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REPORT OF 1968 INDEPENDENT ASSESSMENT TEAM

NEPAL MALARIA ERADICATION PROGRAM

Introduction:

The Nepal Malaria Eradication Organization (N.M.E.O.) after carrying on spraying operations and surveillance for a number of years, requested an external appraisal to assess the suitability of certain areas for withdrawal of spray. Therefore, the World Health Organization (WHO) and the National Communicable Disease Center, USA, jointly provided an Independent Assessment Team to appraise the merits of the areas projected for passing of phase from attack to consolidation.

The areas in the four Zones of the program for consideration by this team were listed following an internal assessment of the program carried out in the latter part of 1967. These "projected" areas were as follows:

Zone	Total Population	Population at risk	Projected Population
Central Zone 'A'	3,805,082	1,771,064	555,209
Central Zone 'B'	1,563,212	1,478,597	1,082,480
East Zone	2,429,967	1,460,521	540,964
West Zone	2,438,228	773,804	None
TOTALS:	10,266,489	5,483,986	2,178,653

Composition of the team:

Following the request of His Majesty's Government to NCDC and WHO,

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a team composed of five members* was assigned for this purpose for the period January 29 to February 21, 1966.

Procedures & criteria adopted by the Independent Assessment Team (I.A.T.):

After an initial briefing in the Headquarters of the NMEO at Kathmandu from January 30 to February 4, during which time broad background information on the projected areas was given to the team, the members met to devise a set of guidelines to be used during the assessment of areas and units into which the Zones are divided for administrative and operational purposes. These sample questionnaires are attached.(Appendices 1 and 2)

In formulating the criteria or standards to be applied, the team agreed that any decision to switch over from attack to consolidation would be based exclusively on technical considerations with the accompanying operational implications which the WHO Expert Committee on Malaria defined in its 7th, 8th and 10th Reports.**

The following criteria were therefore taken into account for the purpose of this specific assessment:

1. Evidence of complete interruption of transmission, although cases restricted to small foci might be permitted.

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2. Depletion of the parasite reservoir to such a level that surveillance operations might be expected to prevent resumption of transmission.
3. Adequacy of the surveillance mechanism, supported by efficient laboratory services.

The team recognized that the above criteria have stood the test of experience in the field, but felt that epidemiological procedures and conditions deserved more clarification and elaboration. Any "district" recommended for withdrawal of spraying should be a relatively compact unit and preferably should contain 100,000 population in the hilly areas, where the density of population is low and localities relatively isolated, and 250,000 people in the plains areas where the density of population is higher. However, where ecological conditions permit, a smaller population could be considered.

Although the Annual Parasite Incidence (API) has been considered an operational standard to be pre-determined for each ME program by epidemiological conditions and operational capacity, the team felt that the permissible API in Nepal should not exceed 0.1 per thousand following the experience of India, as it is believed that the operational maturities in these two countries are comparable. Although it was stated that in Nepal the supervision corresponding, at the lowest level, to a population of 30,000 to 60,000 people might allow an area having a higher API to be considered, the team agreed that an API higher than 0.1 should be considered only when an area has a low receptivity as demonstrated by a low previous endemicity, few indigenous cases, and an effective surveillance system.

The questions of vulnerability and receptivity of the areas projected were also considered. Units bordered by regions of unknown endemicity or regions not yet under ME were regarded as vulnerable and would not in general be recommended.

It should be recalled that during the pre-eradication surveys it was believed (in 1959) that malaria transmission was not taking place above the 4,000 foot level and that therefore the delimitation of malarious areas was determined solely on the basis of altitude. However in two surveys carried out above this altitude it was recently shown that malaria transmission exists above this level, and in one instance an anopheline vector (A. fluviatilis) was found with sporozoites at 4,300 feet. (S. Pradhan, 1965). Restricted investigations above the 4,000' level appear to confirm the presence of malaria transmission in high altitude areas.

There should be no substantial population movement through the projected district, and no large imported aggregations of labor force. In any case, any development scheme, either resettlement villages or other industrial, road-building or agricultural projects, should be kept under attack measures with intensified surveillance even if the district as a whole would be recommended for entry into consolidation.

The degree of receptivity of the district could be estimated on the basis of the previously prevailing endemicity. Within the limit of a permissible API, a few restricted malaria foci might be tolerated if the surveillance operations were found to be satisfactory, with the proviso that any such foci be subjected to adequate remedial measures, and intensified surveillance.

Geographical reconnaissance could be assessed by the availability of village sketch maps at all levels of operation, their current accuracy and also by spot checks in selected villages and checks on house visitors making their appointed rounds.

The quantitative assessment of case detection could be made on the basis of the quantity of blood slides collected by month and by locality. An Annual Blood Examination Rate (ABER) of not less than 1% during each month of malaria transmission was considered to be a quantitative standard which should be met in the rural areas. Qualitative assessment of the active case detection could only tentatively be made by determining the percentage of houses effectively visited during each round of case detection, and the number of rounds performed as compared with the number of rounds planned.

One of the components of an adequate surveillance system is the availability and reliability of laboratory services. This was to be assessed by the number of slides examined per microscopist per working day in the area laboratories, the quality of those slides seen in spot checking in the field and area laboratories, and the accuracy of the slide examination as revealed by the cross-checking system at the National Headquarters, where all positive and 10% of the negative slides are checked as routine.

The extent of the completion of radical treatment of all positive cases and the thoroughness of the case investigation around each case was to be evaluated from the SF 5 forms on file in Unit and Area offices, and on team interviews of actual cases and investigators whenever possible.

This would allow an indirect evaluation of the functioning of the whole surveillance system from the Senior Malaria Inspector on down, an excessive time lag from slide collection to treatment demonstrating shortcomings.

Regarding supervision, it was difficult to formulate standards to assess qualitatively the supervisory system as a whole. Tentatively, therefore, the evaluation of the supervision was estimated on the number of supervisory visits at all levels which were actually carried out as against the number of visits planned.

With respect to spraying operations, it was noted that these began in some areas as early as 1959, and on a yearly or six-monthly basis according to the estimated original level of endemicity. As the houses in the areas visited were subject to regular re-plastering and smoke coverage, the quality of the DDT residue had to be assessed on structures not subjected to these destructive factors such as eaves, verandas and cattle-sheds while the quantitative coverage was to be assessed on house visitation records and accuracy of the geographical reconnaissance.

Program of Work:

According to the program set up in advance by the NMEO, the parts of three zones projected for withdrawal of spray were to be visited as follows from 5 to 18 February 1967:

Central Zone 'A' 5-8 February

Central Zone 'B' 10-14 February

East Zone 15-18 February

In order to overcome transportation difficulties where motorable roads were scarce, the USAID placed two helicopters at the disposal of the team.

Because of size of the area projected, and the short time allotted to the study, it was decided that the members of the team would visit separately, all units projected for withdrawal of spraying by the previous internal assessment. Each team member was accompanied by one member of the NMEO for purposes of guidance and interpretation, and was therefore responsible for investigation of all aspects of the projected Units allotted to him. He then reported to the other team members on his findings. Every Zone, Area and Unit office involved was to be visited by one or more members of the team. In addition, it was planned to visit as many localities as possible in the time allotted.

General Background Information:

After local malaria control operations were carried out from 1953 to 1958, malaria eradication by stages was started in Nepal in 1958. After geographical reconnaissance, spraying operations using mainly DDT water wettable powder 75% started in 1959 (in some small areas of the Central Zone, dieldrin was used at this time). Total spraying coverage of Central Zones A and B with DDT was achieved in 1960. Thereafter the program was progressively extended to the East Zone and to the West Zone. To date, all areas in Nepal below 4,000 feet are in the attack phase. As stated previously, above this level no thorough malaria reconnaissance has yet been carried out, and therefore the extent, degree, and epidemiological characteristics of malaria above this altitude are not known.

Broadly speaking, Nepal can be divided into four ecological strata; terai, foothills and forested belt of inner terai up to Mahabharat Range, hill areas beyond Mahabharat Range and lastly higher mountain zones

above 4,000 feet in the north. Each of these strata is characterised by particular conditions of climate, physiography, vegetation, housing and human ecology, anopheline fauna and in some instance levels of malaria endemicity. The attack operations were based at the outset on consideration of some of these various factors in respect to dosage, timing, cycle and rounds of insecticide application.

Surveillance operations started in 1963/64 in Central Zones A and B and in 1965 in part of the East Zone. Rounds of active case detection are generally on a monthly basis, but in limited areas fortnightly rounds of case detection are carried out. Passive case detection is practically non-existent due to lack of general health facilities in the country. Therefore it was decided not to take into account the degree of coverage for the basic health services, it being clearly understood that the consolidation phase, with all its operational implications will be continued until such time as a sufficient basic health infrastructure is fully implemented.

The identification, distribution and seasonal fluctuation of the anopheline fauna were investigated mainly during the pre-eradication survey. According to information provided to the team, Anopheles minimus and A. fluviatilis are the only proven vectors of malaria in Nepal, the former being restricted to the foothills of the Churia Range and the inner terai up to the southern slopes of the Mahabharat Range. A. fluviatilis is more widely distributed up to an altitude of at least 6,500 feet. Both these species have so far been susceptible to the insecticide employed. A. minimus is no longer being detected in sprayed areas, and the density of A. fluviatilis is greatly reduced.

A. culicifacies, on the other hand, is widely spread throughout the country, and has developed a high level of resistance to DDT in all zones. Although it has not so far been incriminated as a vector in Nepal, it continues to be regarded with suspicion in certain areas of the terai on purely epidemiological grounds.

CENTRAL ZONE 'A'

Background Information

Epidemiologically, Central Zone 'A' may be divided into two broad ecologically homogeneous strata, (see map appendix 3) one to the north of the Mahabharat Range above 2,000 feet intersected by deep valleys where it was believed that malaria endemicity was relatively low, and one region in the south, close to the Churia and Mahabharat ranges where surveys carried out during malaria control in Rapti Valley demonstrated that malaria was hyperendemic.

The two regions referred to above have been known as "hypoendemic" and "hyperendemic" in the reports of the NMEO, and have a population of about 1.85 million people. The zone has had spraying coverage since 1960 with some local variation. The "hyperendemic" region received two rounds (2 and 1g/M^2) before 1967 and three rounds (1g/M^2 per round) from 1967. In 1967 total spraying coverage was achieved in the "hyperendemic" region while it was irregular or even omitted altogether in part of the "hypo-endemic" areas. Surveillance operations, including case detection, radical treatment and focal spraying have been carried out since 1963 and 1964 in the major part of both ecological regions.

To facilitate administration and communication, C.Z. 'A' has been divided into seven Areas, some of them ecologically heterogeneous. This situation was considered during the internal assessment of the C.Z. 'A', and the selection of districts for possible withdrawal of spray were based on the data for 1967 shown in table I.

TABLE I

	Population		Positive Cases		ABER		API	
Area	Total	Projected	Total	Projected	Total	Projected	Total	Projected
A-1	143,688	71,312	147	16	20.35	20.6	1.02	0.22
A-2	263,594	134,773	246	28	13.8	13.9	0.9	0.2
A-3	368,644	291,940	201	50	14.4	14.3	0.7	0.17
A-4	261,840	56,784	1,498	11	18.1	17.2	5.7	0.19
A-5	312,385	None	1,456	None	14.9	None	4.06	None
A-6	184,962	None	348	None	13.2	None	1.8	None
A-7	235,971	None	27	None	-	None	-	None
Total:	1,771,064	555,209	3,923	105		15.4		0.19

The detailed data for each Area, Unit & locality projected for withdrawal of spray were provided for the independent assessment team, and are not reproduced in this report.

Area One

Area one is composed of steep hills and valleys which form the watershed of the Sun Kosi River. With the exception of the east, bordering on East Zone Area-7, the area is entirely limited by the 4,000 foot contour.

DDT at $2g/M^2$ has been applied annually in the area since 1960 with the exception of Units V and VI during 1967, at which time these two units received only focal spraying during the last half of the year. Surveillance

appeared adequate below the 4,000 foot contour. By chance Activated Passive Case Detection (APCD), approximately one third of the positive cases in the area were located above this altitude and were particularly prominent north of the Sun Kosi River. The seasonal movement of people from the hyperendemic regions of Area 10 and 11 - Central Zone B accounted for many of the cases.

Supervision of the Area by personnel from Zonal and National Headquarters was extremely limited in spite of the area office being readily accessible. Supplies and supervision from the area office were often unavailable to the units. Although laboratory facilities are limited, the efficiency of the staff was considered good and the results reliable.

Recommendations:

NONE OF THE PROJECTED LOCALITIES ARE RECOMMENDED FOR WITHDRAWAL OF SPRAY - due to the immaturity of the organization coupled with lack of supervision and the prominence of positive cases above 4,000 feet.

Area Two

Of nine Units in the Area, five are projected totally or partly for withdrawal of spray. The team visited all these projected Units and the Area office, besides carrying out spot checks in many localities selected at random.

After scrutiny of the data, and close consideration f all the factors involved, the team "RECOMMENDS THAT ALL LOCALITIES ORIGINALLY PROJECTED WITH THE EXCEPTION OF UNITS I AND V TOGETHER WITH LOCALITY A-1 OF UNIT IV COVERING A TOTAL APPROXIMATELY POPULATION OF 75,000 SHOULD ENTER INTO CONSOLIDATION"

The following features were among those considered by the team in reaching its decision:

1. The persistence of transmission (API as high as 0.4) in certain Units could in some cases be related to shortcomings in geographical reconnaissance and subsequent failure in spraying and surveillance cover.

2. In general, the Area is highly vulnerable due to both regular population movement and to certain projected roads running for the most part through the center of the projected Units. Vulnerability is increased by almost complete encirclement of most of the projected Units by the 4,000 foot countour line. One of the projected Units contains three enclaves above this level.

3. Long delays in treatment and follow-up of some positive cases indicates a rather immature surveillance system.
4. The laboratory was judged to be particularly competent, and the general supervision and training good. The slide examination was, on the whole, efficient.
5. There appeared to be no great turnover of lower echelon staff, and although supervisory visits from Zone and National Headquarters appeared somewhat scanty, field supervision at lower echelons was adequate in so far as could be judged in the time available.
6. In general, case investigation was below the required standard.

Area Three

The team visited all the eleven units of the area projected for withdrawal of spraying. Following scrutiny of data submitted, visits to Area and Unit offices, and various locality spot checks, THE TEAM DID NOT CONSIDER IT APPROPRIATE TO WITHDRAW SPRAYING FROM SEVEN NORTHERN UNITS, a part or the whole of which were projected. These units are as follows: Units II, III, IV, V, VI, VII and VIII. In five of these seven units, the API was above the permissible level for entry into consolidation. All seven units were adjacent to localities above the 4,000 foot level where it has become known that malaria transmission has been taking place and where no malaria eradication activities were being carried out. In some of the units, such as IV and VI where spot checks of villages were made, surveillance was found to be irregular, patchy or sometimes non-existent. Supervision was found to be below standard in most places visited.

The main trade route from Pokhara to Kathmandu passes through these units and although factual data regarding movement of population was not readily available, it was believed that these units were highly vulnerable, and that preventive measures were not yet adequate to prevent malaria outbreaks if spraying was withdrawn. In Unit III, for example, several infrequently checked temporary structures were seen. These structures were occupied mainly by transients. The Pokhara-Kathmandu highway is under construction and eventually will come through these units. This may present additional problems as construction progresses.

On the other hand, THE TEAM RECOMMENDED THAT A COMPACT BELT, CONSISTING OF UNITS I, IX, XI AND XIII WITH A TOTAL POPULATION OF APPROXIMATELY 130,000 PEOPLE BE ENTERED INTO THE CONSOLIDATION PHASE. Although thirty-one malaria cases were detected in the above four Units during 1967, giving an API higher than 0.1 per thousand, many were imported or were restricted to limited foci where remedial measures were correctly applied. The surveillance operations including laboratory services appeared to be of a reasonable standard, based on the few spot checks made, and the maturity of the staff seemed to be adequate. These four contiguous units are bordered on all sides by other units either projected for consolidation or in the attack phase.

Area Four

Area four extends across the center of the Central Zone with the 4,000 foot contour to the north-east and hyperendemic plains to the south and west. In these plains, over 1300 positive cases were detected in 1967, mostly occurring in new settlement areas. Population movement from the plains and hills was noted to extend to the main market in Hetaura. The projected area consisted of hypoendemic hilly portions of units I, II and III.

Supervision of the Units by the Area and Zone staff was found to be considerably limited, although supervisory visits to the Area office by higher echelons from zonal and national head-uarters has averaged three visits per month. The investigation of cases and remedial measures were found inadequate in several instances.

The Area laboratory has produced a great deal of error in the mis-diagnosis of negative slides as positive. This un-reliable laboratory service has recently been strengthened with an experienced Superintendent Microscopist and will be expected to improve during the next year. It is felt that until such improvement is obtained in both the laboratory and field, THE WITHDRAWAL OF SPRAY FROM ANY PART OF THIS AREA CAN NOT BE RECOMMENDED.

CENTRAL ZONE 'B'

Background Information:

Central Zone 'B' may be divided into three ecologically homogeneous regions. The upper portion of Area B 11 includes the southern slopes and valleys of the Mahabharat Range and has been considered "hypoendemic". Moving toward the south, the adjacent region of inner terai, Churia range and forested terai was considered "hyperendemic". The cultivated plains extending down to the border with India have been considered "hypoendemic" in NMEO reports.

Central Zone 'B' with a population of 1,478,597, has had insecticide coverage since 1959. The "hypoendemic" region received one round of $2g/M^2$ DDT each year and the "hyperendemic" region received two rounds of 2 and 1 g/M^2 before 1967 and three rounds of $1g/M^2$ in 1967. In addition to focal spraying, some "hyperendemic" localities have received fortnightly spray coverage by special mobile teams.

The regions projected for consolidation were located solely in the "hypoendemic" southern region and have had monthly house visits and

surveillance services since 1964. Surveillance in the "hyperendemic" region has also been operating since 1964 with strengthening in 1966 and 1967. Many localities have received fortnightly house visits.

Surveillance check posts have provided some information on population movements but have detected few positive cases among the APCD slides collected. Population movement and resettlement in the "hyperendemic" region was greatest in the eastern and western portions of the zone. Travel for business to the major markets, wood-cutting and seasonal employment coupled with temporary shelters and outdoor sleeping undoubtedly provide opportunity for many infections in people who return to their homes throughout Nepal prior to the monsoon.

Central Zone 'B' has been administratively divided into four areas and proposals for withdrawal of spray were based on the 1967 data shown in Table 2.

TABLE II

	Population		Positive Cases		ABER		API	
Area	Total	Projected	Total	Projected	Total	Projected	Total	Projected
B-8	439,152	376,687	855	40	14%	7.5%	1.9	0.11
B-9	428,673	399,446	114	21	16%	11%	0.27	0.05
B-10	530,904	306,347	269	27	16%	9.5%	0.51	0.09
B-11	79,868	None	258	None	45%	None	3.2	None
Total:	1,478,597	1,082,480	1,496	88	17%	9.6%	1.05	0.08

CENTRAL ZONE 'B'

Area Eight

The team visited six of the seven units of the Area, all or part of which had been projected for consolidation. After scrutiny of the data, visits to the Zonal, Area, and Unit offices combined with spot checks of many villages in various localities, the team recommended that ALL LOCALITIES PROJECTED SHOULD ENTER CONSOLIDATION WITH THE EXCEPTION OF LOCALITIES B1 AND B2 OF UNIT 6 where nine indigenous cases were reported in a population of 25,000 people. The population of the Area recommended for withdrawal from attack therefore approximated 350,000.

In reaching the above decision, the following factors were considered:

1. The API is less than 0.1 per thousand and the history of this area indicates that malaria prevalence has been very low for many years, apparently even before the program started.
2. All of Area 8 is adjacent to Areas where malaria eradication operations are either in attack or in consolidation. Although there is some movement of population from other areas where transmission continues, it appears that there is little danger of the reintroduction of malaria into this area of low receptivity.
3. Accessability of all localities is good, and most can be reached in less than one days walk from the Unit offices. Although Geographical Reconnaissance as such was not carried out in the usual manner, spot checks indicated that houses are being visited regularly and that supervision was reasonably good.

4. In all Units visited the staff was found to be well trained and well aware of its responsibilities. Remedial measures were usually taken within one week following taking of the blood smear, and case follow-up appeared to be satisfactory.

5. The low receptivity of the Area and the efficiency of the surveillance system were inadvertently tested during 1967 due to an unexpected DDT shortage; although one third of the villages could not be sprayed the surveillance system was able to cope with the situation, and the case rate in fact continued to decline.

Area Nine

Area 9 is situated in the centre of Central Zone 'B', and bordered by India on the south, Area 8 on the west, Area 10 on the east and Area 11 (all of Central Zone 'B') on the north. Area 9 had a total population of 428,673 of which 398,941 is projected. From a total of 8 Units, 5.5 were projected; namely Units I, II, IV, V & VI, plus localities A1, A2 & A3 of Unit III.

In general, there was no one particular Unit projected in which malaria continued to be a problem. Surv eillance was, in general, good, with treatment of cases within one or two days of receipt of the slide in the laboratory and with only 4 or 5 days ti e-lag overall. Laboratories were generally adequate in terms of facilities, staff and training. The quality of slides was of a good average in both preparation of the smear and in staining technique.

Supervision from the Zone and higher levels seemed to be more frequent in Area 9. Probably because of greater ease of access on foot to the Unit Offices, local supervision was also better. This appeared to result in greater co-ordination of operations.

ALL OF THE 5.5 PROJECTED UNITS WITH A TOTAL POPULATION OF APPROXIMATELY 400,000 ARE RECOMMENDED FOR WITHDRAWAL OF SPRAYING.

While recommending the above, the team would nevertheless and the following recommendations specifically applying to this Area. In general the ABER is neither adequate nor uniform, and efforts should be made to achieve approximately 1% collection per month from all localities in all Units during the transmission season. Epidemiological classification needs standardization, and close participation in the investigation by the Zone is believed to be the proper approach for this.

It was noted in several laboratories that under the pressure of a backlog of slides microscopists were sometimes reading over 100 slides on one working day on the "shift" system. It is impossible for a microscopist to adequately read this number of slides in one day, no matter how well trained or however diligent. Therefore it is necessary to review the staffing pattern of this particular laboratory.

Area Ten

Area 10 had a total population 530,000 of which 305,000 people lived in the projected portion of the hypoendemic area. Movement of the population from the hypoendemic area is made for the purpose of woodcutting, marketing and cattle grazing. In 1967 only six localities in the hypoendemic portion were sprayed during the regular cycle.

For the whole Area, surveillance has detected a total of 267 positive cases during the year 1967 of which 93 arose in the hypoendemic area. It was noted that 66 of the 93 cases were recorded for the non-projected Units III and IV, the remainder being destributed throughout the projected units.

The laboratory service consists of a main area laboratory situated in Janakpur and two seasonal laboratories in the hyperendemic portion. This main laboratory was found to be well situated, staffed with locally recruited microscopists and was considered efficient. Cross-checking data did show a few discrepancies, but these were confined to the seasonal laboratories where supervision was very difficult during the peak of the monsoon season.

Visits to the four projected Units II, V, VI, and VII were made by the team. All of these units could be reached quite easily by car, train or b y foot within one day from the area office. In each unit it was possible for the unit officers to visit the localities or any positive case and perhaps return to the unit office by evening. House visitors were found to be regular staff having one or more years service in the area or locality.

Epidemiological investigations had been carried out by the Area-in-Charge or he had visited the case to confirm the classification given by the SMI. His knowledge of the area was detailed and a result of active supervision. In a few cases classified as indigenous, the team felt that there was certain information missing that probably would indicate relapse or importation.

A spot check of villages in all units for projection showed clear stencils on every house. Visitors carried clear records, sketch maps, equipment and a note book showing that he was given regular supervision by both unit and area officers.

Taking all the above stated points into consideration, it was RECOMMENDED THAT UNITS II, V, VI AND VII WITH A TOTAL POPULATION OF APPROXIMATELY 306,000 BE WITHDRAWAL FROM SPRAYING OPERATIONS. This recommendation is made with the understanding that the remaining units of the area continue to remain totally under spraying coverage.

EAST ZONE

Background Information

Malaria eradication activities were launched in East Zone in 1962. Spraying operations commenced from 1964 in the Zone with the exception of some of the hill valleys that were covered only during 1965-66.

It is possible to divide the East Zone into two broad ecologically homogeneous areas similar to those described under Central Zone 'B'.

Parasitological surveys carried out in this Zone, mainly in 1962, prior to eradication operations, justify the division of the Eastern Zone into two regions of different levels of endemicity; the Northern part with an average parasite rate of more than 60%, and Southern part with a parasite rate varying from 0.4 to 7.5%.

These two regions, as in Central Zone 'B', are referred to as "hyper" and "hypo" -endemic in the reports of the MEB, and with a total population of 1,360,000 people (census of 1967) came progressively under spraying operations from 1964; the "hypo-endemic" areas receiving one round per year,

(March-June) at $2g/M^2$, and the "hyper-endemic" areas receiving two rounds per year (March-June and November) at $2g/M^2$ and $1g/M^2$ respectively. The spraying operations were implemented in stages, and the whole area was first completely covered in 1966. In 1967, an internal assessment considered for withdrawal of spraying those areas originally "hypo-endemic" which were under spraying coverage since 1964, and where surveillance operations had been fully implemented since 1965.

A. minimus and A. fluviatilis are the only proven vectors in this Zone, A. minimus being restricted to the foothills and inner Terai. In the plain cultivated areas, A. culicifacies is also found, but its role in malaria transmission has never been determined, as in other Zones.

The epidemiological status at the end of 1967 was considered by the Internal Assessment and its proposals for withdrawal of spraying were based on the following data:

TABLE III

	Population		Positive Cases		ABER		API	
Area	Total	Projected	Total	Projected	Total	Projected	Total	Projected
E-1	294,478	277,296	122	22	10.58	9.63	0.42	0.08
E-2	290,018	263,668	35	4	9.89	7.65	0.12	0.01
E-3	380,524	Nil	89	-	Part 1967 only			
E-4	209,229	Nil	Not under surveillance					
E-5	113,949	Nil	271	-	17.01	-	2.41	-
E-6	85,450	Nil	75	-	17.03	-	0.87	-
E-7	86,873	Nil	34	-	14.78	-	0.38	-
Total:	1,460,521	540,964	626	26	-	-	0.45	0.05

Areas 3 to 7 were not considered by the Internal Assessment. Detailed data for each area and unit projected for withdrawal of spraying, were

provided for the Independent Assessment Team, and are therefore not reproduced in this report.

The Team visited the ten units projected for withdrawal of spraying, namely units 1-5 of Area E-1 & units 1-5 of Area E-2.

After scrutiny of the data of the Zone, Area and Unit offices combined with spot checks in selected villages and localities, THE TEAM DOES NOT CONSIDER IT APPROPRIATE TO WITHDRAW SPRAYING FROM ONE UNIT (E-1, UNIT V) WITH A TOTAL POPULATION OF 53,396. The reasons for this are the following:

1. In this Unit, 6 cases were detected in 1967, of which 5 are very probably indigenous.
2. This Unit is adjacent to two other Units where malaria transmission is still taking place and where surveillance activities were started only in 1967.
3. In this Unit, in particular, supervision was found to be far below the required standard.
4. The East-West Highway will be constructed in this Unit and it is very likely that the vulnerability of the Unit will be further increased.

THE TEAM RECOMMENDS THAT A COMPACT BELT CONSISTING OF UNITS I, II, III AND IV OF AREA E-1, AND UNITS I, II, III, IV AND V OF AREA E-2 (AS PROJECTED) WITH A TOTAL POPULATION OF APPROXIMATELY 486,000 PEOPLE, BE ENTERED INTO CONSOLIDATION PHASE) for the following reasons:

1. In 1967, 20 malaria cases were detected giving an API of 0.04; many of these cases were imported and restricted to a few foci where focal spraying has been applied, and will continue to be applied in 1968.

2. From baseline data collected prior to Malaria Eradication Operations, the receptivity of this area is considered to be low. It appears, therefore, that strengthened surveillance mechanism normal to any consolidation phase should be able to deal with the remaining reservoir of malaria and prevent the re-introduction of malaria from the neighbouring malarious areas.
3. The recommended area is bordered on all sides by territories which are either in consolidation or are under attack phase.

CONCLUDING REMARKS

During visits to the program, either in Headquarters, Zones, Areas or Units it was felt that the structure of the program is basically sound and that no major difficulties such as lack of money & supplies or replacement of staff are impediments to the progress of the program.

However, relative immaturity of the administrative machinery of the NMEO was found to be somewhat noticeable in certain districts, particularly in Central Zone 'A'. In some instances the non-availability of supplies at the right time prevented completion of operational schedules, both in quality & in quantity. Many of these shortcomings might well have been prevented if the supervision by higher echelons had been more regular and efficient.

For achieving the goal of eradication it is necessary for all senior officers to devote more time and effort in the field. The concentration of talent in the higher echelons provides a unique opportunity for field instruction. Supervision and instruction would be welcomed by most Unit workers who seem to be enthusiastic and devoted. Although transportation

may well occupy half of the two weeks spent outside the office each month, the example of the senior staff would demonstrate their interest and concern for the problems of the field organization.

The program started rather hurriedly without a proper delimitation of malarious areas above the 4,000' level, therefore the team decided, as a general policy, not to recommend any of the districts adjacent to the 4,000' contour, although some of the Areas appeared to meet some of the standard laid down for consolidation. It is felt that none of the Areas as defined above should, in the future, be considered for consolidation unless adequate investigations are carried out in the neighbouring localities above the 4,000' level, and, if necessary, measures taken appropriate to the findings.

Standards expected to be met in any ME program should be satisfied in all areas that are recommended for consolidation. Although an ABER of less than 1% per month was found to be permissible in the last year of attack phase, the monthly collection of slides in each locality should ideally reach this 1% level, in areas under consolidation. The exact classification of malaria cases in the late attack phase, although important, was not considered as a condition _sine qua non_ for recommendation of these areas for withdrawal of spraying. On the other hand, in consolidation areas, the importance of the correct classification of cases cannot be over-emphasized due to their epidemiological significance and related operational implications. Therefore, during this phase where cases are few, it should be mandatory that these be investigated and classified by a qualified and experienced senior officer.

Any investigation of a case should be accompanied by a contact blood survey large enough to reveal if other cases were associated with the one discovered. A contact blood survey too limited in scope will rarely provide an answer, it is therefore suggested that either 200 slides be taken around any positive case, or from the whole population of the village if the number of people is less than 200. A second contact survey of the same magnitude should be repeated one month after the first survey, at least around all indigenous cases.

In the consolidation phase, any persisting malaria focus should be subjected to a thorough entomological investigation, i.e. anopheline contact with man, longevity and general ecology of the vector. In this respect better epidemiological use of entomological techniques is to be recommended.

The extent and quality of remedial measures applied to malaria foci detected in the attack phase areas were not to be critically assessed by the team as the areas were in general under spraying coverage. However, in consolidation areas, the remedial measures should be of such a standard as to prevent secondary cases derived from imported or relapsing cases. As a general rule it is suggested that as regards the extent of remedial measures to be applied, at least the entire village should be considered as a malaria focus, and not only the few houses around the positive case. It is also to be stressed that a malaria focus of any origin should be protected by spray for at least one year following discovery of the last case.

Treatment of suspected and of confirmed malaria cases, being fundamental in the consolidation phase, it is considered that the scheme for both presumptive and radical treatment should be effectively applied by both ME personnel and medical institutions. Some deviations from the scheme of treatment as prescribed by the NMEO were observed, and should be corrected.

It is to be ensured that correct instruction in Nepali be issued to field personnel, and to all health services.

It is to be stressed that, although important, the ABER is only a quantitative assessment of the surveillance operation. Qualitative efficiency of the case detection mechanism should be assessed by the relative percentage of families that can be interviewed during each round of house visits. Although this concept is new, it has been strongly recommended by the last Meeting on Selection and Processing of Data which was convened in Geneva in November 1967. For example, a low percentage of family interviews during certain months would indicate the need to change the working hours of the field personnel.

To be of the required quality, the blood screening mechanism should be related to groups of population more likely to be malaria carriers. Active development of a country involves movement of people of all categories especially laborers. In addition to the people with actual or recent fever, it is suggested that visitors, immigrants and returnees from malarious areas where transmission is still going on, be screened for presence of malaria parasites in the blood, and receive presumptive treatment at the time the blood is taken whether or not they are suffering from fever.

The improvement of the blood screening mechanism and investigation of malaria foci will undoubtedly increase the workload of the field laboratories, and this may necessitate a review of the laboratory staffing patterns, at least in some of the areas. Also, whenever possible, and in order to improve the quality of slide examination, improvement of laboratory accommodation should be made. It was observed by the team in the field that the number of slides examined by the microscopists per day was in some instances higher than the average of 50 slides per day which is the accepted maximum.

The Independent Assessment Team congratulates the Malaria Eradication staff on the progress made to date which has rendered possible the transition of a sizeable part of the program to another phase, particularly in the more populous areas of the country. It should be recalled, however that consolidation is only a further step towards eradication of the disease and that at this stage co-operation of the few existing health posts with the malaria service should be compulsory in the taking of blood slides of all fever cases, irrespective of the diagnosis. This also is the time to consider the future of the program and the maintenance of malaria eradication once it has been achieved in some parts of the country. The maintenance of freedom from malaria can only be possible if a sufficient and well developed net-work of basic health services is evolved throughout the kingdom. In a country where the health services are faced with a list of medical program priorities, one of these should be the establishment of an operational system of basic health posts ensuring total health coverage of areas which are recommended for entry into consolidation.

ACKNOWLEDGEMENTS

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The USAID kindly provided helicopters, ground transport and secretarial assistance. The WHO Malaria Team assigned in Nepal participated in the administrative arrangements. This is gratefully acknowledged.

Lastly the team wishes to thank each and every malaria worker at all levels for rendering their most essential efforts towards the success of this important program.

AREA QUESTIONNAIRE

Zone________ Area_______ Team member_________________ Date_______________

Population of area_________________ Population projected__________________

1. (Obtain a map showing the location of malaria cases detected in 1967 in the entire area.)

2. Entomological data:

   A. Vectors, seasonal variations, larval sites

   B. Man-vector contact (biting rates)

   C. Dissection data

3. Staffing and supervision:

   A. Number of posts required and present vacancies by category-(attach table)

   B. Supervision in the field--(attach table)

   C. Supervision by personnel of higher echelons at the area level e.g. Zone and National Hqs-(attach table)

4. Laboratory(ies) state number ________

   A. Are the facilities adequate?

   B. Gross and net number of slides per microscopist per day-(attach table)

   C. Quality of slides-thick smear, staining

   D. Cross-checking of slides:

   Total negatives _________; Total positives _________

   a. Negatives slides checked ________, Number of errors________, %______

   b. Positives slides checked ________, Number of errors________, %______

   E. Laboratory personnel training, re-training, turnover:

F. Number of supervisory visits by senior lab personnel of higher echelon ________

G. Quality of recording system--lab register, positive slide register

H. Handling of blood slides (SF 5 or positive slide register)

	time in days	
	average	maximum
slide collection to receipt		
receipt to examination		
examination to treatment		

5. General comments:

UNIT QUESTIONNAIRE

Zone ______ Area ______ Unit ______ Team member__________ Date________

Total unit population __________ Projected population __________

Total number of localities ______ Number of projected localities ________

1. Geographical reconnaissance

   A. Are sketch maps available at all field levels for all localities: (check a house visitor at work)

   B. Are these maps and the GR kept up to date:

   C. How many villages or houses previously undetected were discovered in 1967?

2. Spraying

   A. Number of localities under regular spraying: ______

   B. Date of first spray coverage: ______

   C. Total number of spraying rounds: ______

   D. Date of last spray application: ______

   E. Percentage of houses not sprayed during the last spraying round:______

   Reasons:

   locked ☐ refused ☐ others ☐

3. Case detection in projected portion of unit:

   A. Number of localities in which the planned rounds of ACD were not completed and why: ______________________

   B. Number of localities where less than 70% of the households have not been effectively visited during three or more rounds in 1967:______

   C. Number of localities where the ABER was less than 1% in any month during the transmission season: <u>Localities</u> <u>ABER</u>

D. (Check of ACD in villages--house stencil, reports from villagers, equipment of house visitor)

4. Epidemiology

A. Number of localities in the entire unit where malarial foci exist: ______

B. Number of localities where cases were not investigated within three weeks of the day the original blood film was taken: ______

C. Number of localities where any of the confirmed cases did not complete the approved radical treatment under supervision: ______

D. Was the follow-up of positive cases adequate?

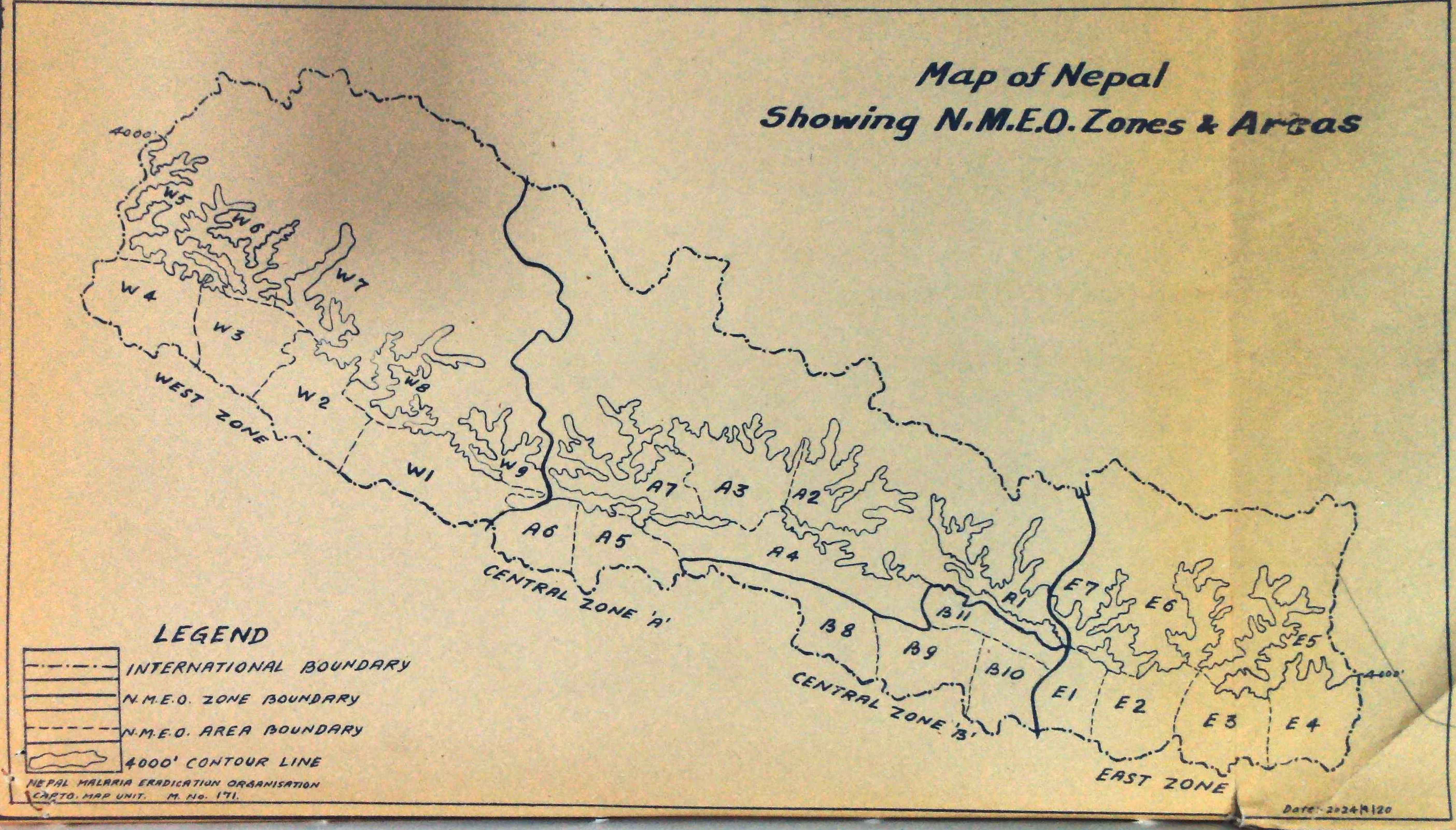
E. Total number of positive cases and the number of these relapsing after radical treatment: ______ ______

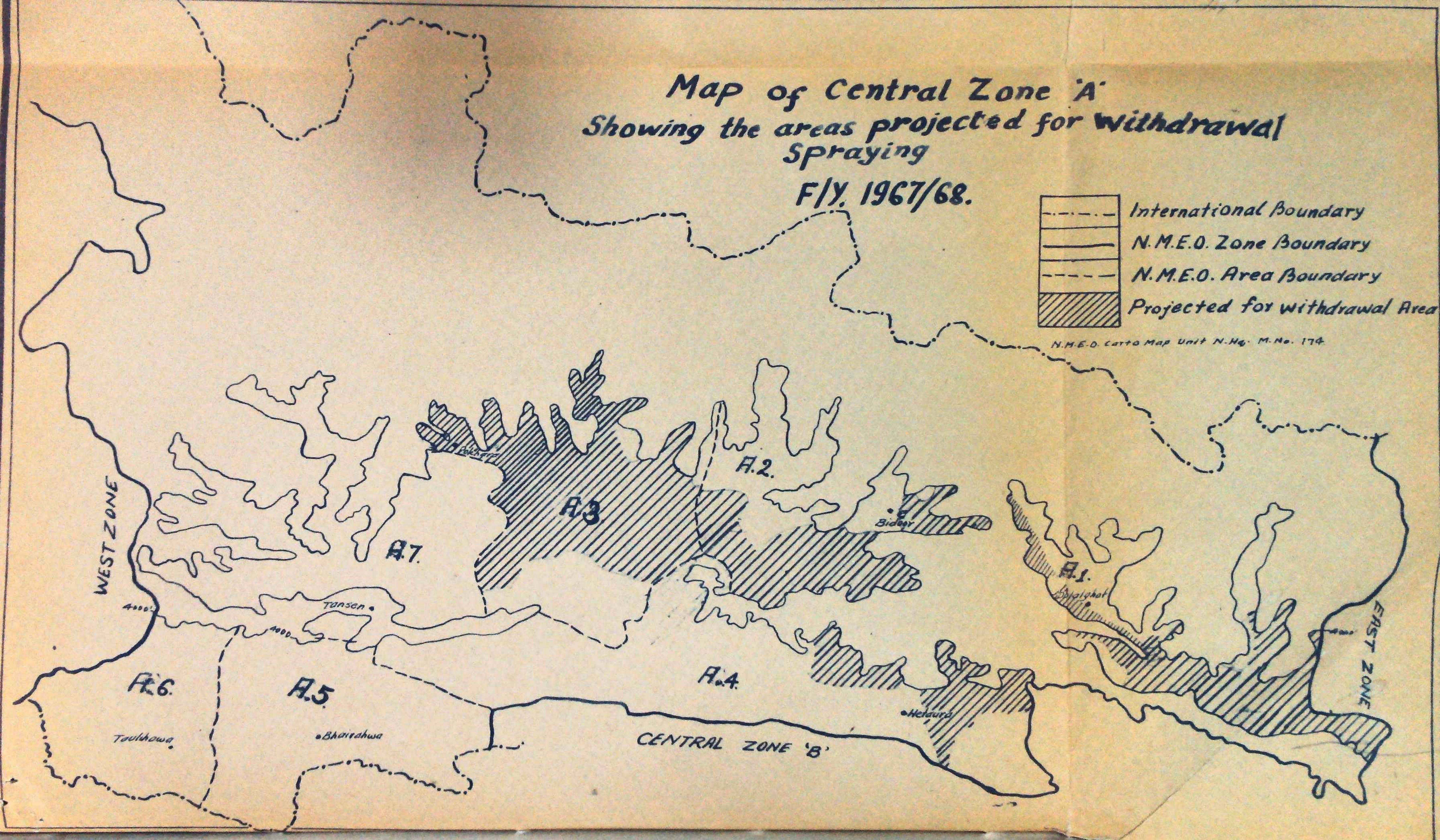
F. Quality of the epidemiological investigation and classification of cases: (see SF 5)

5. Population movement problems (vulnerability of the unit)

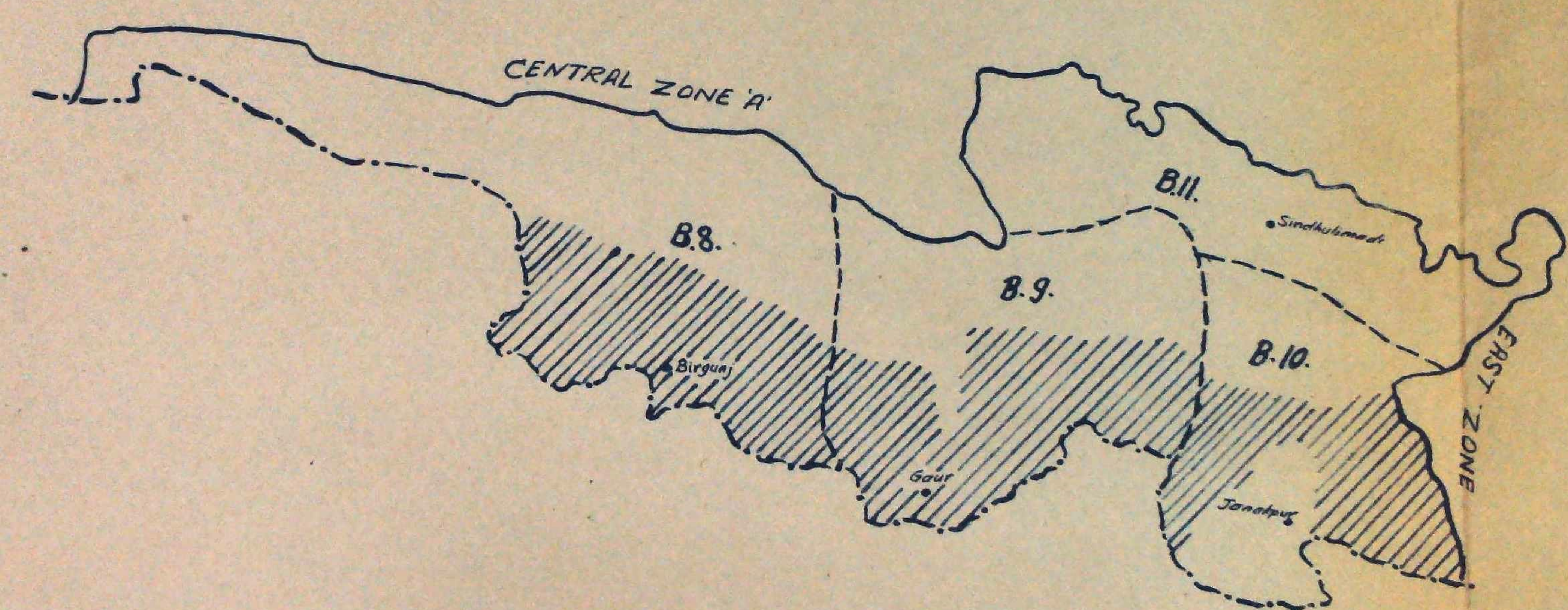
6. Supervision of the house visitor by SMI and assistant

7. General observations:


Map of Nepal
Showing N.M.E.O. Zones & Areas
4000'
W5
W6
W7
W4
W3
W8
W2
WEST ZONE
W1
W9
A7
A3
A2
A6
A5
A4
CENTRAL ZONE 'A'
A1
B11
B8
B9
B10
CENTRAL ZONE 'B'
E7
E6
E5
E1
E2
E3
E4
4000'
EAST ZONE
LEGEND
INTERNATIONAL BOUNDARY
N.M.E.O. ZONE BOUNDARY
N.M.E.O. AREA BOUNDARY
4000' CONTOUR LINE
NEPAL MALARIA ERADICATION ORGANISATION
CARTO. MAP UNIT. M. No. 171.
Date: 2024/11/20


Map of Central Zone 'A'
Showing the areas projected for withdrawal Spraying
F/Y. 1967/68.
International Boundary
N.M.E.O. Zone Boundary
N.M.E.O. Area Boundary
Projected for withdrawal Area
N.M.E.O. Carto Map Unit N.Hq. M.No. 174
WEST ZONE
EAST ZONE
CENTRAL ZONE 'B'
A.1.
A.2.
A.3
A.4.
A.5
A.6.
A.7.
Pokhara
Bidoor
Tansen
Hetaura
Bhairahwa
Taulihawa
4000'
4000

Map of central Zone 'B'
Showing the areas projected for withdrawal Spraying
F/Y. 1967/68.



International Boundary

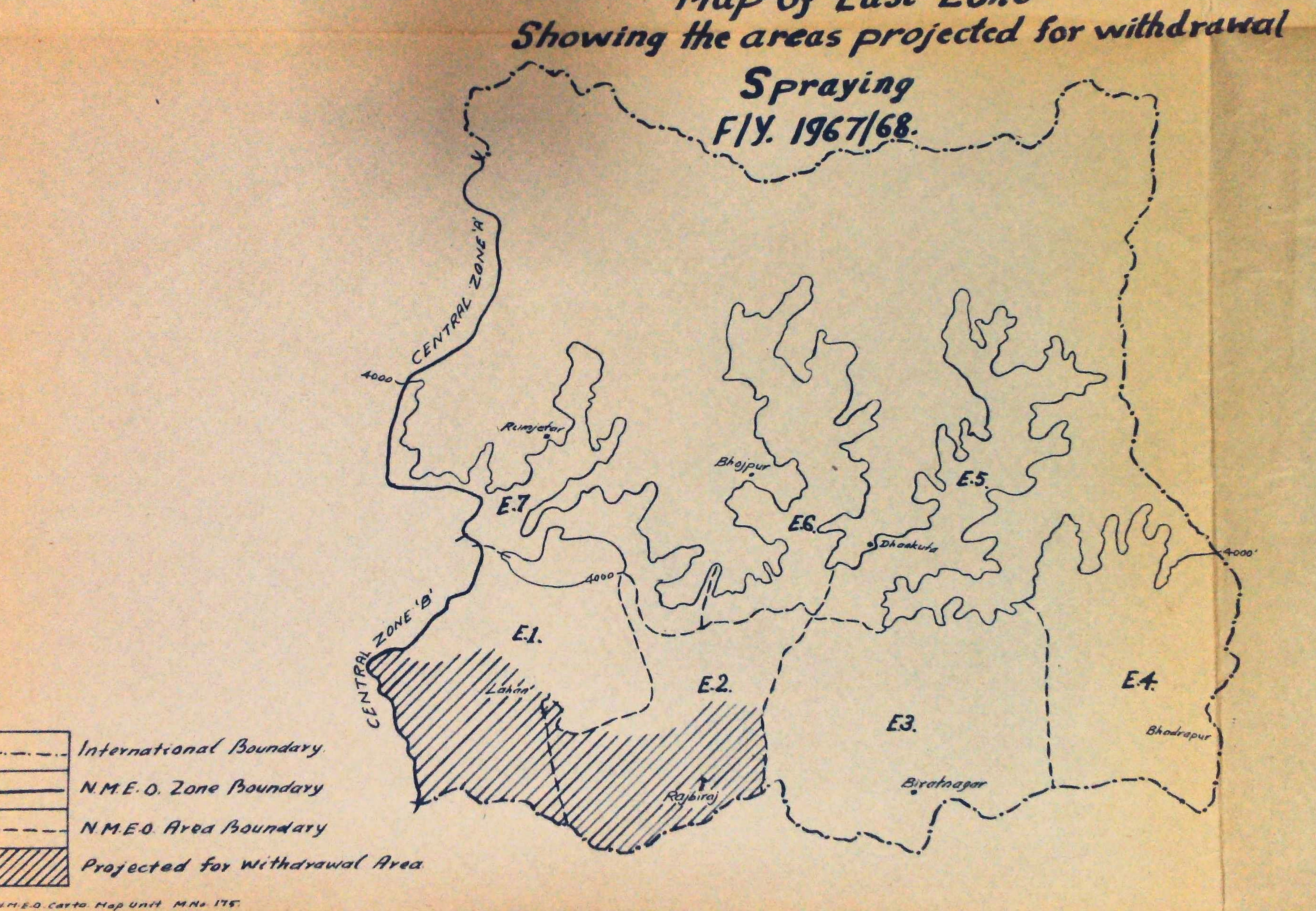
N.M.E.O. Zone Boundary

N.M.E.O. Area Boundary

Projected for withdrawal Area

N.M.E.O Carto. Map Unit M.No. 175
Date: 2024/9/24

Map of East Zone
Showing the areas projected for withdrawal
Spraying
F/Y. 1967/68.



Date:- 2024/[illegible]