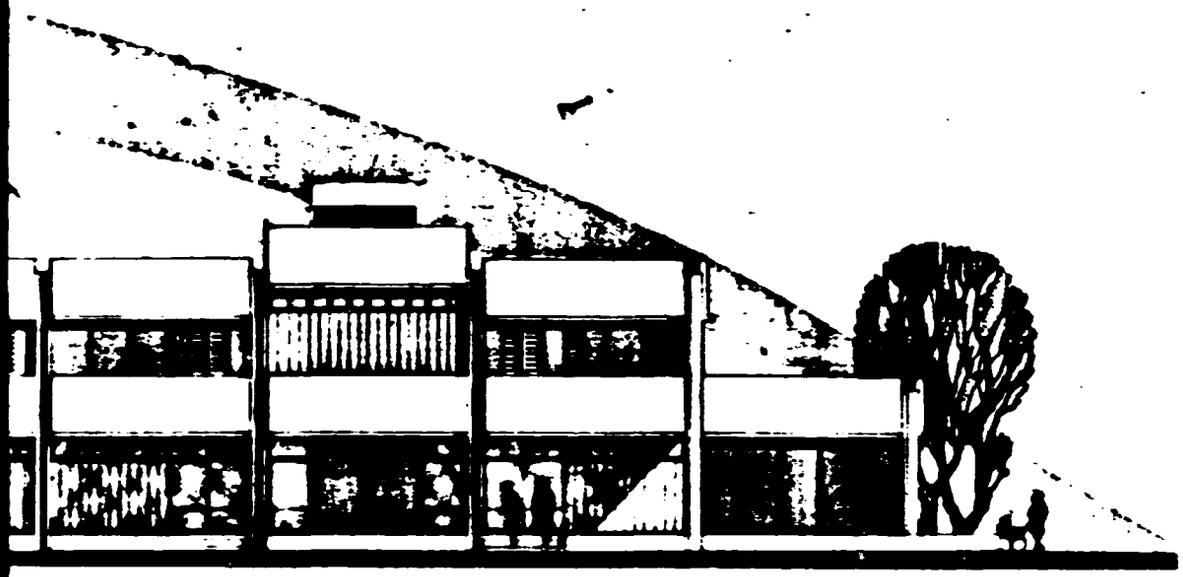
ELEVATION B
SCALE 1:200

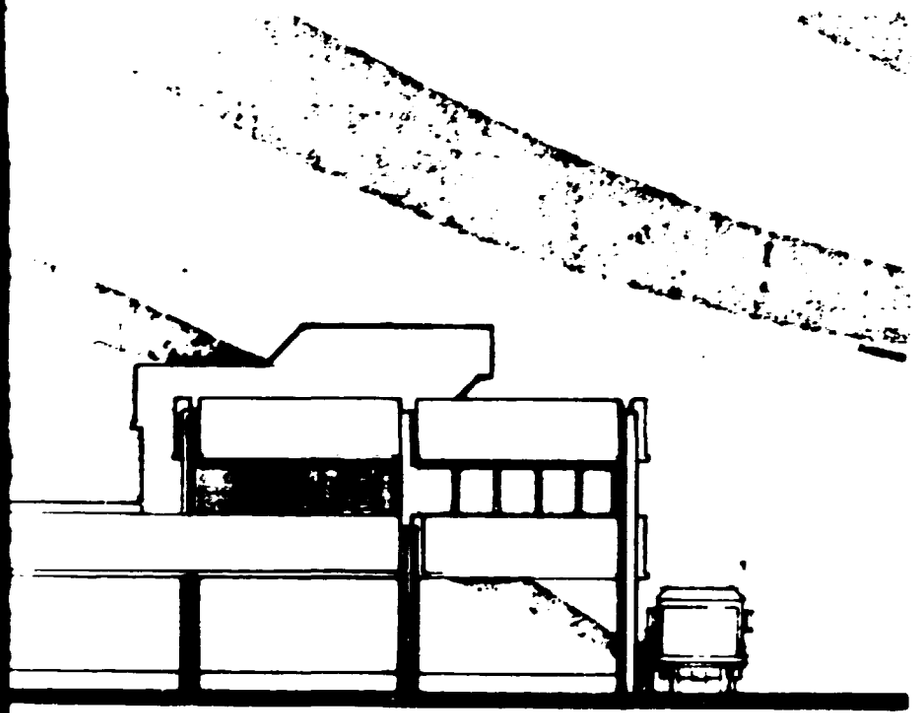
SECTION 1



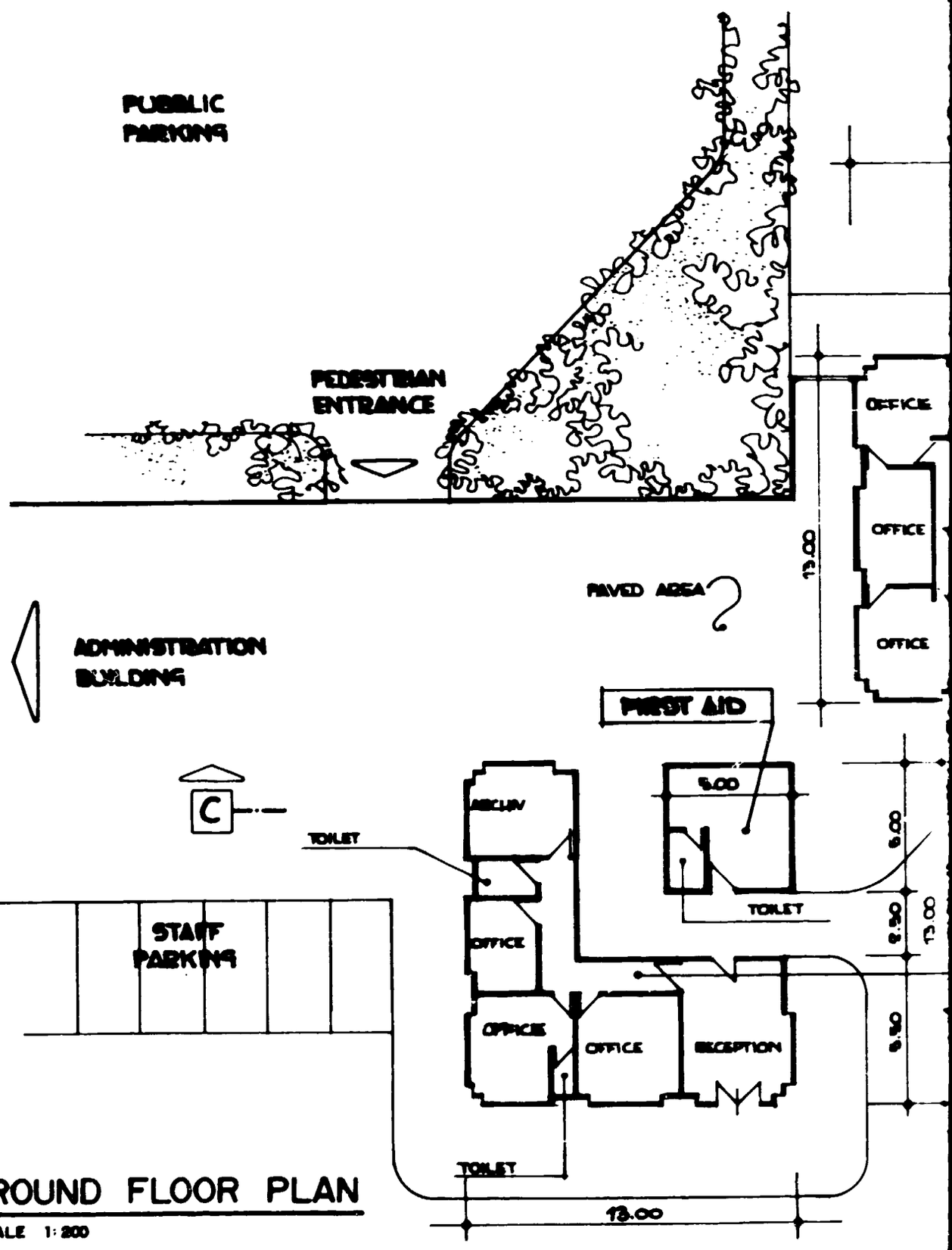
ELEVATION D
SCALE 1:200

POST OFFICE





SECTION 2

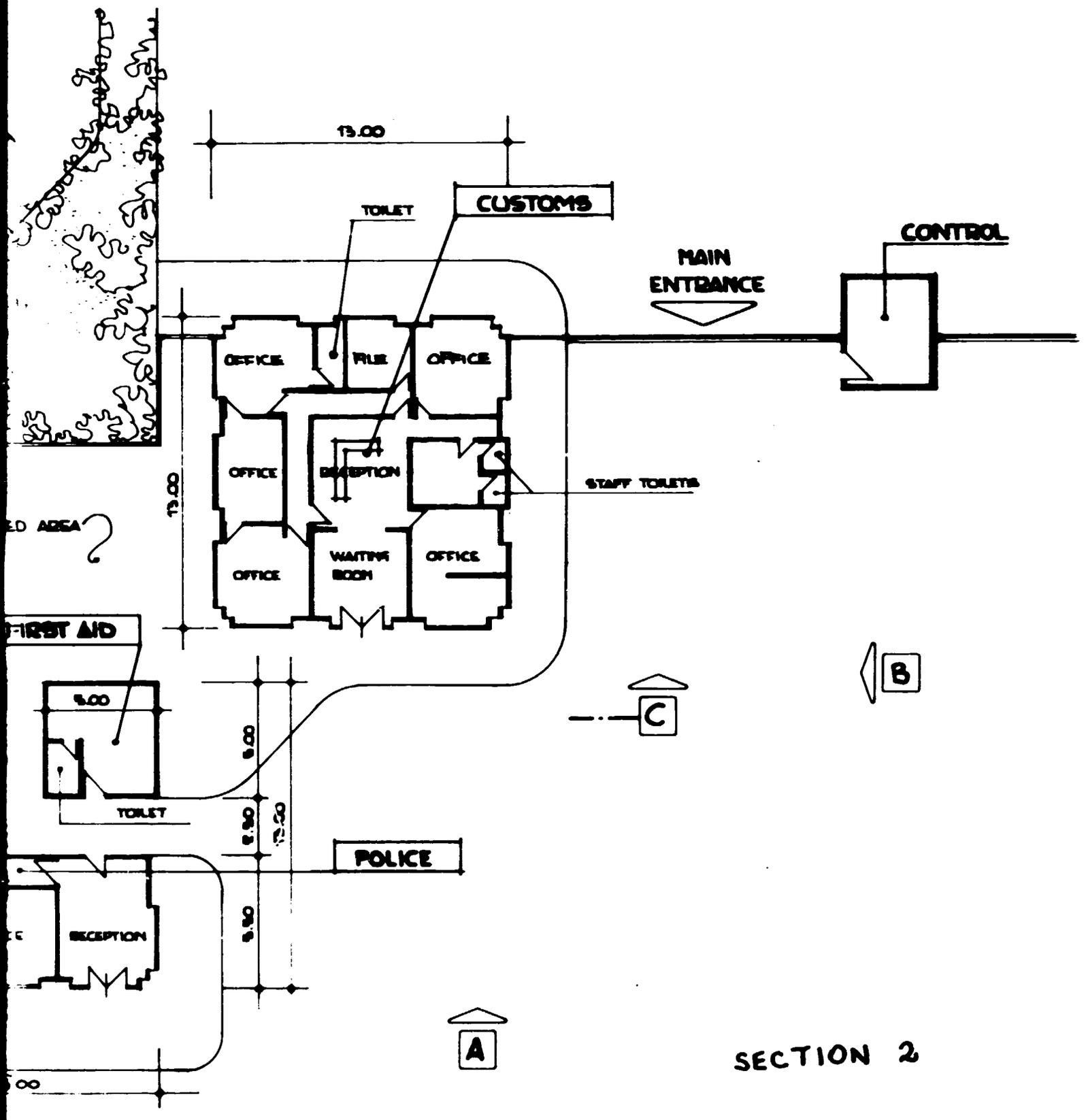


GROUND FLOOR PLAN

SCALE 1:200

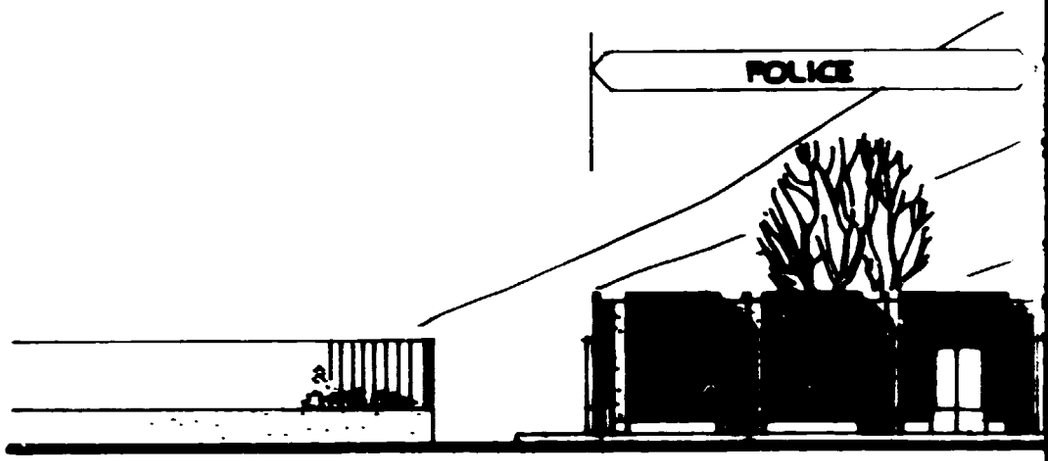
SECTION 1

POLICE, FIRST AID

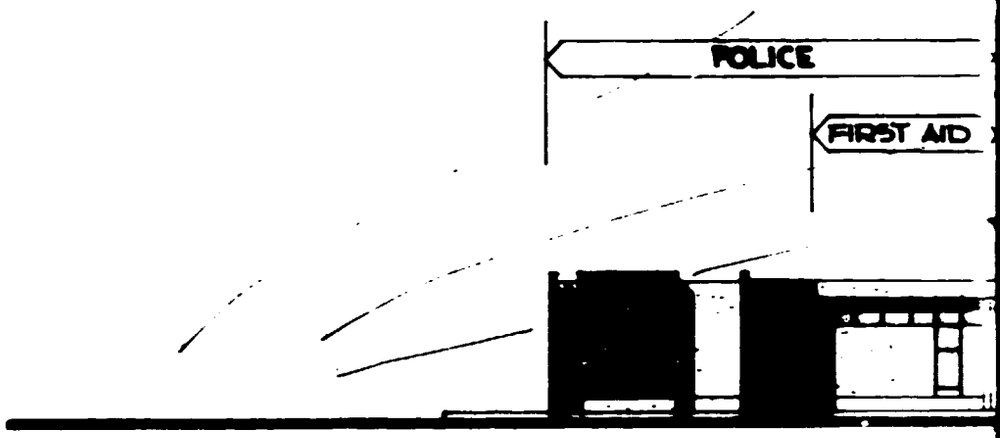


SECTION 2

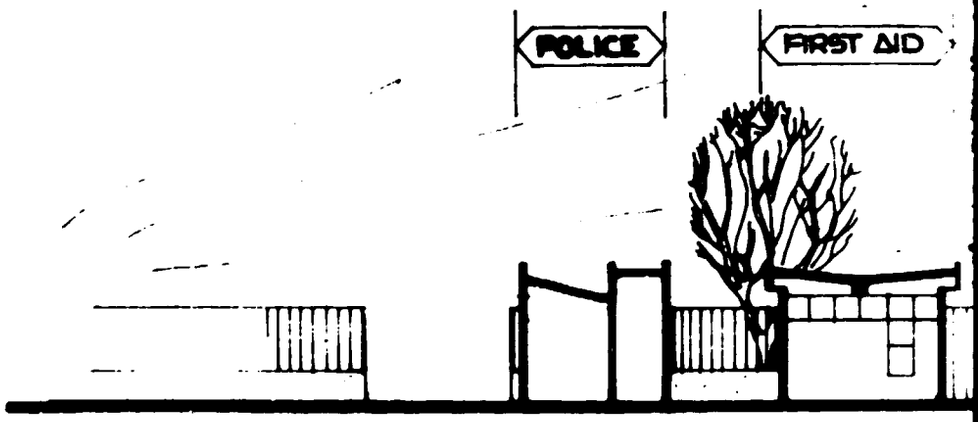
CE, FIRST AID AND CUSTOMS BUILDINGS



ELEVATION A
SCALE 1:200



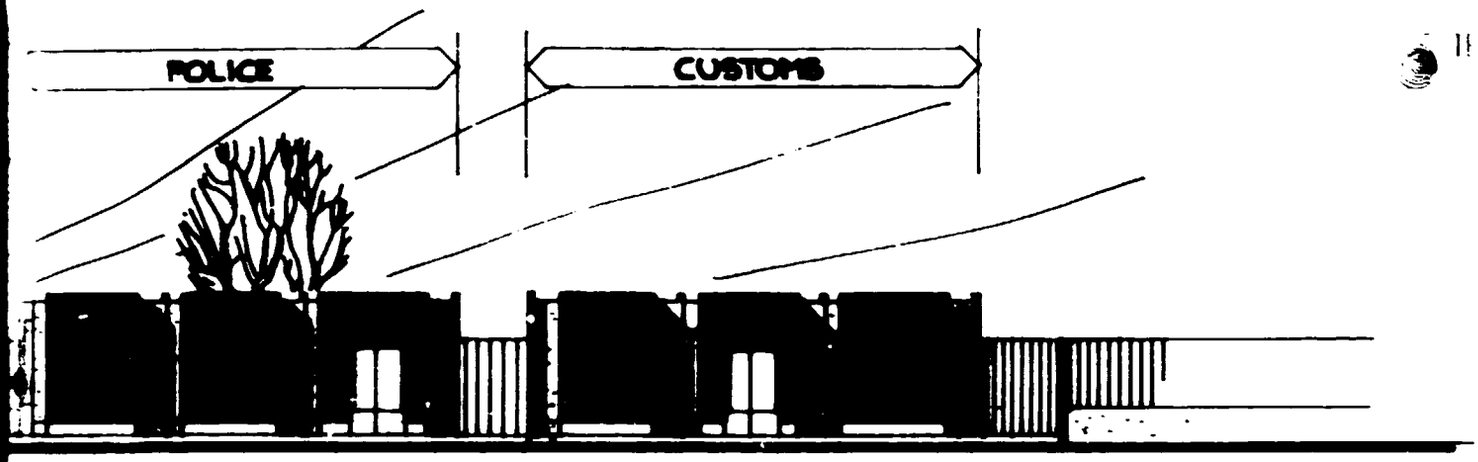
ELEVATION B
SCALE 1:200

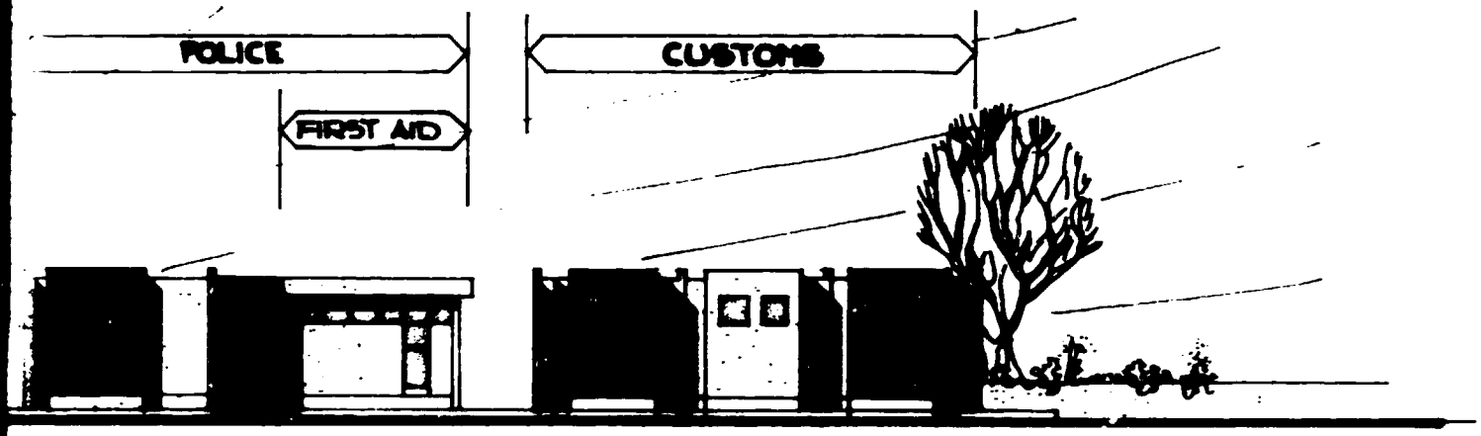


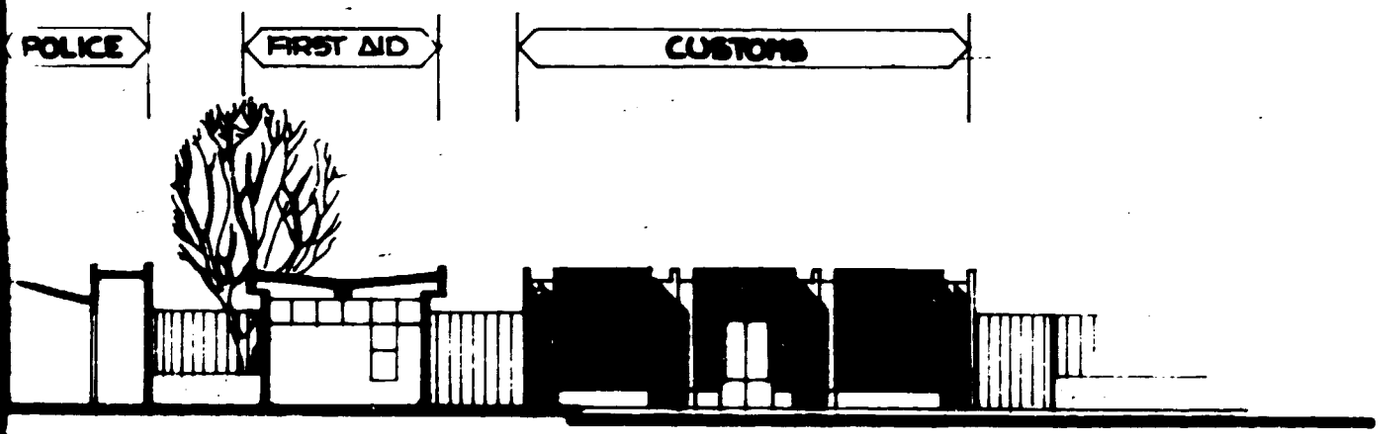
ELEVATION C
SCALE 1:200

SECTION 1

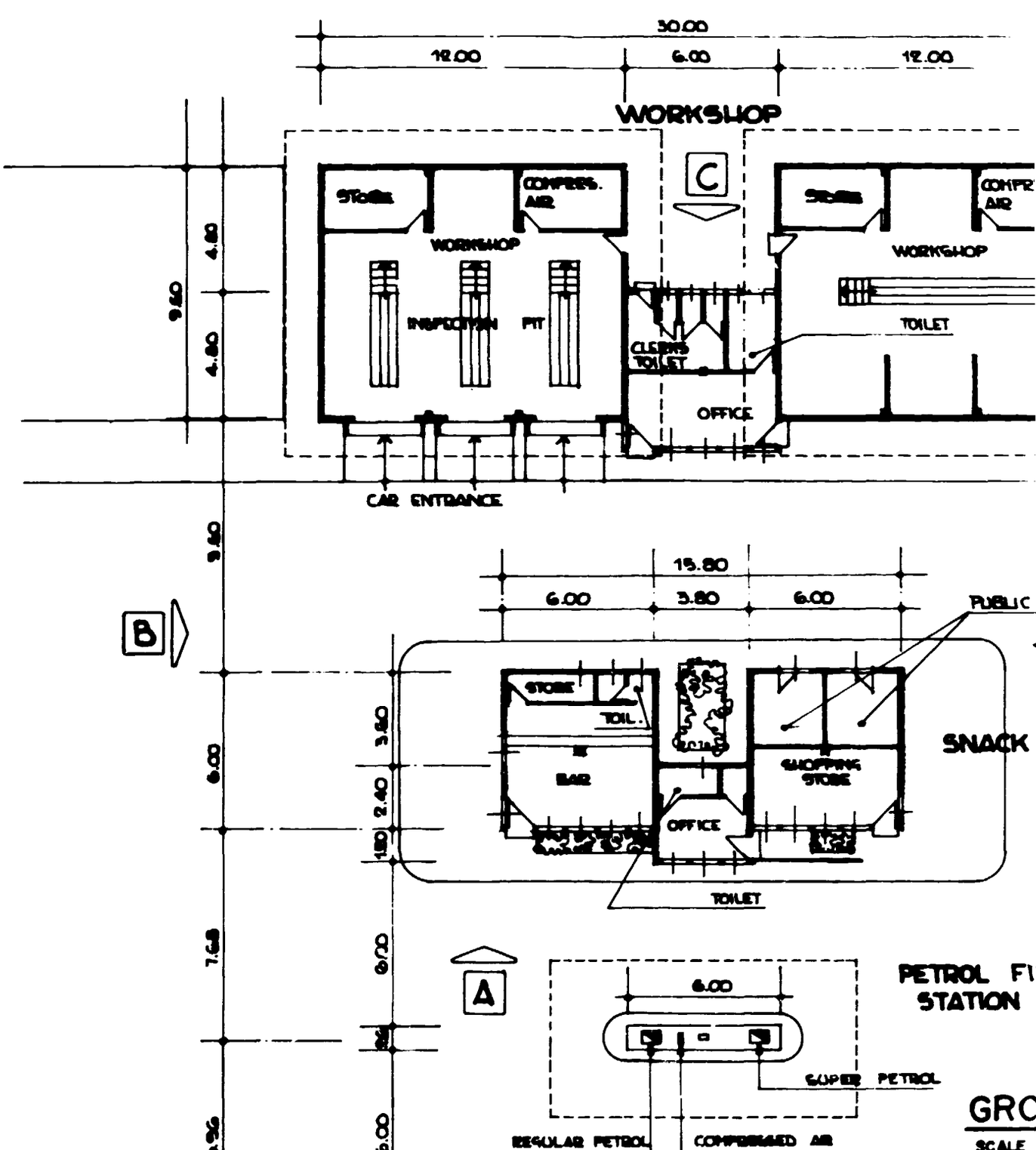
POLICE, FIRST AID


POLICE
CUSTOMS


POLICE
FIRST AID
CUSTOMS

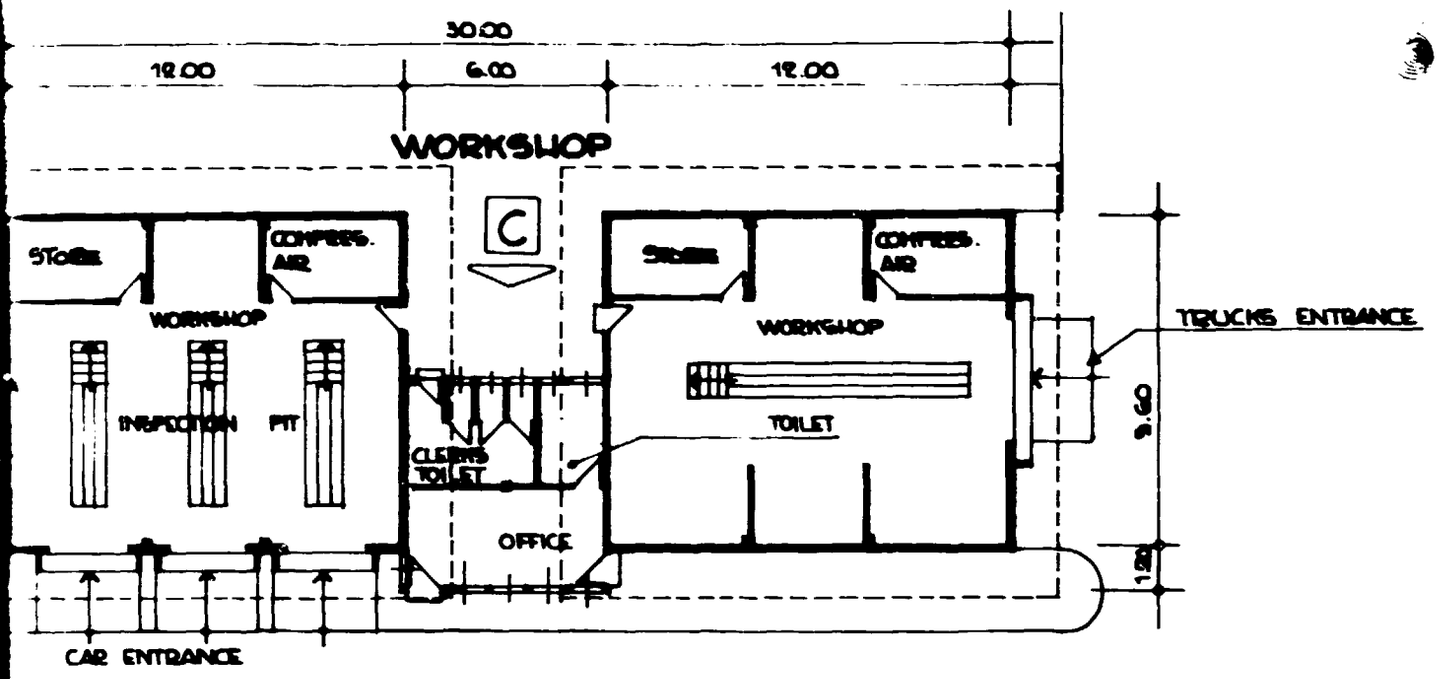

POLICE
FIRST AID
CUSTOMS

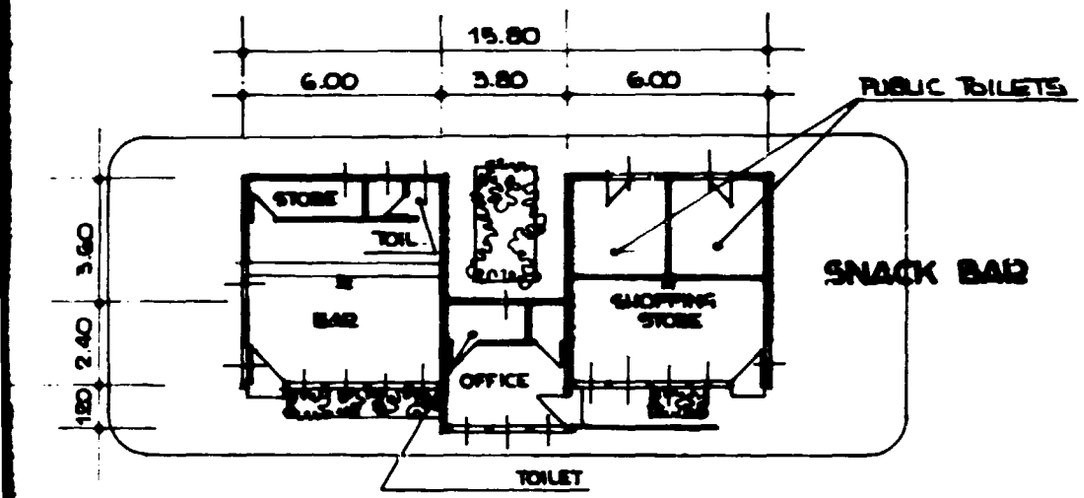
SECTION 2

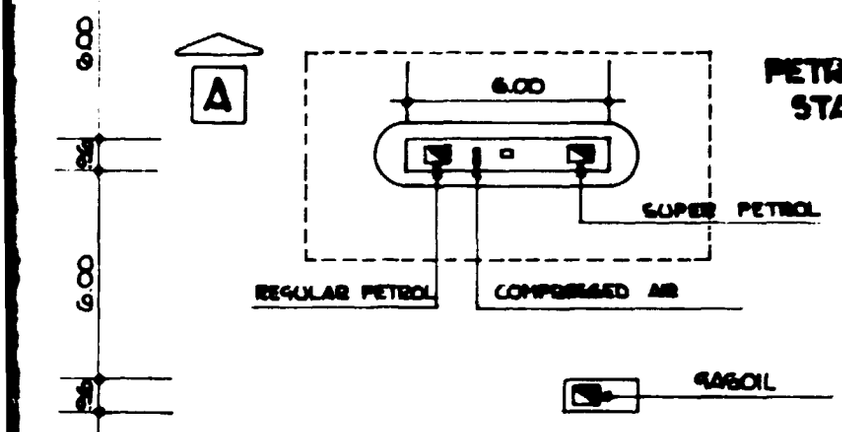


SECTION 1

PETROL FILL





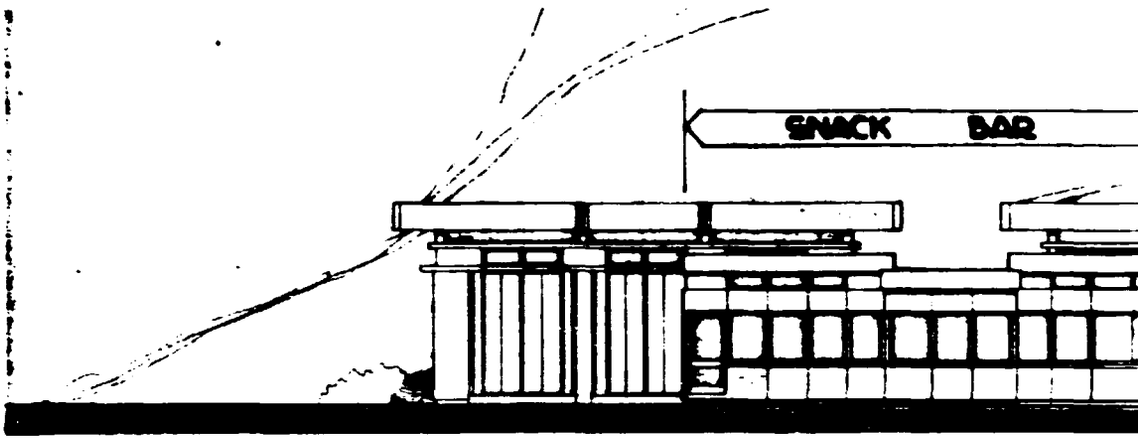


PETROL FILLING STATION

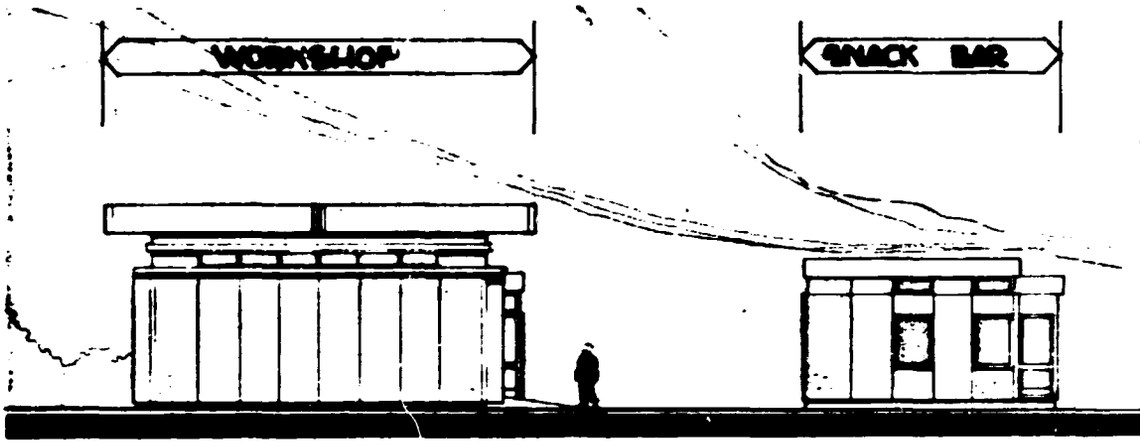
GROUND FLOOR PLAN

SCALE 1:200

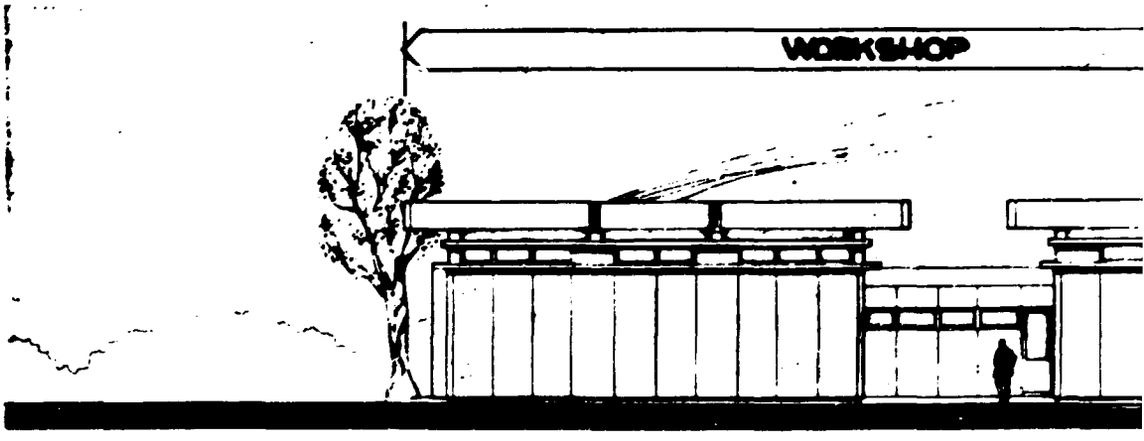
SECTION 2



ELEVATION A
SCALE 1:200

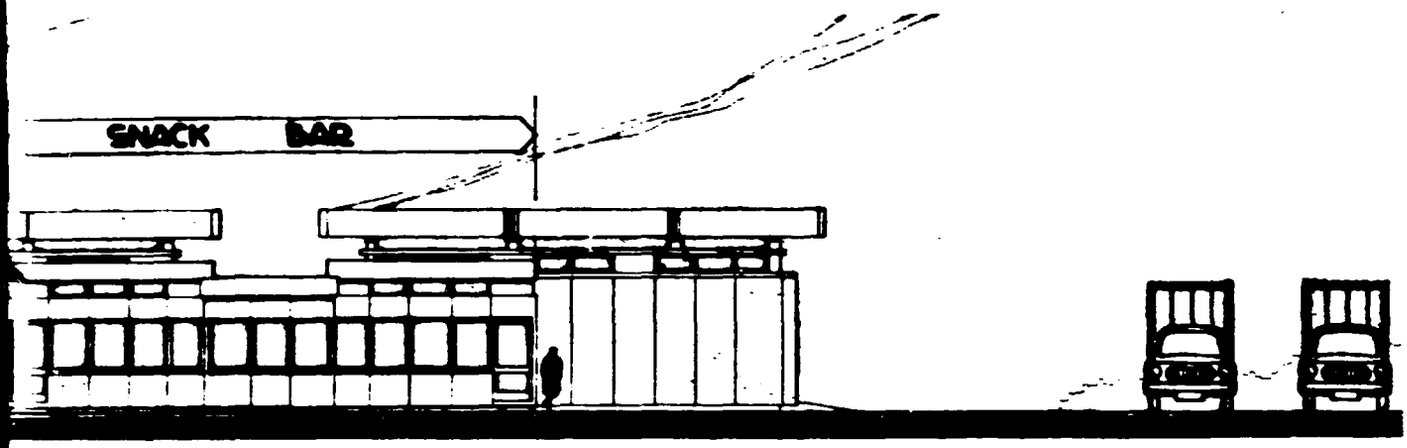


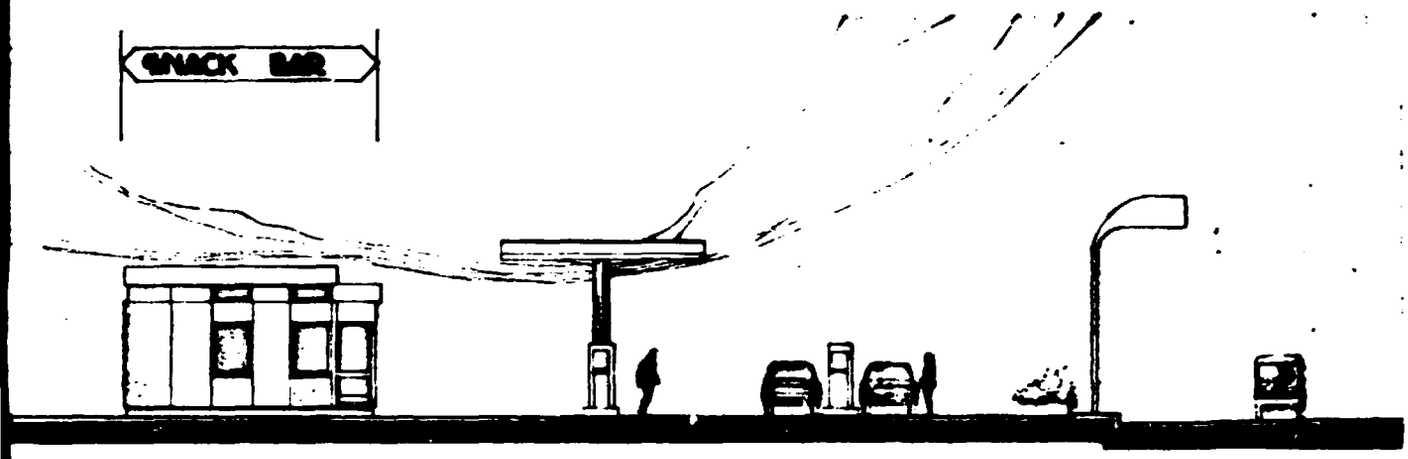
ELEVATION B
SCALE 1:200

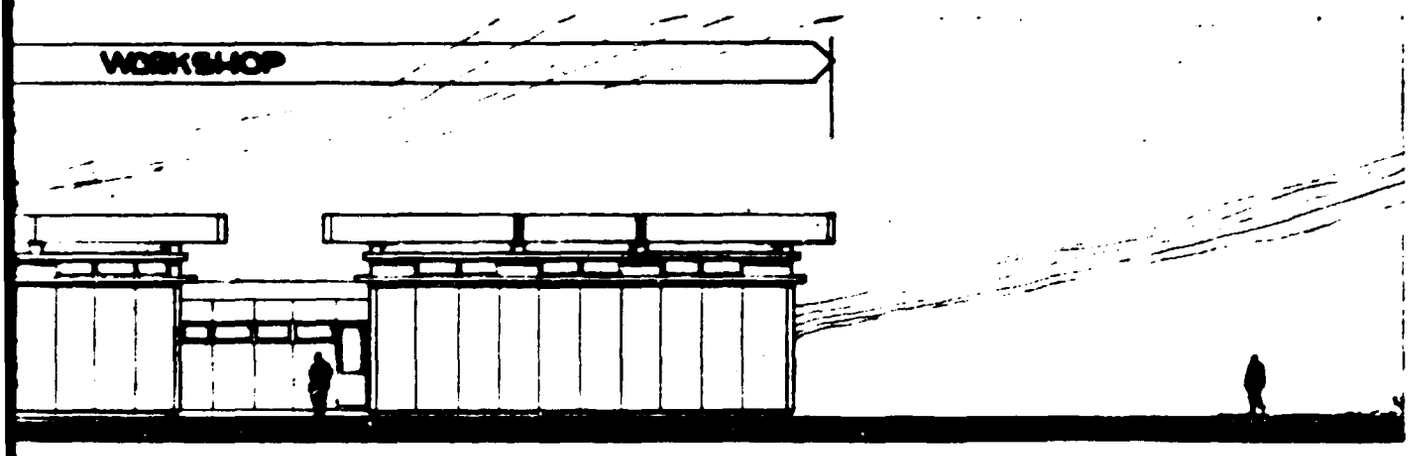


ELEVATION C
SCALE 1:200

SECTION 1

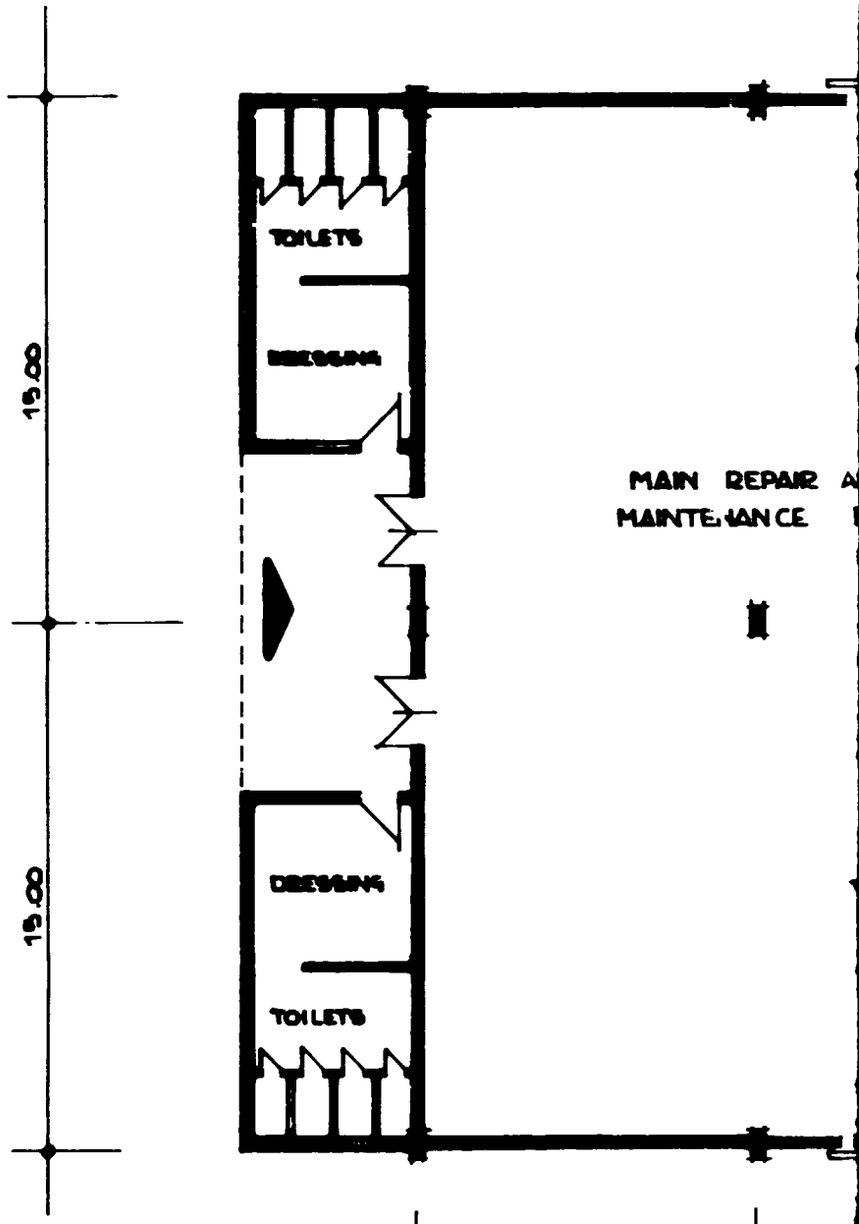






SECTION 2

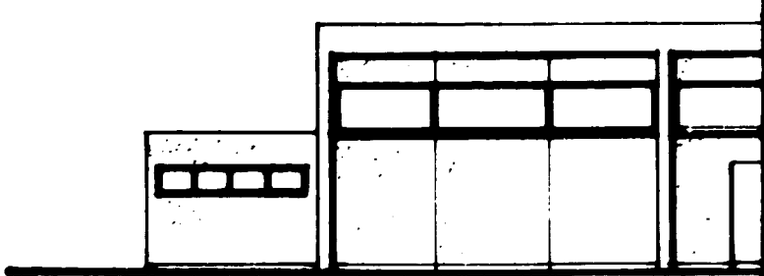
PETROL FILLING STATION



GROUND FLOOR PLAN

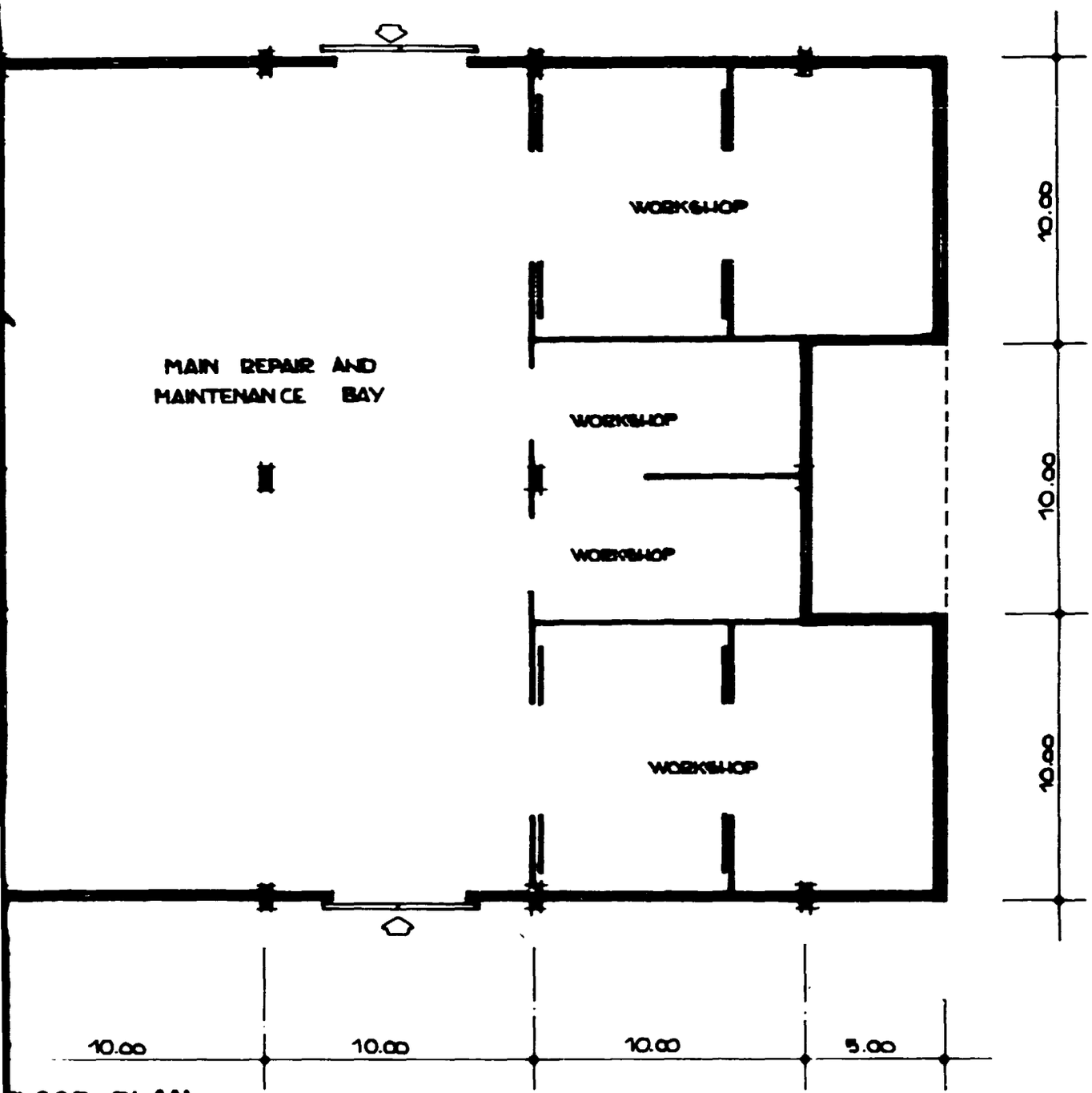
SCALE 1:200

SECTION 1



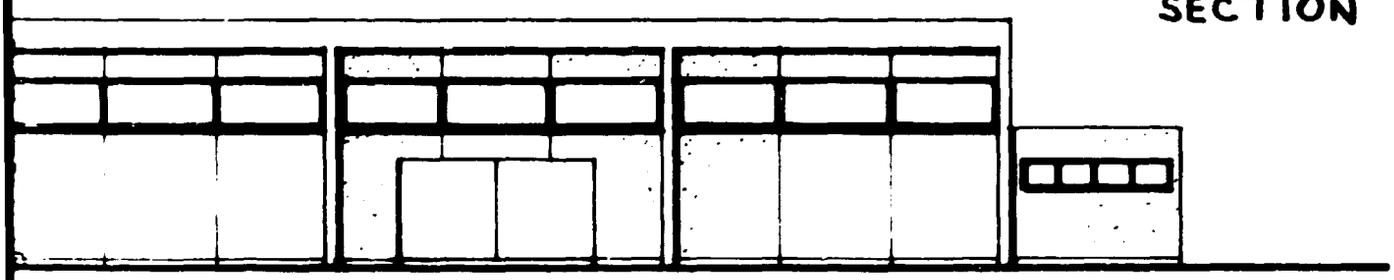
ELEVATION

SCALE 1:200

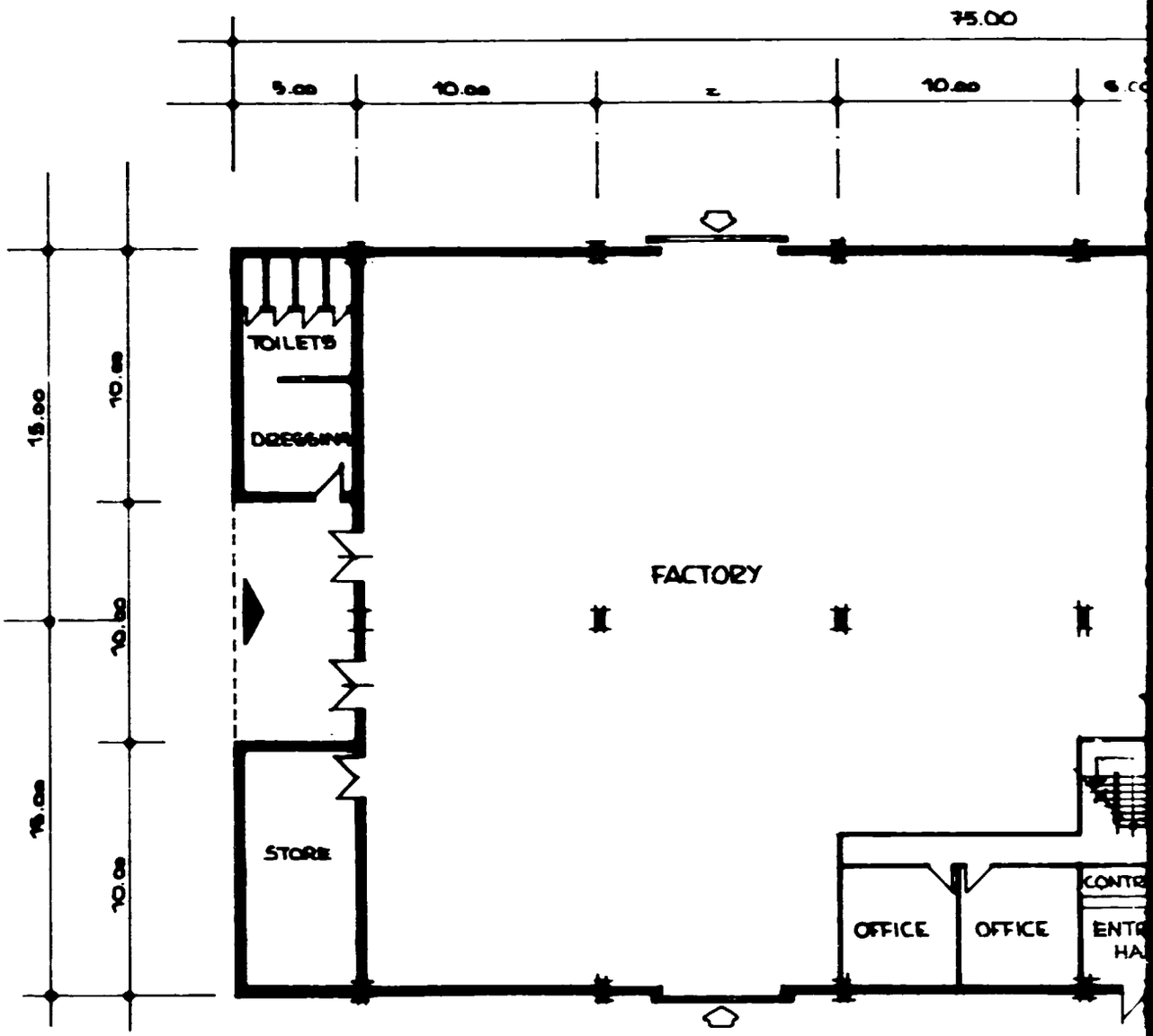


FLOOR PLAN

SECTION 2

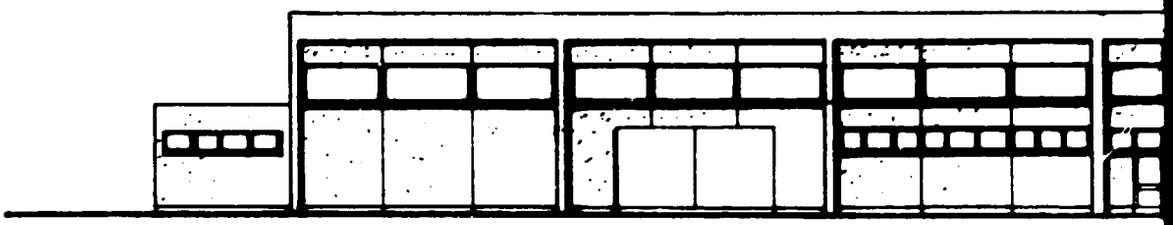


MAINTENANCE WORKSHOP



GROUND FLOOR PLAN

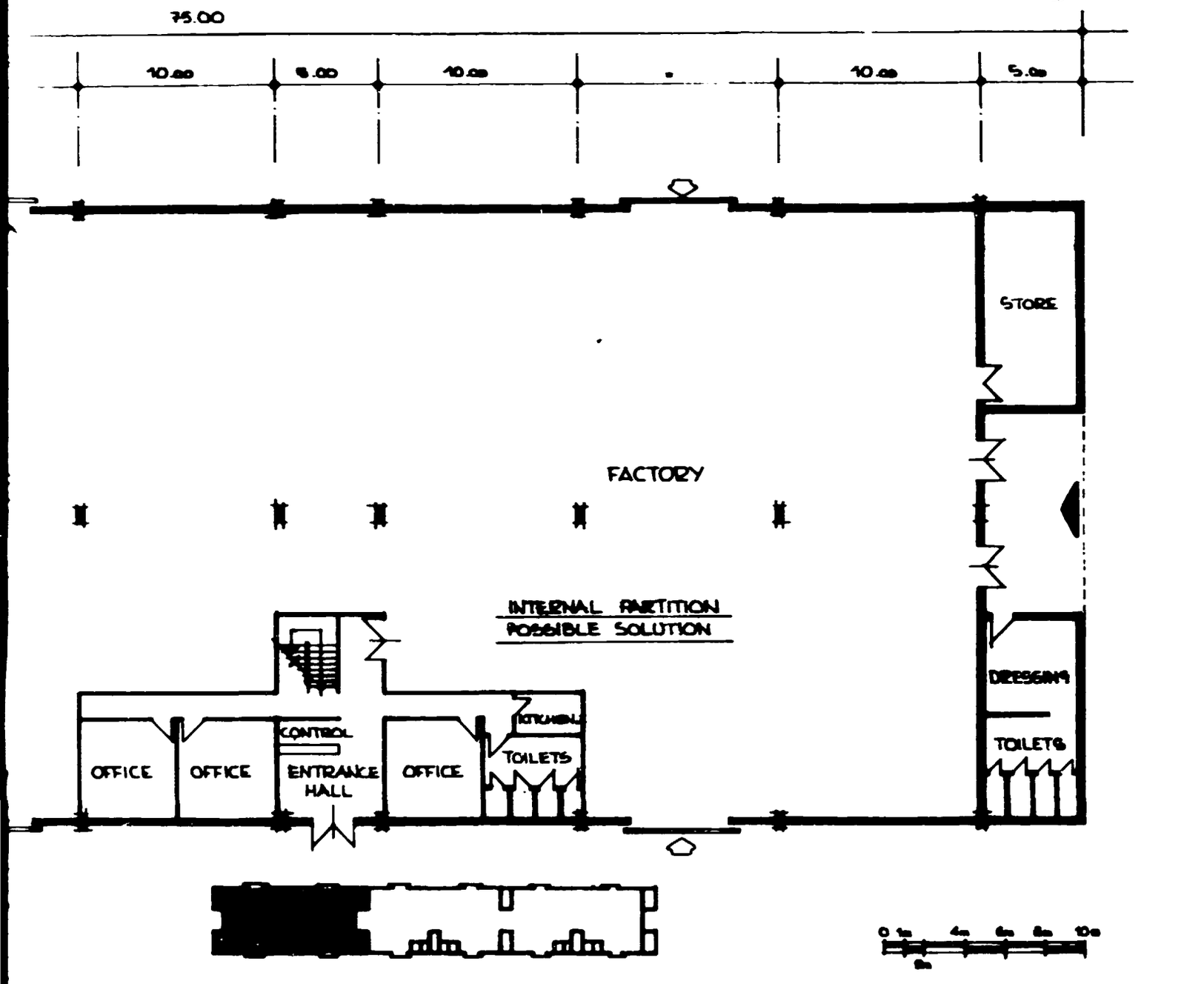
AGGREGAT



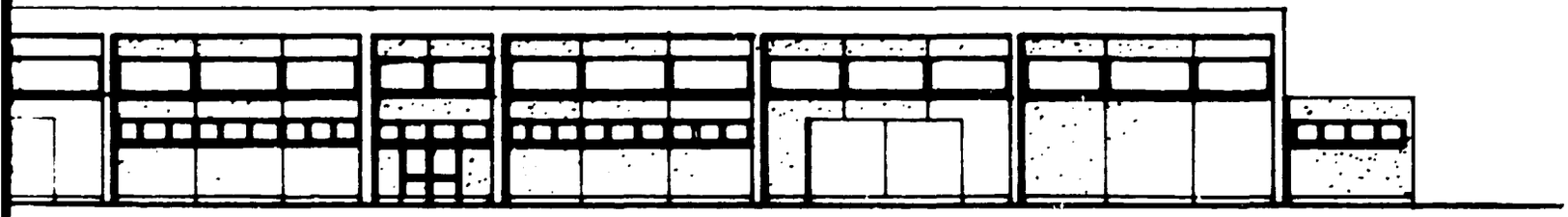
ELEVATION

SECTION 1

TYPICAL SMA

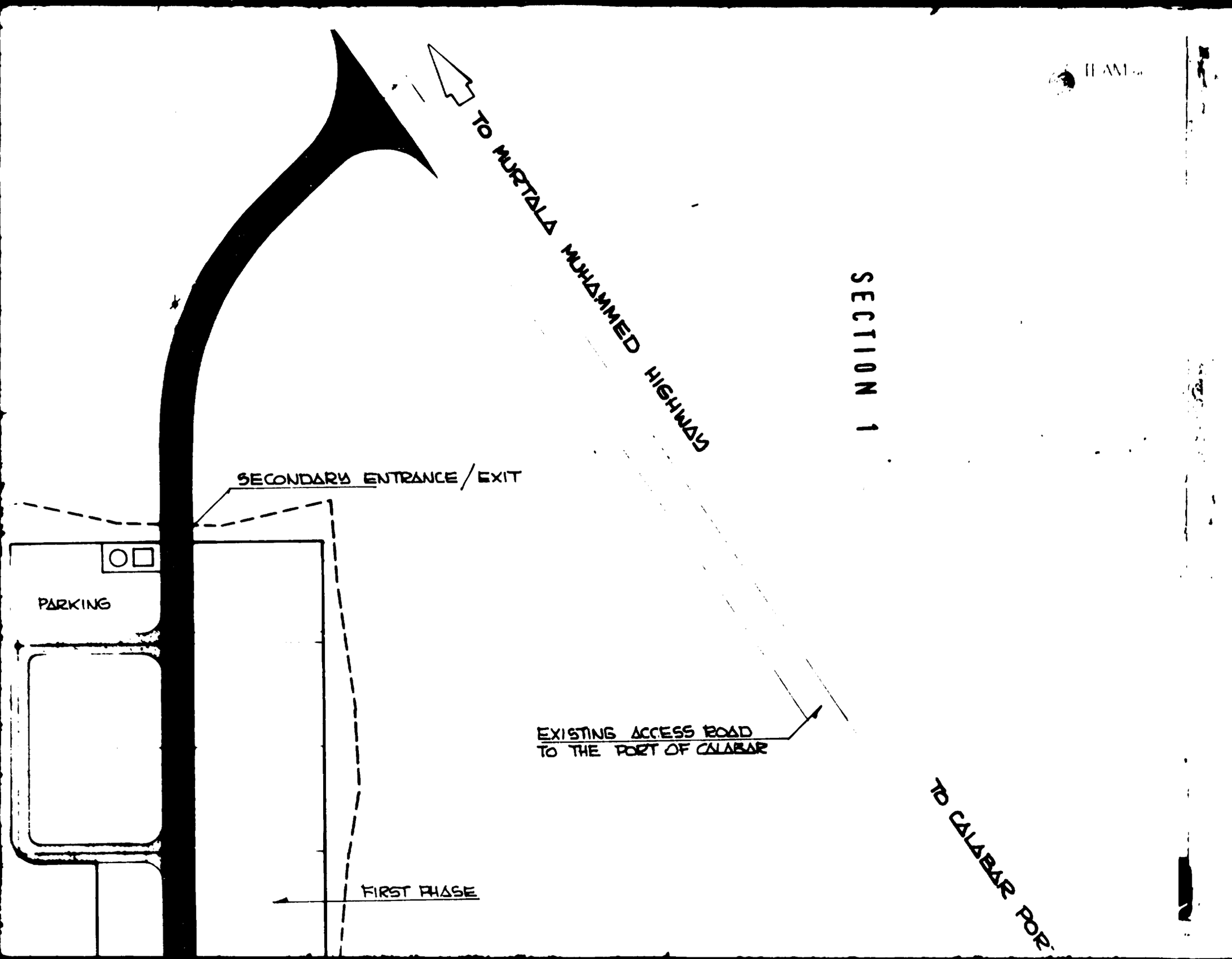


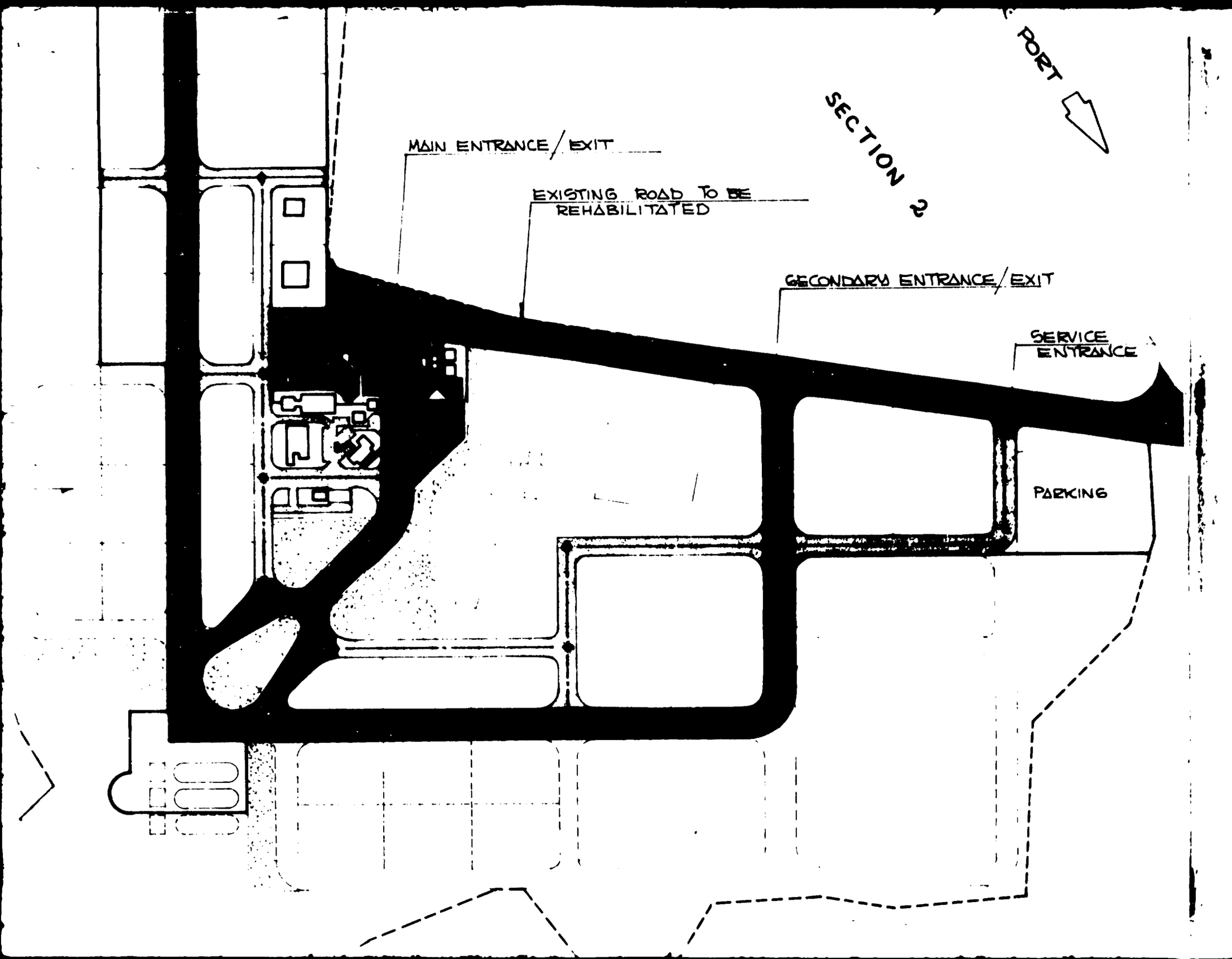
AGGREGATIVE SCHEME

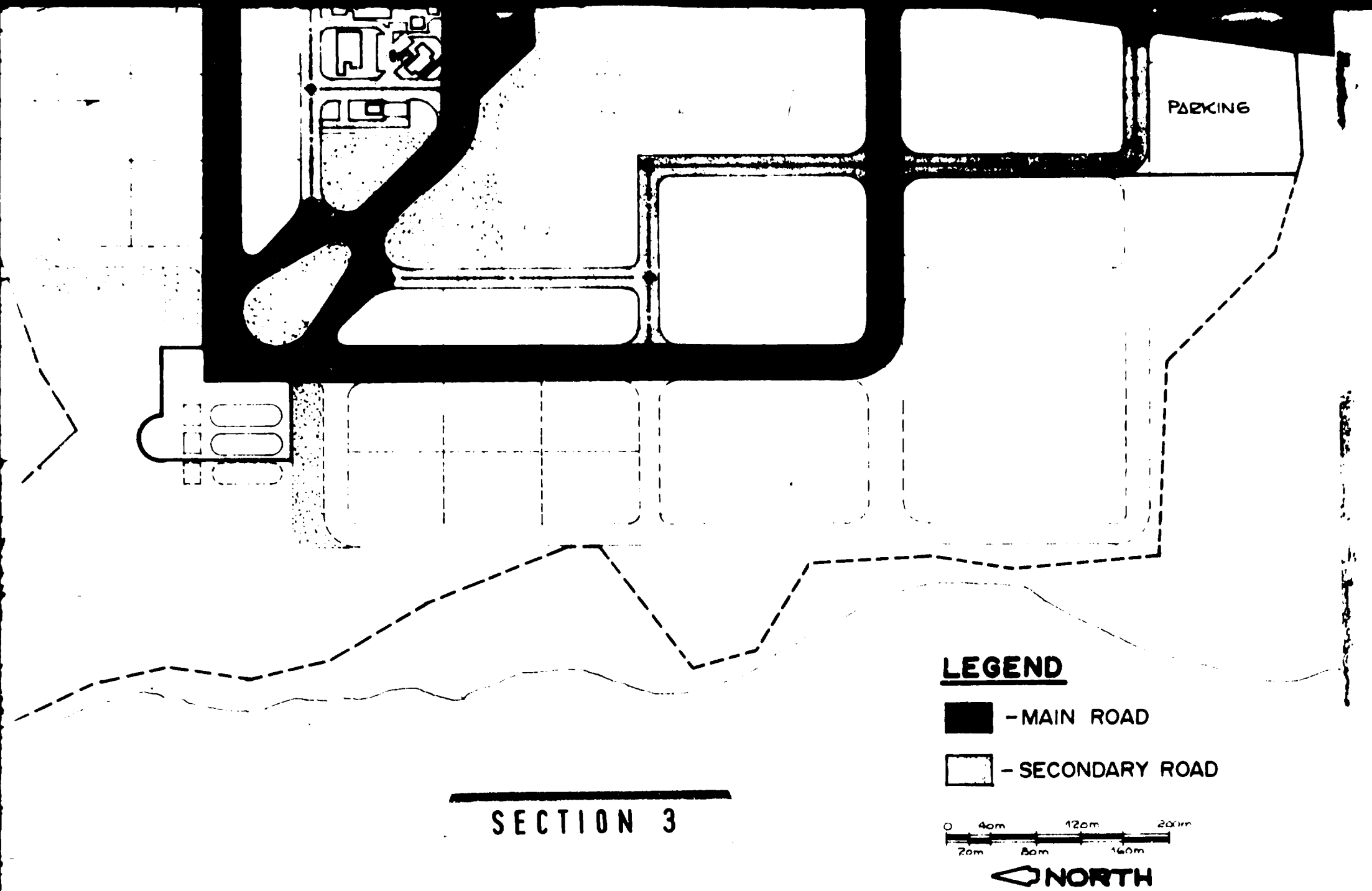


SECTION 2

TYPICAL SMALL SCALE INDUSTRY BUILDING

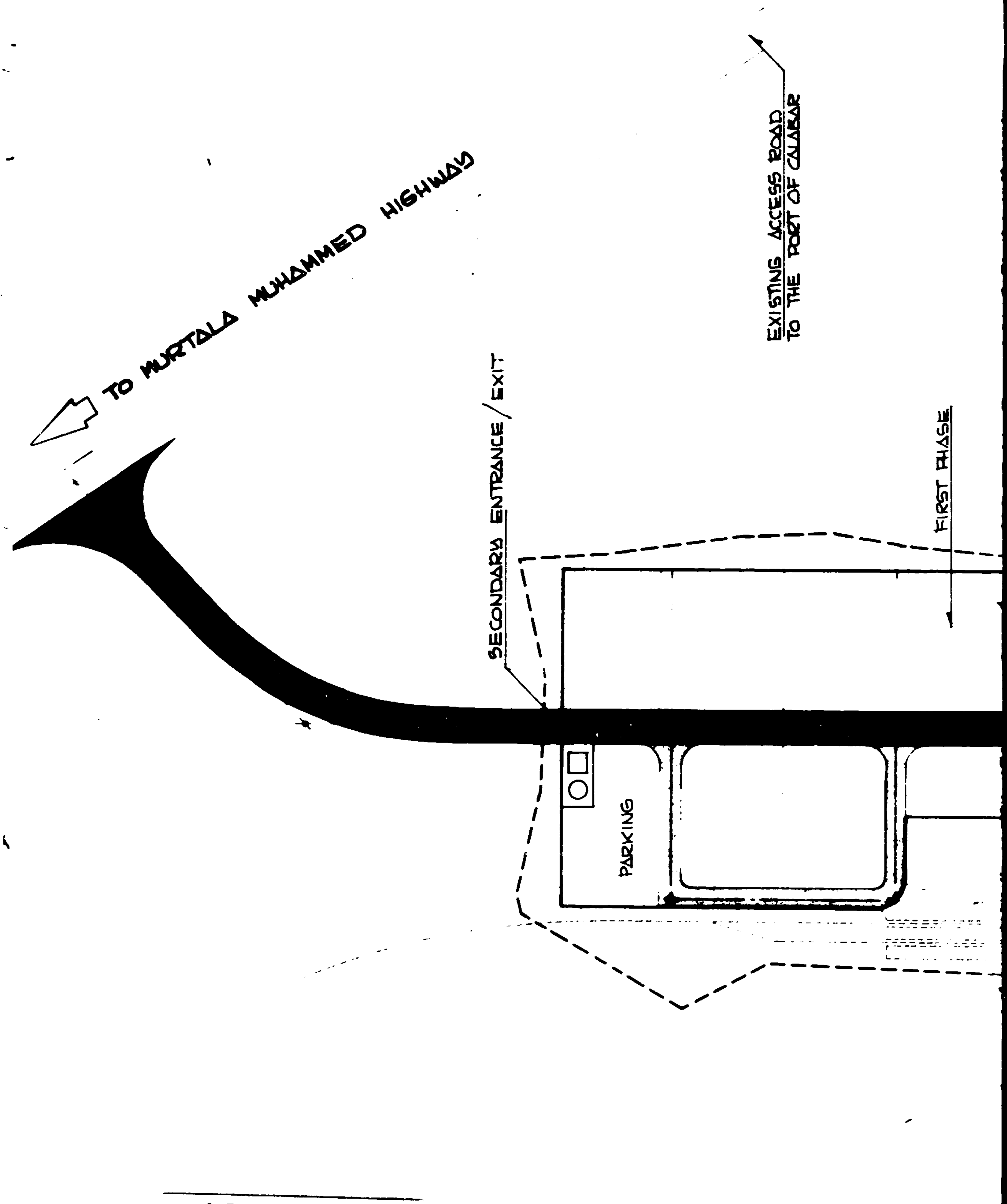

TO MURTALA MUHAMMED HIGHWAY
SECTION 1
SECONDARY ENTRANCE / EXIT
PARKING
EXISTING ACCESS ROAD
TO THE PORT OF CALABAR
FIRST PHASE
TO CALABAR POR


PORT
SECTION 2
MAIN ENTRANCE / EXIT
EXISTING ROAD TO BE REHABILITATED
SECONDARY ENTRANCE / EXIT
SERVICE ENTRANCE
PARKING

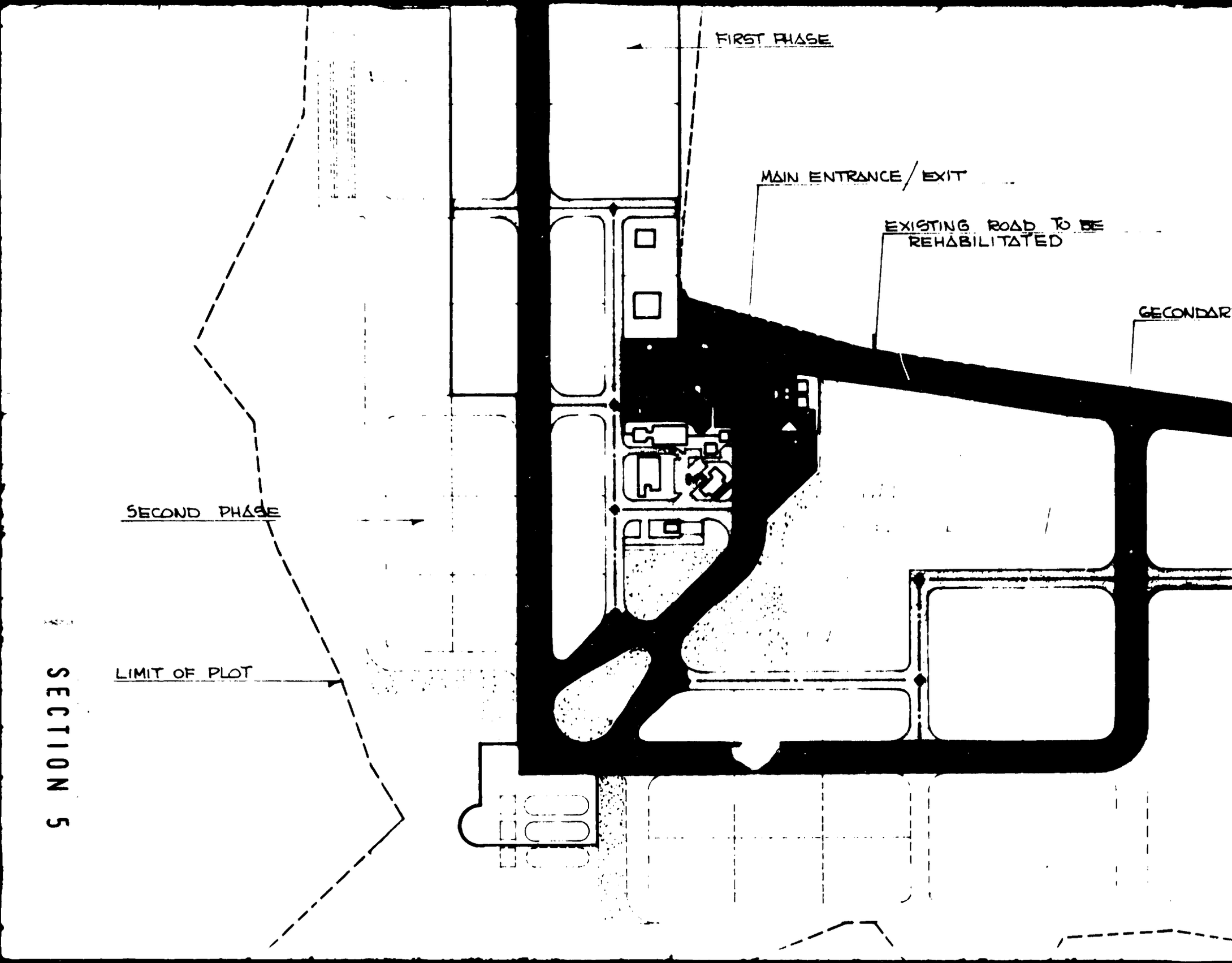


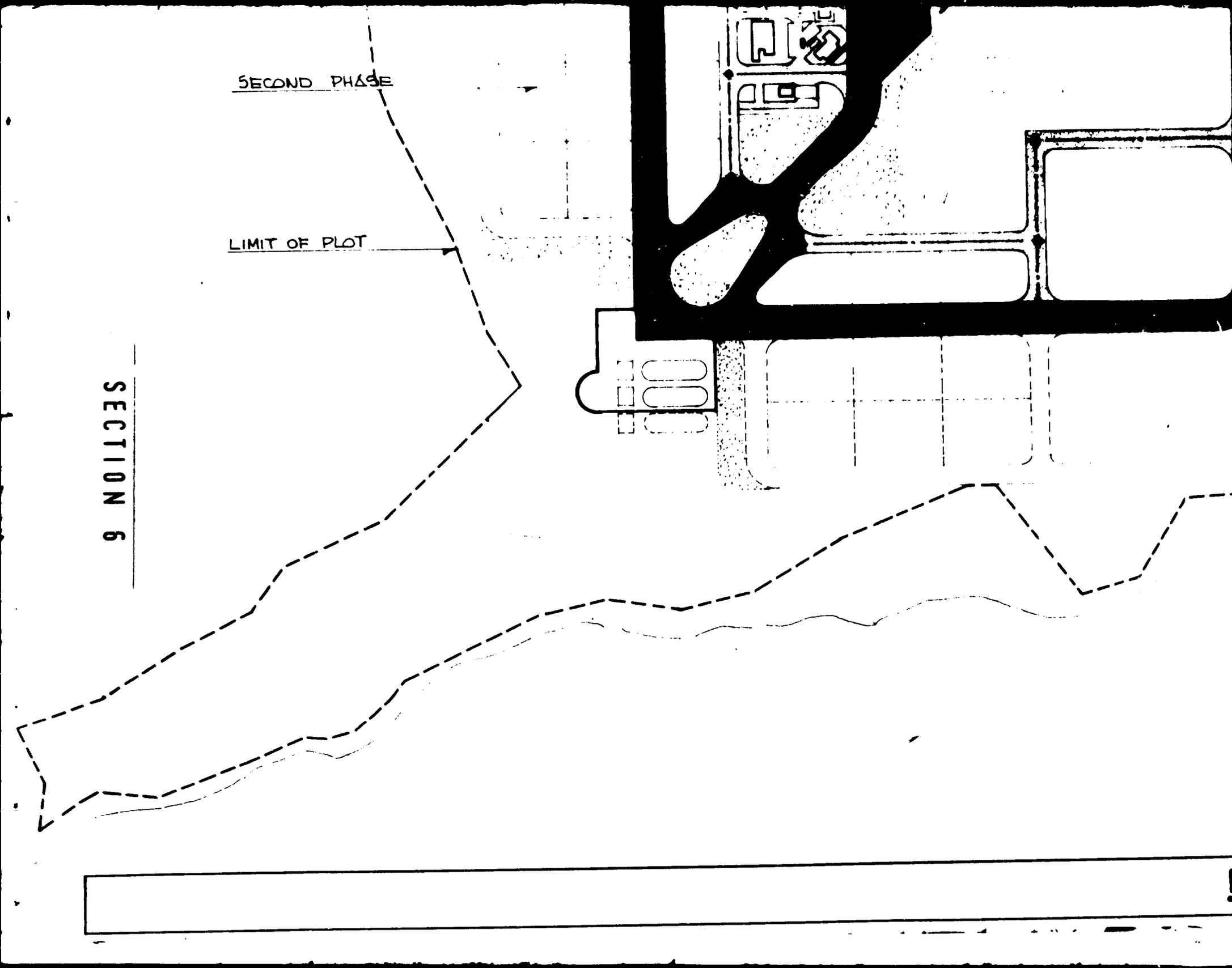
SECTION 3

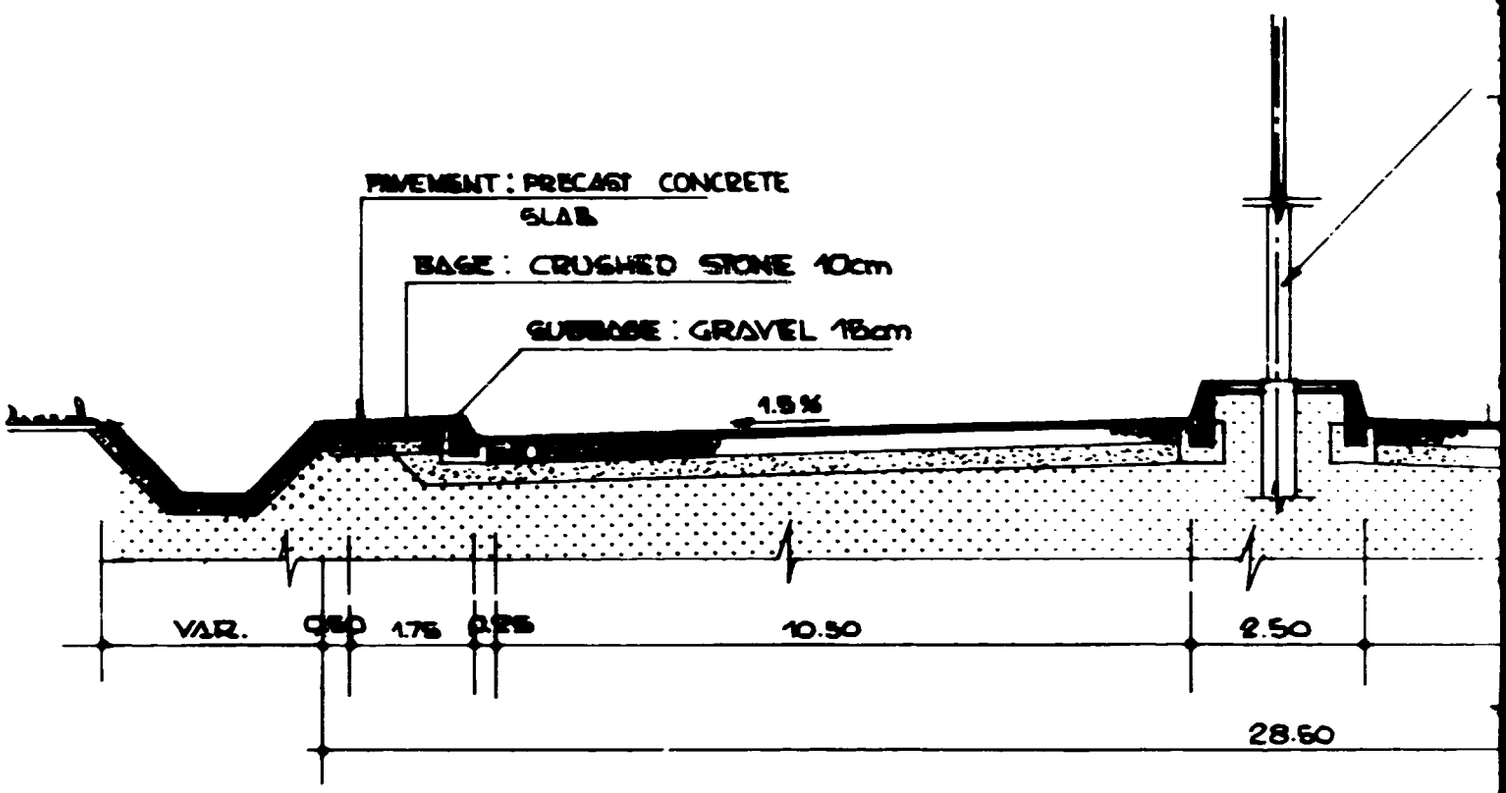
ROAD NETWORK

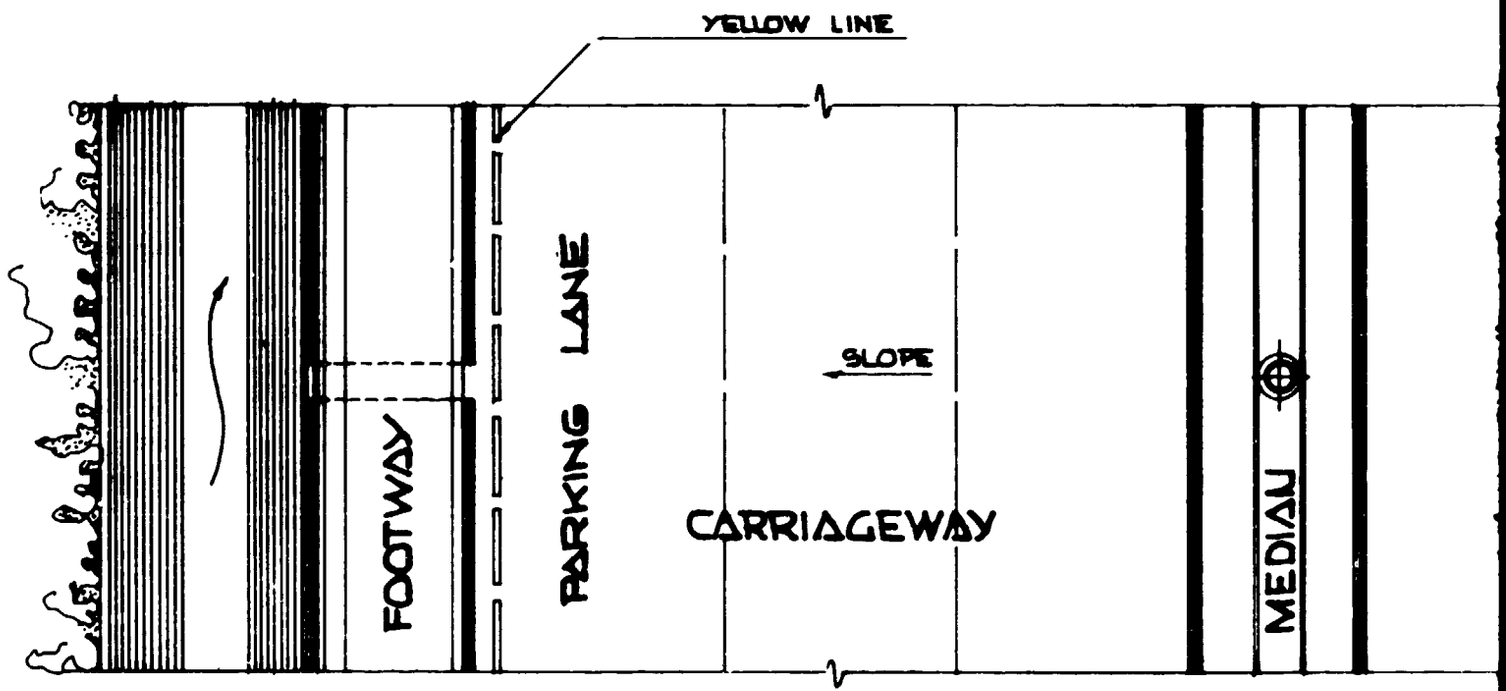

TO MURTALA MUHAMMED HIGHWAY
SECONDARY ENTRANCE / EXIT
EXISTING ACCESS ROAD
TO THE PORT OF CALABAR
FIRST PHASE
PARKING

SECTION 4


FIRST PHASE
MAIN ENTRANCE / EXIT
EXISTING ROAD TO BE REHABILITATED
GECONDAR
SECOND PHASE
LIMIT OF PLOT
SECTION 5

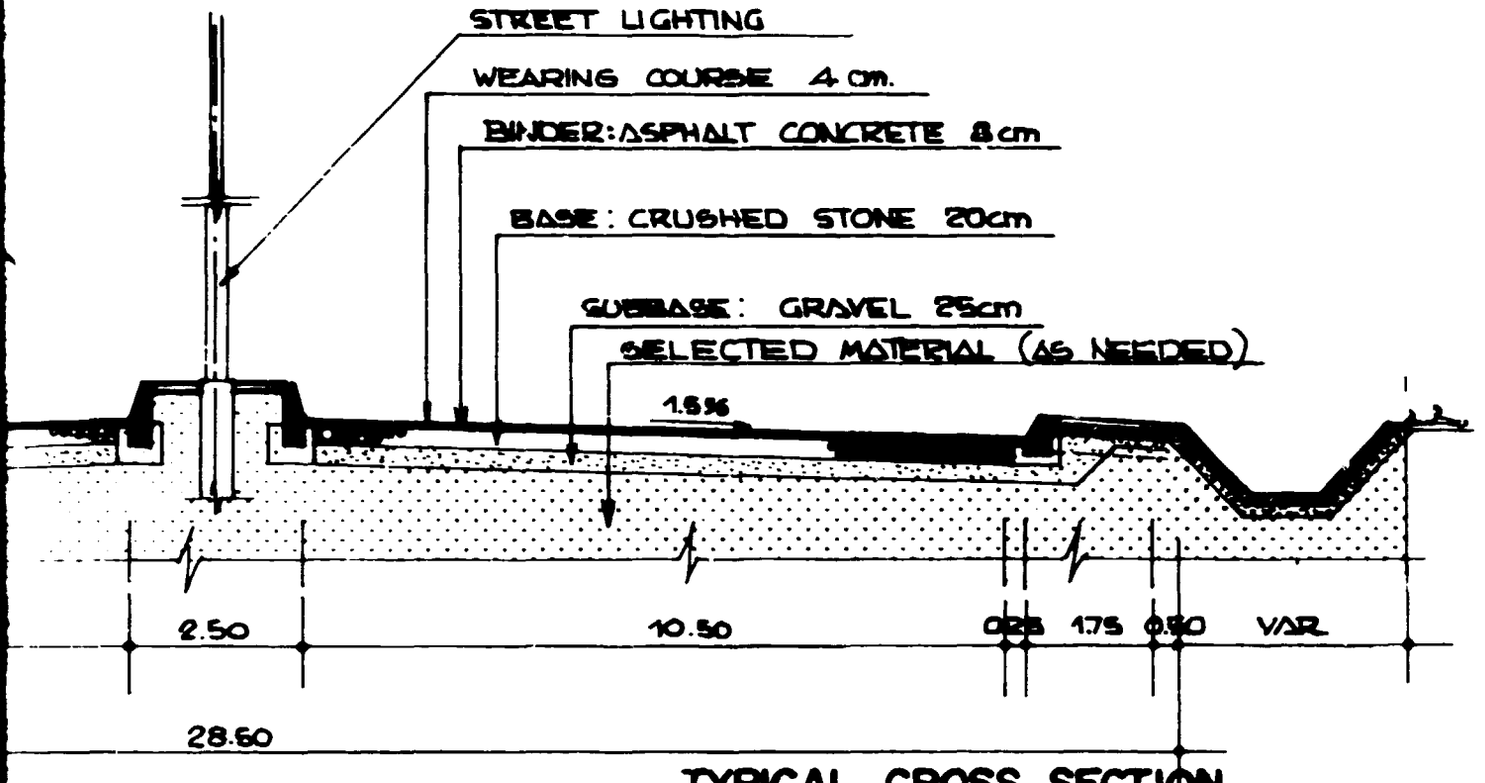

SECOND PHASE
LIMIT OF PLOT
SECTION 6





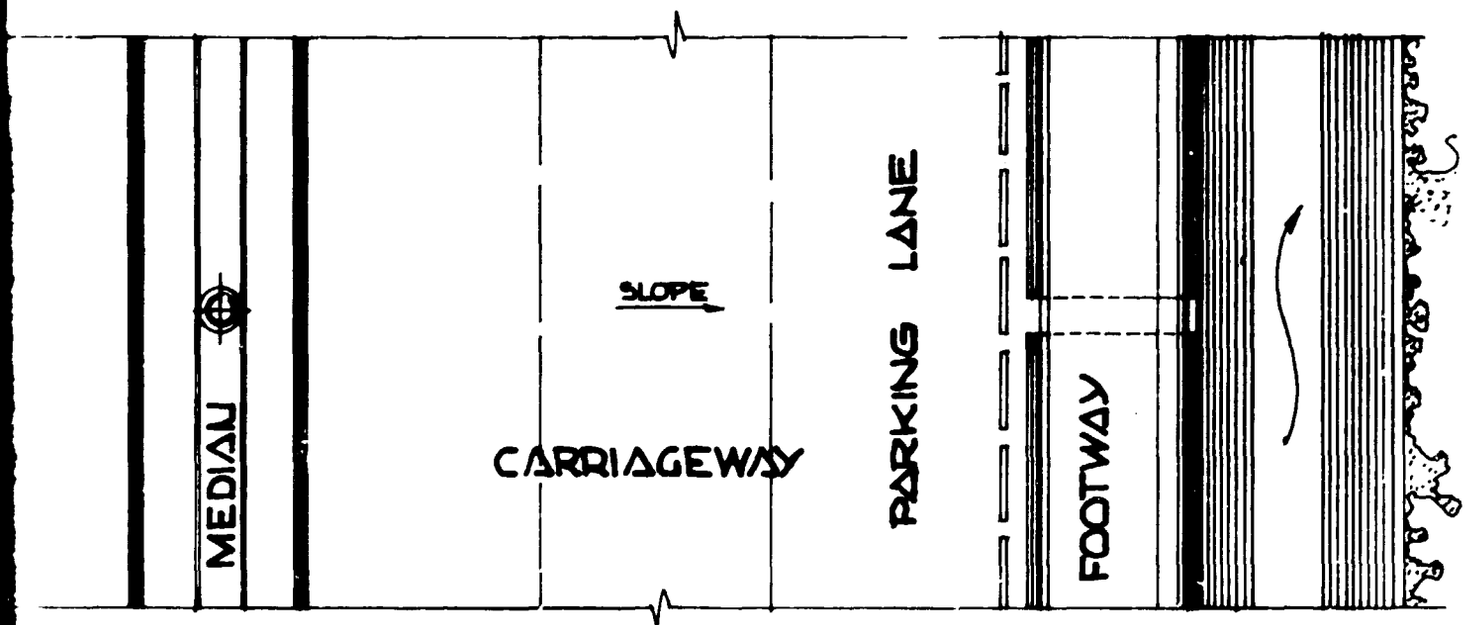
SECTION 1

MAIN



TYPICAL CROSS SECTION

SCALE 1:100



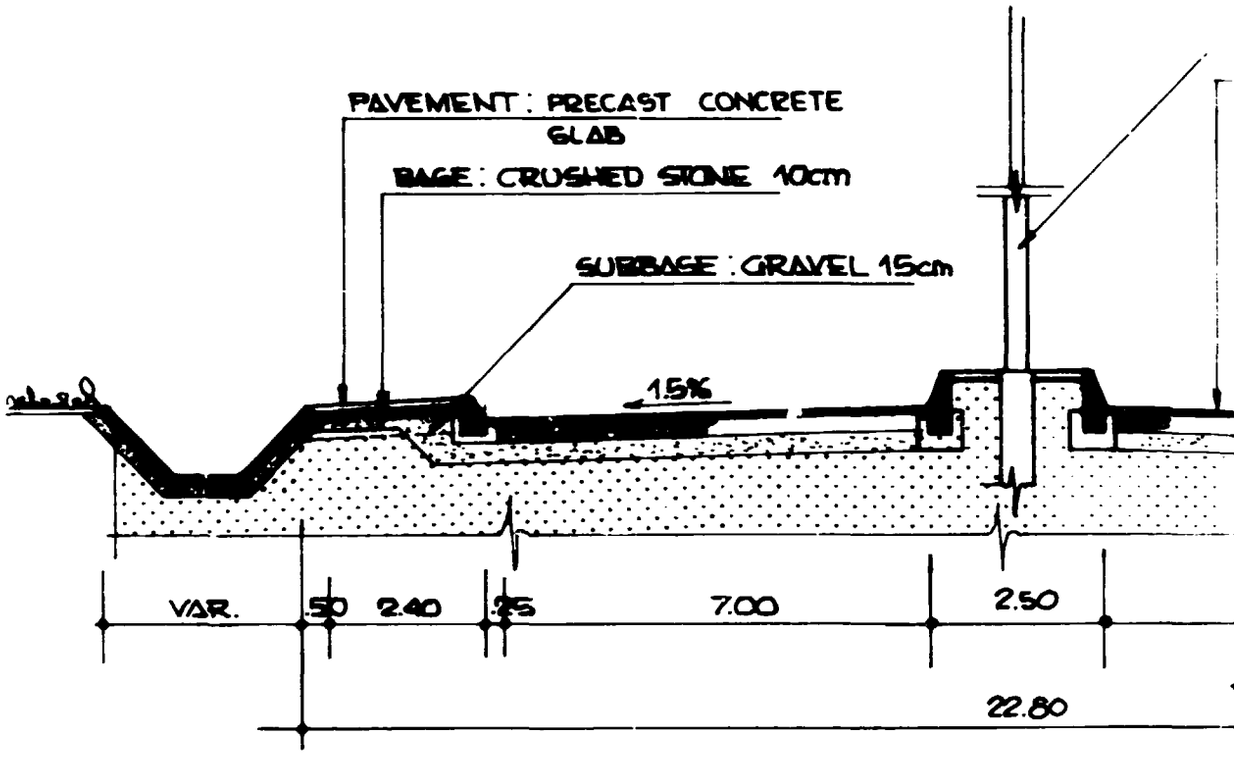
PLAN

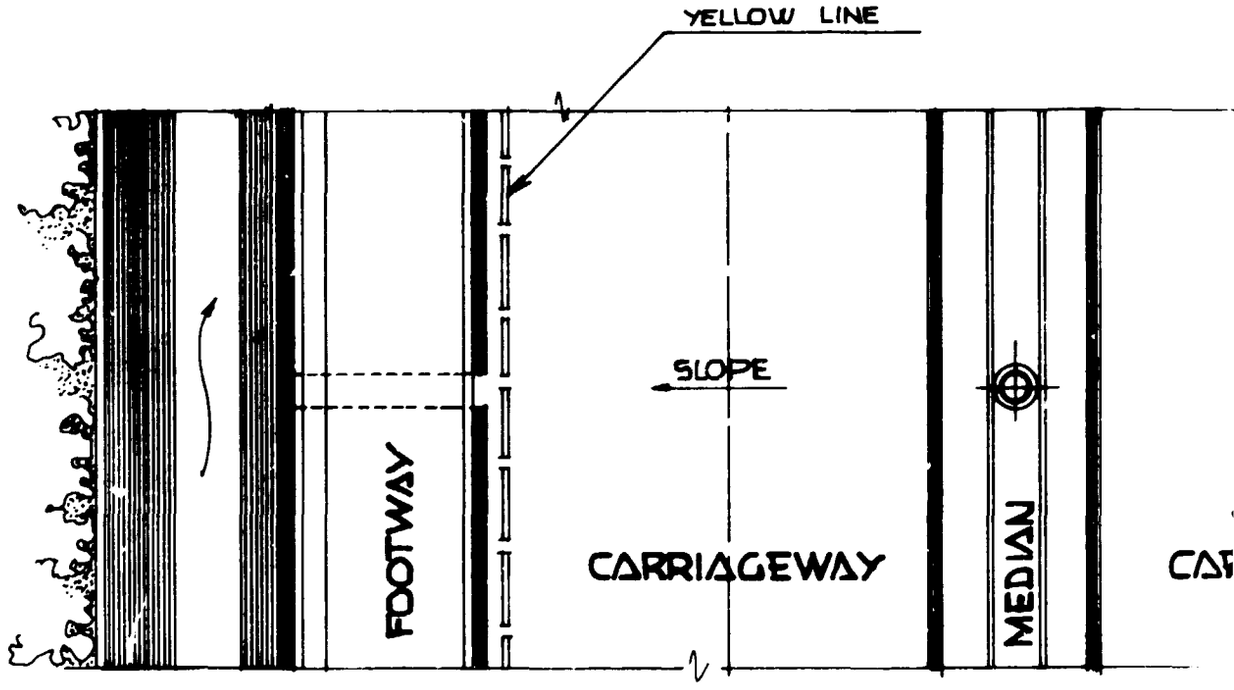
SCALE 1:100

SECTION 2

MAIN ROADS - TYPICAL SECTION

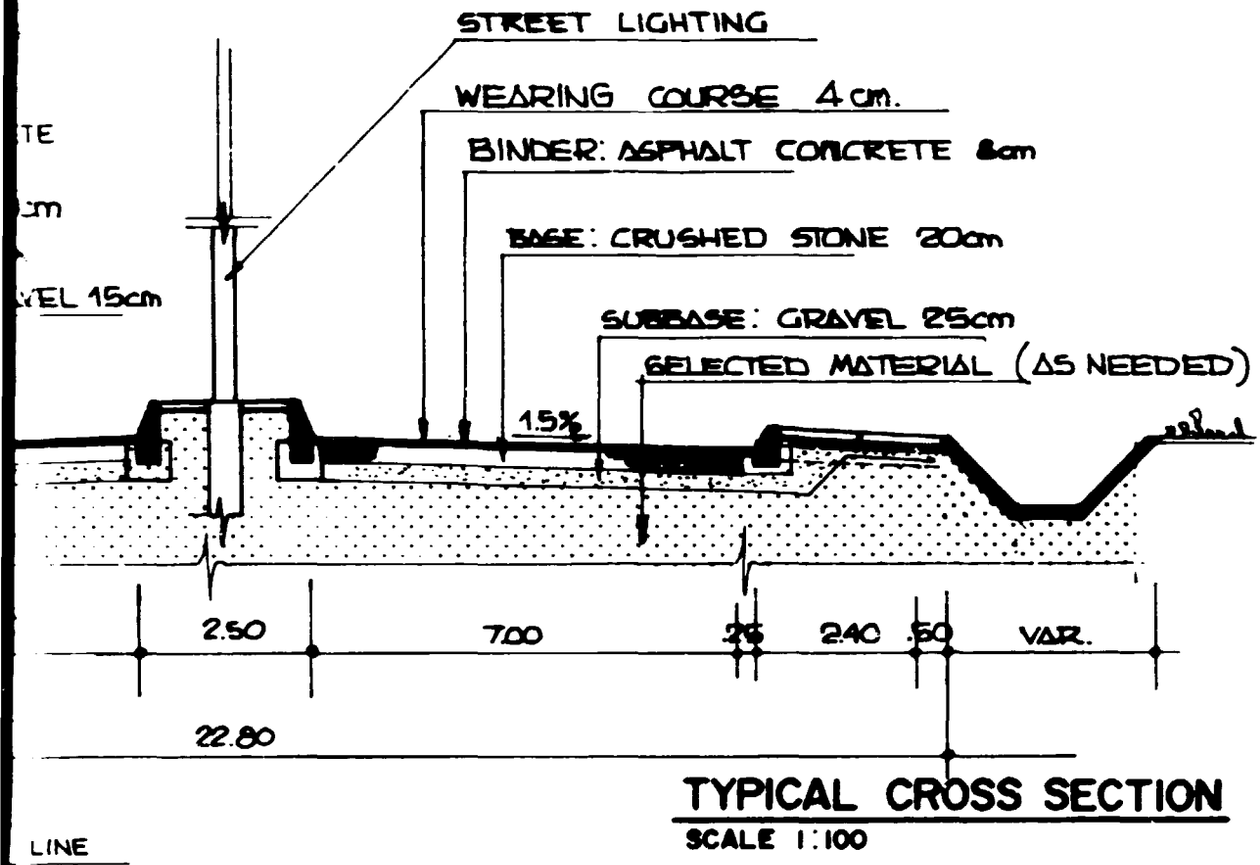
27



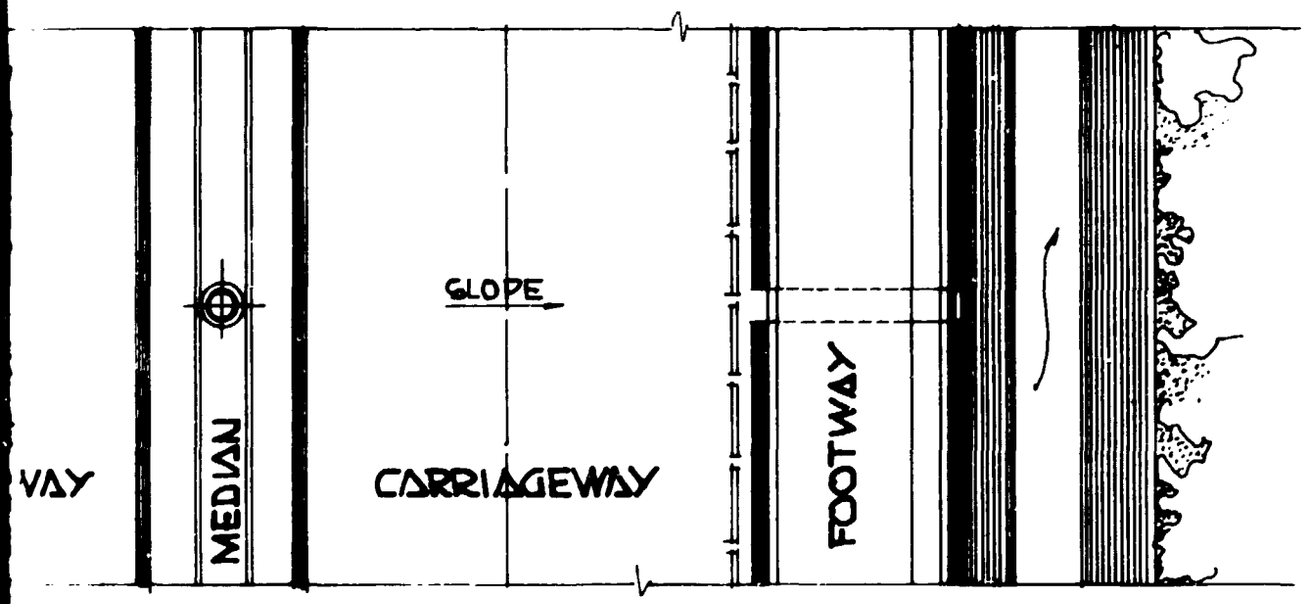


SECTION 1

SECONDARY



TYPICAL CROSS SECTION
SCALE 1:100



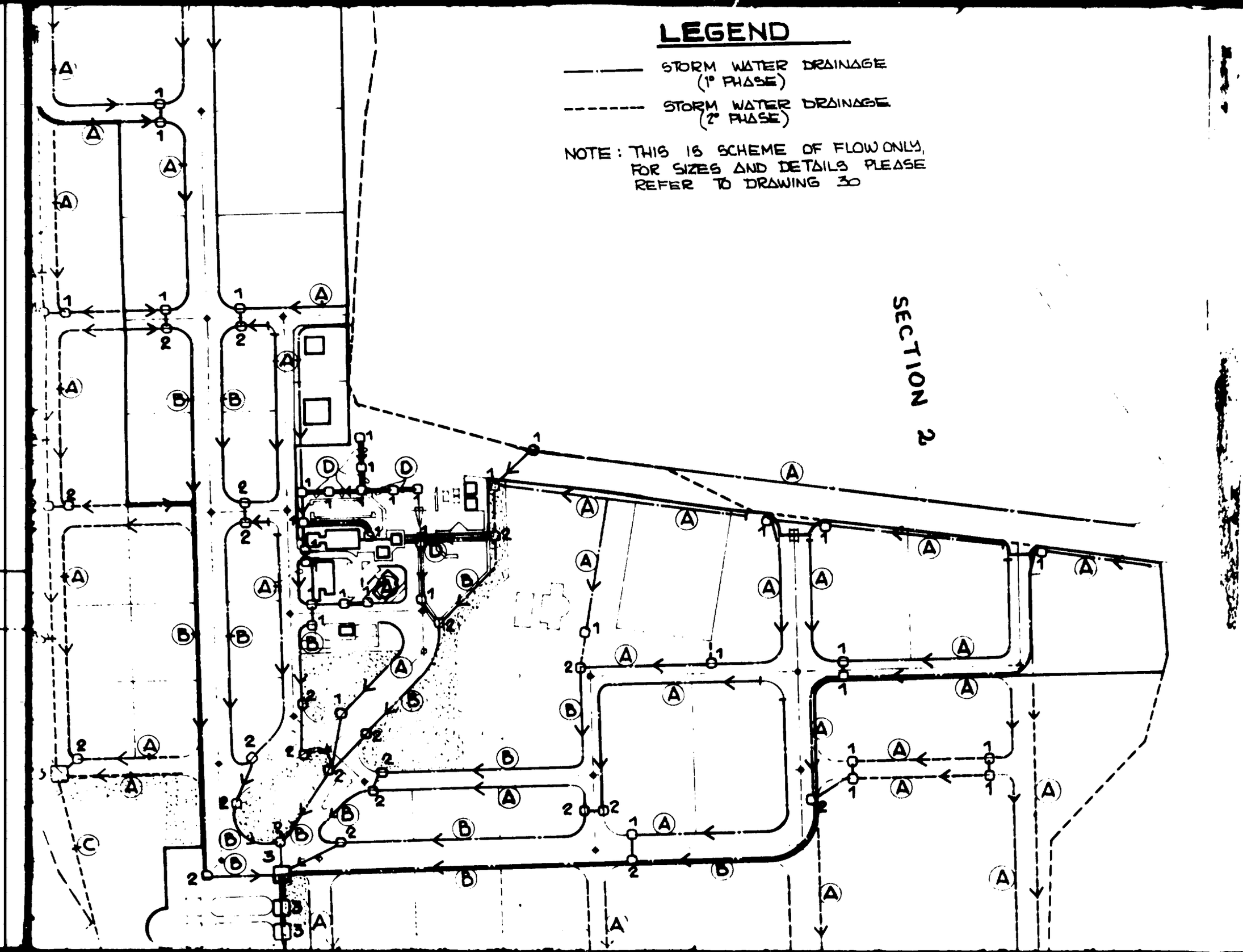
PLAN
SCALE 1:100

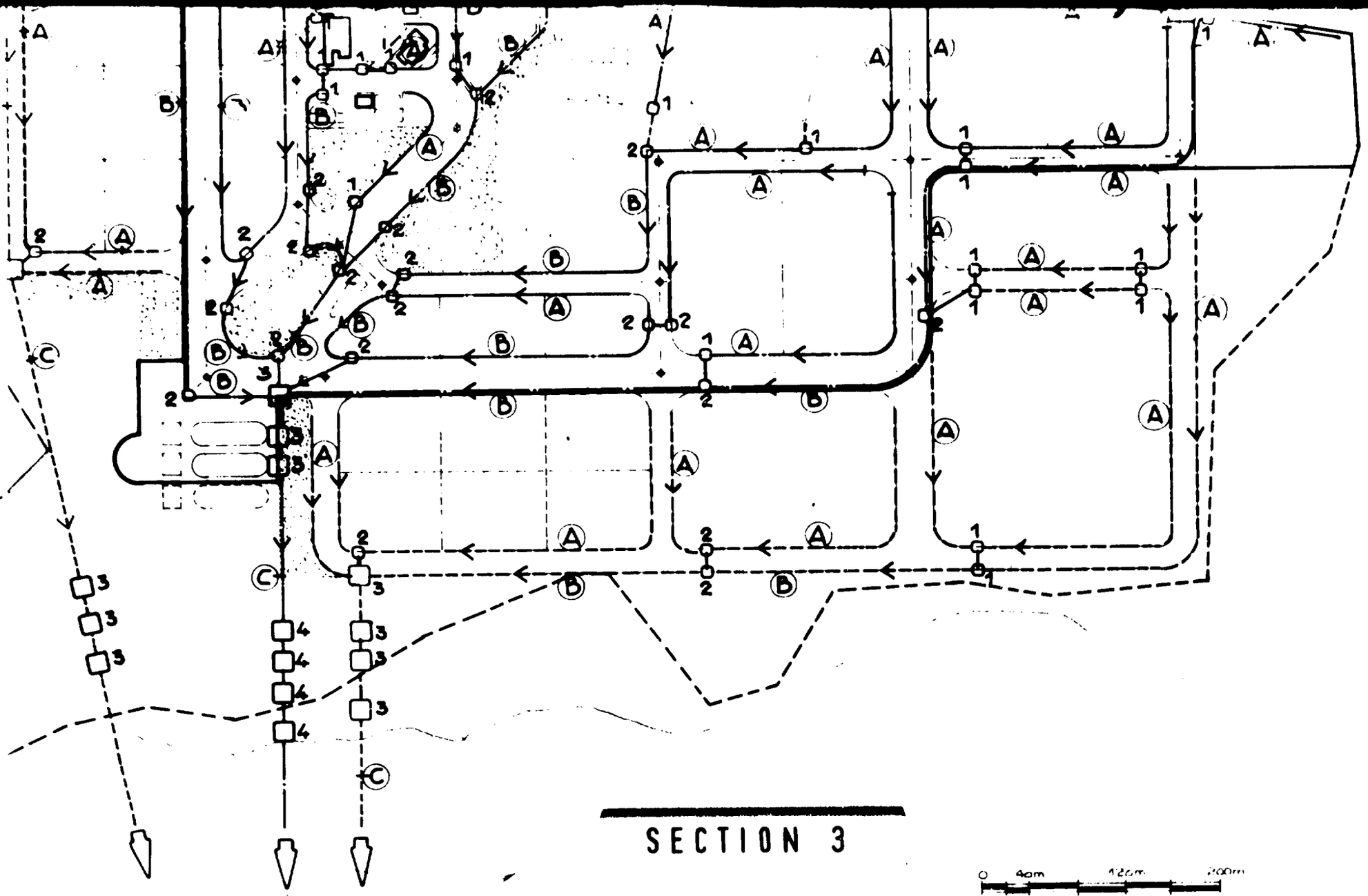
SECTION 2

SECONDARY ROADS - TYPICAL SECTION

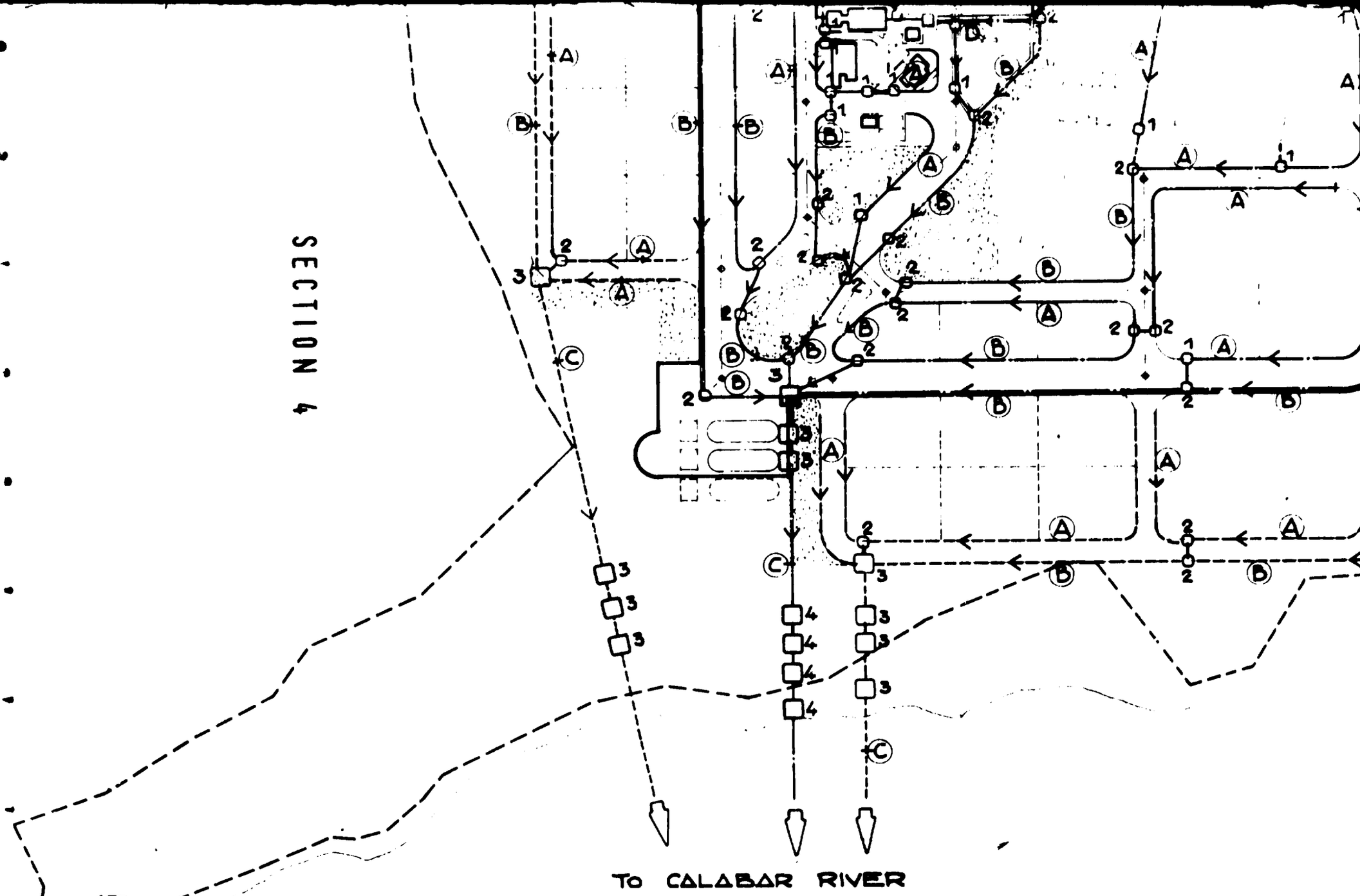

LEGEND
STORM WATER DRAINAGE (1st PHASE)
STORM WATER DRAINAGE (2nd PHASE)
NOTE : THIS IS SCHEME OF FLOW ONLY, FOR SIZES AND DETAILS PLEASE REFER TO DRAWING

SECTION 1

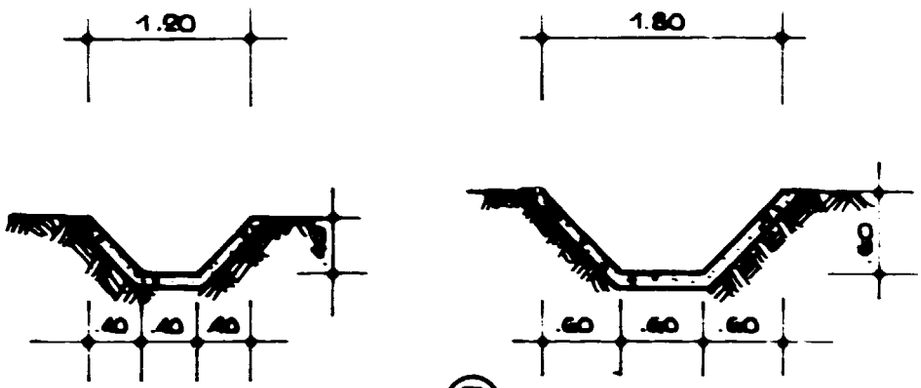

LEGEND
STORM WATER DRAINAGE (1° PHASE)
STORM WATER DRAINAGE (2° PHASE)
NOTE : THIS IS SCHEME OF FLOW ONLY, FOR SIZES AND DETAILS PLEASE REFER TO DRAWING 30
SECTION 2



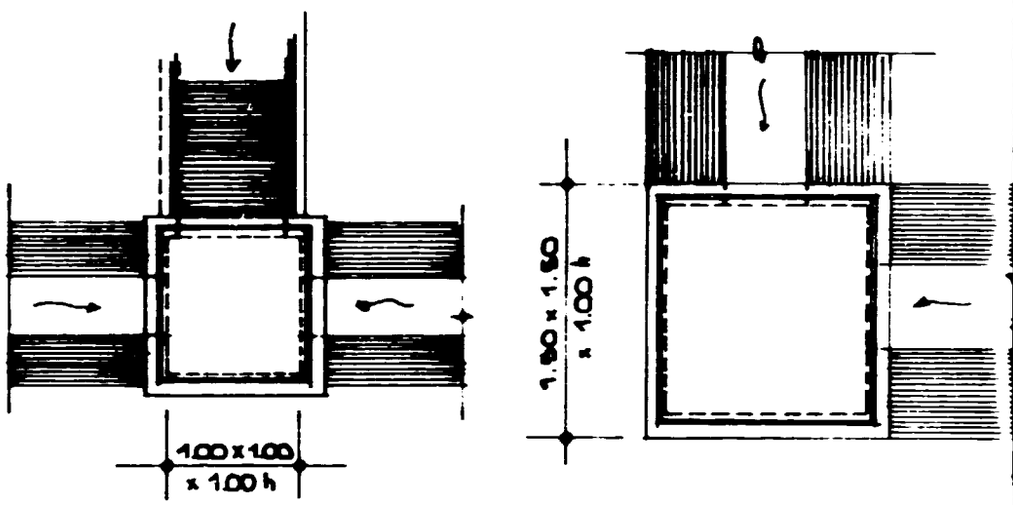
SECTION 3



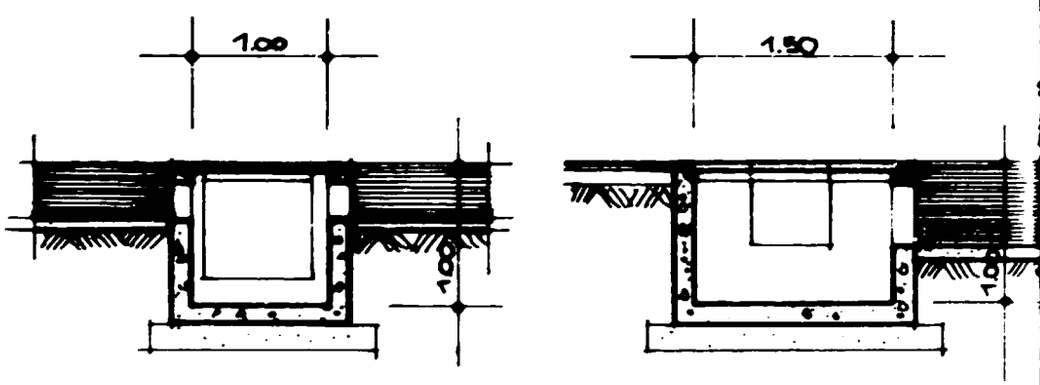
DRAIN



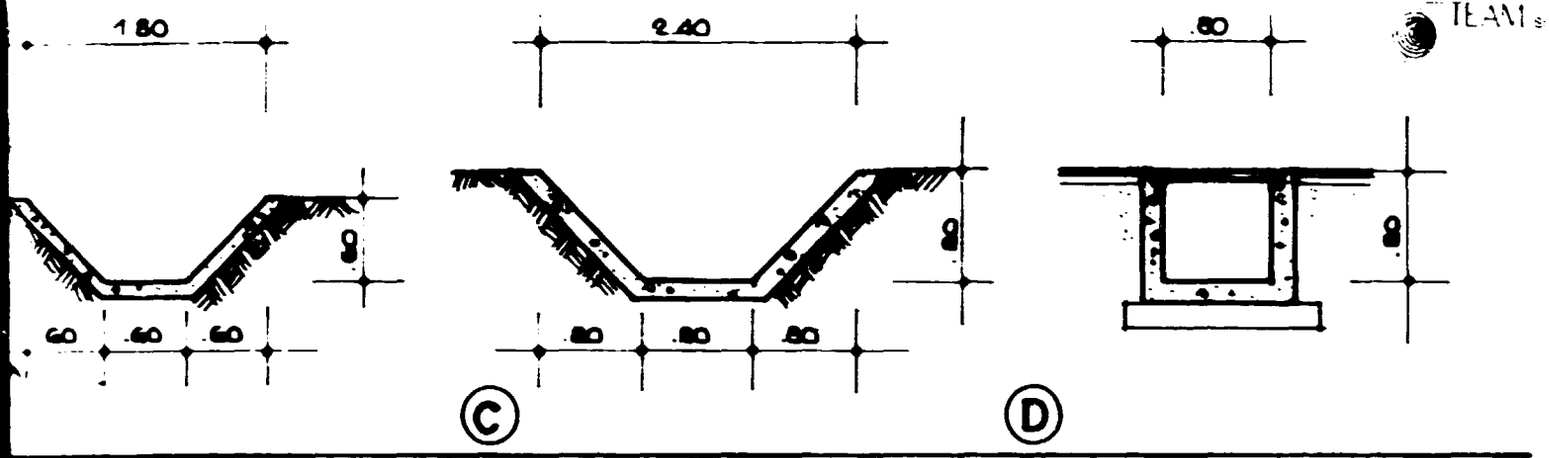
CHANNEL TYPE (A) (B)

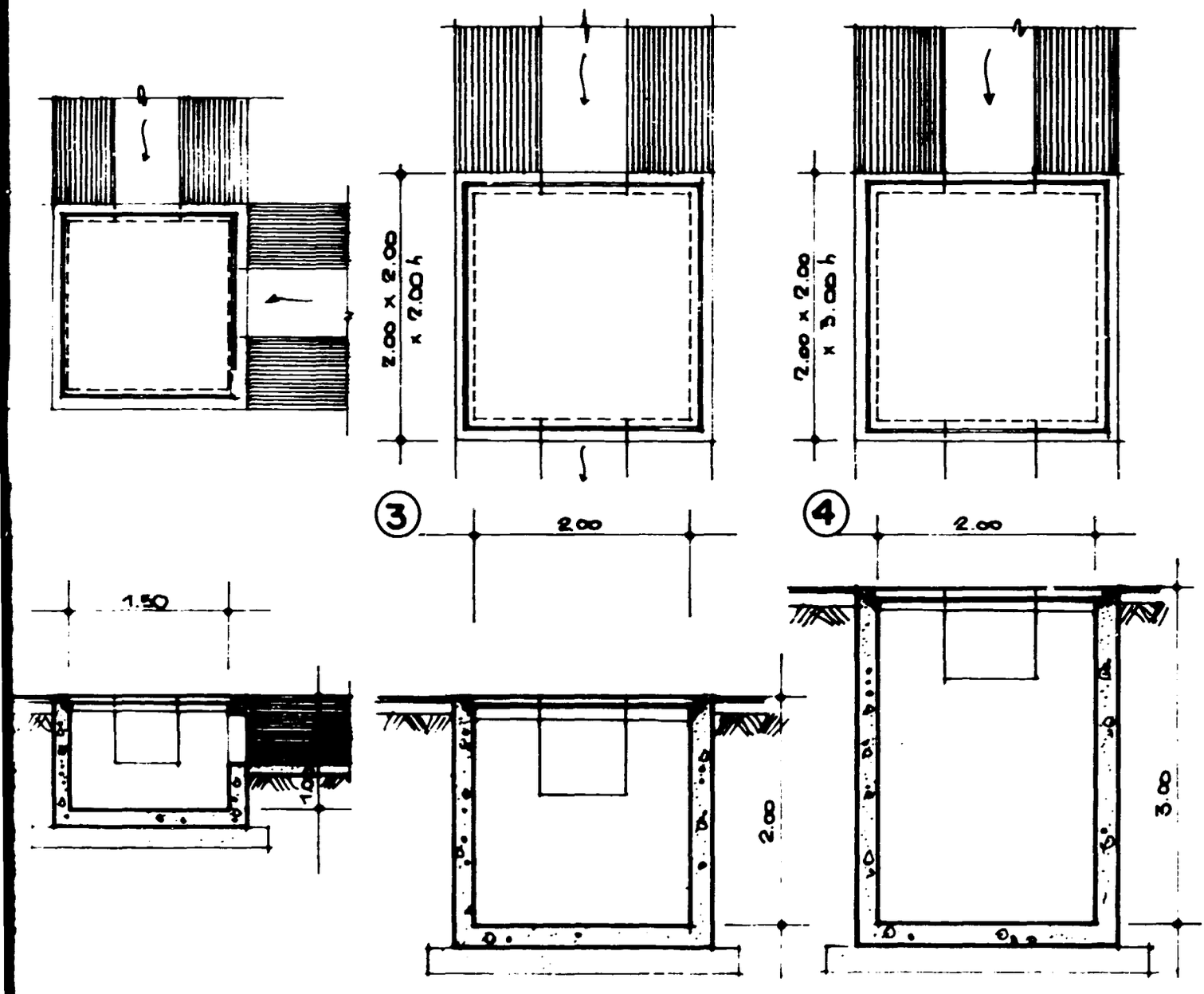


MANHOLE TYPE (1) (2)

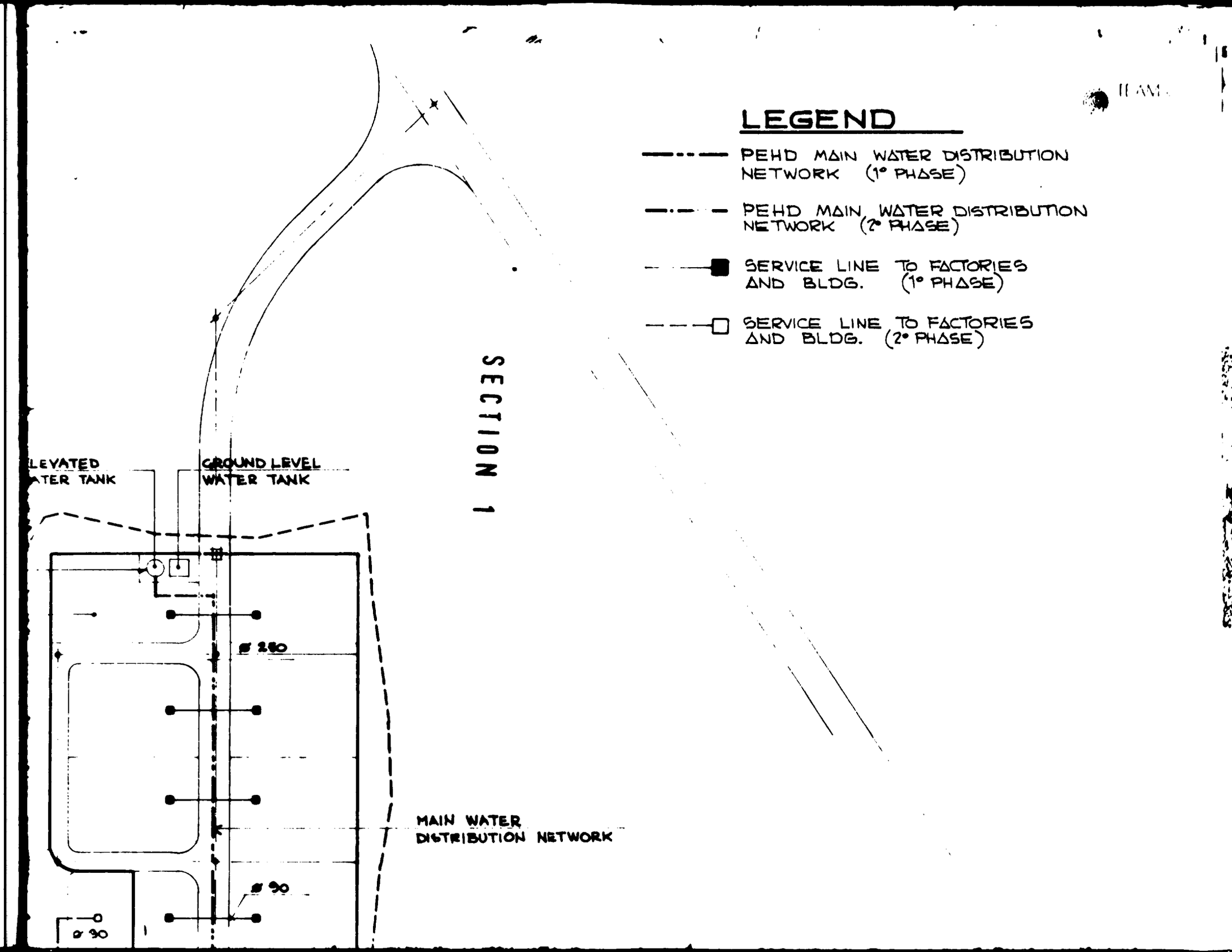


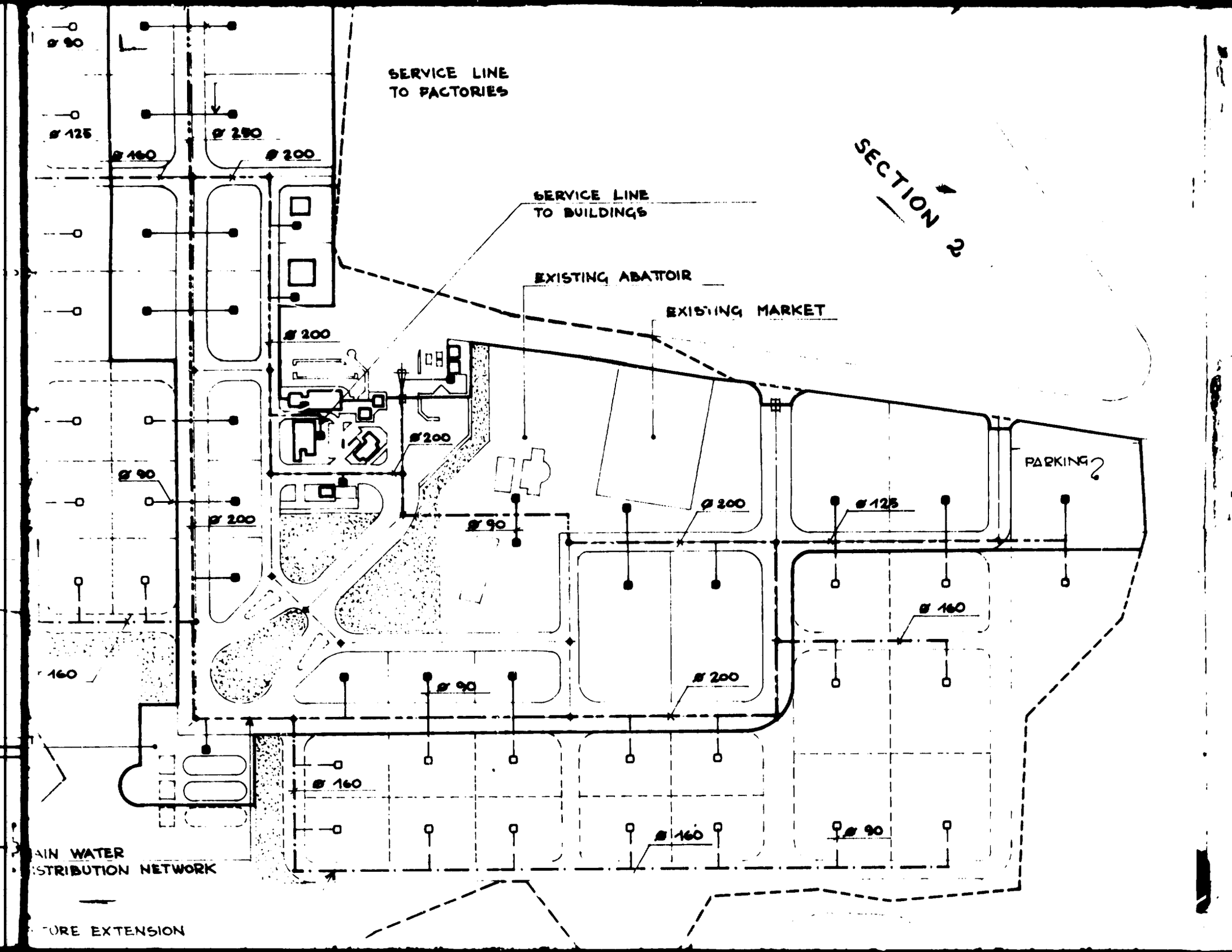
SECTION 1

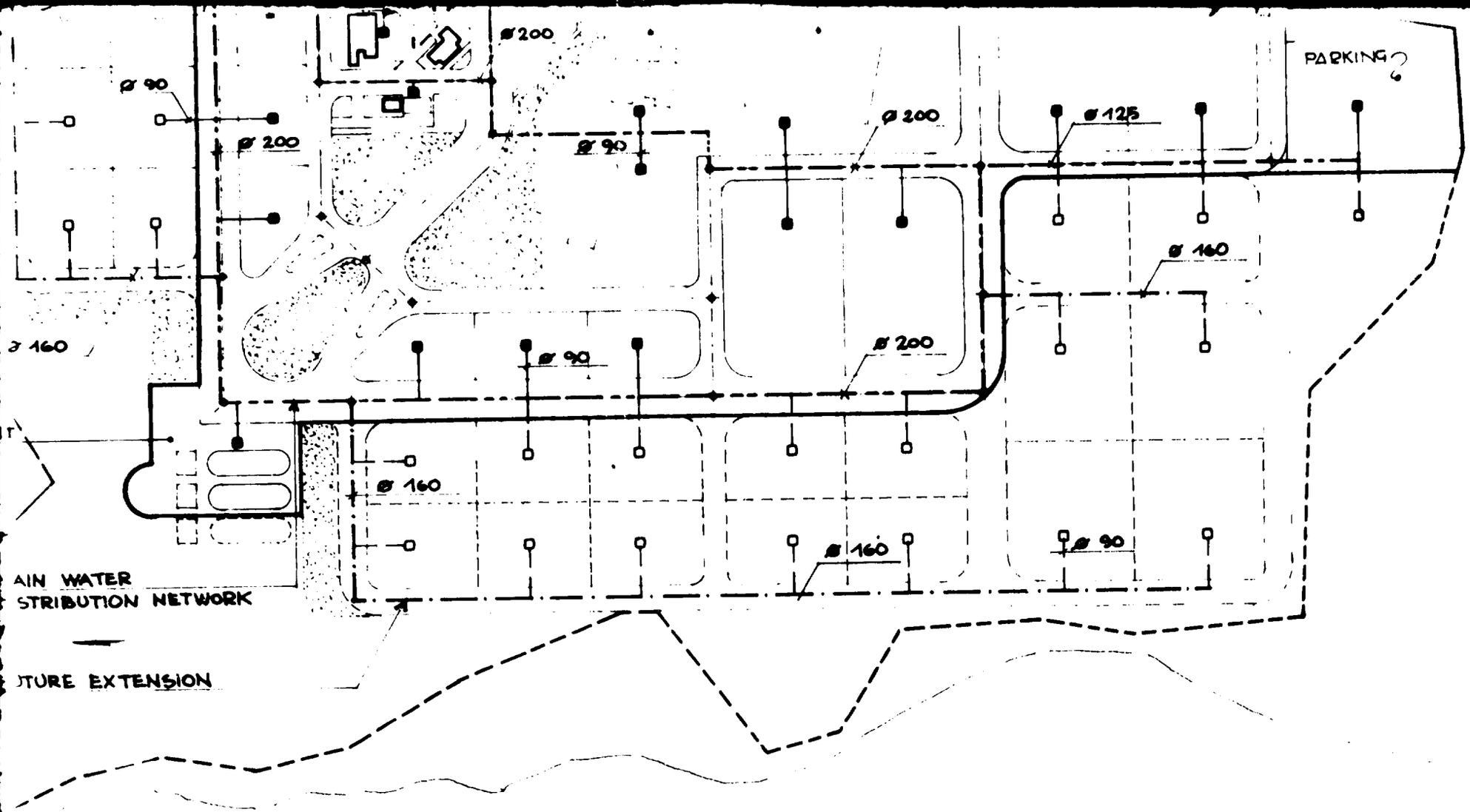

1.80
.60
.60
.60
2.40
.80
.80
.80
.80
C
D


2.00 x 2.00 x 2.00h
2.00 x 2.00 x 3.00h
3
4
2.00
2.00
1.50
1.0
2.8
3.8

SECTION 2


LEGEND
PEHD MAIN WATER DISTRIBUTION NETWORK (1° PHASE)
PEHD MAIN WATER DISTRIBUTION NETWORK (2° PHASE)
SERVICE LINE TO FACTORIES AND BLDG. (1° PHASE)
SERVICE LINE TO FACTORIES AND BLDG. (2° PHASE)
SECTION 1
LEVATED TER TANK
GROUND LEVEL WATER TANK
ø 250
ø 90
ø 90
MAIN WATER DISTRIBUTION NETWORK

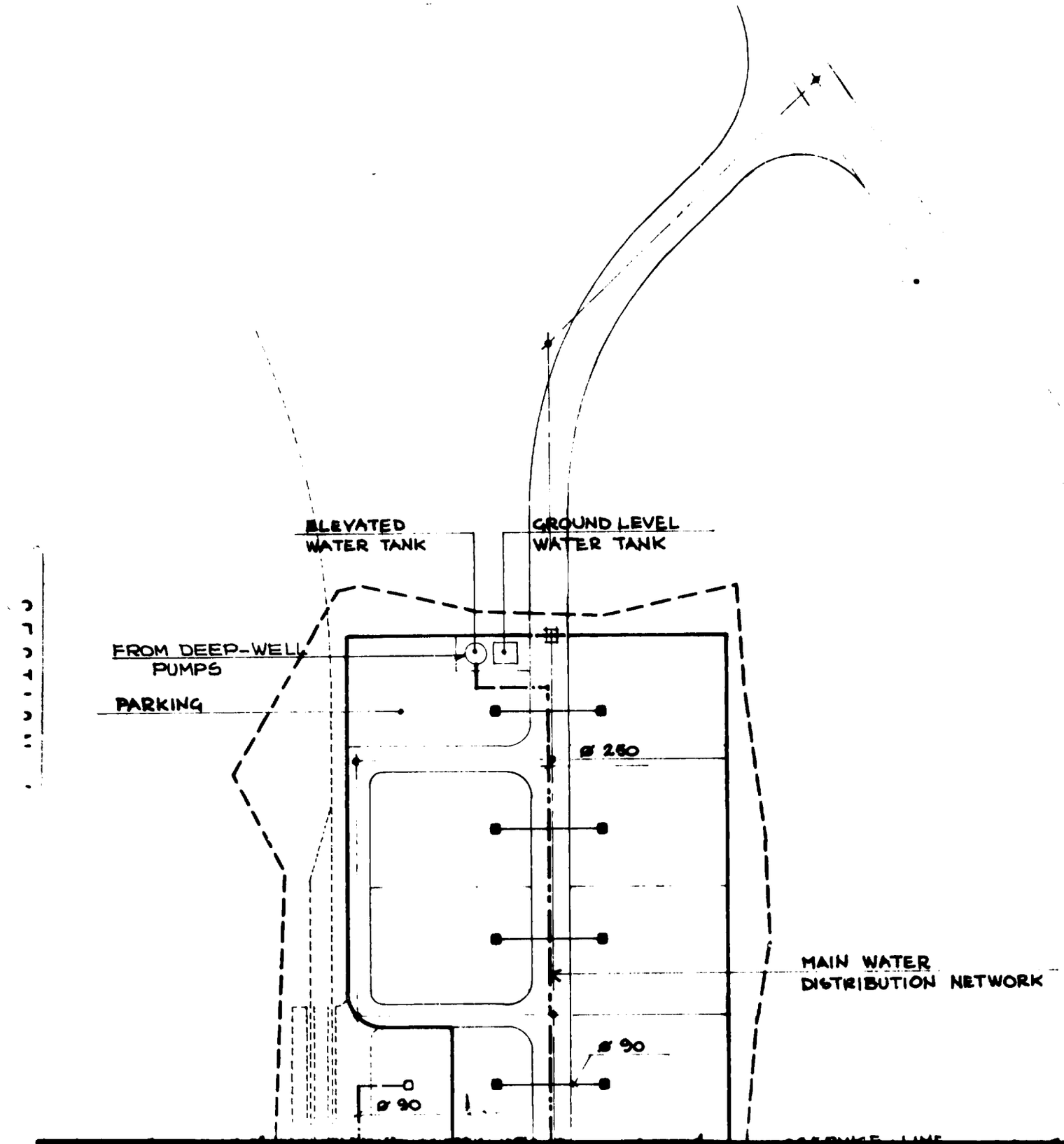

SERVICE LINE
TO FACTORIES
SECTION 2
SERVICE LINE
TO BUILDINGS
EXISTING ABATTOIR
EXISTING MARKET
PARKING ?
ø 90
ø 125
ø 160
ø 200
AIN WATER
STRIBUTION NETWORK
TURE EXTENSION



SECTION 3

0 40m 120m 200m
20m 80m 160m
NORTH

WATER DISTRIBUTION NETWORK



LEGEND

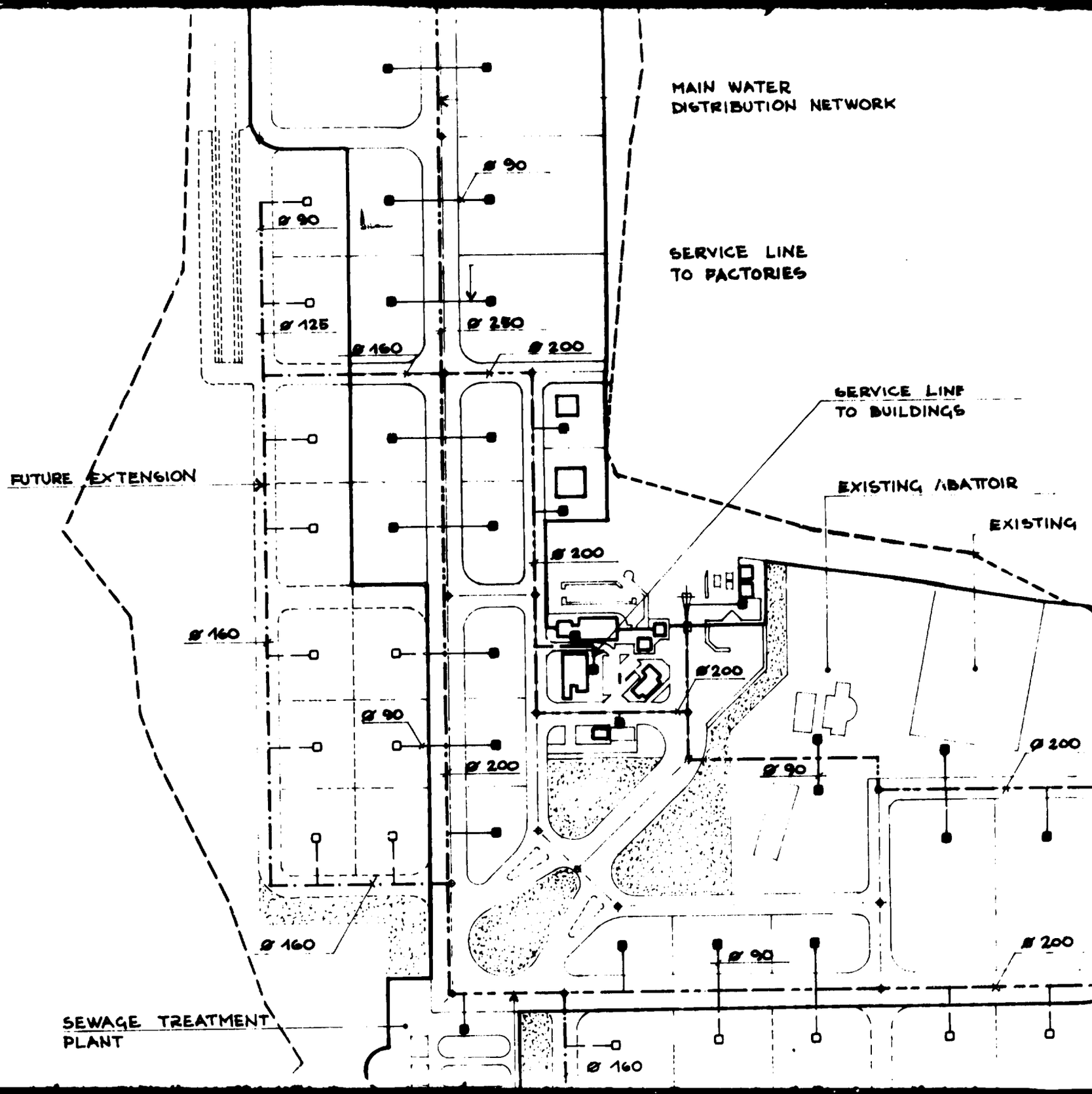
PEHD MAIN W.
NETWORK (1°

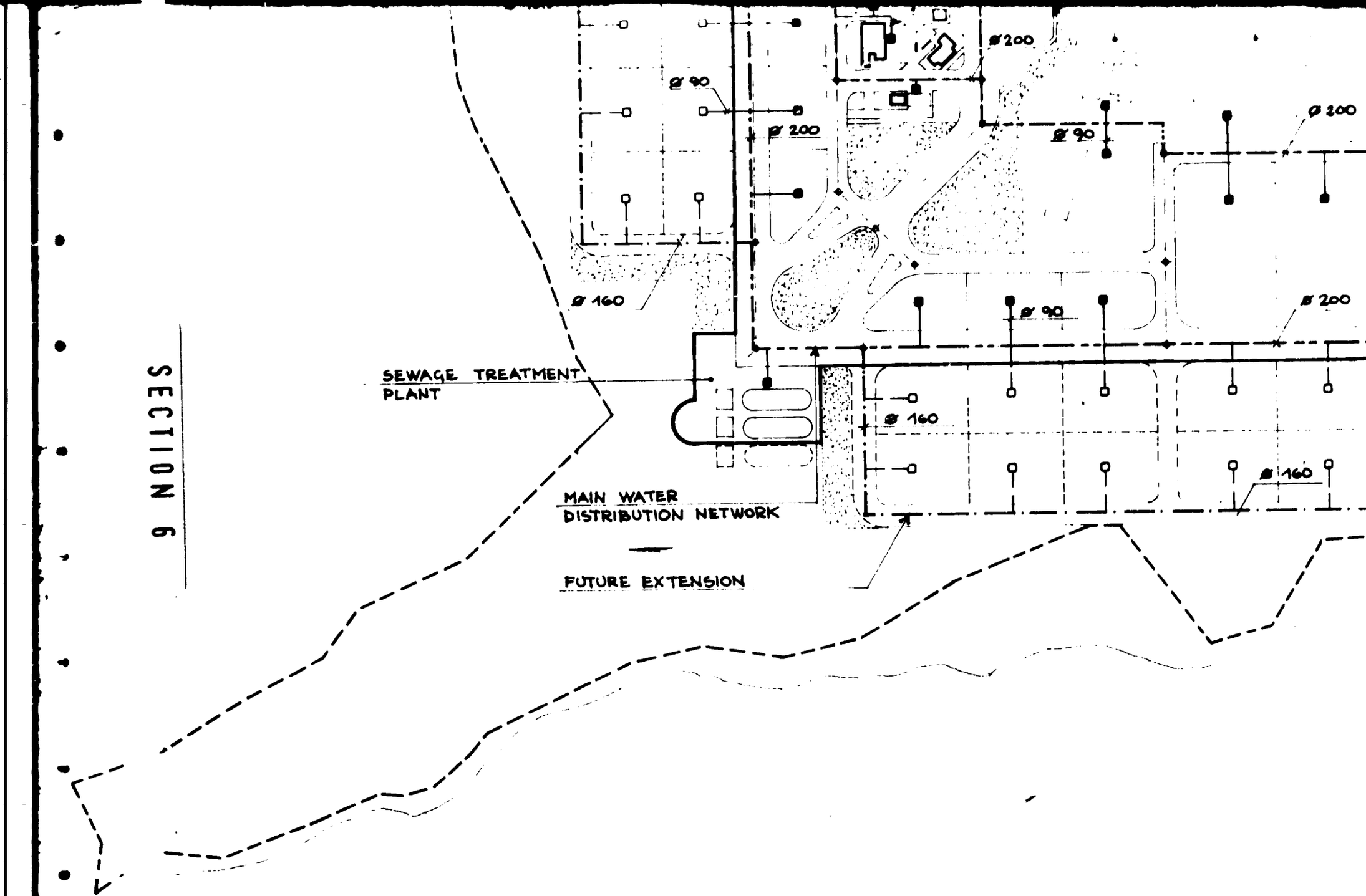
PEHD MAIN W
NETWORK (2°

SERVICE LINE
AND BLDG.

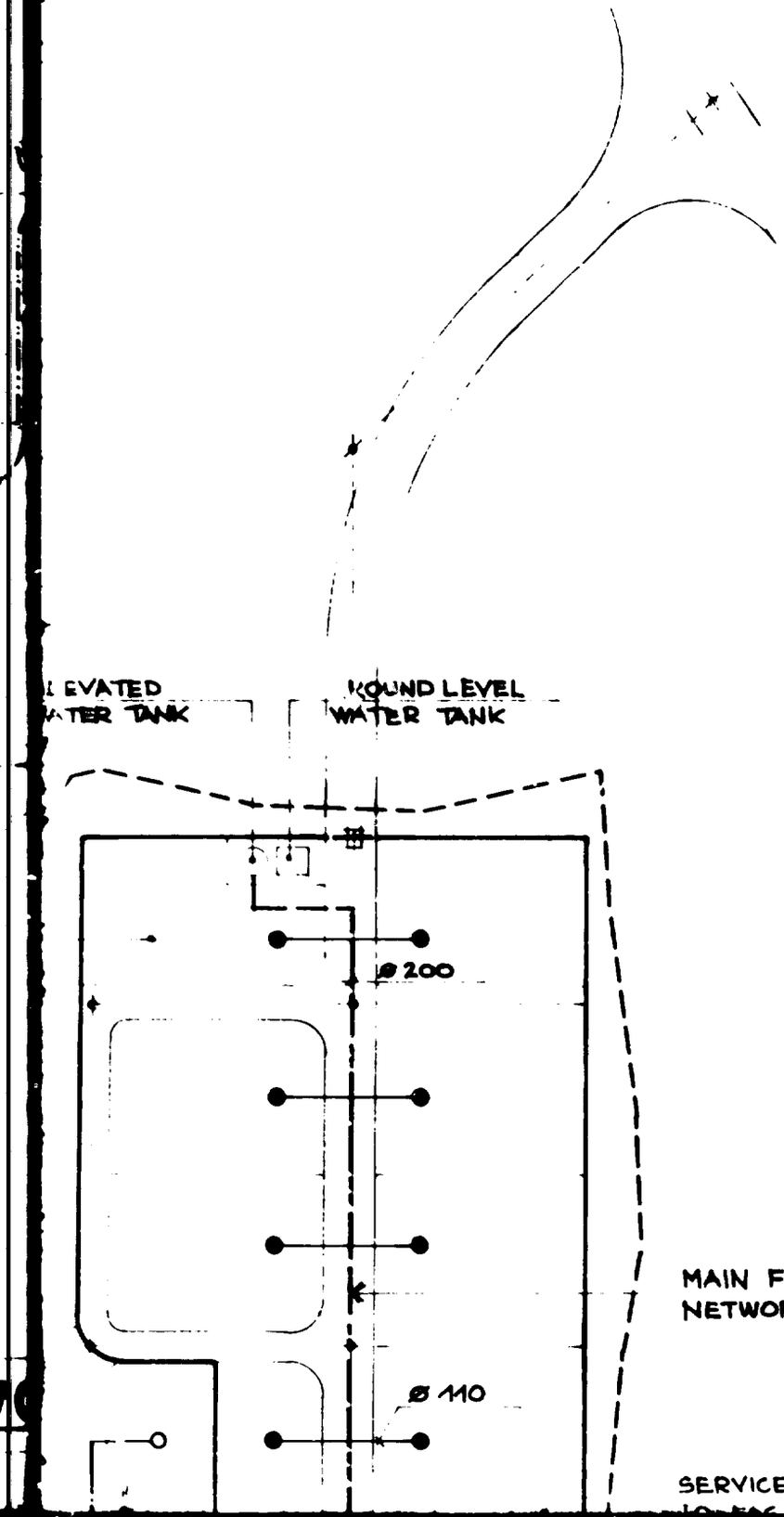
SERVICE LINE
AND BLDG.

SECTION 5


MAIN WATER
DISTRIBUTION NETWORK
SERVICE LINE
TO FACTORIES
SERVICE LINE
TO BUILDINGS
FUTURE EXTENSION
EXISTING ABATTOIR
EXISTING
SEWAGE TREATMENT
PLANT
ø 90
ø 125
ø 160
ø 200
ø 250

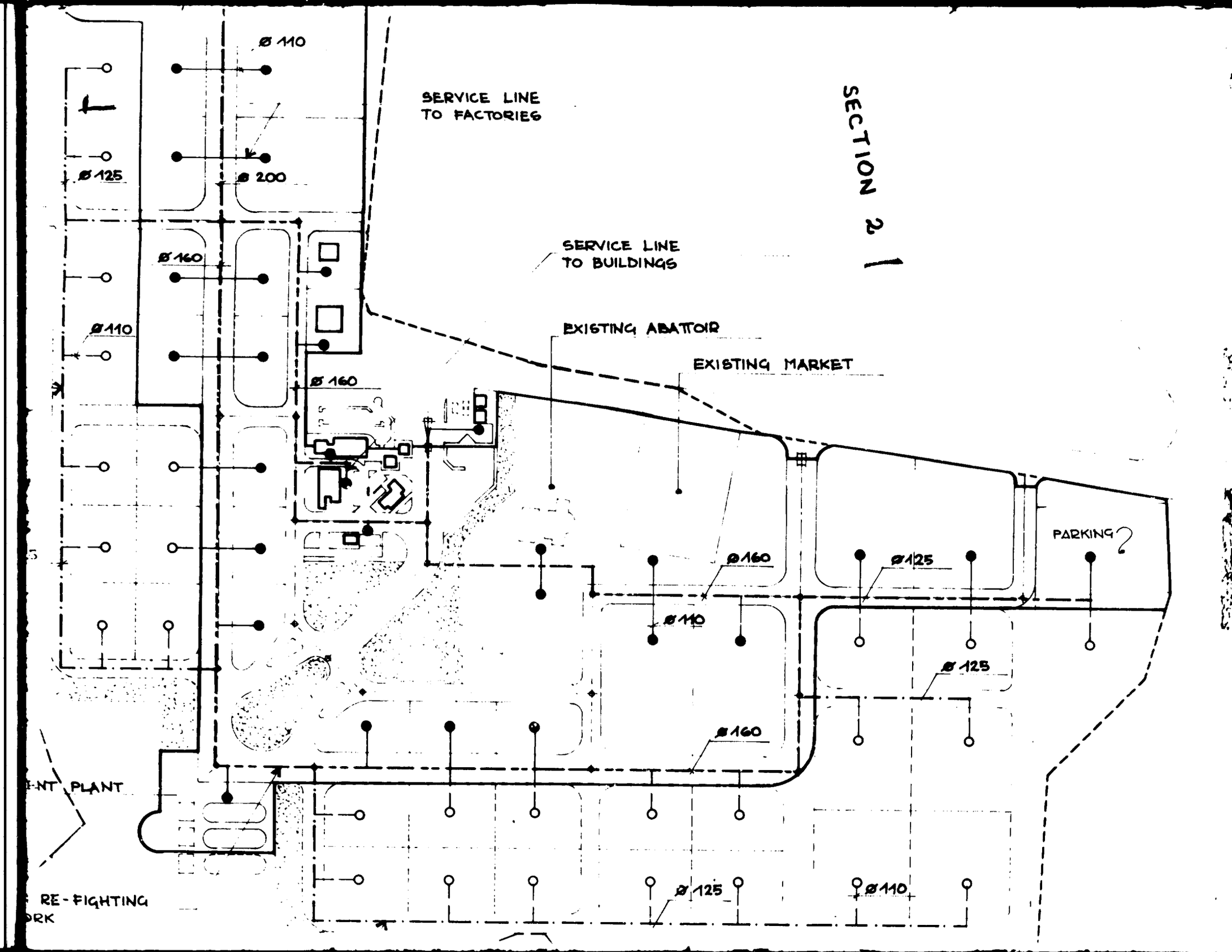


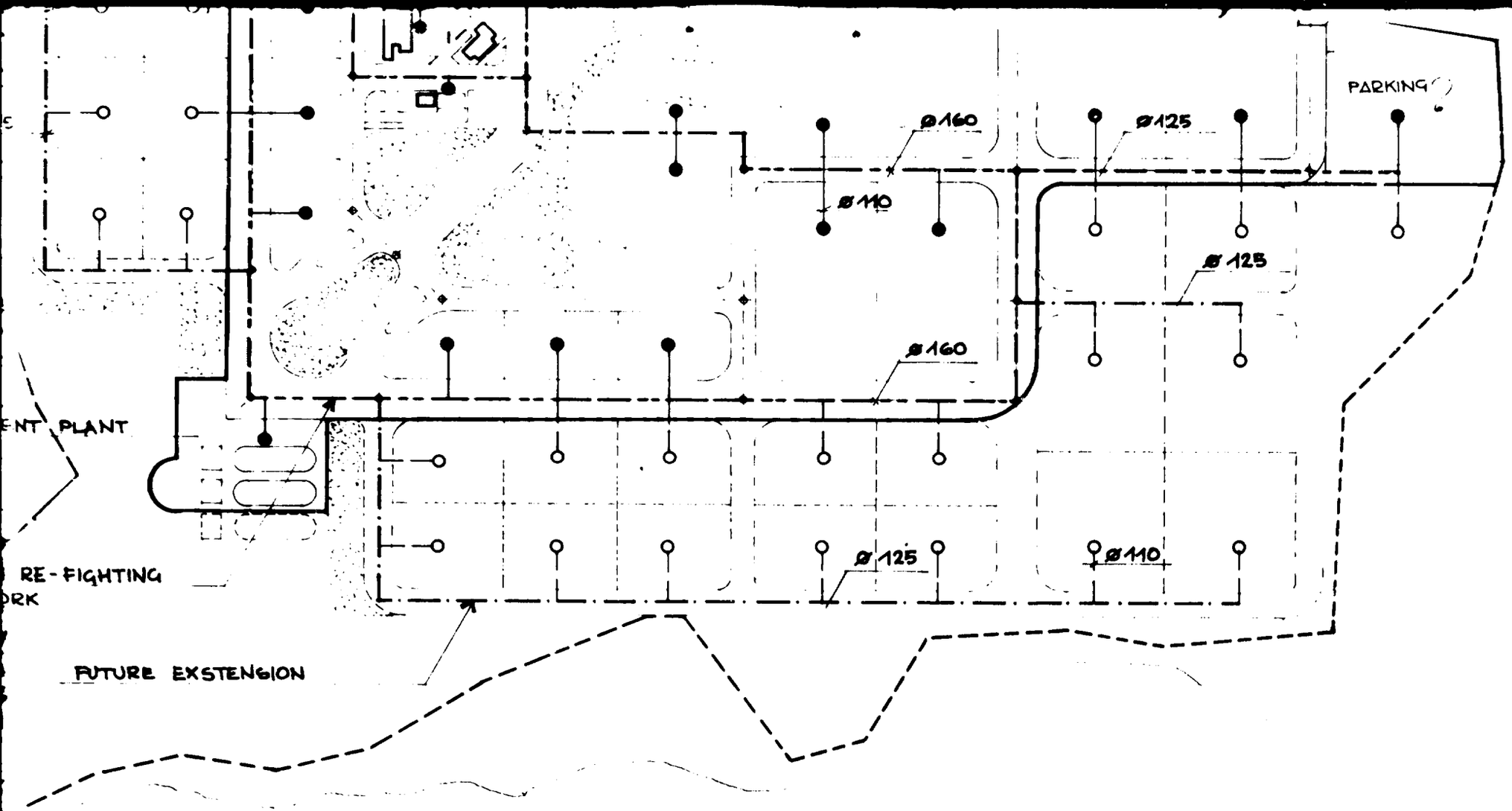
WATER DISTRIBUT



LEGEND

- FIRE FIGHTING NETWORK (1° PHASE)
- FIRE FIGHTING NETWORK (2° PHASE)
- FIRE HYDRANT (1° PHASE)
- FIRE HYDRANT (2° PHASE)


Ø 110
SERVICE LINE
TO FACTORIES
SECTION 2
Ø 125
Ø 200
Ø 160
SERVICE LINE
TO BUILDINGS
Ø 110
EXISTING ABATTOIR
EXISTING MARKET
Ø 160
PARKING ?
Ø 160
Ø 125
Ø 110
Ø 125
Ø 160
NT PLANT
RE-FIGHTING
RK
Ø 125
Ø 110

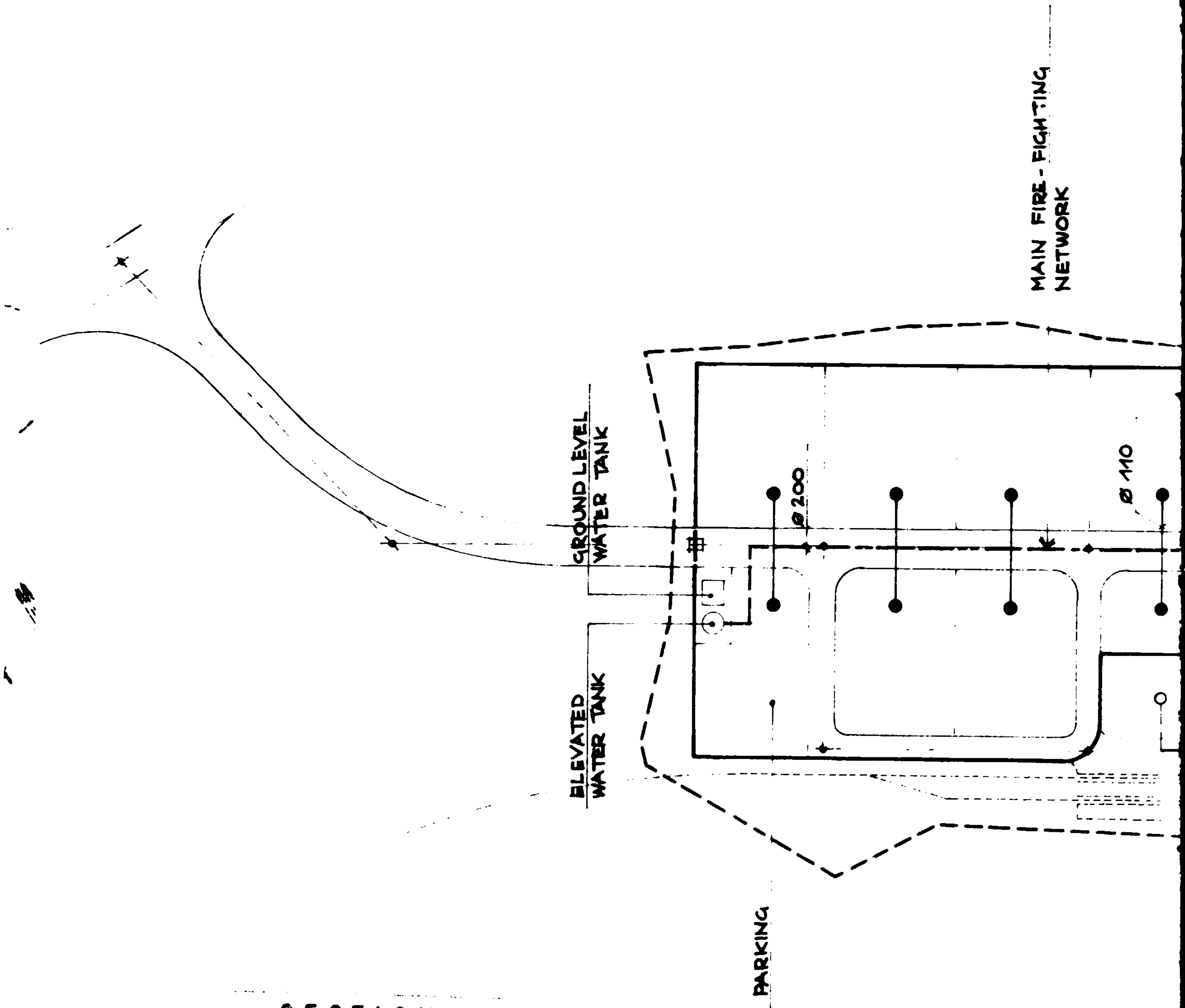


SECTION 3

0 40m 120m 200m
20m 80m 160m

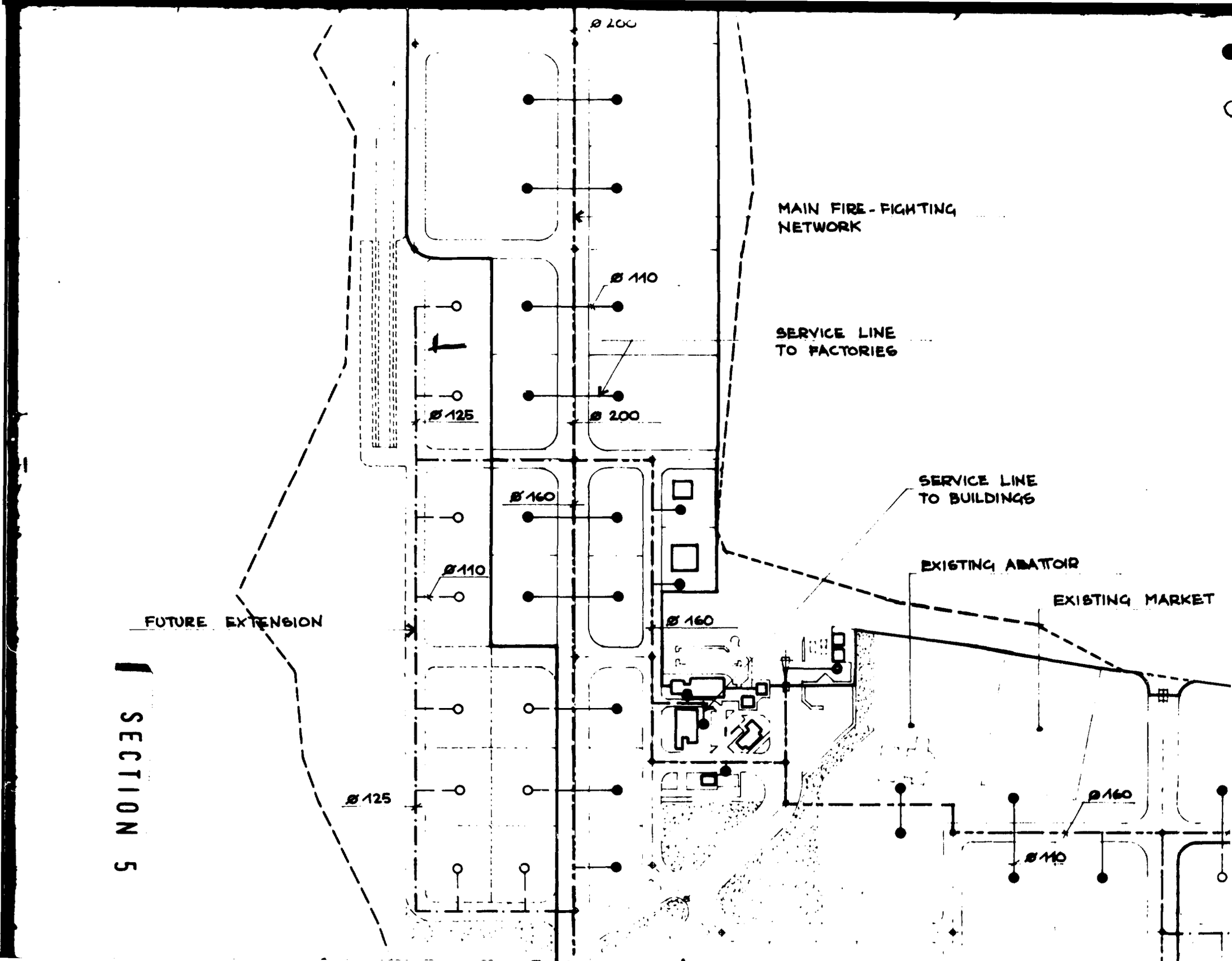
NORTH

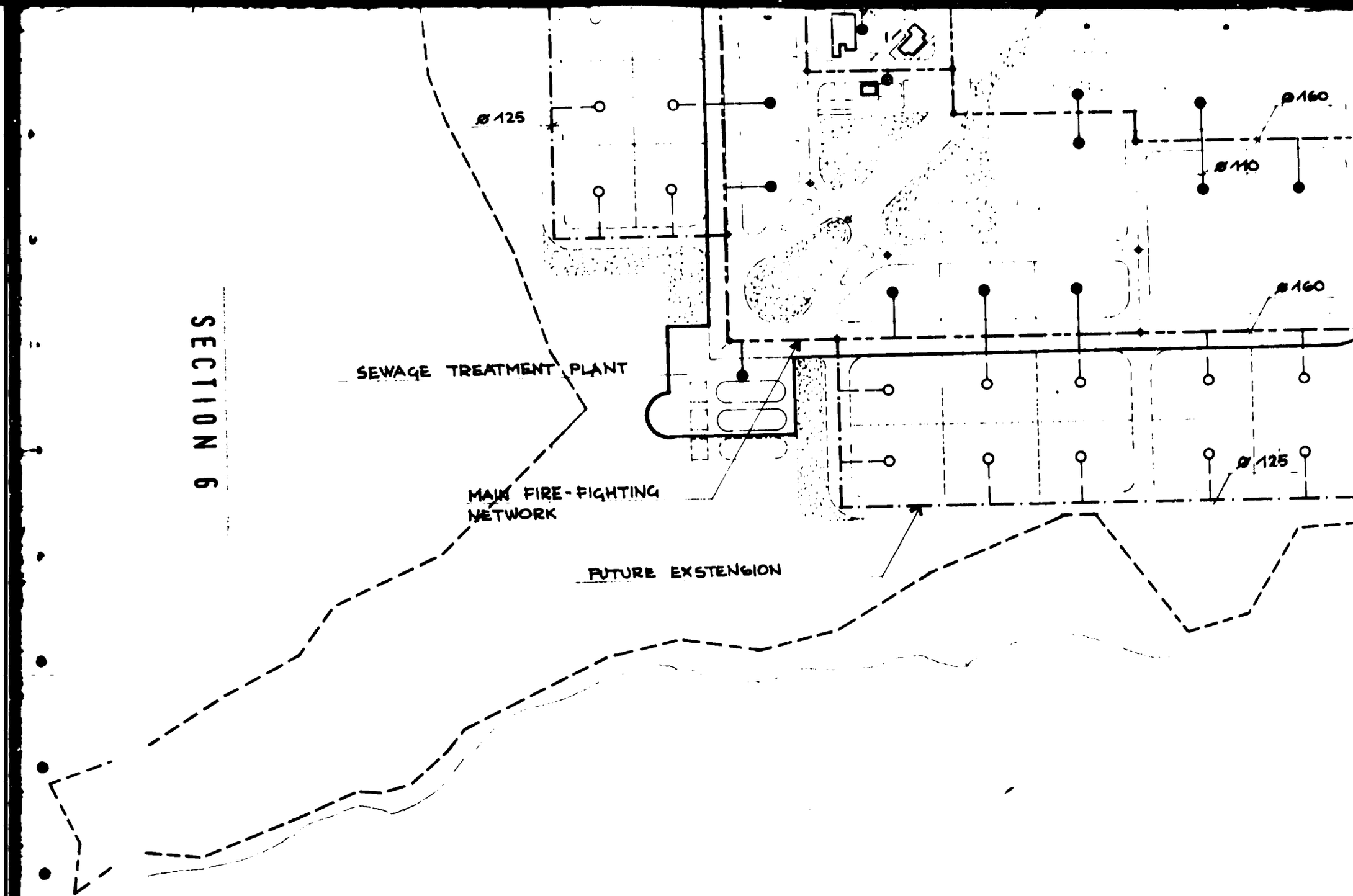
FIRE FIGHTING NETWORK



MAIN FIRE - FIGHTING NETWORK
GROUND LEVEL WATER TANK
ELEVATED WATER TANK
Ø 200
Ø 110
PARKING

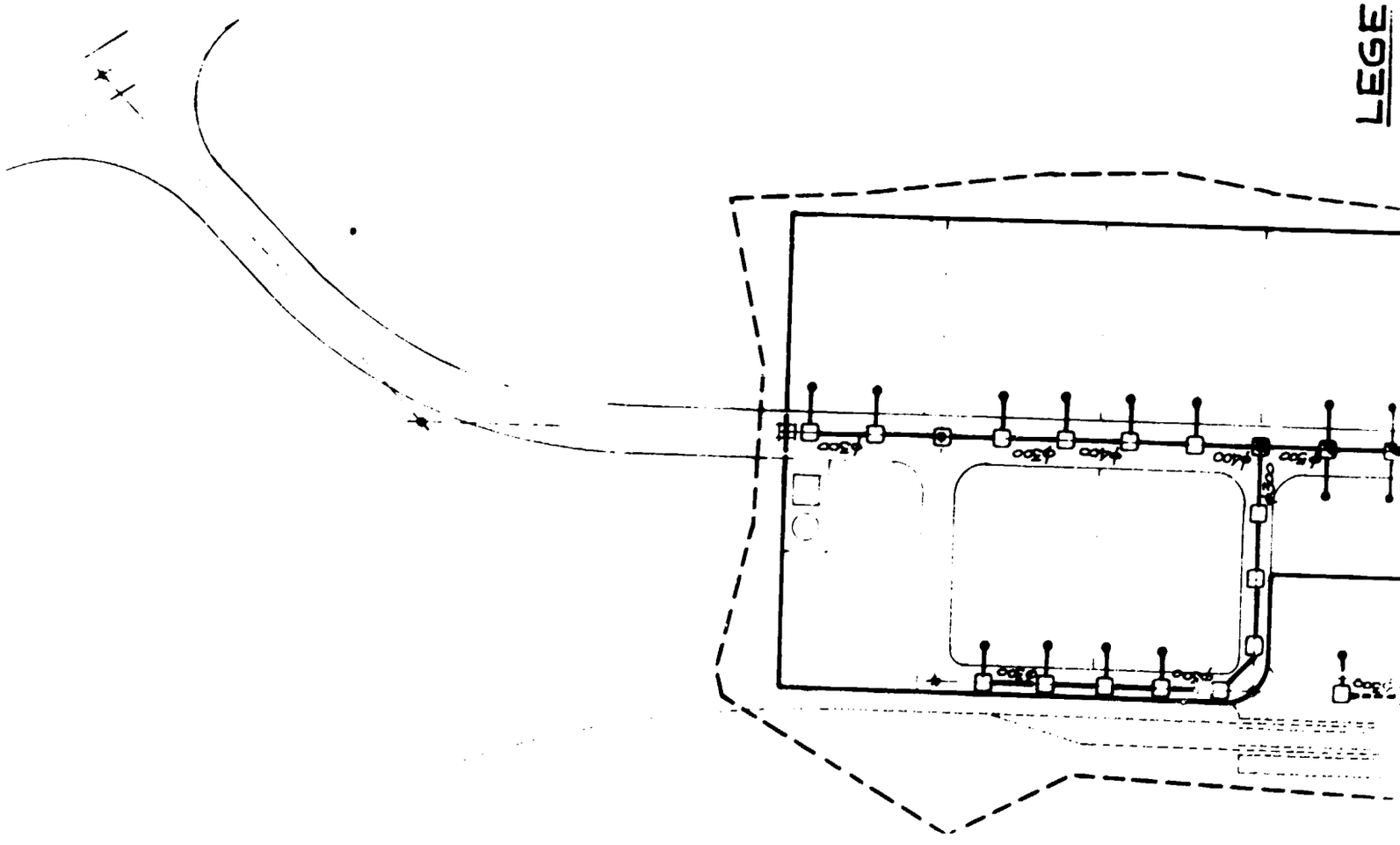
SECTION 4

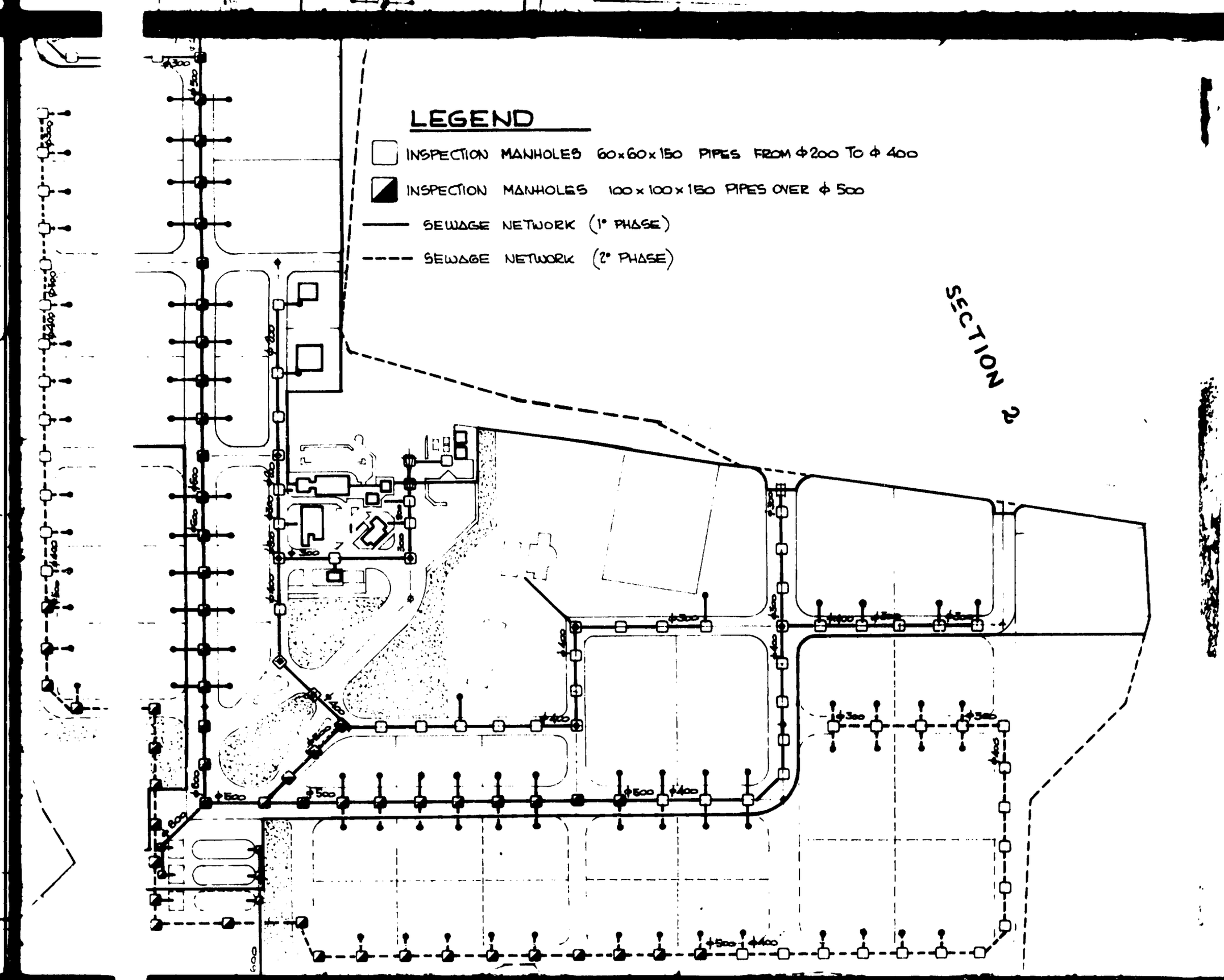

Ø 200
MAIN FIRE-FIGHTING NETWORK
Ø 110
SERVICE LINE TO FACTORIES
Ø 125
Ø 200
Ø 160
SERVICE LINE TO BUILDINGS
Ø 110
EXISTING ABATTOIR
EXISTING MARKET
FUTURE EXTENSION
Ø 160
Ø 125
Ø 160
Ø 110
SECTION 5

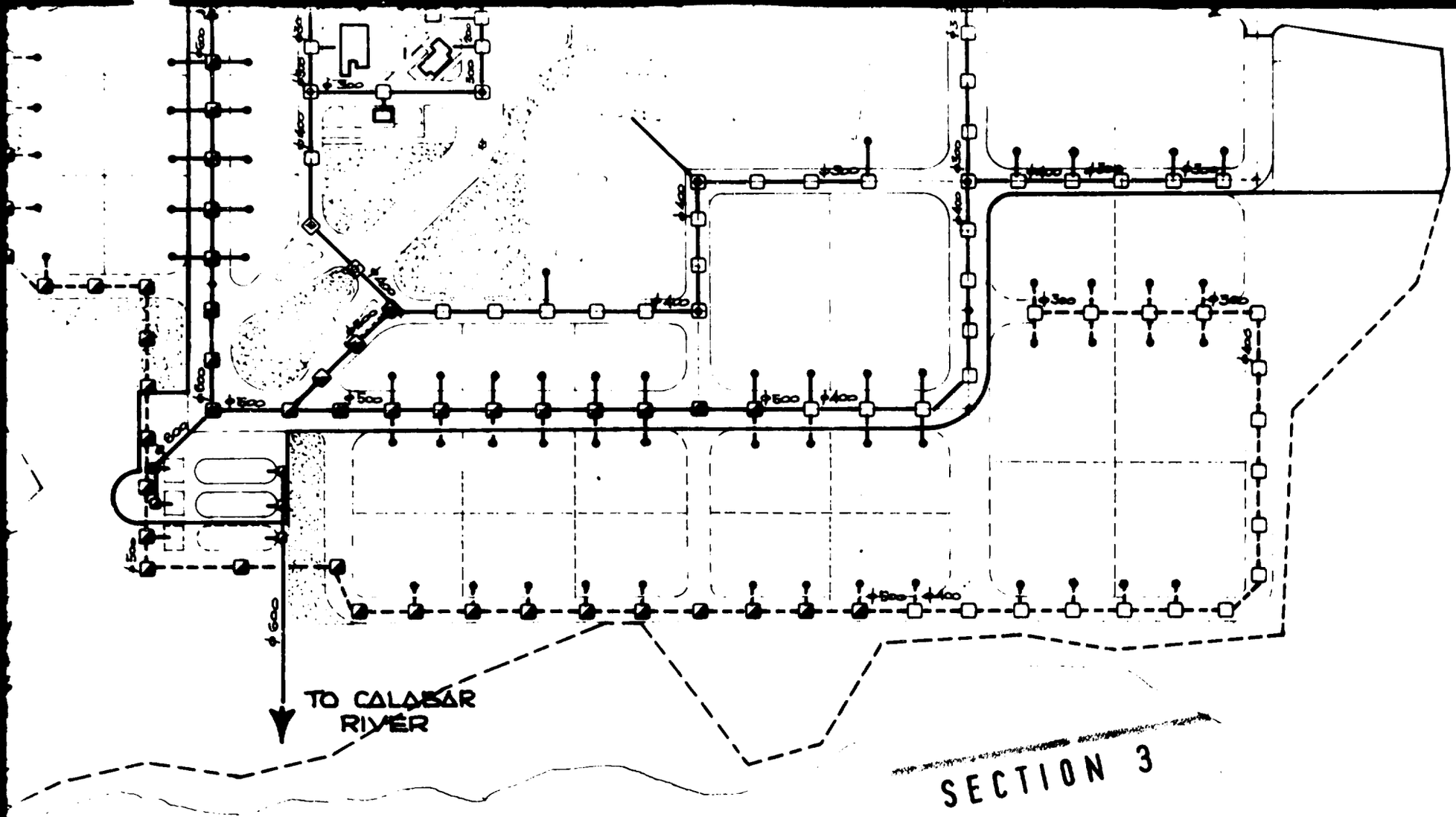

Ø 125
Ø 160
Ø 110
Ø 160
Ø 125
SEWAGE TREATMENT PLANT
MAIN FIRE-FIGHTING NETWORK
FUTURE EXSTENSION
SECTION 6

FIRE FIGHT

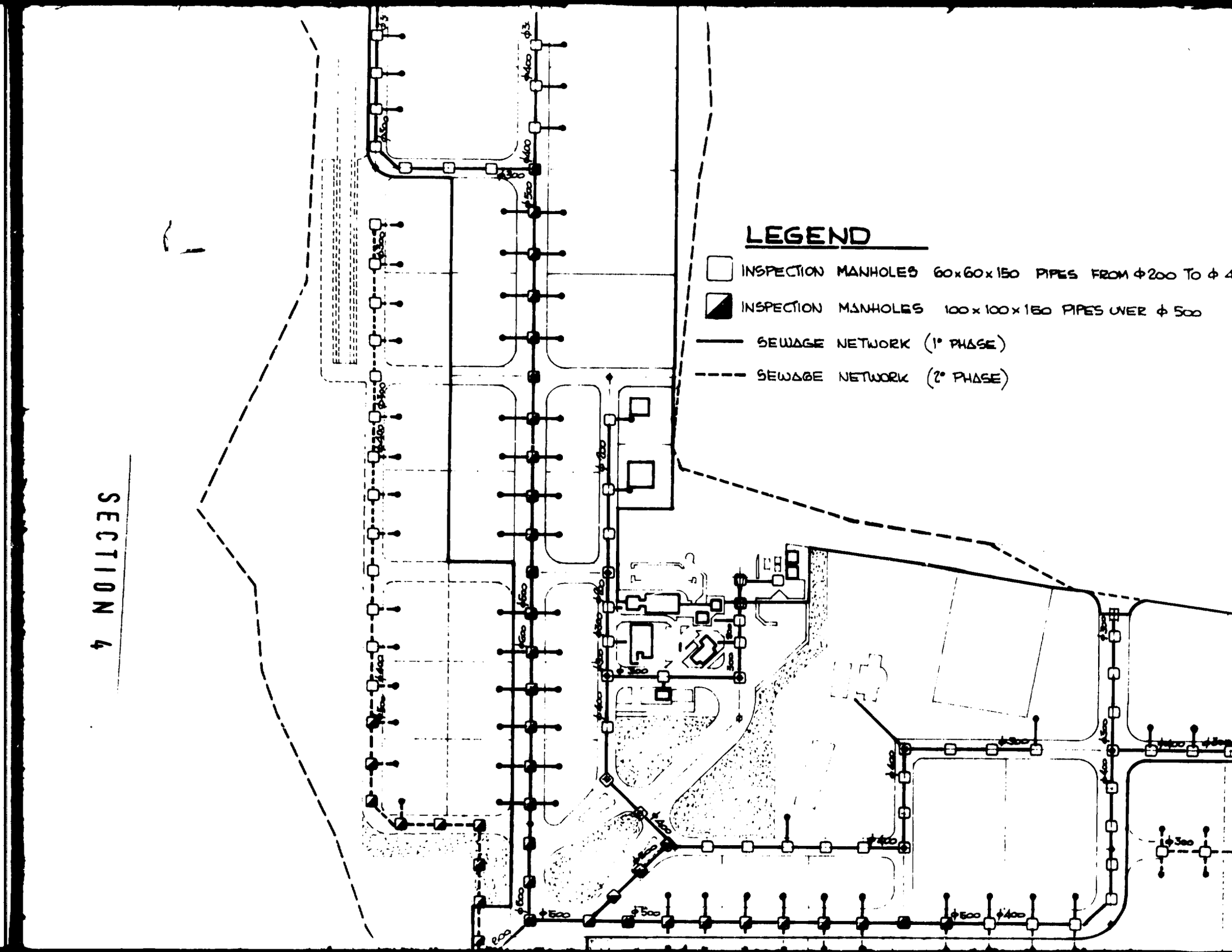
SECTION 1

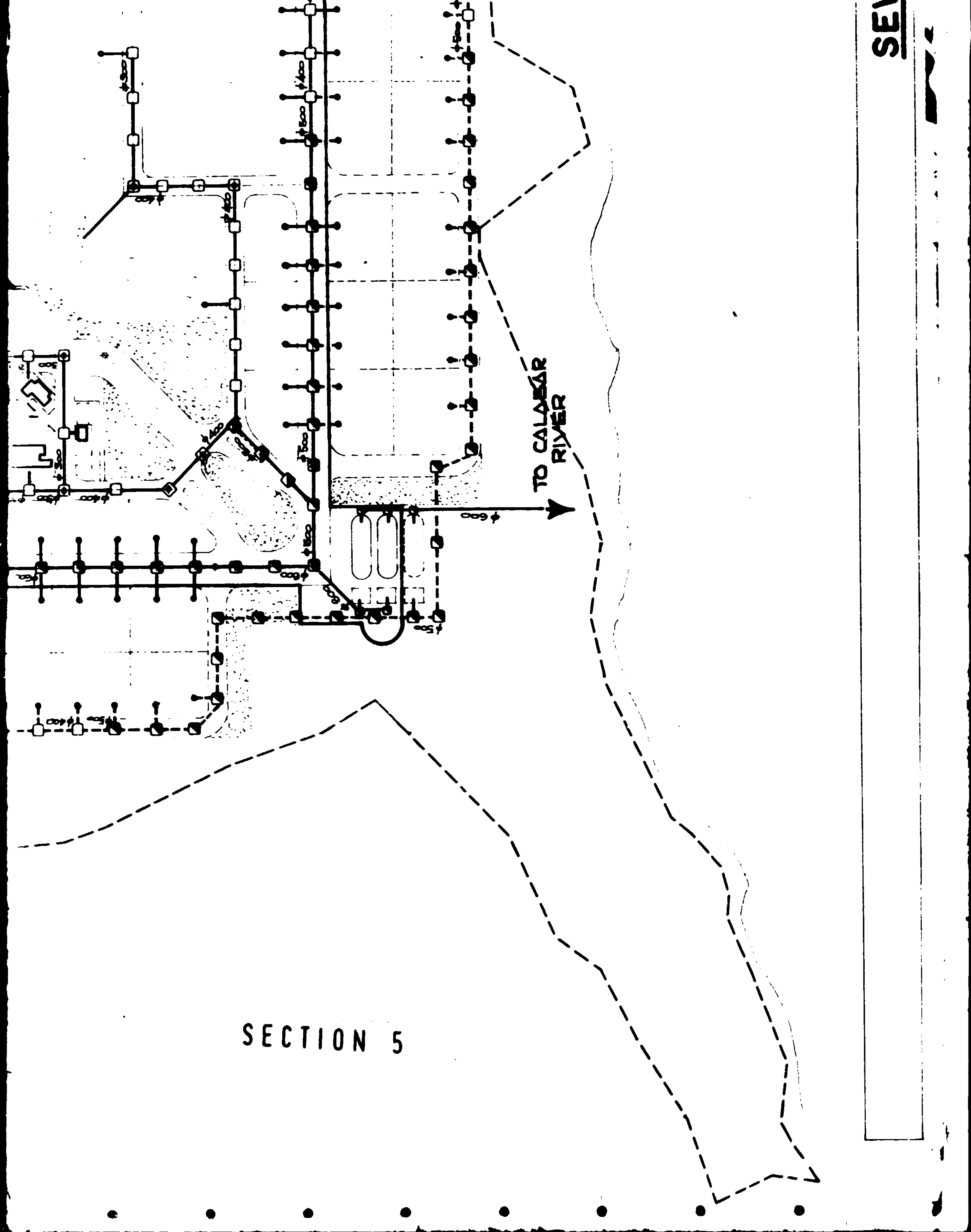



LEGEND
INSPECTION MANHOLES 60x60x150 PIPES FROM Φ200 TO Φ 400
INSPECTION MANHOLES 100x100x150 PIPES OVER Φ 500
SEWAGE NETWORK (1° PHASE)
SEWAGE NETWORK (2° PHASE)
SECTION 2

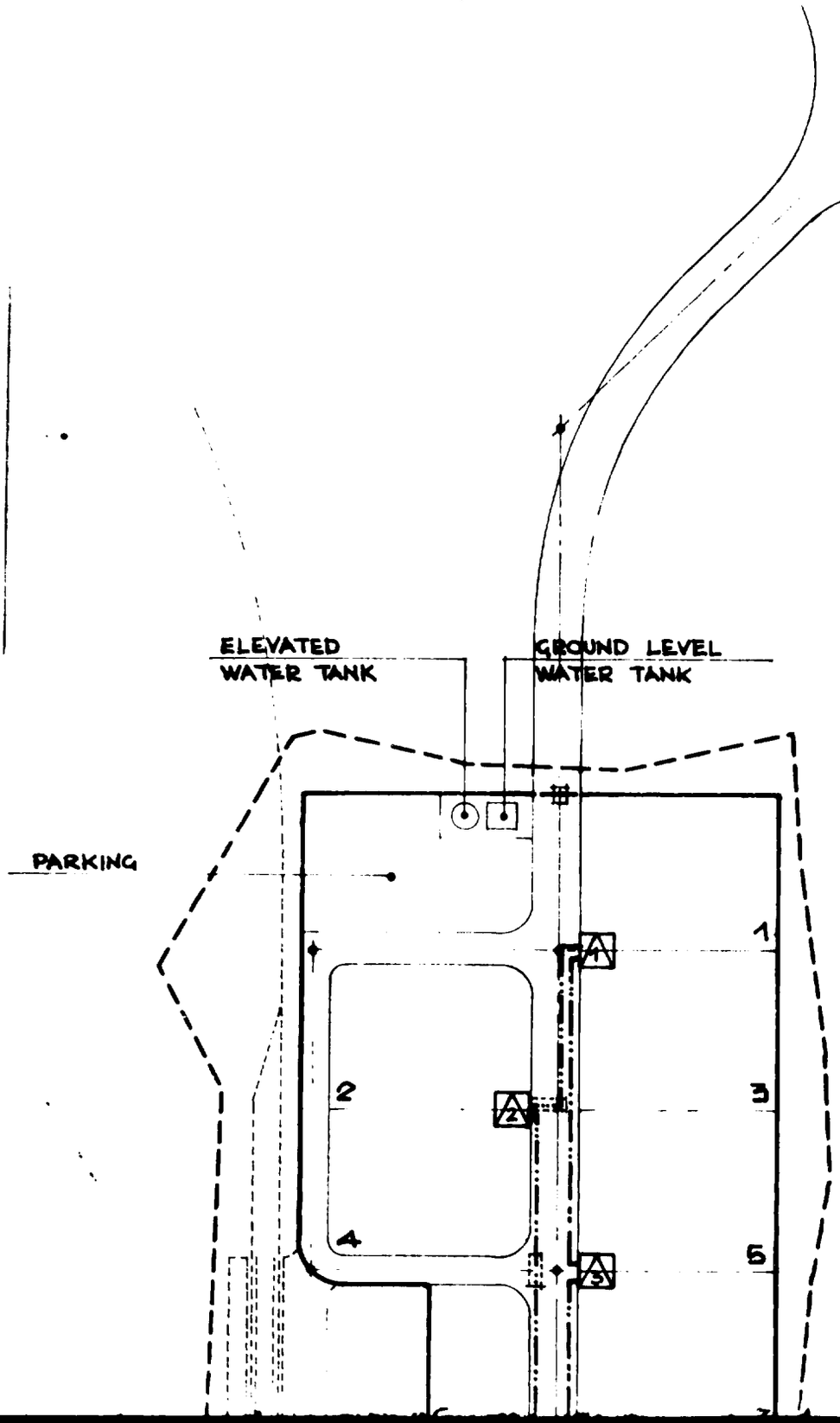


SEWAGE NETWORK


LEGEND
INSPECTION MANHOLES 60x60x150 PIPES FROM ϕ200 TO ϕ 4
INSPECTION MANHOLES 100x100x150 PIPES OVER ϕ 500
SEWAGE NETWORK (1° PHASE)
SEWAGE NETWORK (2° PHASE)
SECTION 4


TO CALABAR RIVER
SECTION 5

SECTION 1



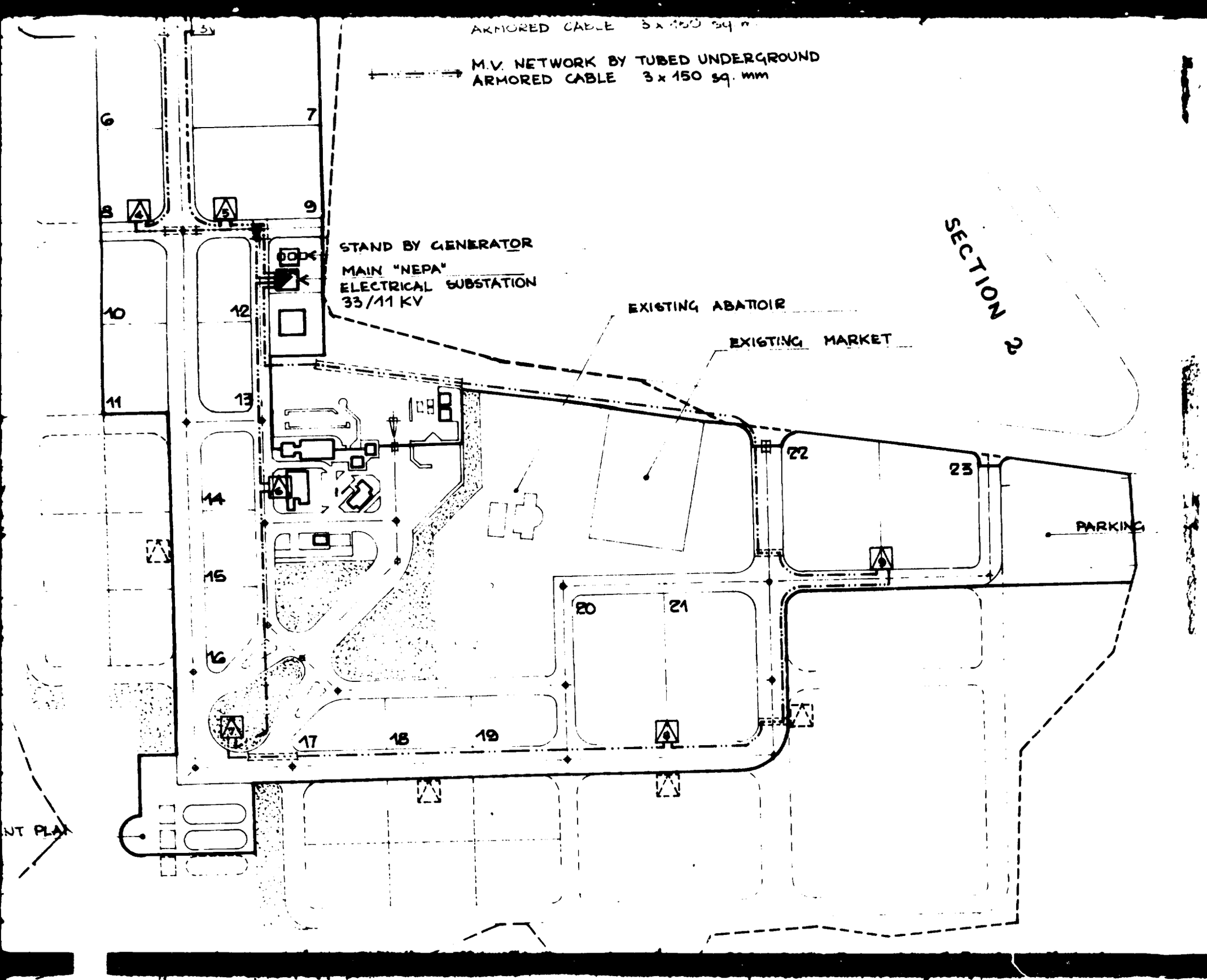
LEGEND

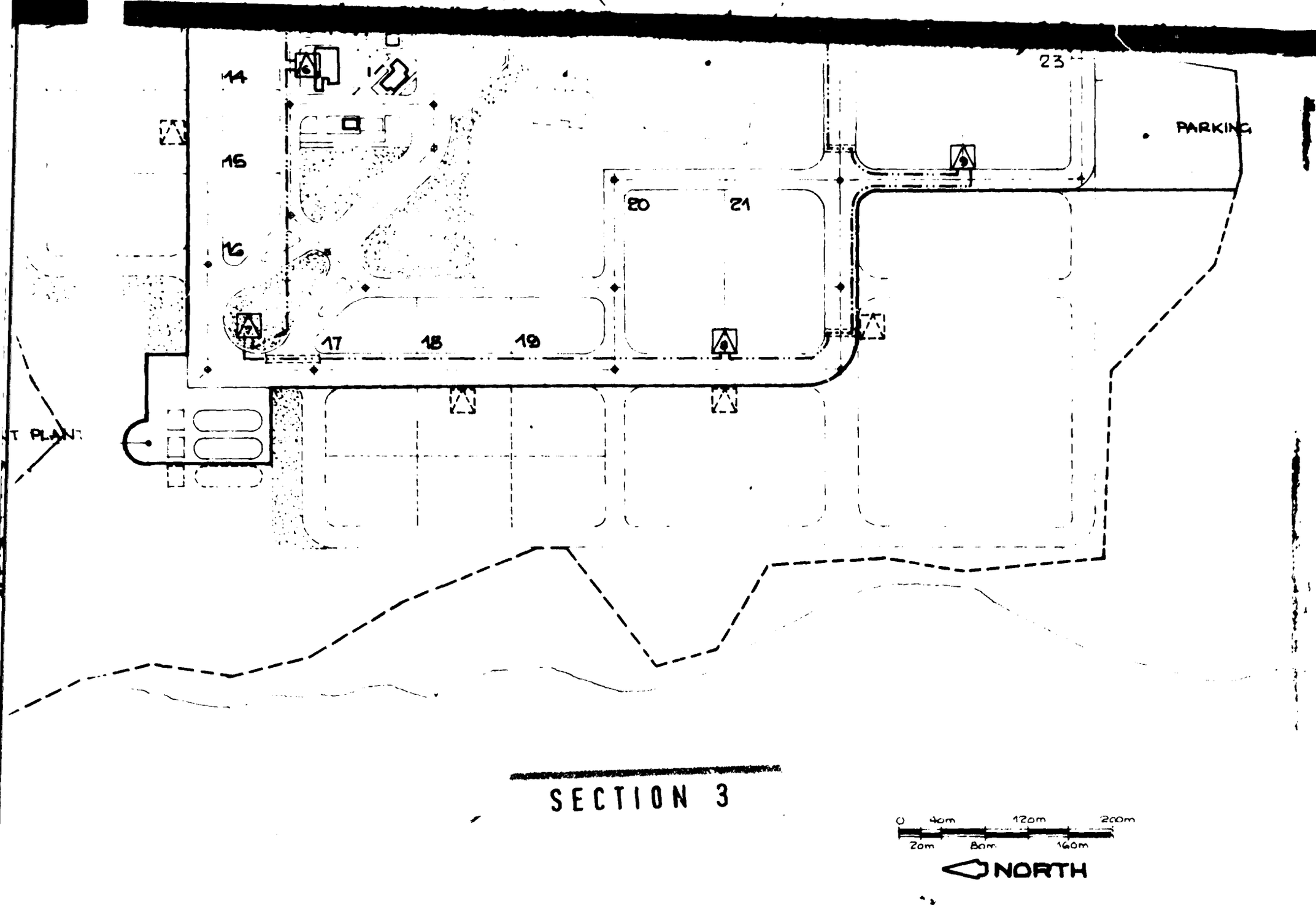
TRANSFORMER STATION (1° PHASE)

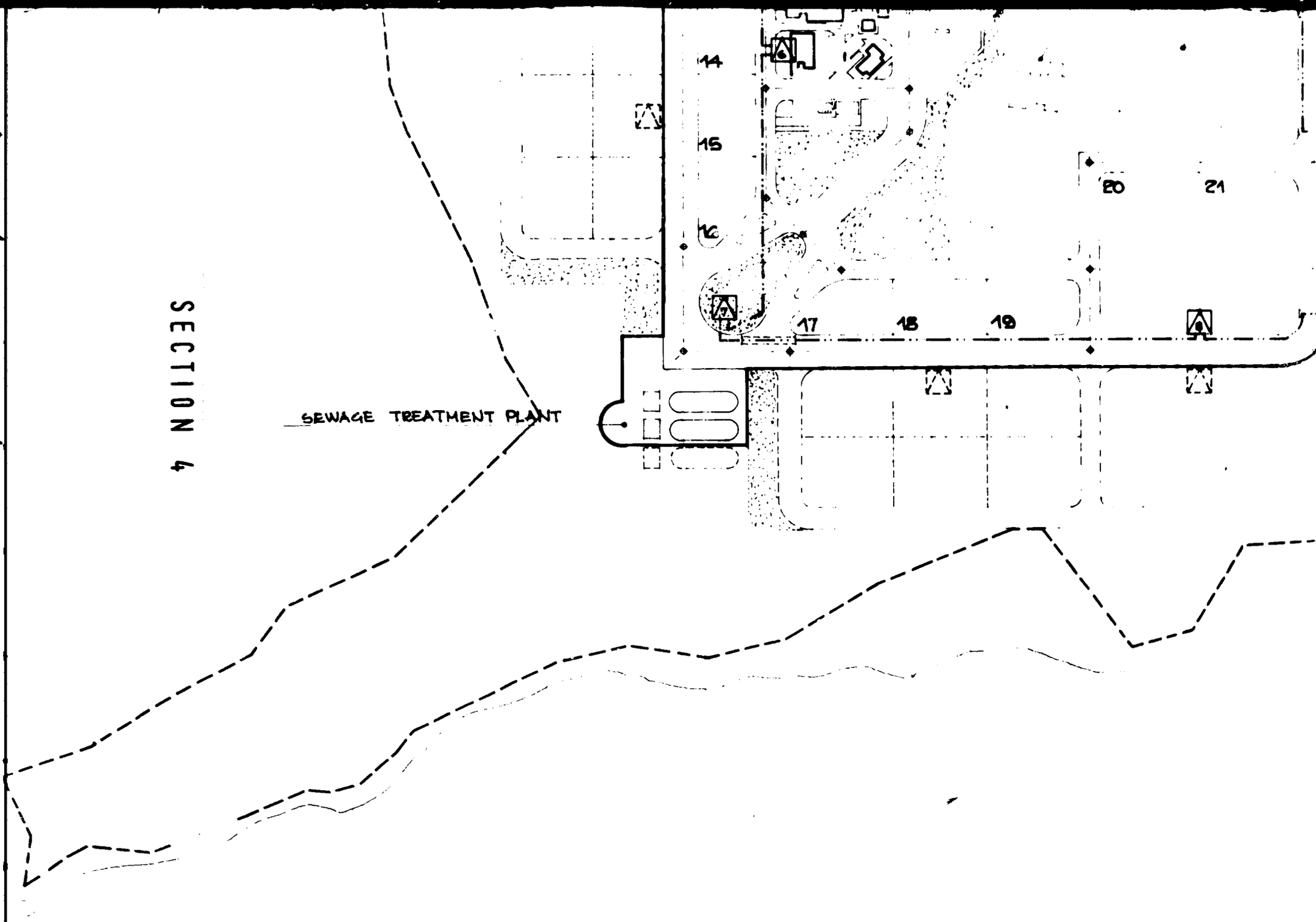
TRANSFORMER STATION (2° PHASE)

M.V. NETWORK BY UNDERGROUND ARMORED CABLE 3 x 150 sq. mm

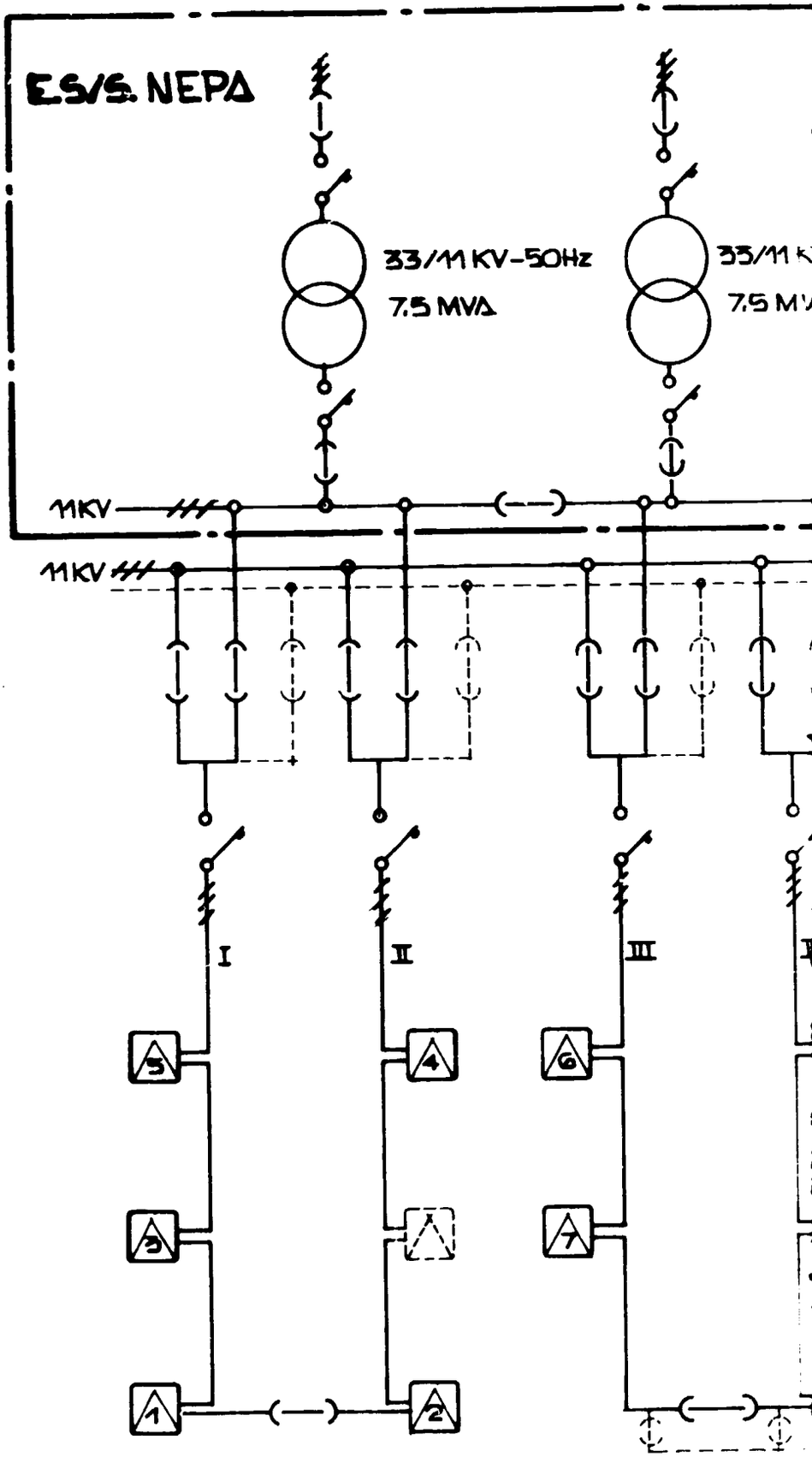
M.V. NETWORK BY TUBED UNDERGROUND ARMORED CABLE 3 x 150 sq. mm


ARMORED CABLE 3 x 150 sq. mm
M.V. NETWORK BY TUBED UNDERGROUND
ARMORED CABLE 3 x 150 sq. mm
STAND BY GENERATOR
MAIN "NEPA"
ELECTRICAL SUBSTATION
33/11 KV
EXISTING ABATTOIR
EXISTING MARKET
SECTION 2
PARKING
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

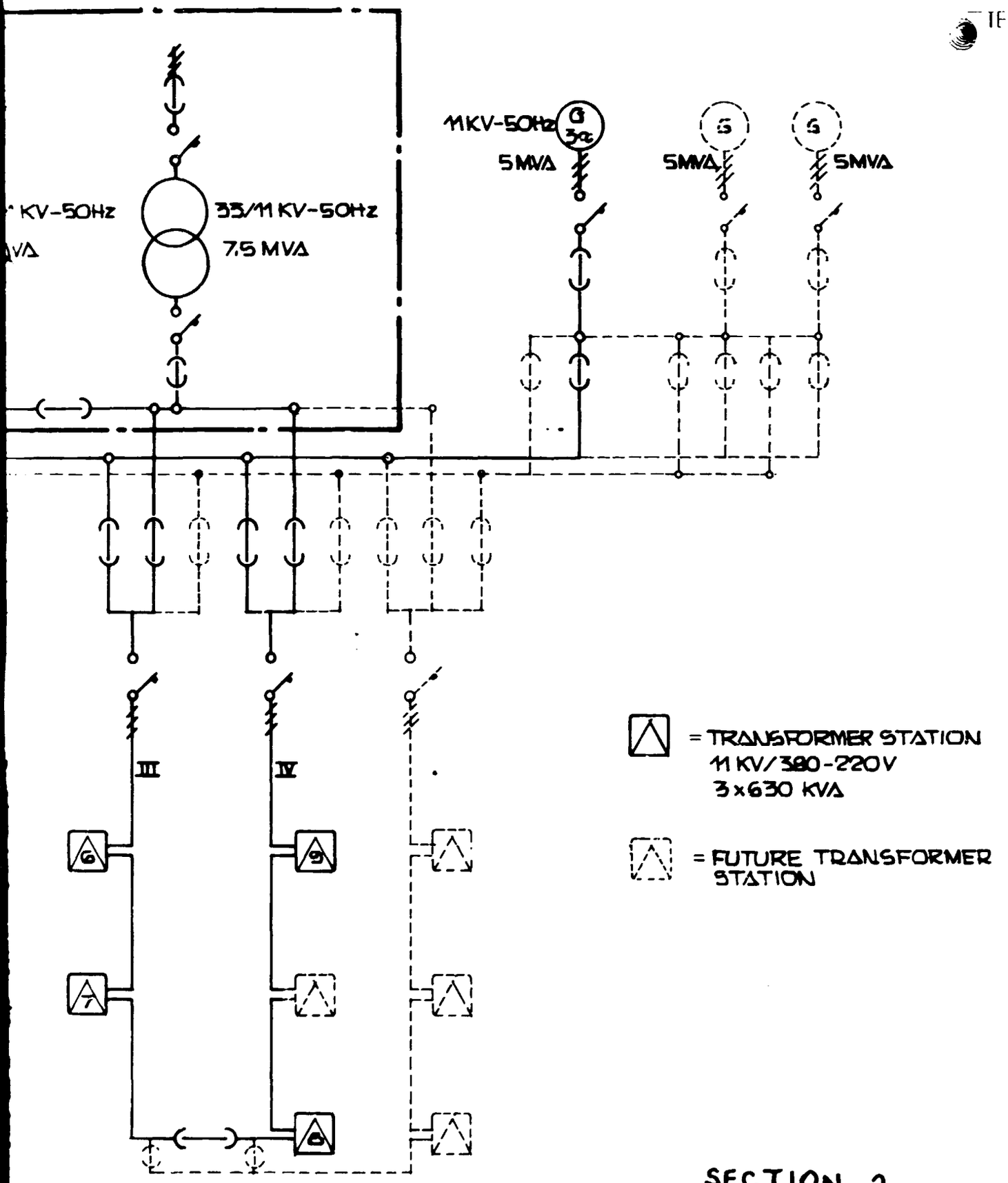

14
15
16
17
18
19
20
21
23
PARKING
T PLANT
SECTION 3
0 40m 120m 200m
20m 80m 160m
NORTH



MEDIUM VOLTAGE DISTRIBUTION NETW


E.S/S. NEPA
33/11 KV-50Hz
7.5 MVA
33/11 K
7.5 MV
11KV
11KV
I
II
III
3
4
6
5
7
1
2

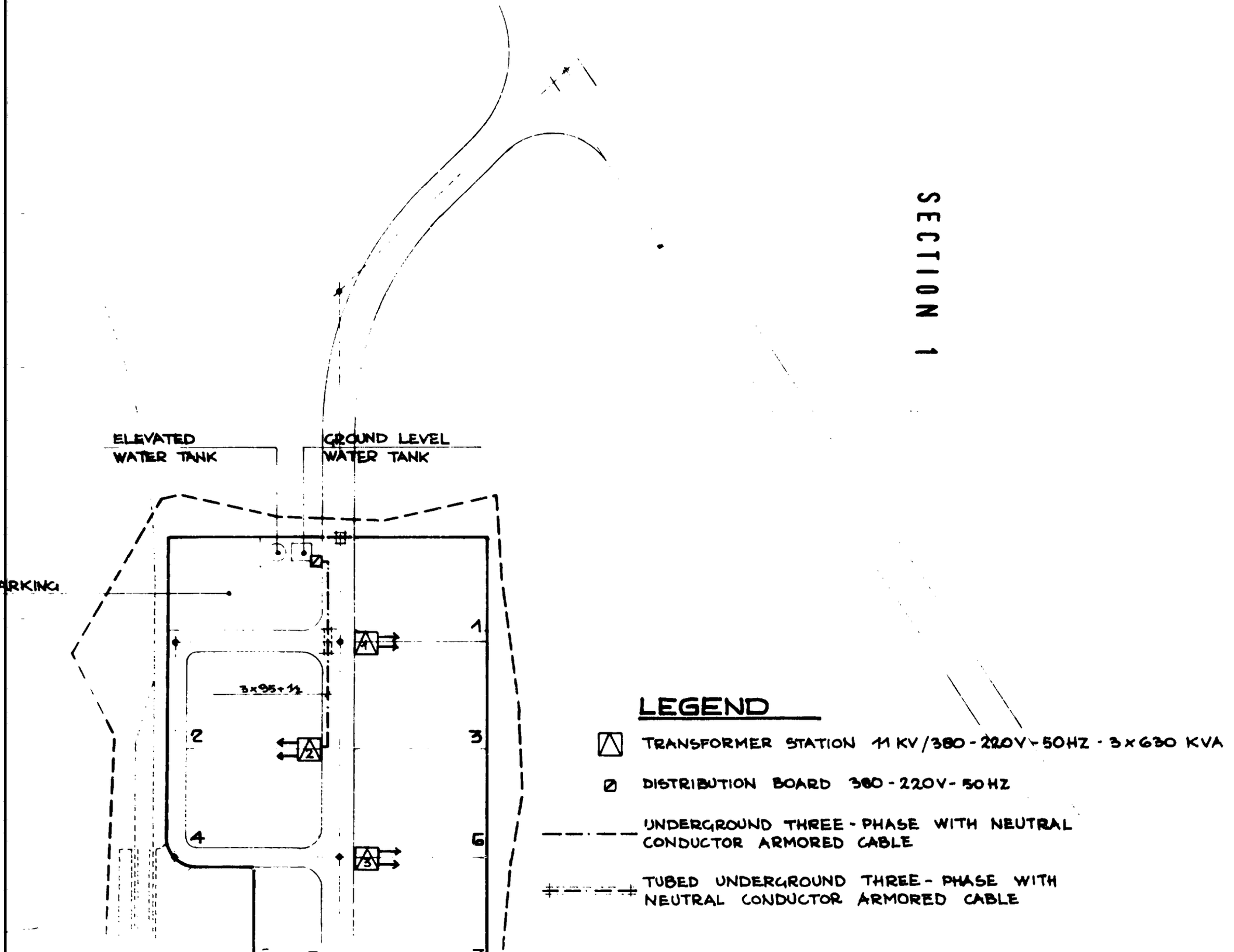
SECTION 1

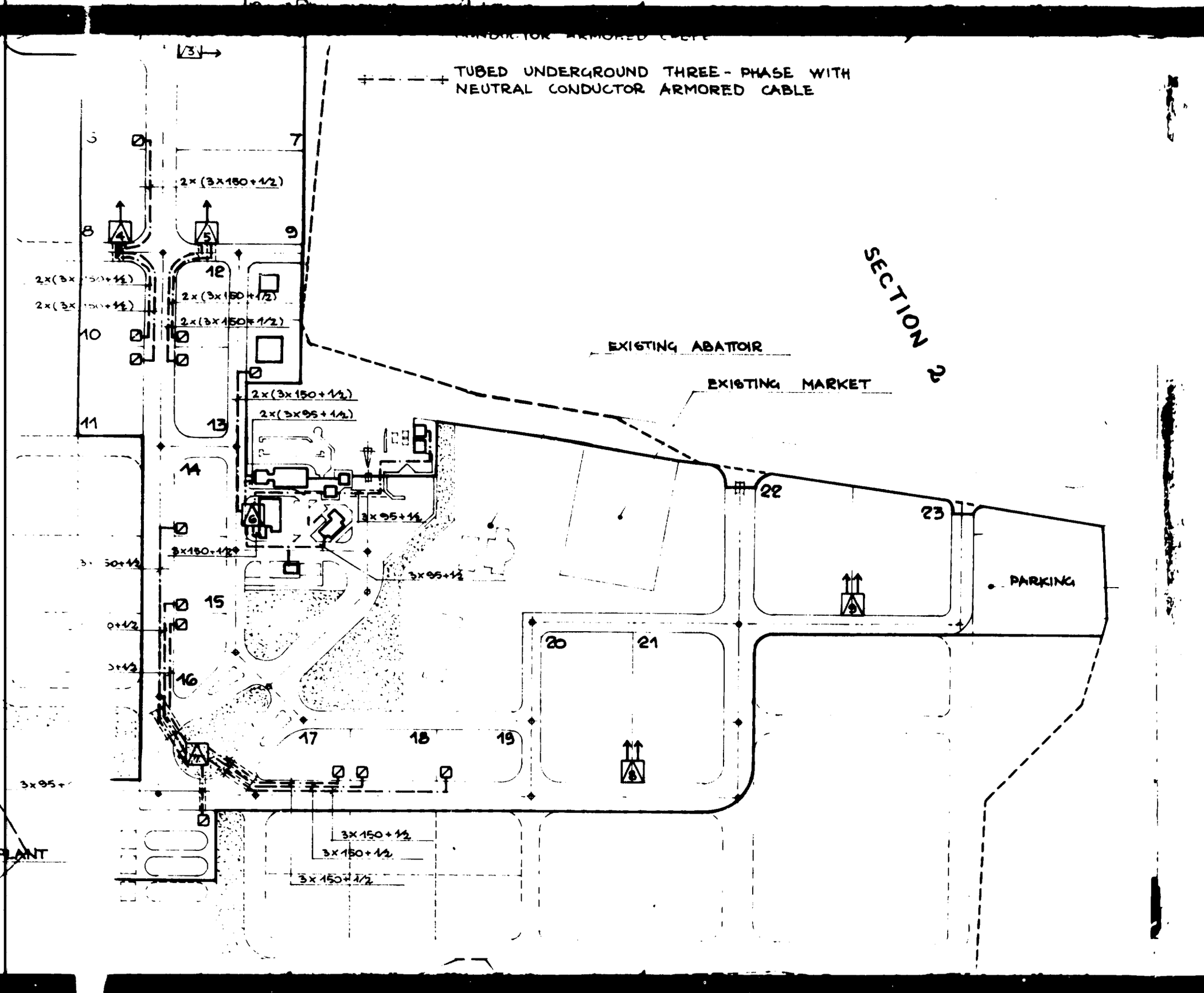


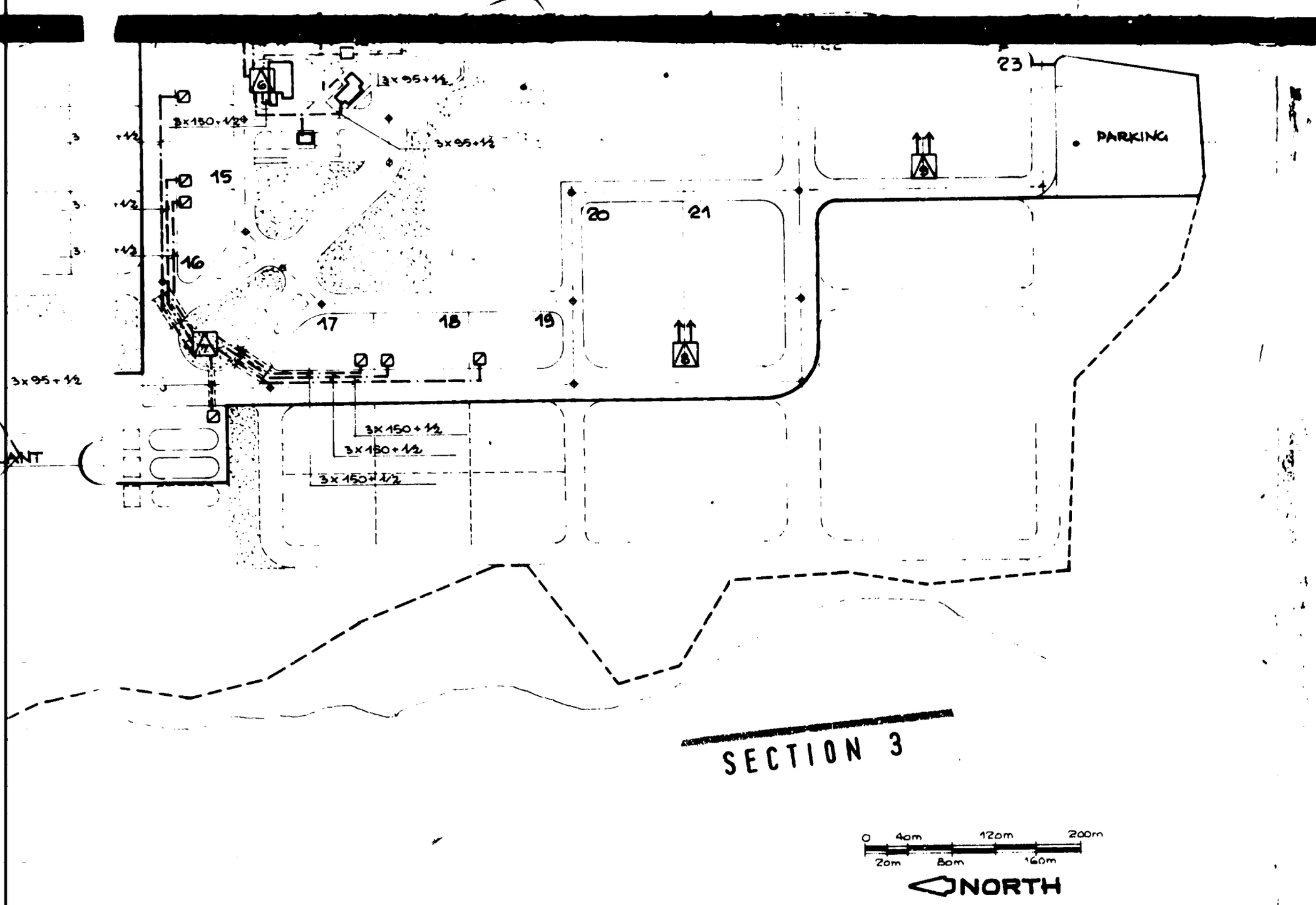
SECTION 2

M.V. ONE-LINE DIAGRAM

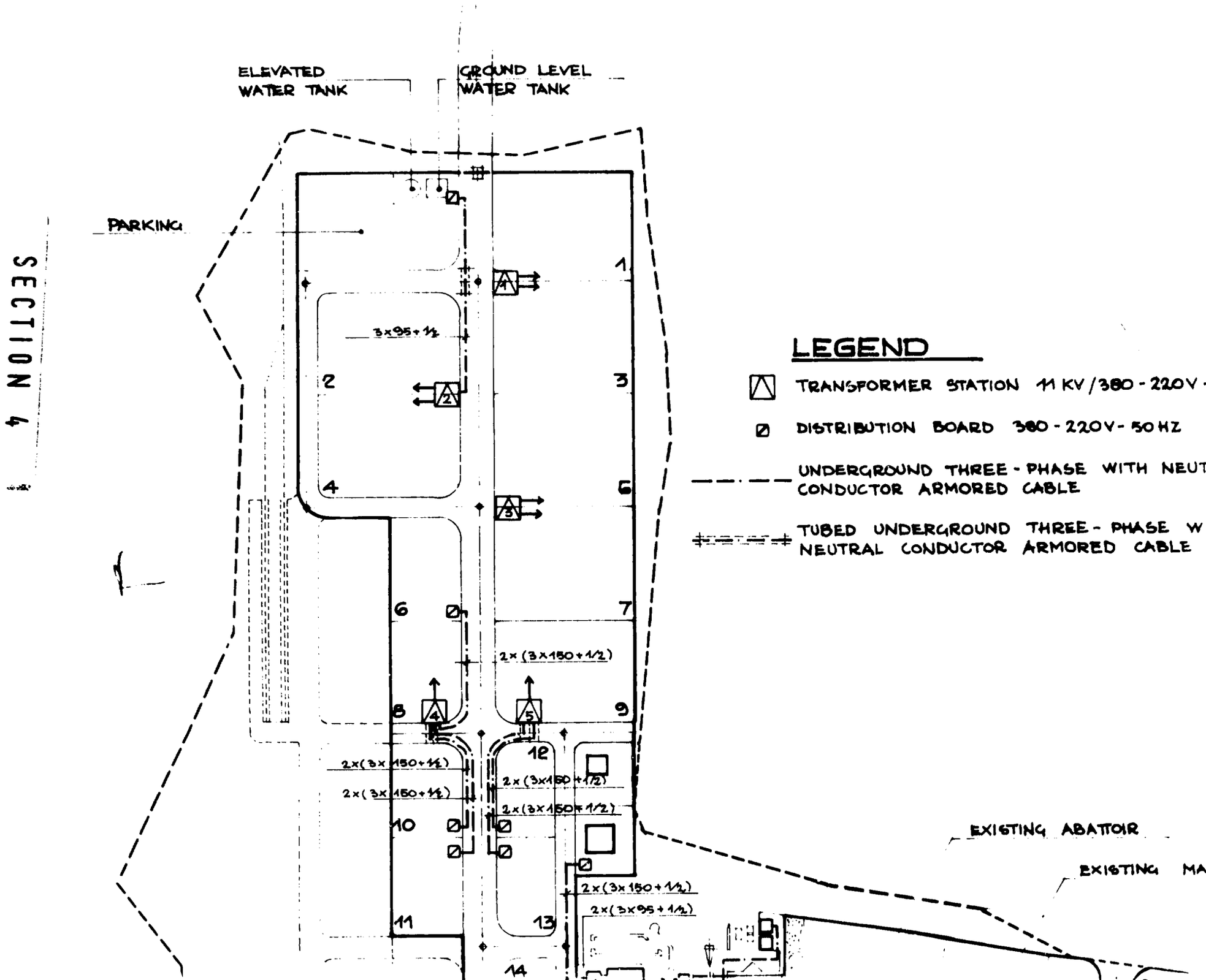
SECTION 1

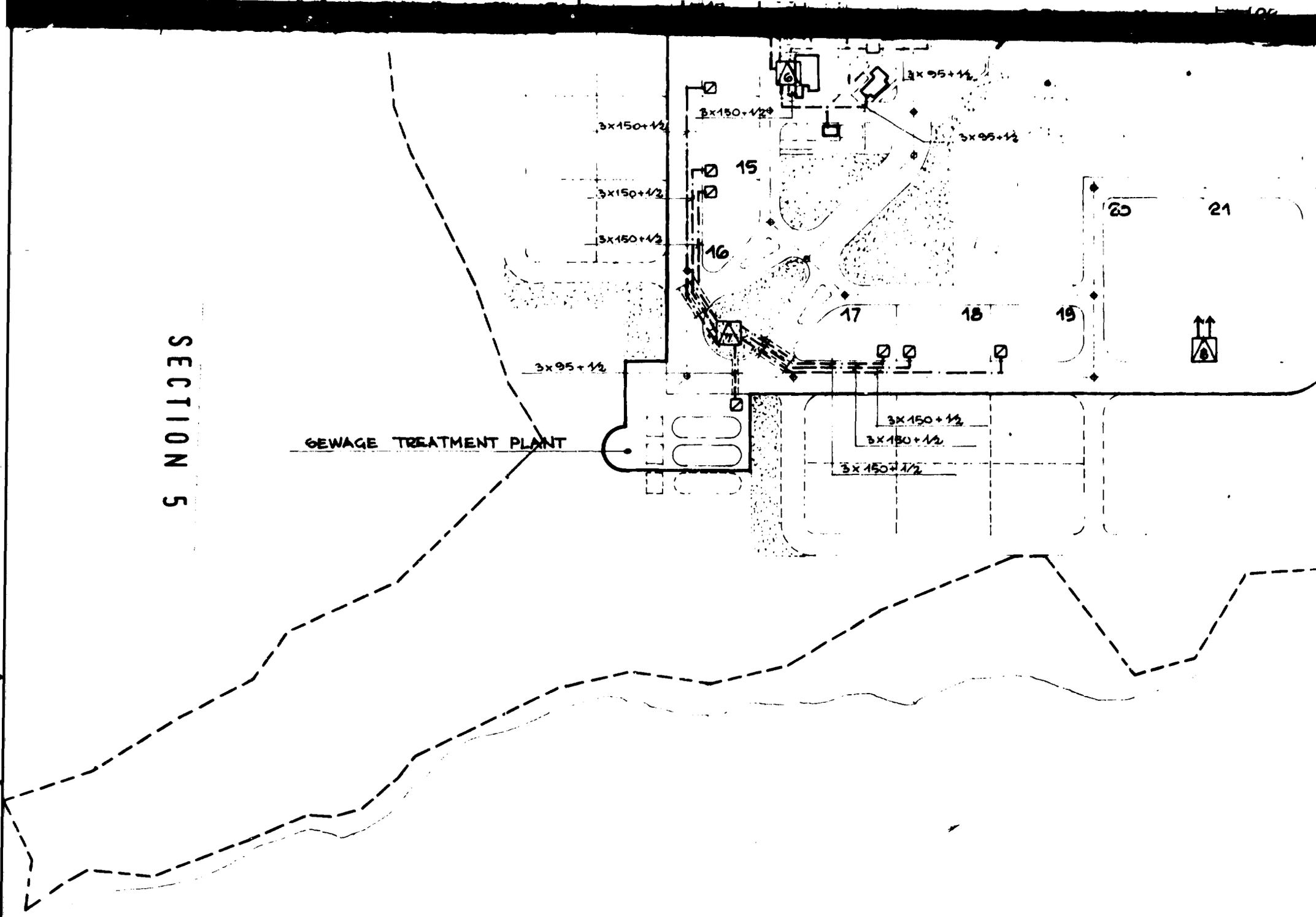

ELEVATED WATER TANK
GROUND LEVEL WATER TANK
RKING
3x95+1½
1
2
3
4
6
1
2
3
4
LEGEND
TRANSFORMER STATION 11 KV/380-220V-50HZ - 3x630 KVA
DISTRIBUTION BOARD 380-220V-50HZ
UNDERGROUND THREE-PHASE WITH NEUTRAL CONDUCTOR ARMORED CABLE
TUBED UNDERGROUND THREE-PHASE WITH NEUTRAL CONDUCTOR ARMORED CABLE


TUBED UNDERGROUND THREE-PHASE WITH NEUTRAL CONDUCTOR ARMORED CABLE
SECTION 2
EXISTING ABATTOIR
EXISTING MARKET
PARKING
2x(3x150+1½)
3x95+1½
3x150+1½
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23


23
PARKING
3x95+1½
3x150+1½
15
16
17
18
19
20
21
3x95+1½
3x150+1½
3x150+1½
3x150+1½
0 40m 120m 200m
20m 80m 160m
NORTH

SECTION 3


ELEVATED WATER TANK
GROUND LEVEL WATER TANK
PARKING
SECTION 4
3x95+1½
2x(3x150+1½)
2x(3x150+1½)
2x(3x150+1½)
2x(3x150+1½)
2x(3x150+1½)
2x(3x95+1½)
EXISTING ABATTOIR
EXISTING MA
LEGEND
TRANSFORMER STATION 11 KV/380-220V
DISTRIBUTION BOARD 380-220V-50HZ
UNDERGROUND THREE-PHASE WITH NEUT CONDUCTOR ARMORED CABLE
TUBED UNDERGROUND THREE-PHASE W NEUTRAL CONDUCTOR ARMORED CABLE



LOW VOLTAGE DISTRIBUTION NETWORK

TRANS. STATION	LOW VOLTAGE DISTRIBUTION	LOAD	CONNECTION
1	PLOT 1 " 3	700 KW 700 KW	* SEE NOTE
2	PLOT 2 " 4 WATER TANK	700 KW 700 KW 120 KW	* SEE NOTE CABLE (3x95+1/2) mm2
3	PLOT 5 " 7 FENCE LIGHTING	700 KW 700 KW	* SEE NOTE
4	PLOT 8 " 6 " 10 " 11 FENCE LIGHTING STREET LIGHTING	350 KW 350 KW 350 KW 350 KW	* SEE NOTE 2 N° CABLES (3x150+1/2) mm2 " " " " " "
5	PLOT 9 " 12 " 13 STREET LIGHTING (ZONE "A")	700 KW 350 KW 350 KW	* SEE NOTE 2 N° CABLES (3x150+1/2) mm2 " " "
6	MAINTENANCE WORKSHOP ADMINISTRATION BLDG. MESS HALL POST OFFICE AND FIRE STATION	350 KW 300 KW 200 KW 150 KW	2 N° CABLES (3x150+1/2) mm2 " " " (3x95+1/2) mm2 " "

TRANS. STATION
6
7
8
9

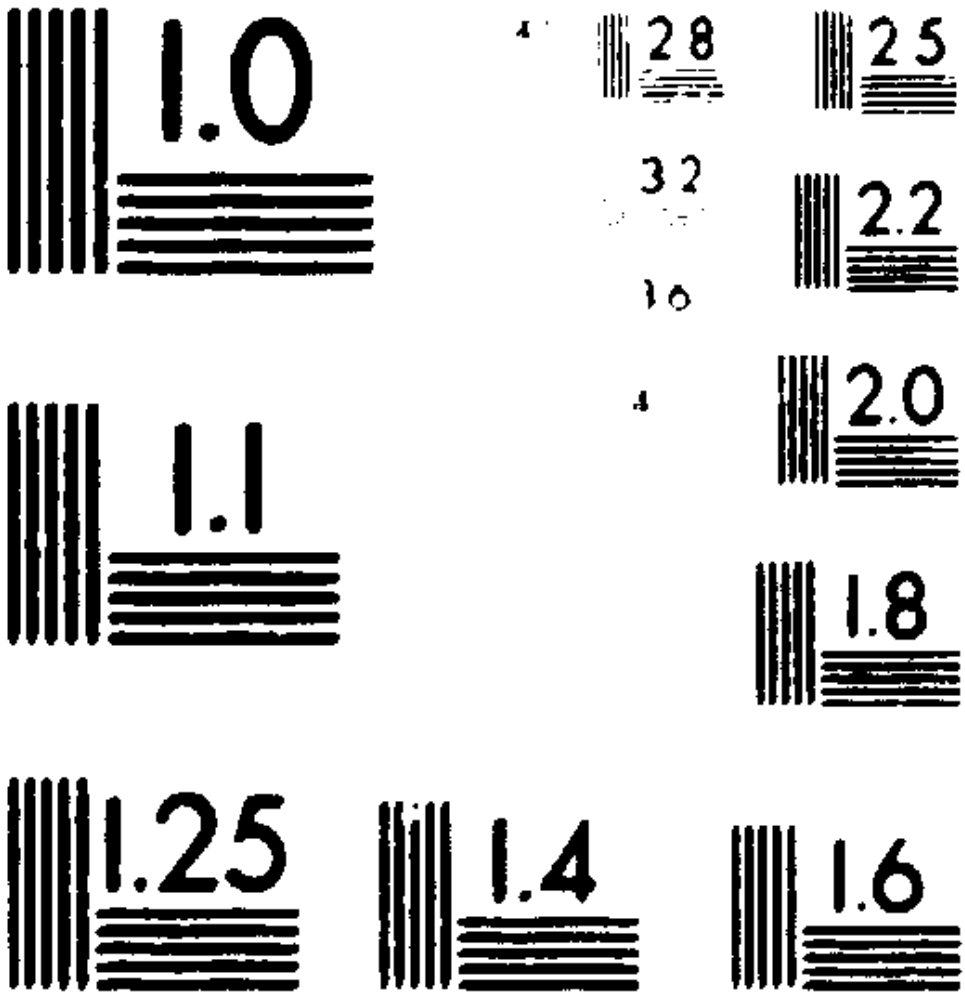
NOTE =

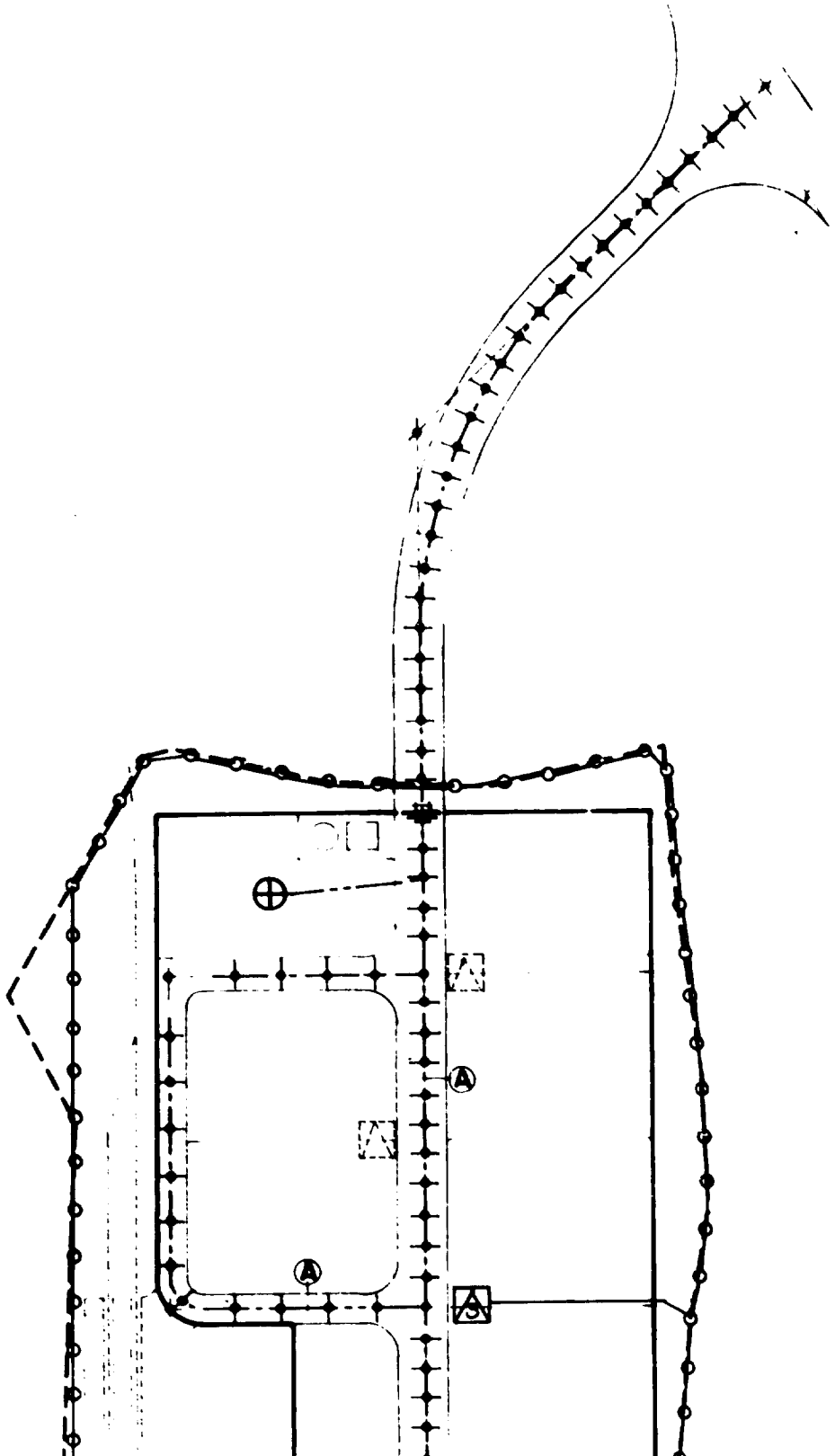
SECTION 1

TRANS. STATION	LOW VOLTAGE DISTRIBUTION	LOAD	CONNECTION
6	POLICE STATION - CUSTOMS PETROL FILLING STATION STREET LIGHTING (ZONE "B")	150 KW	CABLE (3x95+1/2) mm2
7	PLOT 14 " 15 " 16 " 17 " 18 " 19 SEWAGE TREATMENT PLANT FENCE LIGHTING STREET LIGHTING (ZONE "B-C")	200 KW " " " " " 100 KW	CABLE (3x150+1/2) mm2 " " " " " " " " " " " (3x95+1/2) mm2
8	PLOT 20 " 21 STREET LIGHTING (ZONE "C") STREET LIGHTING (ZONE "D") FENCE LIGHTING	700 KW 700 KW	
9	PLOT 22 " 23 STREET LIGHTING (ZONE "D")	700 KW 700 KW	

NOTE = DIRECTLY FROM THE TRANSFORMER STATION LOW VOLTAGE SWITCH BOARD

SECTION 2

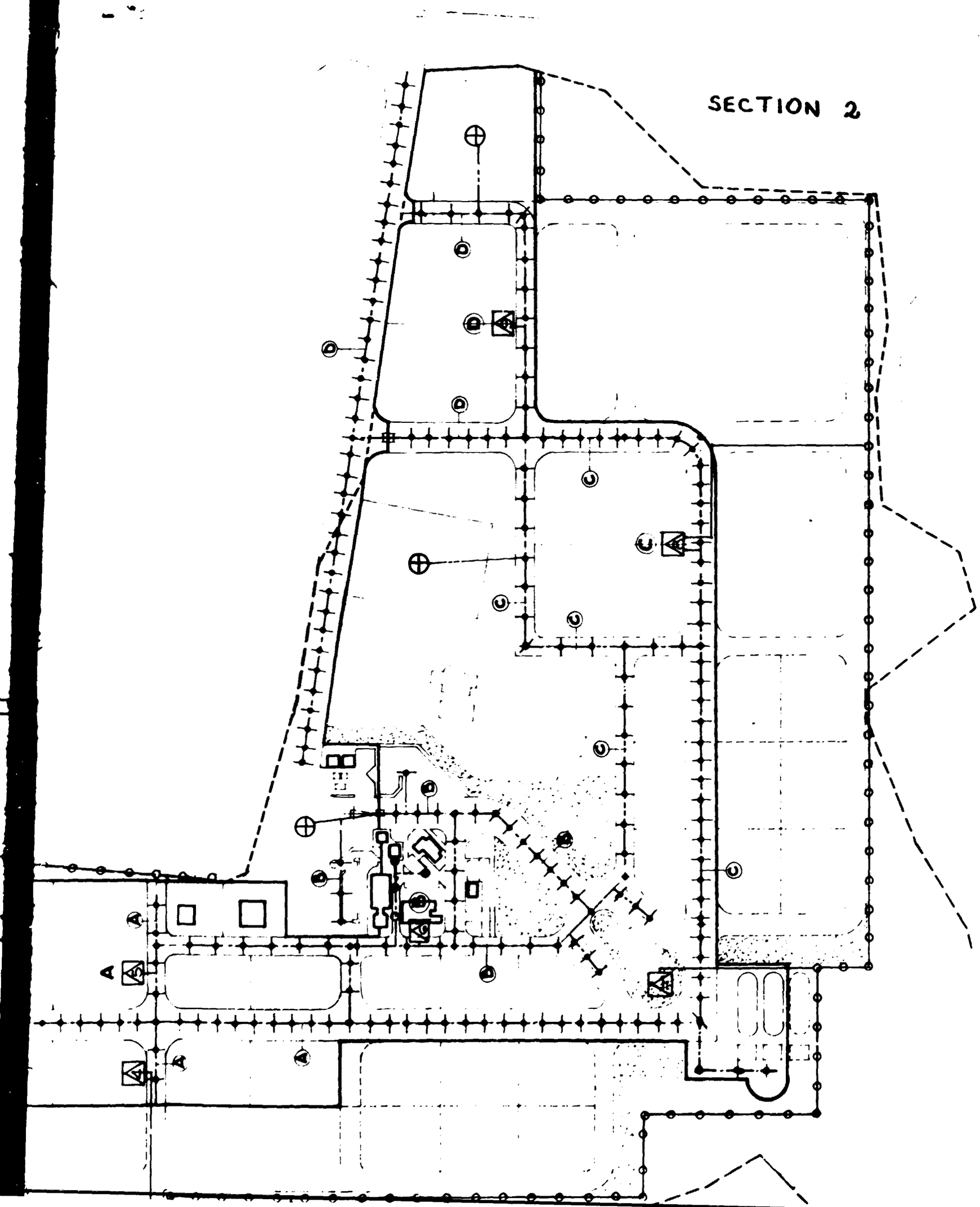


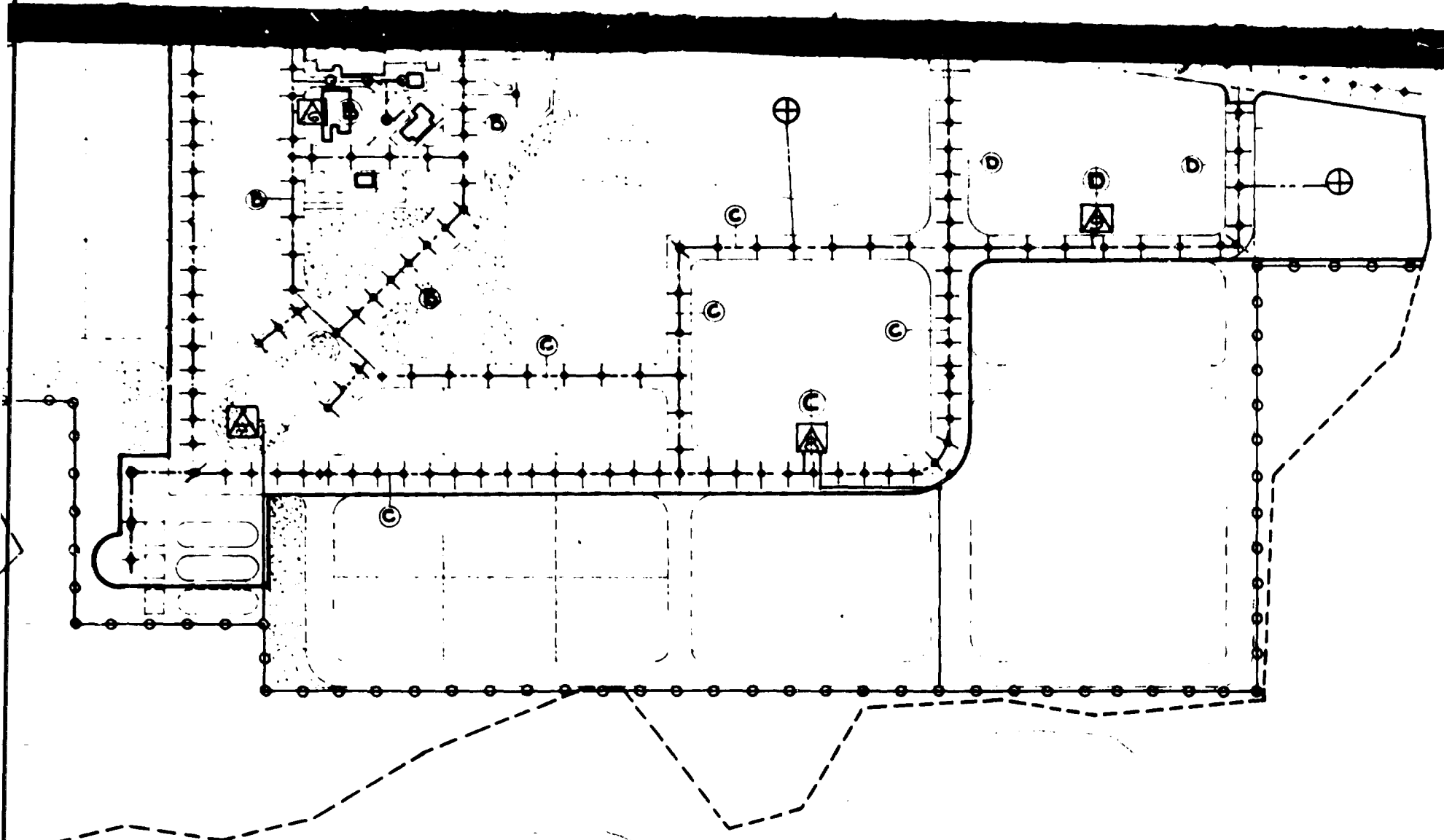


SECTION 1

LEGEND:

- TRANSFORMER STATION
- ● LIGHTING POLE, 10 m, WITH DOUBLE ARM (N° 2 x 250 W MERCURY LAMP)
- ○ LIGHTING POLE, 10 m, WITH SINGLE ARM (N° 1 x 125 W MERCURY LAMP)
- ⊕ HIGH MAST, 20 m (N° 6 x 400 W MERCURY LAMP)

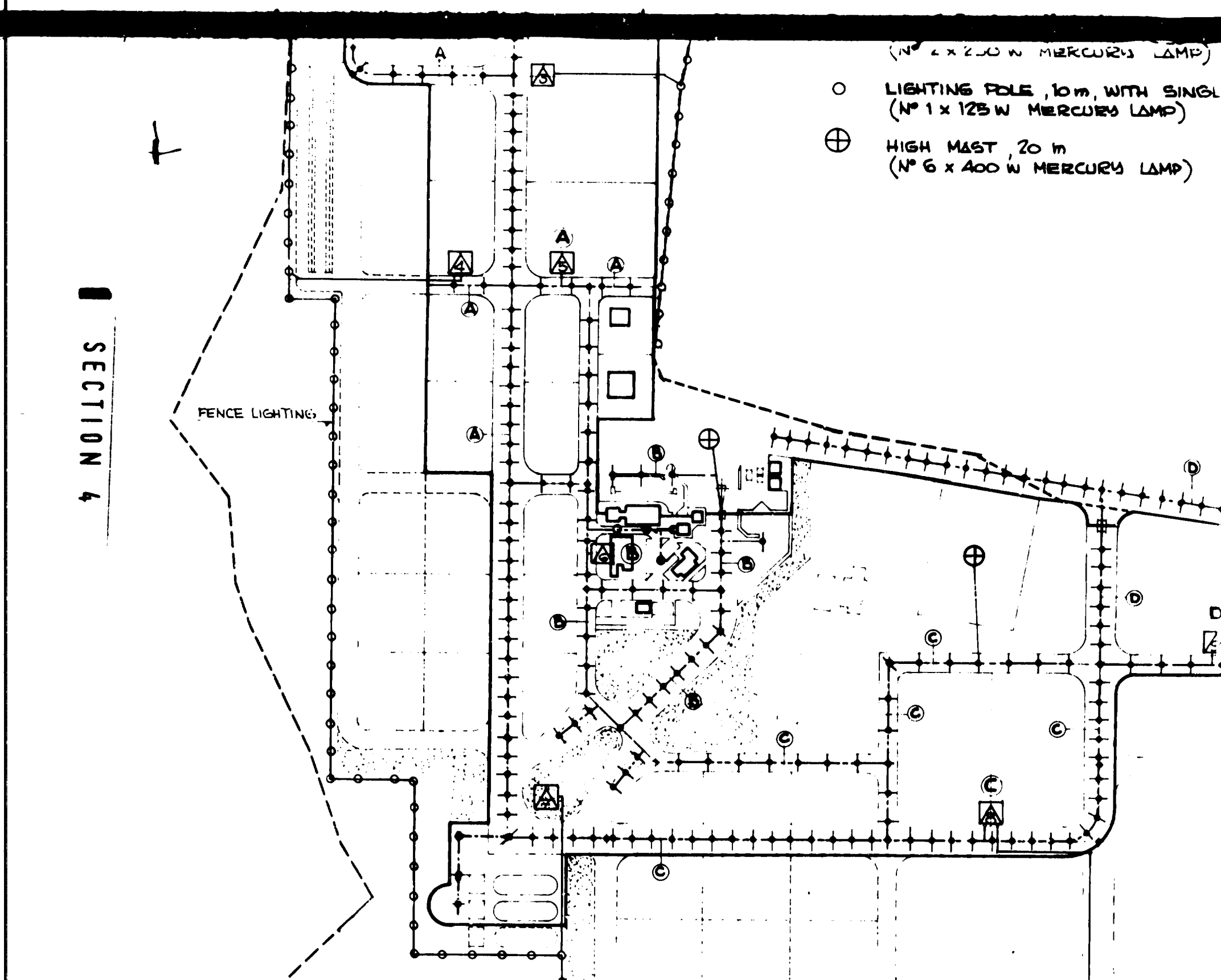

SECTION 2

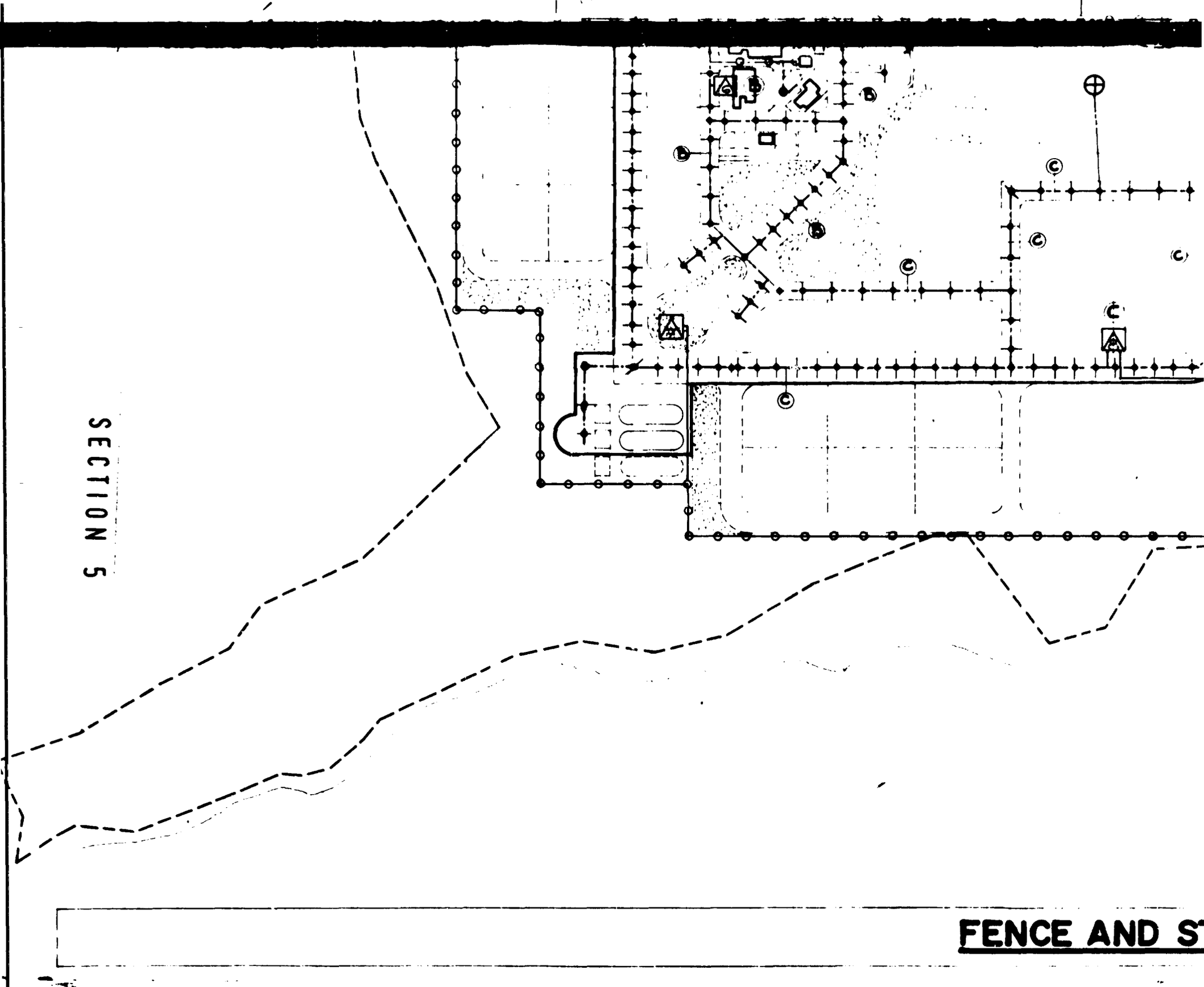


SECTION 3

0 40m 120m 200m
20m 80m 160m
NORTH

FENCE AND STREET LIGHTING


(N° 2 x 250 W MERCURY LAMP)
LIGHTING POLE, 10 m, WITH SINGL
(N° 1 x 125 W MERCURY LAMP)
HIGH MAST, 20 m
(N° 6 x 400 W MERCURY LAMP)
FENCE LIGHTING
SECTION 4



FENCE AND S