



Department of
Environment and Conservation

Dieback Interpretation Report
Red Hill Quarry, Herne Hill

FOREST MANAGEMENT BRANCH

Department of Environment and Conservation

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1 Introduction

1.1 Background

Forest Management Branch within the Department of Environment and Conservation (DEC) has been engaged by Hanson Construction Materials Pty Ltd (Hanson) to map the occurrence of *Phytophthora cinnamomi* on the Hanson Red Hill Quarry site in Red Hill. This report details the process and results of mapping *Phytophthora cinnamomi* and establishes *Phytophthora cinnamomi* presence or absence.

Two areas within the boundary of the Red Hill Quarry were interpreted as well as a linear survey on all internal tracks around existing operations and throughout the property.

1.2 Location and Size of Areas

The quarry is located adjacent to Toodyay Road approximately 10 kilometers north east of the Roe Highway/Toodyay Road intersection, north east of Midland.

The Red Hill property (Lot 11) extends from Toodyay Rd in the south to Weir Road in the north. The majority of property is bounded by unnamed forest tracks and in some parts fenced. In total the property is 815 hectares.

The total area surveyed for *Phytophthora cinnamomi* at the quarry is 226.5 hectares which includes all internal tracks with a width of 25 meters either side and two small polygons one at 72 hectares and the other at 8 hectares in size.

2 Methods

2.1 Historical land use and past disturbance

There has been quarrying operations at the Herne Hill/Red Hill site since the early 1960's. The location of the quarry is on the Darling Scarp which yields rocky granite outcrops and steep slopes.

The forest types on the Darling Scarp are those of Jarrah with some Wandoo. The forest is characterised by species including *Eucalyptus marginata*, *Banksia grandis*, *Macrozamia reidleyi*, *Xanthorrhoea preissii*, *Xanthorrhoea gracilis* and some *Eucalyptus wandoo*.

Due to certain characteristics of the Perth hills, the disease caused by *Phytophthora cinnamomi*, is expected to range from low to very high impact and to be strongly associated with roading and other man made disturbances in these areas. Its effects are also greatly increased in areas of higher rainfall.

Fire history and harvesting information was sourced from the DEC corporate records. Records indicate no harvesting or fire information for the Red Hill site.

2.2 Interpretation

Field interpretation commenced in September 2007 and followed the standard methods and operating procedures described in the document titled "Volume 2 - *Phytophthora cinnamomi* and disease caused by it: Interpreter guidelines for detection, diagnosis and mapping" (CALM 2001).

There has been no previous formal dieback surveying done at the Red Hill site according to DEC records although Landform Research has visually assessed for and commented on presence of dieback in various documents (e.g. Annual Environmental Reports and management plans). An initial interpretation was carried out which involved walking through the forested areas inside the two polygons, observing any recent plant deaths that were apparent and looking for patterns associated with the presence of *Phytophthora cinnamomi*. Also all the tracks were interpreted by linear means which involves walking along them observing any plant deaths and in some cases sampling them.

Non-differential, hand-held global positioning system (GPS) receivers were used for navigation and to record survey boundaries and waypoints within the areas. Waypoints were recorded to indicate *Phytophthora cinnamomi* related deaths or points in areas of uninfested vegetation. Waypoints were recorded along the way to signify any of the three categories at that location.

The three categories used in the interpretation process are uninfested, infested and uninterpretable. The definitions are below.

1. Uninfested – no plant disease symptoms were observed that were consistent with the presence of *Phytophthora cinnamomi*.
2. Infested – symptoms of the disease where present on plants.
3. Uninterpretable – insufficient indicator species present to be able to observe the presence or absence of *Phytophthora cinnamomi*.

2.3 Demarcation

The boundaries between the 'infested' and 'uninfested' areas were demarcated in the field using wide "Day-glo" orange coloured flagging tape. They were recorded using GPS receivers as a track. The end of a demarcation line was indicated by tying the tape twice (at different heights) around a tree. Along the demarcation line, tapes were tied once around trees at a visible height, with the knots facing the infested area.

The line was taped with a 15-20m buffer to the last visible symptom to ensure that cryptic *Phytophthora cinnamomi* disease is within the demarcation. Uninterpretable was also demarcated with narrow white tape with no buffer and knots facing the category and is clearly indicated on the occurrence map. The majority of the uninterpretable is on the steep slopes of the scarp.

2.4 Soil and plant sampling

There were a total of twelve samples taken in the forest areas of the property. Figure 1 is an example of the sampling process. Methylated spirits is used to clean the sample tool to the appropriate standard ensuring no infection of the sample from the previous one taken.



3 Results

3.1 Disease Distribution

Due to a lack of species that indicate *Phytophthora cinnamomi* presence the sections of the property that lie on the steep slopes of the scarp are uninterpretable. This means that most of the tracks and a large part of the larger polygon are uninterpretable. Areas upslope, including ridges, have indicator species that you would normally expect to find in the Jarrah forest, and were able to be interpreted.

As is often the case infestation is associated with roads, tracks, powerlines and other manmade influences. The main area of infestation is associated with the powerline and tracks inside the smaller polygon. The other infestations are also associated with tracks. The western most infestation (situated east of the Herne Hill Quarry) is associated with a gravel pit.

Significant parts of the polygons interpreted are uninfested. Some of the tracks and the powerline also remain uninfested but are at risk of becoming infested if access is not controlled and vehicle movement is not done hygienically.

Uninterpretable areas adjacent to infested areas have a potential to be infested but will not indicate so.

Category	Area of each Category (ha)
Uninfested	62.5
Infested	7.1
Uninterpretable	156.6
Total	226.2

3.2 Disease expression and impact

The disease expression ranged from subtle to obvious in the areas interpreted. Two of the infested areas had black gravel which as a result intensifies the effects of *Phytophthora cinnamomi* due to a greater amount of heat attracted to the ground. This resulted in better expression and higher impact.

The infested area inside the smaller polygon and the section of track to the north indicated more subtle expression and a lower impact of *Phytophthora cinnamomi*. The infestation in the gravel pit was harder to determine. Mostly only *Dryandra sessilis* was present. This plant is an indicator to *Phytophthora cinnamomi*, but with no other vegetation around it is difficult to determine expression and predicted impact.

3.3 Sample Results

The twelve samples taken during the interpretation yielded both positive and negative results. Seven of the samples returned a positive for *Phytophthora cinnamomi*. All these results were expected based on field interpretation and observations, except samples 4 and 12. The following two tables represent a variety of information on the samples taken.

Table 1 below indicates number of samples taken, species botanical name with their GDA reference, sample number and the result.

Table 1.

Date	NO_	Plant Sampled	Northing	Easting	Result
16.09	1	<i>Xanthorrhoea gracilis</i>	6477 795	412 777	CIN
16.09	2	<i>Xanthorrhoea gracilis</i>	6477 802	412 870	CIN
16.09	3	<i>Dryandra sessilis</i>	6477 861	412 951	NEG
16.09	4	<i>Dryandra sessilis</i>	6477 783	4412 971	CIN
16.09	5	<i>Xanthorrhoea presseii</i>	6477 560	412 855	NEG
23.09	6	<i>Banksia grandis</i>	6481 141	412 275	NEG
01.10	7	<i>Dryandra sessilis</i>	6478 295	412 042	CIN
23.09	8	<i>Dryandra sessilis</i>	6481 008	412 373	NEG
23.09	9	<i>Dryandra sessilis</i>	6481 204	412 558	NEG
23.09	10	<i>Xanthorrhoea presseii</i>	6480 695	413 043	CIN
23.09	11	<i>Xanthorrhoea gracilis</i>	6481 098	413 746	CIN
01.10	12	<i>Dryandra sessilis</i>	6478 403	412 438	NEG

Table two indicates the samples taken and number of positives and negatives and their indicator species death class.

Table 2.

Species	No. of sample	No. positive	Positive for <i>P.cinnamomi</i> (%)	ISD <i>P. cinnamomi</i> positive				ISD <i>P.cinnamomi</i> negative			
				M	C	S	I	M	C	S	I
<i>Banksia grandis</i>	1	0	0	0	0	0	0	0	0	0	1
<i>Dryandra sessilis</i>	6	2	33	0	0	2	0	0	0	2	2
<i>Xanthorrhoea presseii</i>	2	1	50	0	1	0	0	0	0	0	1
<i>Xanthorrhoea gracilis</i>	3	2	100	1	0	1	0	0	0	0	0
TOTALS	12	5	50	1	1	3	0	0	0	2	4

Indicator species deaths (ISD) class identifies the death of plant, whether it is recent or not by the following categories:

- **Multiple**; whereby deaths are recorded from more than one species of plant.
- **Cluster**; deaths are of one species and are close together with other deaths.
- **Scattered**; deaths are of one species and appear random with no set pattern.
- **Isolated**; one species of death with no others observed in vicinity

4 Conclusion

A total of 226.2 hectares were interpreted at the site of the Hanson Red Hill Quarry in Red Hill. The property is largely uninterpretable but has *Phytophthora cinnamomi* present in five different locations. There are significant areas of uninfested along some of the tracks and within the polygons interpreted. The infested areas are associated with tracks, powerlines and a gravel pit. To minimise further spread of infestations it is advised that unused roads are blocked or that vehicle movement is done in a hygienic manner i.e. with appropriate clean downs and signs.

A map of the occurrence is provided with this report. Due to the capacity of *Phytophthora cinnamomi* to spread either autonomously or through uncontrolled vectors, the map boundaries should be re-checked before operations proceed if the map is more than **one** year old (**December 2008**). A complete interpretation must be done after three years (**December 2010**).

Operations in this area will need to comply with relevant hygiene management measures if human vectoring of the pathogen is to be prevented (as described in "Volume 1 *Phytophthora cinnamomi* and Disease caused by it: Management Guidelines CALM 2000). Vehicle movement is to be controlled and determined by the condition of the soil. "Clean on Entry" rules should be applied to vehicles entering uninfested areas. Wash down units should be available for movement into uninfested areas under moist soil conditions. Run off from wash down points should drain into infested areas to prevent further spread of the pathogen. Dry soil access can be permitted, provided all vehicles are Clean on Entry to uninfested areas.

29th February 2008

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5 References

Department of Conservation and Land Management (2000) *Phytophthora cinnamomi* and disease caused by it. Volume I Management Guidelines

Department of Conservation and Land Management (2001) *Phytophthora cinnamomi* and disease caused by it. Volume II Interpreter guidelines for detection, diagnosis and mapping

Havel, J.J. (1975) Site Vegetation Mapping in the Northern Jarrah Forest (Darling Range). 2. Location and Mapping of Site-Vegetation Types.

Botanic Gardens Trust Sydney NSW. Armillaria root Rot – fact sheet.
http://www.rbgsyd.gov.au/information_about_plants/pests_diseases/fact_sheets/armillaria_root_rot

PERTH HILLS DISTRICT RED HILL QUARRY

PHYTOPHTHORA CINNAMOMI OCCURRENCE MAP

MAP LEGEND

- UNINFESTED (PROTECTABLE)**
Determined by a qualified Interpreter to be free of plant disease symptoms which indicates the presence of *P. cinnamomi*.
- UNINTERPRETABLE (PROTECTABLE)**
Where susceptible plants are absent or too few to enable the interpretation of *P. cinnamomi* presence or absence.
- INFESTED**
Determined by a qualified Interpreter to have plant disease symptoms consistent with the presence of *P. cinnamomi*.

BOUNDARY OF INTERPRETATION

AGE LIMITS FOR THIS MAP

Map Boundaries should be checked before Operations proceed if this map is older than 1 year (December 2008).
This map should not be used if it is older than 3 years (December 2010).

Areas that have had an Operation in them become unreliable and should be checked prior to Further / New activities.

MAP LIMITATIONS

The smallest areas of interpretation that can be portrayed on this map are 1 millimetre in diameter, representing 20.0 metres diameter on the ground.
Areas less than this are symbolised to this size.

MAP METHOD

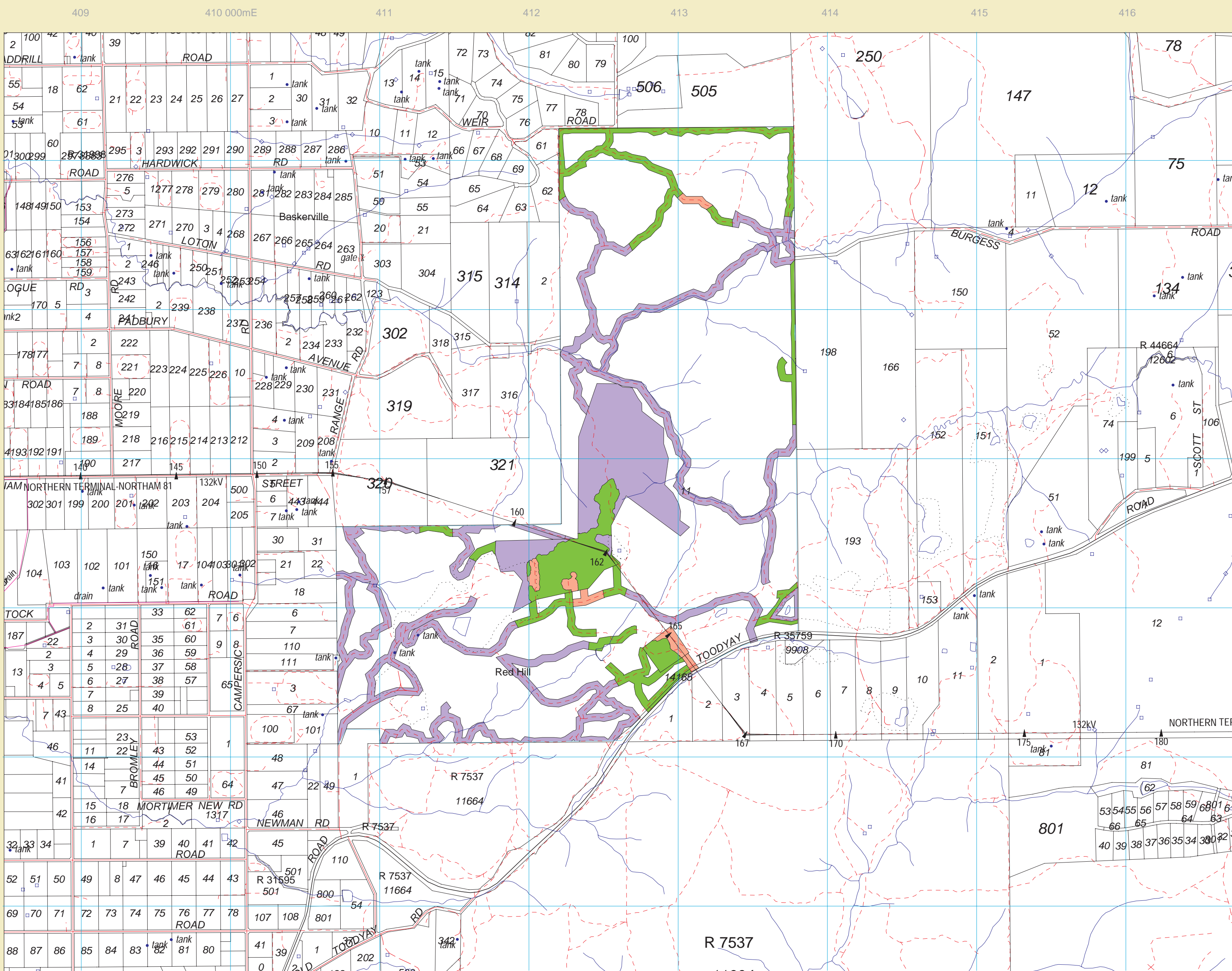
Interpreted using strip line survey.
Boundaries captured using GPS.

PRODUCT VERSION STATEMENT

Product	Code	Complete Date	Interps	Initials	Digitised	Recheck Due	Expiry Date
Occurrence	Red Hill Quarry	10/12/07	GC	GC	11/02/08	10/12/08	10/12/10

AREA STATEMENT

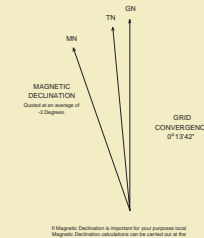
Categories	Area ha	Notes
UNINFESTED	62.5	
UNINTERPRETABLE	156.6	
INFESTED	7.1	
TOTAL AREA	226.4	



LEGEND

- 2 LANE SEALED ROAD
- 1 LANE SEALED ROAD
- 1 LANE UNSEALED ROAD
- VEHICULAR TRACK
- POWERLINE, PYLON No.
- REFERENCE TREE
- HYDROLOGY
- CONTOUR (5 metre intervals)
- SWAMP
- DAM
- LOADING RAMP
- WATER POINT
- SPOT HEIGHT

SCALE 1 : 20 000



PROJECTION: TRANSVERSE MERCATOR C.M. 117 E ZONE 50
HORIZONTAL DATUM: GEOCENTRIC DATUM AUSTRALIA 1994.
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM 1971.



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