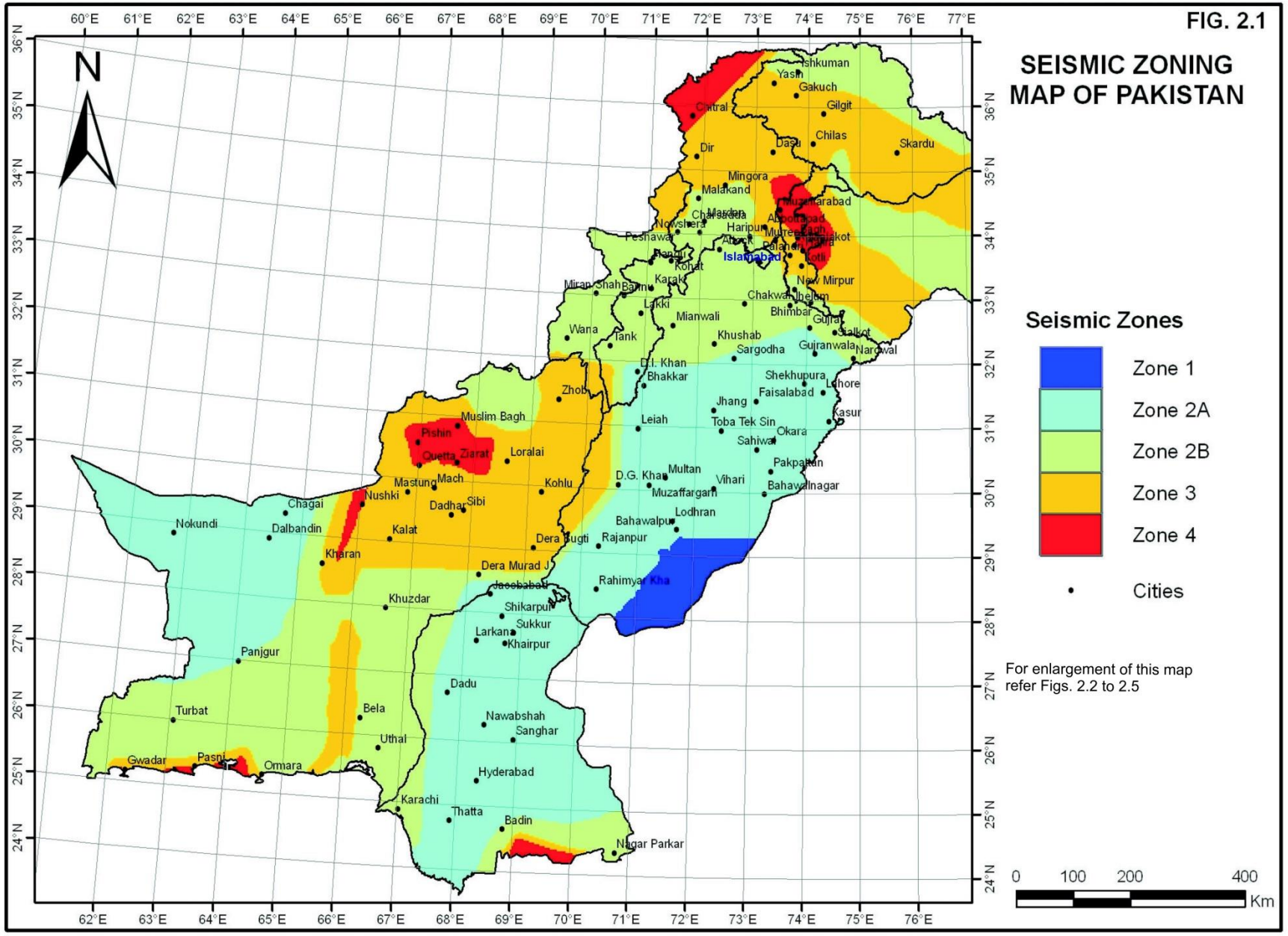


FIG. 2.1
SEISMIC ZONING MAP OF PAKISTAN
N
Seismic Zones
Zone 1
Zone 2A
Zone 2B
Zone 3
Zone 4
Cities
For enlargement of this map refer Figs. 2.2 to 2.5
0 100 200 400
Km
Ishkuman
Yasin
Gakuch
Chitral
Gilgit
Chilas
Skardu
Dir
Dasu
Mingora
Malakand
Muzaffarabad
Mardan
Abbottabad
Nowshera
Haripur
Peshawar
Attock
Rawalpindi
Islamabad
Kohat
Karak
Miran Shah
Bannu
New Mirpur
Chakwal
Jhelum
Lakki
Bhimbar
Gujrat
Mianwali
Wana
Tank
Khushab
Sialkot
Sargodha
Gujranwala
Narowal
D.I. Khan
Bhakkar
Shekhupura
Lahore
Zhob
Faisalabad
Jhang
Kasur
Muslim Bagh
Leiah
Toba Tek Sin
Pishin
Okara
Quetta
Ziarat
Loralai
Sahiwal
Pakpattan
Multan
Mastung
Mach
Kohlu
D.G. Khan
Vihari
Bahawalnagar
Nushki
Chagai
Dadhar
Sibi
Muzaffargarh
Lodhran
Nokundi
Dalbandin
Kalat
Bahawalpur
Dera Ghugti
Rajanpur
Kharan
Dera Murad J
Jacobabad
Rahimyar Kha
Khuzdar
Shikarpur
Sukkur
Larkana
Khairpur
Panjgur
Dadu
Turbat
Bela
Nawabshah
Sanghar
Uthal
Gwadar
Pasni
Ormara
Hyderabad
Karachi
Thatta
Badin
Nagar Parkar

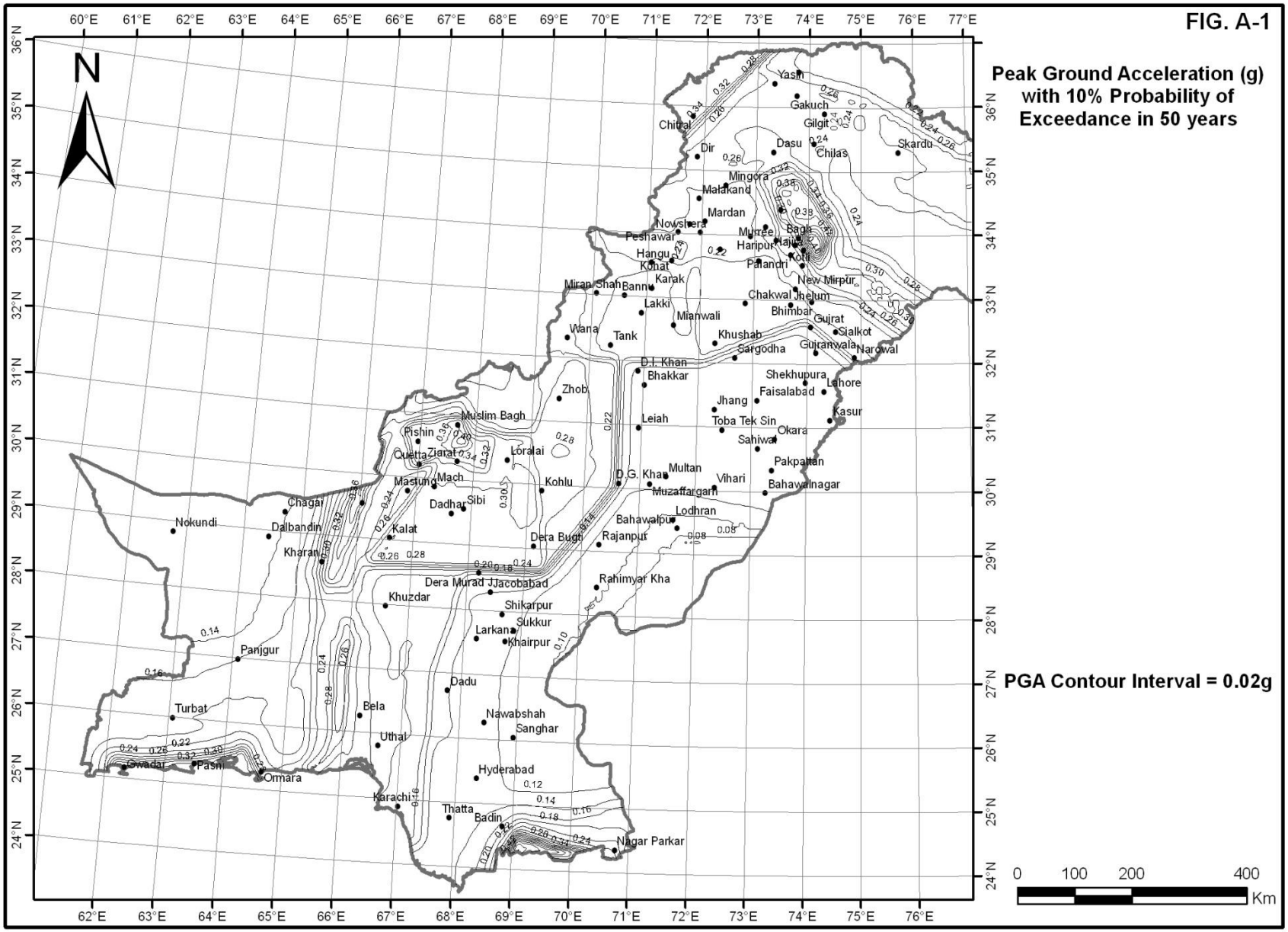
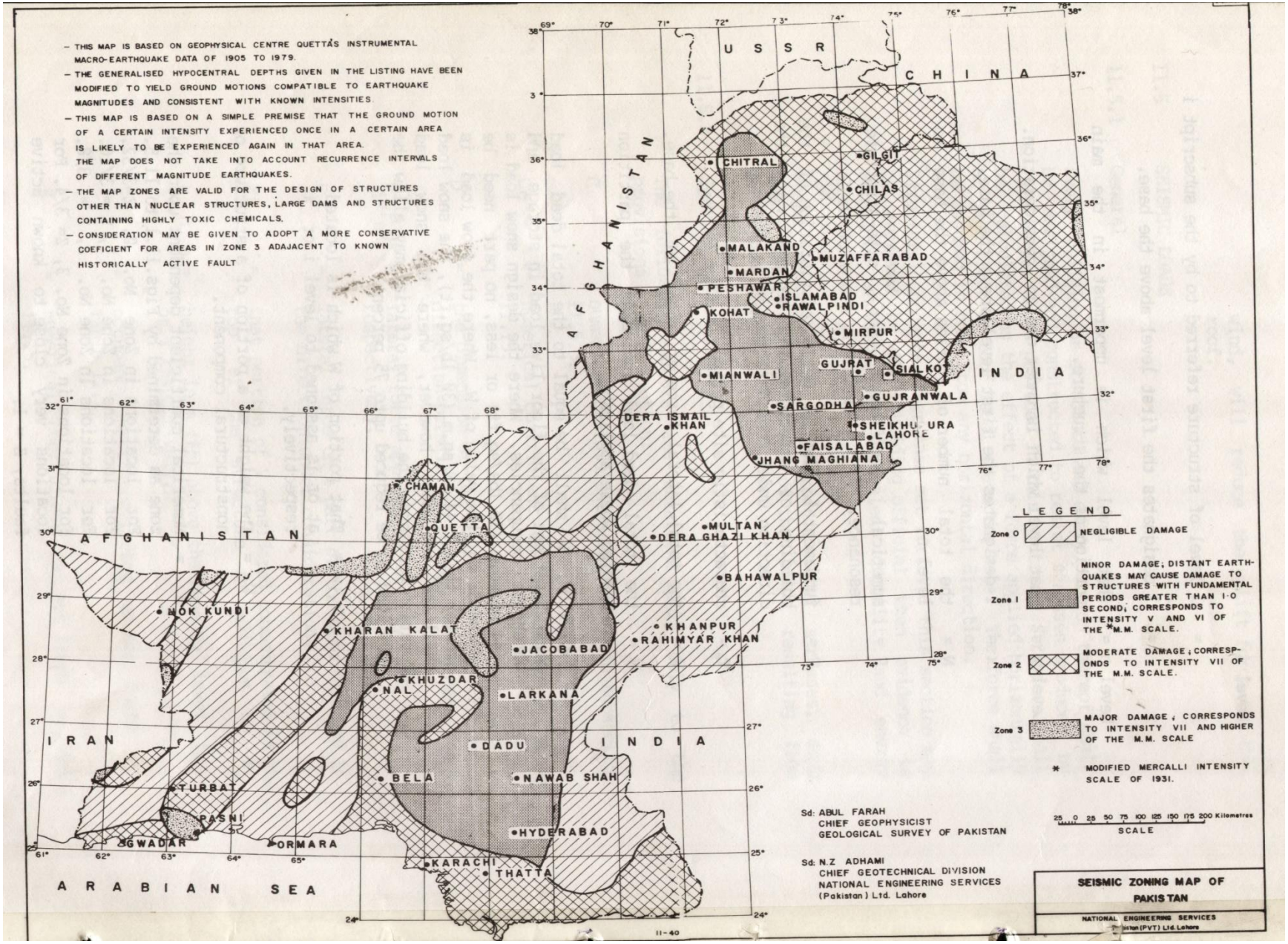


FIG. A-1
Peak Ground Acceleration (g) with 10% Probability of Exceedance in 50 years
PGA Contour Interval = 0.02g
N
0 100 200 400
Km
Yasin
Gakuch
Chitral
Gilgit
Skardu
Dasu
Chilas
Dir
Mingora
Malakand
Mardan
Nowshera
Peshawar
Murree
Bagh
Haripur
Hangu
Kohat
Kotli
Palandri
Miran Shah
Bannu
Karak
New Mirpur
Chakwal
Jhelum
Lakki
Bhimbar
Mianwali
Gujrat
Wana
Tank
Khushab
Sialkot
Sargodha
Gujranwala
Narowal
D.I. Khan
Bhakkar
Shekhupura
Lahore
Zhob
Faisalabad
Jhang
Kasur
Muslim Bagh
Leiah
Toba Tek Sin
Okara
Pishin
Sahiwal
Quetta
Ziarat
Loralai
Pakpattan
Multan
Mastung
Mach
Kohlu
D.G. Khan
Vihari
Bahawalnagar
Muzaffargarh
Chagai
Dadhar
Sibi
Lodhran
Nokundi
Bahawalpur
Dalbandin
Kalat
Rajanpur
Dera Bugti
Kharan
Rahimyar Kha
Dera Murad J
Jacobabad
Khuzdar
Shikarpur
Sukkur
Larkan
Khairpur
Panjgur
Dadu
Turbat
Bela
Nawabshah
Sanghar
Uthal
Hyderabad
Gwadar
Pasni
Ormara
Karachi
Thatta
Badin
Nagar Parkar


- THIS MAP IS BASED ON GEOPHYSICAL CENTRE QUETTAS INSTRUMENTAL MACRO-EARTHQUAKE DATA OF 1905 TO 1979.
- THE GENERALISED HYPOCENTRAL DEPTHS GIVEN IN THE LISTING HAVE BEEN MODIFIED TO YIELD GROUND MOTIONS COMPATIBLE TO EARTHQUAKE MAGNITUDES AND CONSISTENT WITH KNOWN INTENSITIES.
- THIS MAP IS BASED ON A SIMPLE PREMISE THAT THE GROUND MOTION OF A CERTAIN INTENSITY EXPERIENCED ONCE IN A CERTAIN AREA IS LIKELY TO BE EXPERIENCED AGAIN IN THAT AREA. THE MAP DOES NOT TAKE INTO ACCOUNT RECURRENCE INTERVALS OF DIFFERENT MAGNITUDE EARTHQUAKES.
- THE MAP ZONES ARE VALID FOR THE DESIGN OF STRUCTURES OTHER THAN NUCLEAR STRUCTURES, LARGE DAMS AND STRUCTURES CONTAINING HIGHLY TOXIC CHEMICALS.
- CONSIDERATION MAY BE GIVEN TO ADOPT A MORE CONSERVATIVE COEFICIENT FOR AREAS IN ZONE 3 ADAJACENT TO KNOWN HISTORICALLY ACTIVE FAULT
U S S R
C H I N A
A F G H A N I S T A N
I N D I A
I R A N
A R A B I A N S E A
CHITRAL
GILGIT
CHILAS
MALAKAND
MUZAFFARABAD
MARDAN
PESHAWAR
ISLAMABAD
RAWALPINDI
KOHAT
MIRPUR
GUJRAT
SIALKOT
MIANWALI
GUJRANWALA
SARGODHA
DERA ISMAIL KHAN
SHEIKHUPURA
LAHORE
FAISALABAD
JHANG MAGHIANA
CHAMAN
QUETTA
MULTAN
DERA GHAZI KHAN
BAHAWALPUR
NOK KUNDI
KHARAN KALAT
KHANPUR
RAHIMYAR KHAN
JACOBABAD
KHUZDAR
NAL
LARKANA
DADU
BELA
NAWAB SHAH
TURBAT
PASNI
GWADAR
ORMARA
HYDERABAD
KARACHI
THATTA
LEGEND
Zone 0 NEGLIGIBLE DAMAGE
Zone 1 MINOR DAMAGE; DISTANT EARTHQUAKES MAY CAUSE DAMAGE TO STRUCTURES WITH FUNDAMENTAL PERIODS GREATER THAN 1·0 SECOND, CORRESPONDS TO INTENSITY V AND VI OF THE *M.M. SCALE.
Zone 2 MODERATE DAMAGE; CORRESPONDS TO INTENSITY VII OF THE M.M. SCALE.
Zone 3 MAJOR DAMAGE; CORRESPONDS TO INTENSITY VII AND HIGHER OF THE M.M. SCALE
* MODIFIED MERCALLI INTENSITY SCALE OF 1931.
Sd: ABUL FARAH
CHIEF GEOPHYSICIST
GEOLOGICAL SURVEY OF PAKISTAN
Sd: N.Z ADHAMI
CHIEF GEOTECHNICAL DIVISION
NATIONAL ENGINEERING SERVICES
(Pakistan) Ltd. Lahore
25 0 25 50 75 100 125 150 175 200 Kilometres
SCALE
SEISMIC ZONING MAP OF PAKISTAN
NATIONAL ENGINEERING SERVICES
(PVT) Ltd. Lahore
II-40

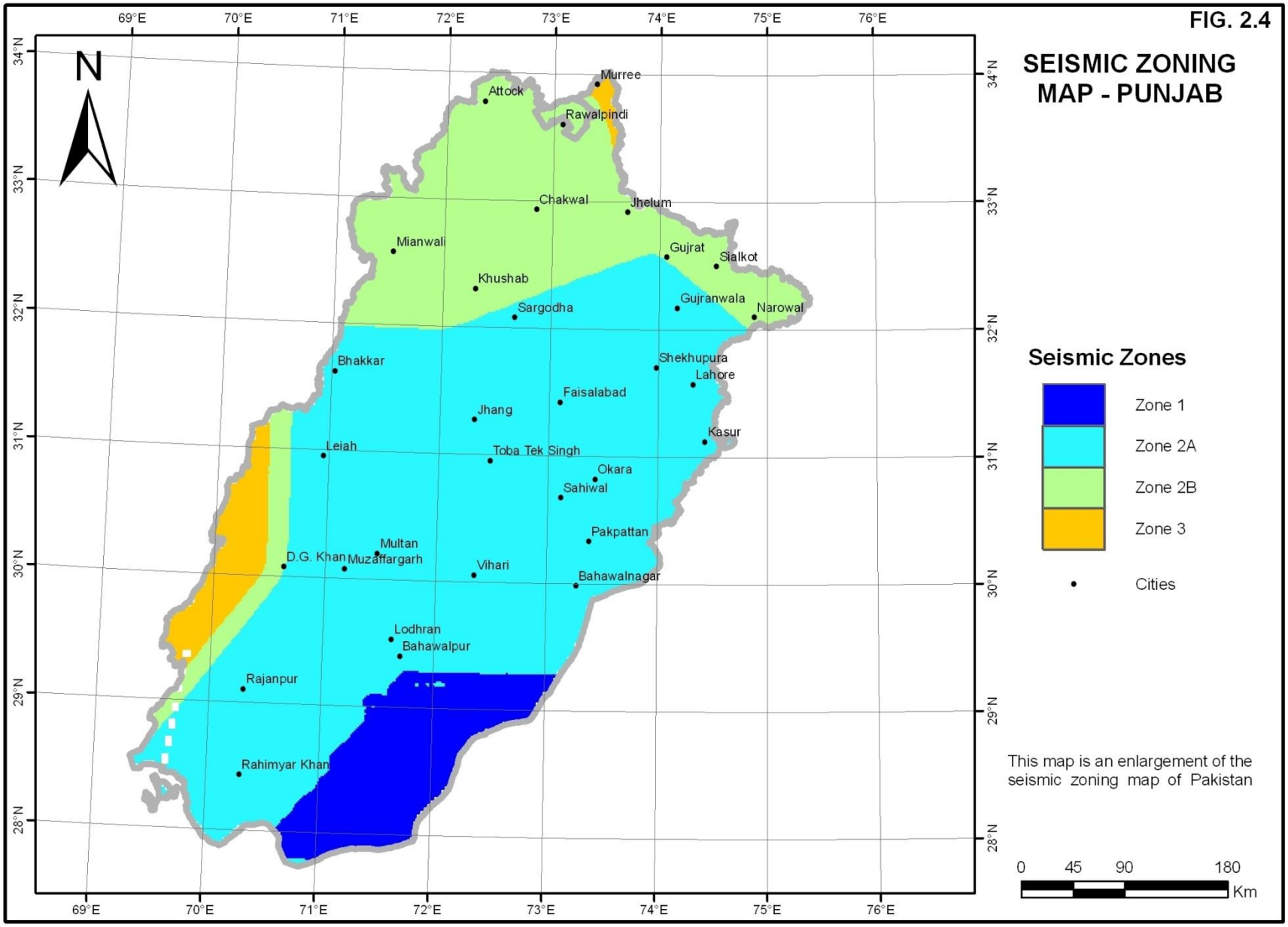


FIG. 2.4
SEISMIC ZONING MAP - PUNJAB
N
69°E
70°E
71°E
72°E
73°E
74°E
75°E
76°E
34°N
33°N
32°N
31°N
30°N
29°N
28°N
Murree
Attock
Rawalpindi
Chakwal
Jhelum
Mianwali
Gujrat
Sialkot
Khushab
Gujranwala
Narowal
Sargodha
Bhakkar
Shekhupura
Lahore
Faisalabad
Jhang
Kasur
Leiah
Toba Tek Singh
Okara
Sahiwal
Pakpattan
Multan
D.G. Khan
Muzaffargarh
Vihari
Bahawalnagar
Lodhran
Bahawalpur
Rajanpur
Rahimyar Khan
Seismic Zones
Zone 1
Zone 2A
Zone 2B
Zone 3
Cities
This map is an enlargement of the seismic zoning map of Pakistan
0
45
90
180
Km

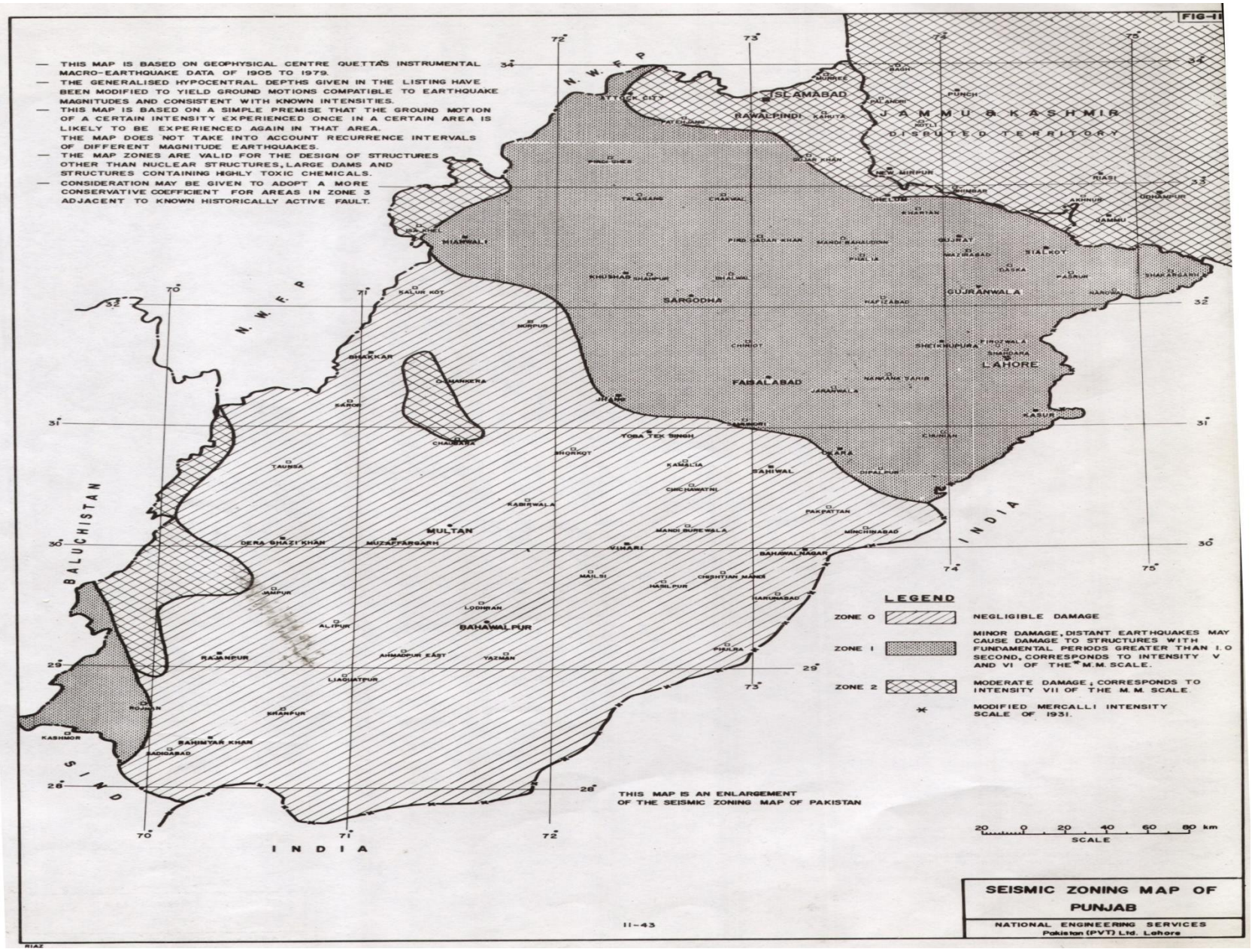


FIG-II
— THIS MAP IS BASED ON GEOPHYSICAL CENTRE QUETTA'S INSTRUMENTAL MACRO-EARTHQUAKE DATA OF 1905 TO 1979.
— THE GENERALISED HYPOCENTRAL DEPTHS GIVEN IN THE LISTING HAVE BEEN MODIFIED TO YIELD GROUND MOTIONS COMPATIBLE TO EARTHQUAKE MAGNITUDES AND CONSISTENT WITH KNOWN INTENSITIES.
— THIS MAP IS BASED ON A SIMPLE PREMISE THAT THE GROUND MOTION OF A CERTAIN INTENSITY EXPERIENCED ONCE IN A CERTAIN AREA IS LIKELY TO BE EXPERIENCED AGAIN IN THAT AREA. THE MAP DOES NOT TAKE INTO ACCOUNT RECURRENCE INTERVALS OF DIFFERENT MAGNITUDE EARTHQUAKES.
— THE MAP ZONES ARE VALID FOR THE DESIGN OF STRUCTURES OTHER THAN NUCLEAR STRUCTURES, LARGE DAMS AND STRUCTURES CONTAINING HIGHLY TOXIC CHEMICALS.
— CONSIDERATION MAY BE GIVEN TO ADOPT A MORE CONSERVATIVE COEFFICIENT FOR AREAS IN ZONE 3 ADJACENT TO KNOWN HISTORICALLY ACTIVE FAULT.
N.W.F.P
ISLAMABAD
RAWALPINDI
JAMMU & KASHMIR
DISPUTED TERRITORY
MIANWALI
SARGODHA
GUJRANWALA
LAHORE
FAISALABAD
SHEIKHUPURA
MULTAN
BAHAWALPUR
DERA GHAZI KHAN
MUZAFFARGARH
BALUCHISTAN
SIND
INDIA
INDIA
LEGEND
ZONE 0 — NEGLIGIBLE DAMAGE
ZONE 1 — MINOR DAMAGE, DISTANT EARTHQUAKES MAY CAUSE DAMAGE TO STRUCTURES WITH FUNDAMENTAL PERIODS GREATER THAN 1.0 SECOND, CORRESPONDS TO INTENSITY V AND VI OF THE * M.M. SCALE.
ZONE 2 — MODERATE DAMAGE, CORRESPONDS TO INTENSITY VII OF THE M.M. SCALE.
* MODIFIED MERCALLI INTENSITY SCALE OF 1931.
THIS MAP IS AN ENLARGEMENT OF THE SEISMIC ZONING MAP OF PAKISTAN
20 0 20 40 60 80 km
SCALE
SEISMIC ZONING MAP OF PUNJAB
NATIONAL ENGINEERING SERVICES Pakistan (PVT) Ltd. Lahore
II-43
RIAZ

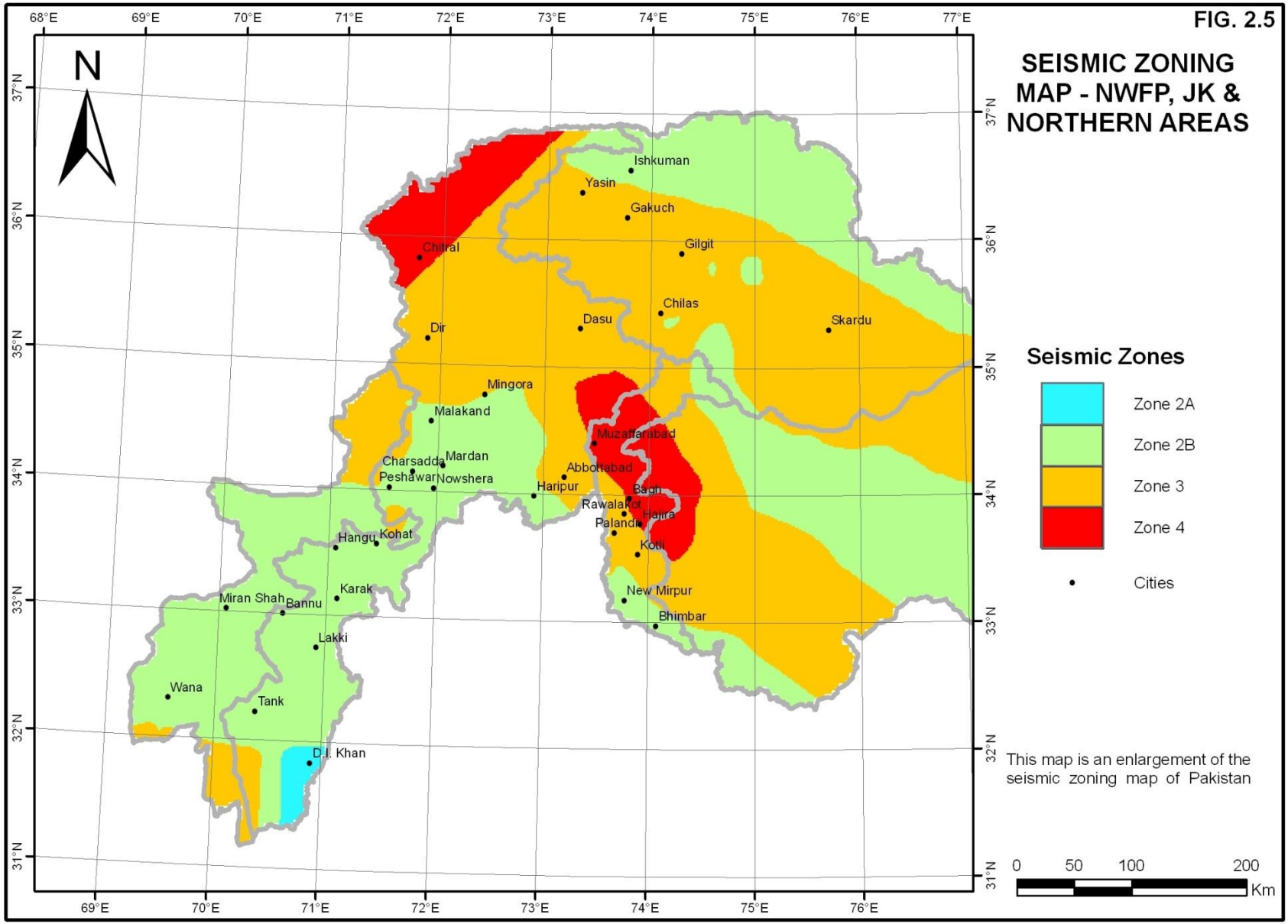
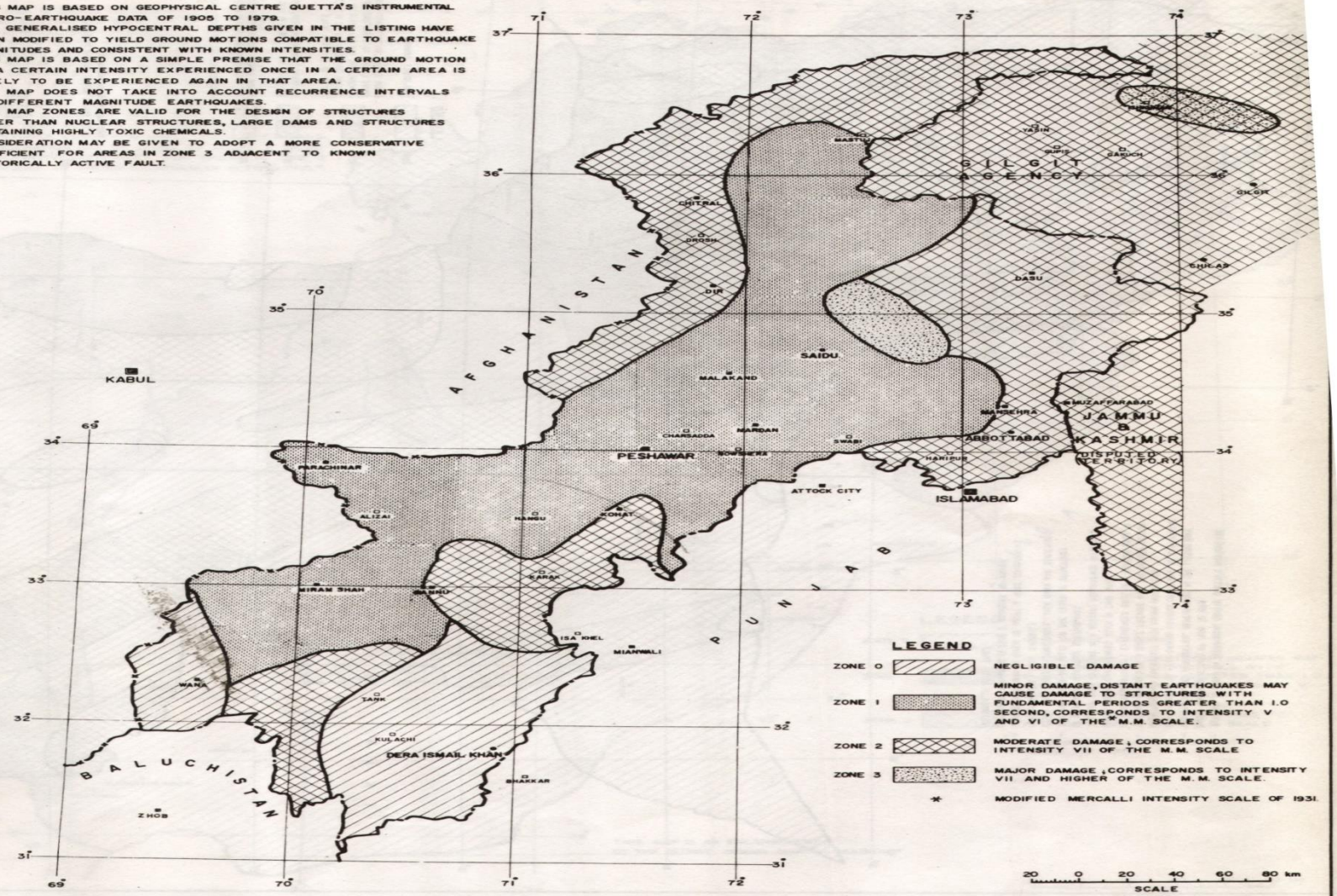


FIG. 2.5
SEISMIC ZONING MAP - NWFP, JK & NORTHERN AREAS
N
68°E
69°E
70°E
71°E
72°E
73°E
74°E
75°E
76°E
77°E
37°N
36°N
35°N
34°N
33°N
32°N
31°N
Ishkuman
Yasin
Gakuch
Gilgit
Chitral
Chilas
Skardu
Dasu
Dir
Mingora
Malakand
Muzaffarabad
Charsadda
Mardan
Abbottabad
Peshawar
Nowshera
Haripur
Bagh
Rawalakot
Haripur
Palandri
Kotli
Hangu
Kohat
New Mirpur
Karak
Miran Shah
Bannu
Bhimbar
Lakki
Wana
Tank
D.I. Khan
Seismic Zones
Zone 2A
Zone 2B
Zone 3
Zone 4
Cities
This map is an enlargement of the seismic zoning map of Pakistan
0
50
100
200
Km

FIG-

— THIS MAP IS BASED ON GEOPHYSICAL CENTRE QUETTA'S INSTRUMENTAL MACRO-EARTHQUAKE DATA OF 1905 TO 1979.
— THE GENERALISED HYPOCENTRAL DEPTHS GIVEN IN THE LISTING HAVE BEEN MODIFIED TO YIELD GROUND MOTIONS COMPATIBLE TO EARTHQUAKE MAGNITUDES AND CONSISTENT WITH KNOWN INTENSITIES.
— THIS MAP IS BASED ON A SIMPLE PREMISE THAT THE GROUND MOTION OF A CERTAIN INTENSITY EXPERIENCED ONCE IN A CERTAIN AREA IS LIKELY TO BE EXPERIENCED AGAIN IN THAT AREA. THE MAP DOES NOT TAKE INTO ACCOUNT RECURRENCE INTERVALS OF DIFFERENT MAGNITUDE EARTHQUAKES.
— THE MAP ZONES ARE VALID FOR THE DESIGN OF STRUCTURES OTHER THAN NUCLEAR STRUCTURES, LARGE DAMS AND STRUCTURES CONTAINING HIGHLY TOXIC CHEMICALS.
— CONSIDERATION MAY BE GIVEN TO ADOPT A MORE CONSERVATIVE COEFFICIENT FOR AREAS IN ZONE 3 ADJACENT TO KNOWN HISTORICALLY ACTIVE FAULT.



LEGEND

ZONE 0	NEGLIGIBLE DAMAGE
ZONE 1	MINOR DAMAGE, DISTANT EARTHQUAKES MAY CAUSE DAMAGE TO STRUCTURES WITH FUNDAMENTAL PERIODS GREATER THAN 1.0 SECOND, CORRESPONDS TO INTENSITY V AND VI OF THE * M.M. SCALE.
ZONE 2	MODERATE DAMAGE ; CORRESPONDS TO INTENSITY VII OF THE M.M. SCALE
ZONE 3	MAJOR DAMAGE ; CORRESPONDS TO INTENSITY VII AND HIGHER OF THE M.M. SCALE.
*	MODIFIED MERCALLI INTENSITY SCALE OF 1931.

20 0 20 40 60 80 km
SCALE

THIS MAP IS AN ENLARGEMENT OF THE SEISMIC ZONING MAP OF PAKISTAN

SEISMIC ZONING MAP OF N. W. F. P

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Pakistan (PVT) Ltd. Lahore

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RIAZ

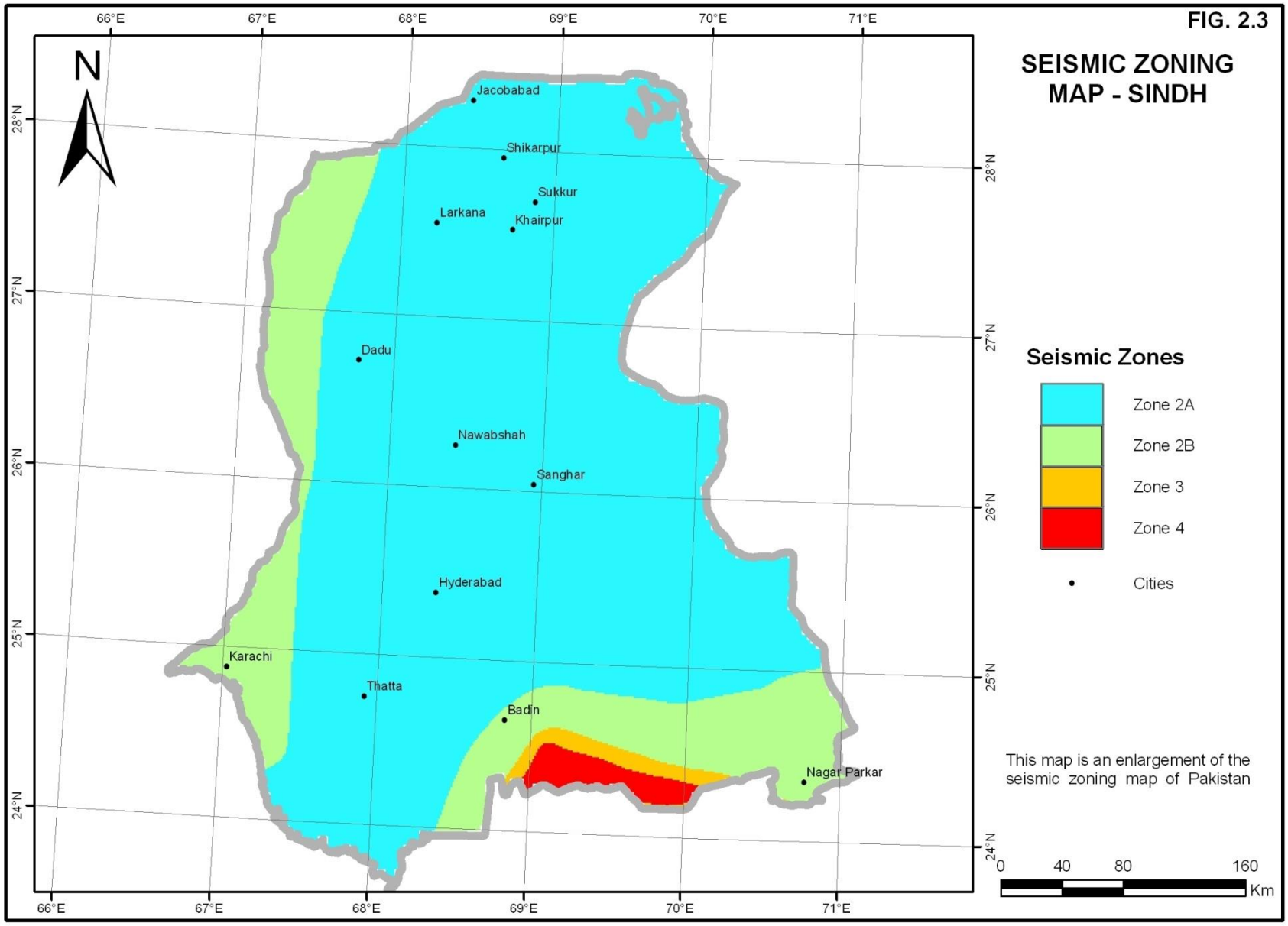
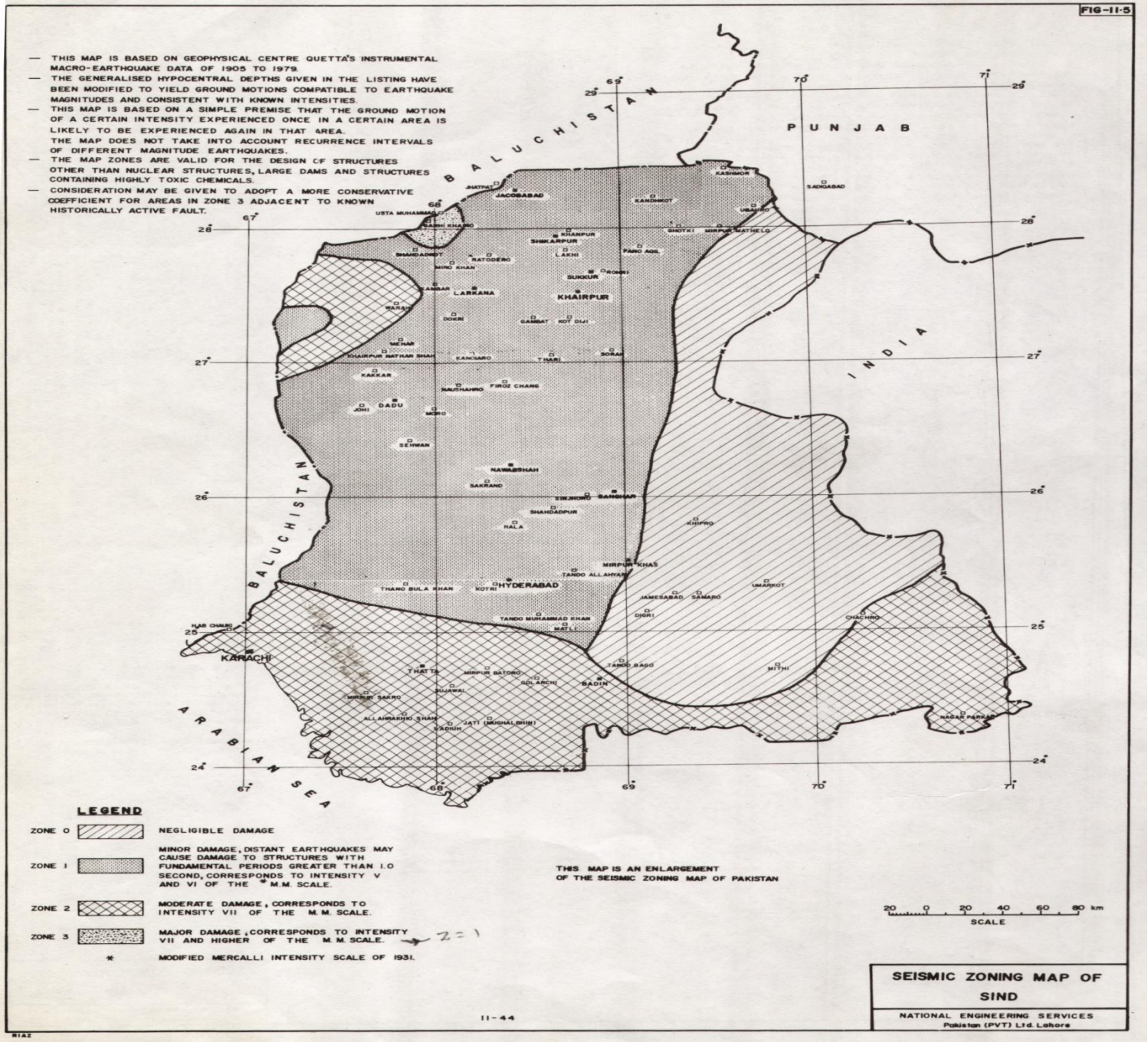


FIG. 2.3
SEISMIC ZONING MAP - SINDH
N
66°E
67°E
68°E
69°E
70°E
71°E
28°N
27°N
26°N
25°N
24°N
Jacobabad
Shikarpur
Sukkur
Larkana
Khairpur
Dadu
Nawabshah
Sanghar
Hyderabad
Karachi
Thatta
Badin
Nagar Parkar
Seismic Zones
Zone 2A
Zone 2B
Zone 3
Zone 4
Cities
This map is an enlargement of the seismic zoning map of Pakistan
0
40
80
160
Km

FIG-II-5


— THIS MAP IS BASED ON GEOPHYSICAL CENTRE QUETTA'S INSTRUMENTAL MACRO-EARTHQUAKE DATA OF 1905 TO 1979.
— THE GENERALISED HYPOCENTRAL DEPTHS GIVEN IN THE LISTING HAVE BEEN MODIFIED TO YIELD GROUND MOTIONS COMPATIBLE TO EARTHQUAKE MAGNITUDES AND CONSISTENT WITH KNOWN INTENSITIES.
— THIS MAP IS BASED ON A SIMPLE PREMISE THAT THE GROUND MOTION OF A CERTAIN INTENSITY EXPERIENCED ONCE IN A CERTAIN AREA IS LIKELY TO BE EXPERIENCED AGAIN IN THAT AREA. THE MAP DOES NOT TAKE INTO ACCOUNT RECURRENCE INTERVALS OF DIFFERENT MAGNITUDE EARTHQUAKES.
— THE MAP ZONES ARE VALID FOR THE DESIGN OF STRUCTURES OTHER THAN NUCLEAR STRUCTURES, LARGE DAMS AND STRUCTURES CONTAINING HIGHLY TOXIC CHEMICALS.
— CONSIDERATION MAY BE GIVEN TO ADOPT A MORE CONSERVATIVE COEFFICIENT FOR AREAS IN ZONE 3 ADJACENT TO KNOWN HISTORICALLY ACTIVE FAULT.
BALUCHISTAN
PUNJAB
INDIA
BALUCHISTAN
ARABIAN SEA
JACOBABAD
KASHMOR
SADIQABAD
KANDHKOT
UBAURO
USTA MUHAMMAD
KHANPUR
SHIKARPUR
LAKHI
PANO AQIL
SHAHDADKOT
RATODERO
MIRO KHAN
SUKKUR
ROHRI
LARKANA
KHAIRPUR
WARAH
DOKRI
GARHI YASIN
KHAIRPUR NATHAN SHAH
KANDIARO
THARI
SOOMRO
KAKKAR
NAUSHAHRO
FIROZ CHANG
JOHI
DADU
MORO
SEHWAN
NAWABSHAH
SAKRAND
SANGHAR
SHAHDADPUR
HALA
KHIPRO
MIRPUR KHAS
TANDO ALLAHYAR
HYDERABAD
THANO BULA KHAN
KOTRI
UMARKOT
JAMESABAD
SAMARO
DIGRI
CHACHRO
TANDO MUHAMMAD KHAN
MATLI
HAB CHAUKI
KARACHI
THATTA
MIRPUR BATORO
SUJAWAL
GOLARCHI
BADIN
TANDO BAGO
MITHI
MIRPUR SAKRO
ALLAHARKHO SHAHANI
JATI (MUGHALBHIN)
SADRUH
NAGAR PARKAR
67°
68°
69°
70°
71°
28°
27°
26°
25°
24°
LEGEND
ZONE 0 NEGLIGIBLE DAMAGE
ZONE 1 MINOR DAMAGE, DISTANT EARTHQUAKES MAY CAUSE DAMAGE TO STRUCTURES WITH FUNDAMENTAL PERIODS GREATER THAN 1.0 SECOND, CORRESPONDS TO INTENSITY V AND VI OF THE * M.M. SCALE.
ZONE 2 MODERATE DAMAGE, CORRESPONDS TO INTENSITY VII OF THE M.M. SCALE.
ZONE 3 MAJOR DAMAGE, CORRESPONDS TO INTENSITY VII AND HIGHER OF THE M.M. SCALE.
Z=1
* MODIFIED MERCALLI INTENSITY SCALE OF 1931.
THIS MAP IS AN ENLARGEMENT OF THE SEISMIC ZONING MAP OF PAKISTAN
20 0 20 40 60 80 km
SCALE
SEISMIC ZONING MAP OF SIND
NATIONAL ENGINEERING SERVICES
Pakistan (PVT) Ltd. Lahore
II-44
RIAZ

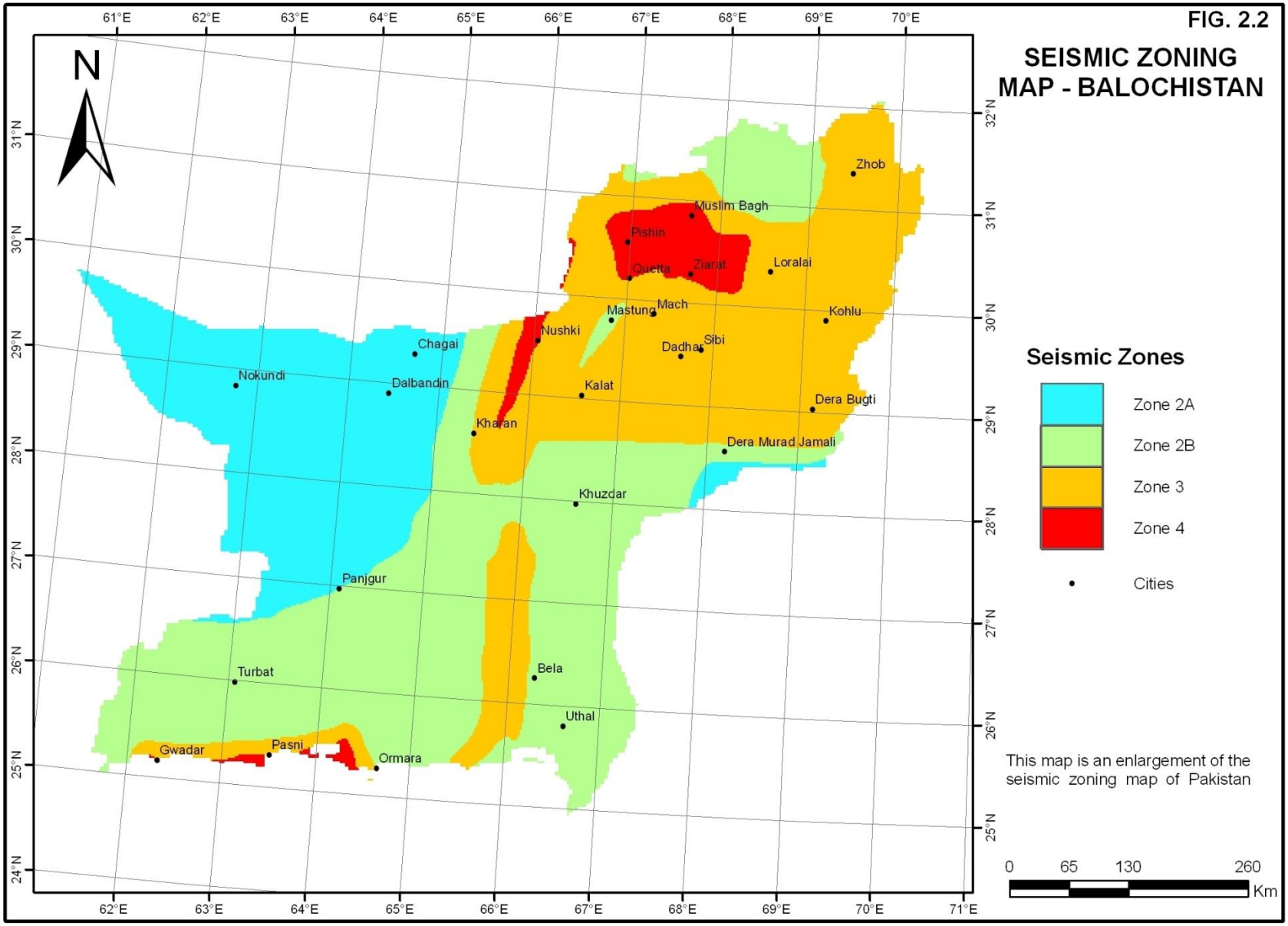
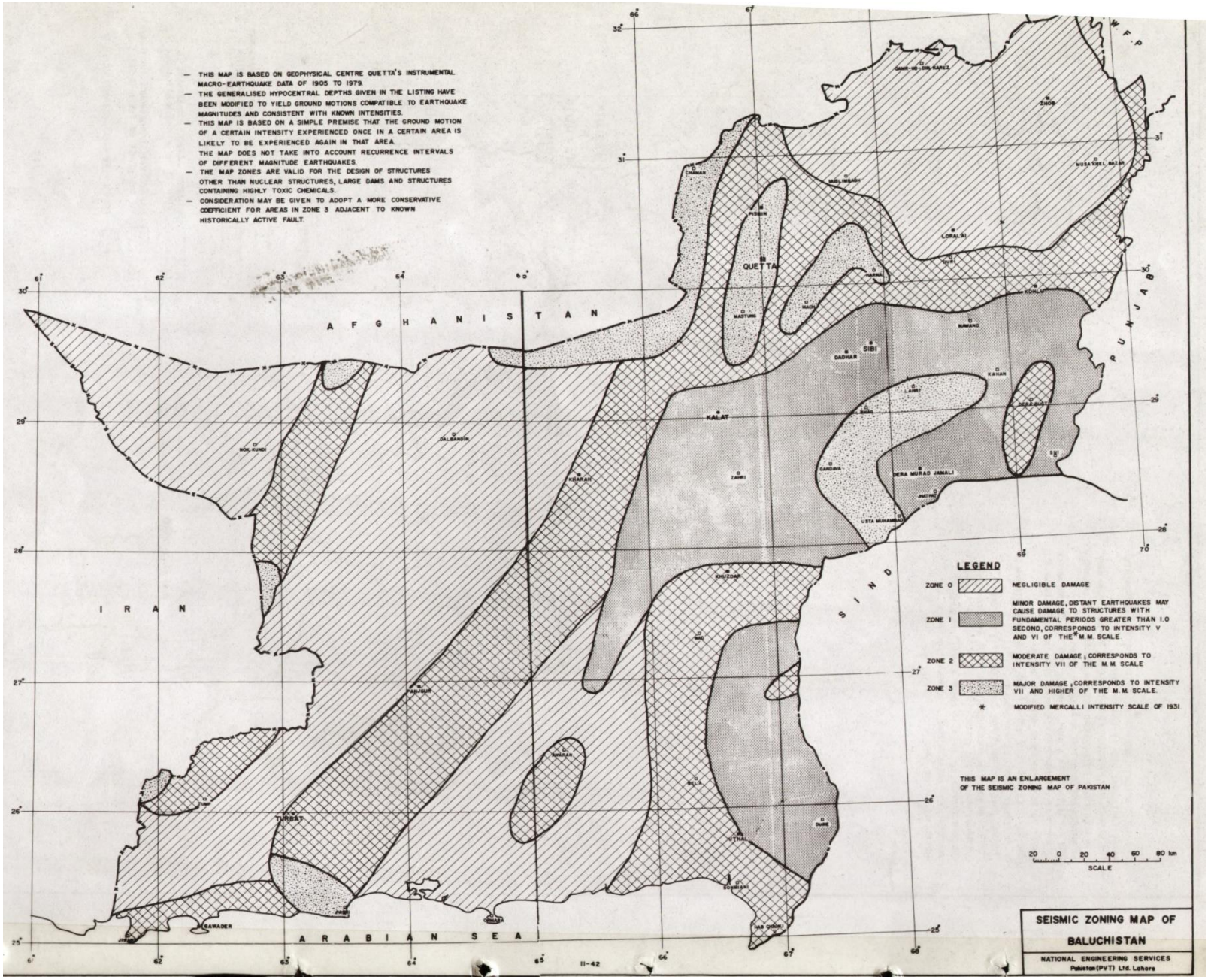


FIG. 2.2
SEISMIC ZONING MAP - BALOCHISTAN
N
61°E
62°E
63°E
64°E
65°E
66°E
67°E
68°E
69°E
70°E
71°E
32°N
31°N
30°N
29°N
28°N
27°N
26°N
25°N
24°N
Zhob
Muslim Bagh
Pishin
Quetta
Ziarat
Loralai
Mastung
Mach
Kohlu
Nushki
Chagai
Dadhar
Sibi
Nokundi
Dalbandin
Kalat
Dera Bugti
Kharan
Dera Murad Jamali
Khuzdar
Panjgur
Turbat
Bela
Uthal
Gwadar
Pasni
Ormara
Seismic Zones
Zone 2A
Zone 2B
Zone 3
Zone 4
Cities
This map is an enlargement of the seismic zoning map of Pakistan
0
65
130
260
Km


— THIS MAP IS BASED ON GEOPHYSICAL CENTRE QUETTA'S INSTRUMENTAL MACRO-EARTHQUAKE DATA OF 1905 TO 1979.
— THE GENERALISED HYPOCENTRAL DEPTHS GIVEN IN THE LISTING HAVE BEEN MODIFIED TO YIELD GROUND MOTIONS COMPATIBLE TO EARTHQUAKE MAGNITUDES AND CONSISTENT WITH KNOWN INTENSITIES.
— THIS MAP IS BASED ON A SIMPLE PREMISE THAT THE GROUND MOTION OF A CERTAIN INTENSITY EXPERIENCED ONCE IN A CERTAIN AREA IS LIKELY TO BE EXPERIENCED AGAIN IN THAT AREA.
THE MAP DOES NOT TAKE INTO ACCOUNT RECURRENCE INTERVALS OF DIFFERENT MAGNITUDE EARTHQUAKES.
— THE MAP ZONES ARE VALID FOR THE DESIGN OF STRUCTURES OTHER THAN NUCLEAR STRUCTURES, LARGE DAMS AND STRUCTURES CONTAINING HIGHLY TOXIC CHEMICALS.
— CONSIDERATION MAY BE GIVEN TO ADOPT A MORE CONSERVATIVE COEFFICIENT FOR AREAS IN ZONE 3 ADJACENT TO KNOWN HISTORICALLY ACTIVE FAULT.
AFGHANISTAN
IRAN
ARABIAN SEA
PUNJAB
SIND
QUETTA
KALAT
SIBI
DADHAR
MASTUNG
CHAMAN
PISHIN
KHUZDAR
TURBAT
PASNI
GWADER
JIWANI
LEGEND
ZONE 0 NEGLIGIBLE DAMAGE
ZONE 1 MINOR DAMAGE, DISTANT EARTHQUAKES MAY CAUSE DAMAGE TO STRUCTURES WITH FUNDAMENTAL PERIODS GREATER THAN 1.0 SECOND, CORRESPONDS TO INTENSITY V AND VI OF THE M.M. SCALE.
ZONE 2 MODERATE DAMAGE, CORRESPONDS TO INTENSITY VII OF THE M.M. SCALE
ZONE 3 MAJOR DAMAGE, CORRESPONDS TO INTENSITY VII AND HIGHER OF THE M.M. SCALE.
* MODIFIED MERCALLI INTENSITY SCALE OF 1931
THIS MAP IS AN ENLARGEMENT OF THE SEISMIC ZONING MAP OF PAKISTAN
20 0 20 40 60 80 km
SCALE
SEISMIC ZONING MAP OF BALUCHISTAN
NATIONAL ENGINEERING SERVICES Pakistan (PVT) Ltd. Lahore
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S. No	Building Code 1986		Building Code 2007	
	Zone	Description	Zone	Acceleration
1	0	Negligible Damage	1	0.05 to 0.08g
2	1	Minor Damage, Distant Earthquakes May Cause Damage To Structures With Fundamental Periods. Greater Than 1-0 Second, Corresponds to Intensity V and VI of the *M.M. Scale	2A	0.08 to 0.16g
3	2	Moderate Damage, Corresponds to Intensity VII of the M.M. Scale	2B	0.16 to 0.24g
4	3	Major Damage, Corresponds to intensity VII and higher of the M.M. Scale	3	0.24 to 0.32g
5			4	> 0.32g

* Modified Mercalli Intensity Scale of 1931