First, Hatfield fails to consider the distances between non-contiguous on-ring end offices. Second, Hatfield fails to account for obstacles (e.g., bodies of water, buildings, mountains). For instance, in the state of Hawaii, Hatfield ignores the Pacific Ocean. This is particularly grievous, given that 50% of the IOF air miles in Hawaii are over water. Despite this fact, the Hatfield Model does not include costs for any submarine cable; nor does it alter its assumption that 75% of IOF facilities share structure with feeder plant. Third, the model does not address the inability to gain access to rights-of-way. This analysis clearly highlights that the Hatfield Model understates IOF costs and thus would produce an incorrect and insufficient distribution of high cost support.

b) The Hatfield Model Does Not Protect Off-Ring Wire Centers from IOF Facility Failures.

The SONET ring architecture modeled by Hatfield is an appropriate forward-looking architecture. Ring architecture provides redundancy and protection of the IOF in the event of a fiber cable break. However, the Hatfield Model's description leads readers to believe that survivability is provided for all SS7 signaling links, stating that "All links are assumed to be carried on the interoffice rings."[34] In reality, the fact that the on-ring IOF is not long enough to complete the ring renders the entire SS7 signaling system inoperable. Thus, no interoffice calls at all could be completed over the network modeled by Hatfield.

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[34] Hatfield Model Description 3.1, Page 49.

Furthermore, the IOF network modeled by the Hatfield Model is inherently unreliable because it does not provide facility diversity for SS7 signaling link pairs serving off-ring offices. The model assumes that all of the trunks and circuits from each off-ring office are routed to their serving tandem via a single point-to-point OC-3 transmission facility. The Hatfield Model's failure to provide diverse IOF for approximately 60% of the end offices in the United States[35] creates a network that has little likelihood of meeting the industry-recommended network reliability and unavailability (downtime) objectives. Accepted industry guidelines specify an annual average downtime of no more that 2 minutes for the A-link signaling pairs between the local switch and its mated SS7 STP pair.[36] A single fiber cable failure on the point-to-point OC-3 facility serving an off-ring office could easily take up to 4 hours, or more, to isolate and repair. With no facility diversity in place, the served office is isolated for the entire duration of the failure. This is inconsistent with prudent network design standards.

c) The Hatfield Model Fails to Provide Digital Cross-Connect Equipment for Direct Trunks Between Off-Ring Offices

The Hatfield Model calculates "the investment required for a digital cross connect system that interfaces DS-1 signals between switches and OC-3 multiplexers"[37] GTE

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35 Northern Business Information, US Central Office Equipment Market: 1996 Edition, p.66.

36 Bellcore BOC Notes on the LEC Networks, April 1994, Section 4.6.4, p.4-51.

37 Hatfield Inputs Portfolio, Section 4.4.11, p. 62.

agrees that Digital Cross-connect Systems (DCS) are appropriate in a forward-looking network architecture and should be included in any model that calculates investment in the IOF network. However, the Hatfield Model models DCS capacity only for trunks and circuits between on-ring offices. The model does not provide any DCS capacity for the off-ring offices; rather, it assumes that all direct trunks between these offices will route via tandem locations. This omission means that direct trunks and circuits routing between the other 60% of the wire centers must be cross-connected using the outdated, labor-intensive, high maintenance architecture that was commonly used before the development of the DCS. Assuming that this outdated architecture is what the Hatfield developers intended for use in routing trunk groups between offices, an increase, rather than a decrease, in the Hatfield Model forward-looking network operations factor is in order.

d) The Hatfield Model Fails to Include all Costs of Local Tandem Components.

The final mechanism adopted by the Commission must be able to be validated, and must include costs for all aspects of the local tandem. The Hatfield Model fails on both accounts, and therefore should not be utilized to produce local tandem costs. It is difficult to validate and assess the reasonableness of local tandem related costs produced by Hatfield because Hatfield uses a "black box" approach to develop these costs. Indeed, it is impossible to decipher the inputs and algorithms used by Hatfield to arrive at local tandem costs. The locations of tandem switches cannot be identified. It is unclear what, if any, power investment has been included. The power investment in Hatfield is identified as a function of the number of lines in the switch. Since tandems

do not have lines, it appears that either no investment or minimal investment has been assigned to tandems in the model. There is no way to validate sizing and scaling techniques included in the model.

Ironically, the only input that has been validated is that the model does not include tandem to tandem trunks.[38] A stand-alone tandem is of no use to anyone. There must be tandem-to-tandem trunks that allow traffic to flow between tandems. The Hatfield Model fails to include such trunks, and therefore represents a tandem network that creates "islands" of local subscribers who are homed on different tandems and cannot communicate with each other. In this respect, too, Hatfield is patently unreliable and inconsistent with real-world engineering requirements.

* * *

In choosing a mechanism for determining forward-looking IOC costs for universal service high cost support, the Commission must ensure that the modeled network is functional and captures the factors and conditions that impact the network on a daily basis. Clearly, the Hatfield Model is entirely unsuitable for this purpose. It models a hypothetical network that cannot "talk," and therefore is not a reasonable estimator of forward-looking costs.

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[38] Supplemental Responses of AT&T to GTE Northwest Incorporated's Seventh Set of Data Requests, Washington Consolidated Cost Docket Nos. UT-960369,-71,-71, Request No. 148, June 23, 1997.

III. CONCLUSION

The Commission should not pursue its efforts to develop a mandatory cost proxy model for estimating the hypothetical forward-looking costs of providing universal service. Such a model would not produce sufficient funding and therefore would be inconsistent with Section 254. Moreover, such a model, even if not biased toward understating relevant costs, would employ essentially arbitrary assumptions to second-guess real-world investment decisions made under the scrutiny of state and federal regulators. It is particularly important that the Commission once and for all reject the Hatfield Model, which includes severe methodological flaws and grossly understates the true forward-looking costs of providing universal service.

The most prudent course is for the Commission to permit carriers to utilize state-approved engineering models to determine the costs of providing universal service, and to afford carriers an opportunity to recover any stranded investment (that is, the difference between the forward-looking costs produced by those models and actual embedded costs). As rapidly as possible, the Commission should adopt an auction approach, as proposed by GTE, which will assure sufficient and efficient funding while

eliminating the need for massive and almost certainly harmful regulatory intrusion into the marketplace.

Respectfully submitted,

GTE SERVICE CORPORATION and its affiliated domestic telephone operating and wireless companies

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August 8, 1997

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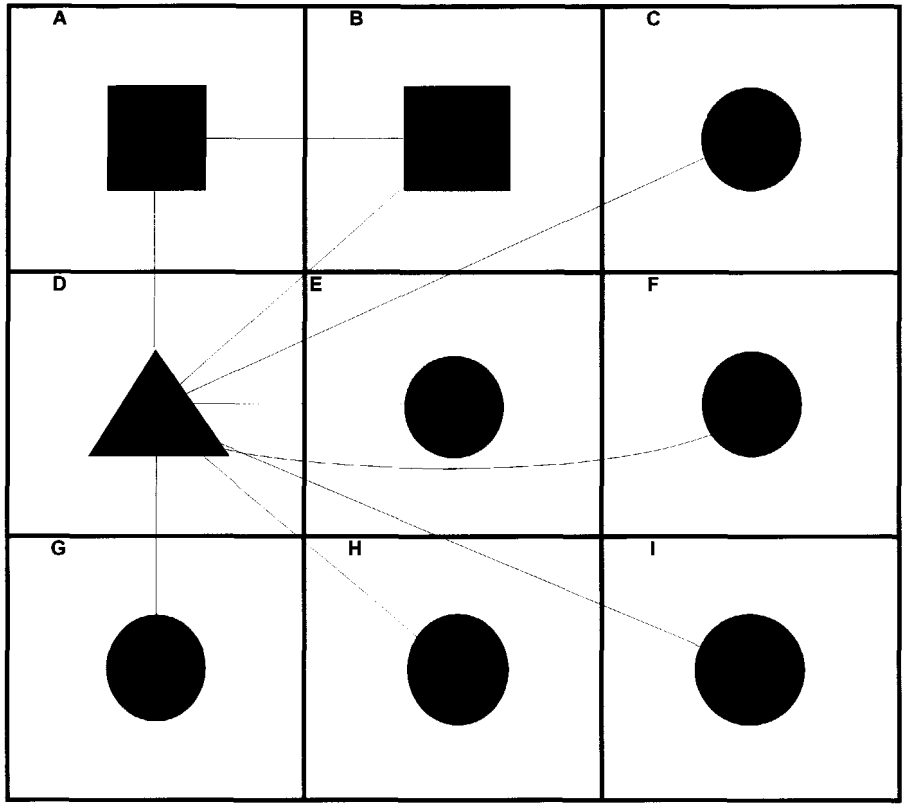
Robin B. Walker

* BY HAND

ATTACHMENT A



= On-Ring Office

= Off-Ring Office

= Tandem Office

Approximately 60% of GTE's Are Classified as Off-ring by Hatfield

Assume for this example:

Each Wire Center serves an area = 100 sq. miles

Using the Hatfield transport distance calculation * for IOF Distance for each On-Ring Office:

* 1.5 times the square root of the area served by the Wire Center

Office A = 1.5 X 10 = 15 miles
Office B = 1.5 X 10 = 15 miles
Office D = 1.5 X 10 = 15 miles
Total Route Miles = 45

Using basic trigonometry to calculate Air Miles for each On-Ring Office:

A-B = .5(10) + .5(10) = 10 miles
the resultant R/A ratio = 15/10 = 1.5
B-D = sq. root of the sum of the squares of A-B and A-D = 14.14 miles
the resultant R/A ratio = 15/14.14 = 1.06
A-D = .5(10) + .5(10) = 10 miles
the resultant R/A ratio = 15/10 = 1.5
Total Air Miles = 34.14
the resultant R/A ratio = 45/34.14 = 1.318

Using the Hatfield right angle route calculation for IOF Distance for each Off-Ring Office:

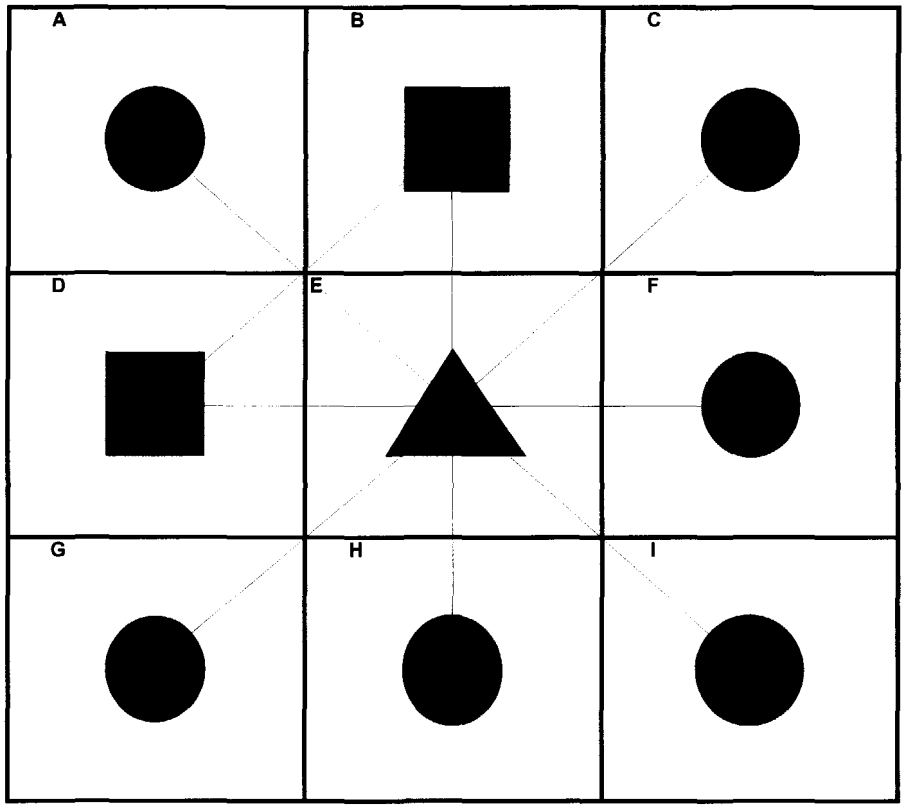
D-C = 30 miles
D- I = 30 miles
D-E = 10 miles
D-G = 10 miles
D-F = 20 miles
D-H = 20 miles
Total Route Miles = 120 miles

Using Trigonometry to Calculate Air Miles for each Off-Ring Office:

D-C = 22 miles
the resultant R/A ratio = 30/22 = 1.36
D-I = 22 miles
the resultant R/A ratio = 30/22 = 1.36
D-E = 10 miles
the resultant R/A ratio = 10/10 = 1
D-G = 10 miles
the resultant R/A ratio = 10/10 = 1
D-F = 20 miles
the resultant R/A ratio = 20/20 = 1
D-H = 14.14 miles
the resultant R/A ratio = 20/14.14 = 1.41
Total Air Miles = 98.14
the resultant R/A ratio = 120/98.14 = 1.22

Total Route Miles for all on- & off-ring offices = 165
Total Air Miles for all on- & off-ring offices = 132.28
the resultant R/A ratio for all on- & off-ring offices = 165/132.28 = 1.247

IOF Distance Example 2



= On-Ring Office

= Off-Ring Office

= Tandem Office

Approximately 60% of GTE's Are Classified as Off-ring by Hatfield

Assume for this example:
Each Wire Center serves an area = 100 sq. miles

Using the Hatfield transport distance calculation * for IOF Distance for each On-Ring Office:
* 1.5 times the square root of the area served by the Wire Center
Office B = 1.5 X 10 = 15 miles
Office D = 1.5 X 10 = 15 miles
Office E = 1.5 X 10 = 15 miles
Total Route Miles = 45

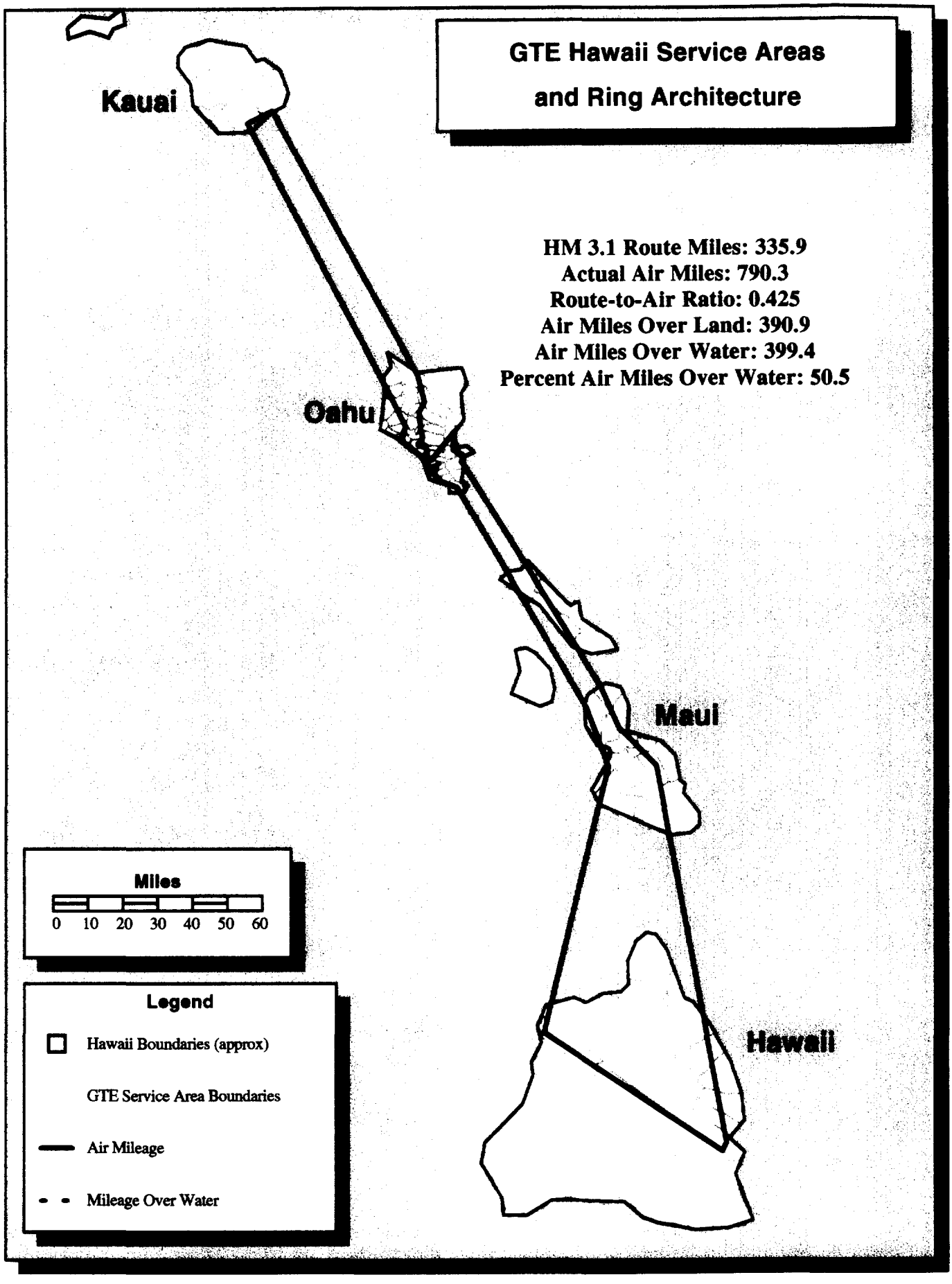
Using basic trigonometry to calculate Air Miles for each On-Ring Office:
B-E = .5(10) + .5(10) = 10 miles
the resultant R/A ratio = 15/10 = 1.5
B-D = sq. root of the sum of the squares of B-E and D-E = 14.14 miles
the resultant R/A ratio = 15/14.14 = 1.06
D-E = .5(10) + .5(10) = 10 miles
the resultant R/A ratio = 15/10 = 1.5
Total Air Miles = 34.14
the resultant R/A ratio = 45/34.14 = 1.318

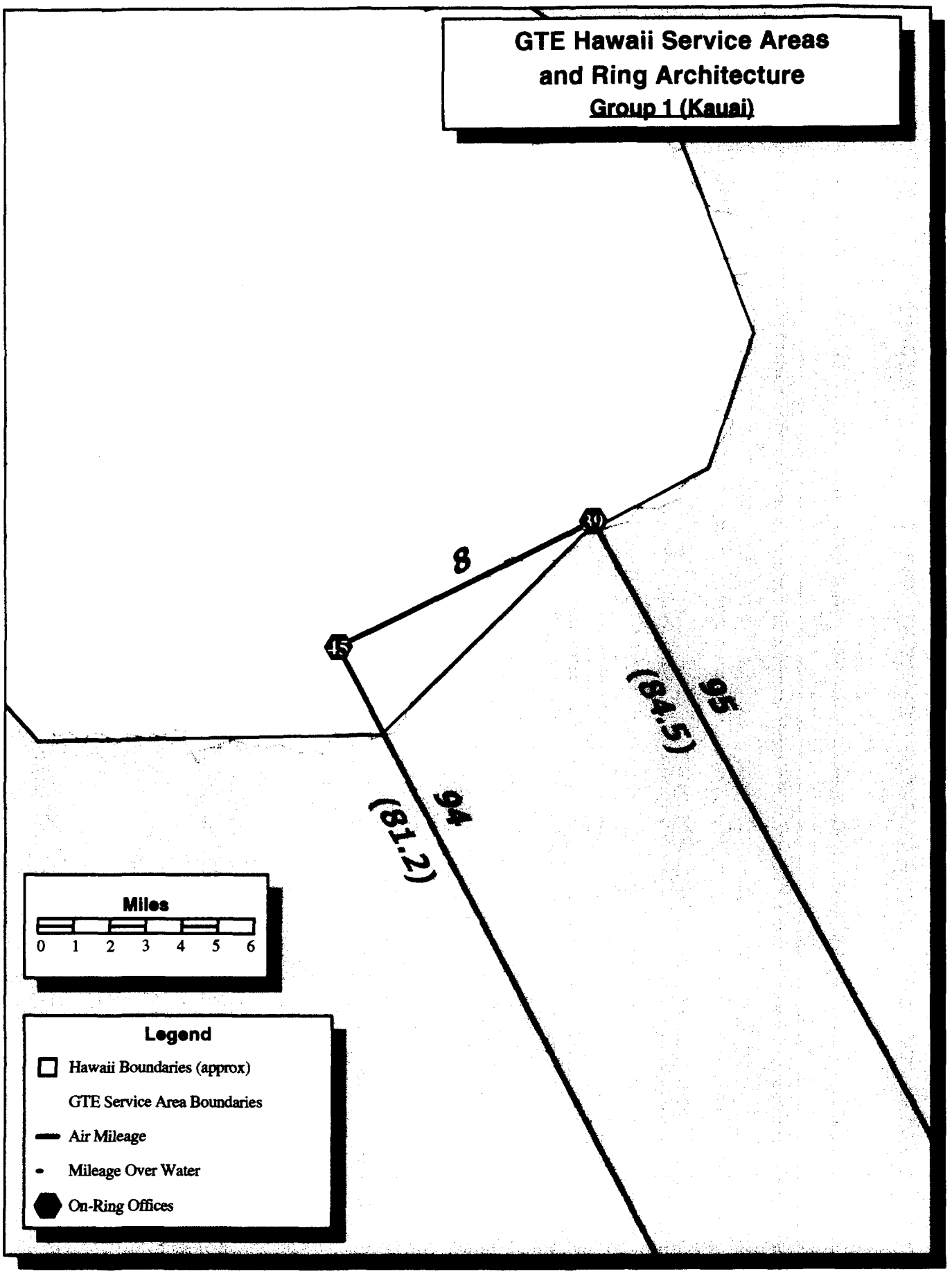
Using the Hatfield right angle route calculation for IOF Distance for each Off-Ring Office:
A-E = 20 miles
C-E = 20 miles
F-E = 10 miles
G-E = 20 miles
H-E = 10 miles
I-E = 20 miles
Total Route Miles = 100 miles

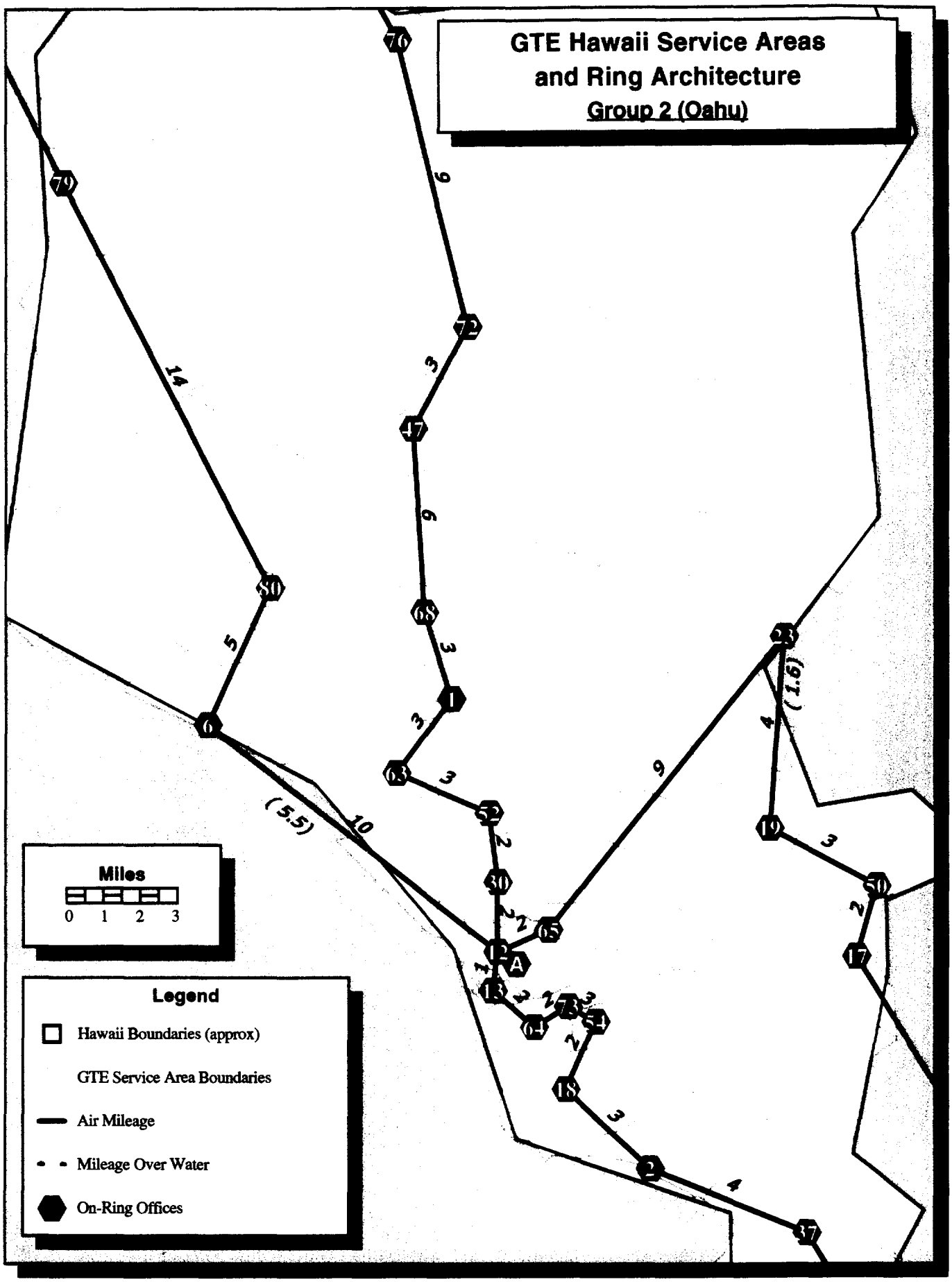
Using Trigonometry to Calculate Air Miles for each Off-Ring Office:
A-E = 14.14 miles
the resultant R/A ratio = 20/14.14 = 1.41
C-E = 14.14 miles
the resultant R/A ratio = 20/14.14 = 1.41
F-E = 10 miles
the resultant R/A ratio = 10/10 = 1
G-E = 14.14 miles
the resultant R/A ratio = 20/14/14 = 1.41
H-E = 10 miles
the resultant R/A ratio = 10/10 = 1
I-E = 14.14 miles
the resultant R/A ratio = 20/14.14 = 1.41
Total Air Miles = 76.56
the resultant R/A ratio = 100/76.56 = 1.31

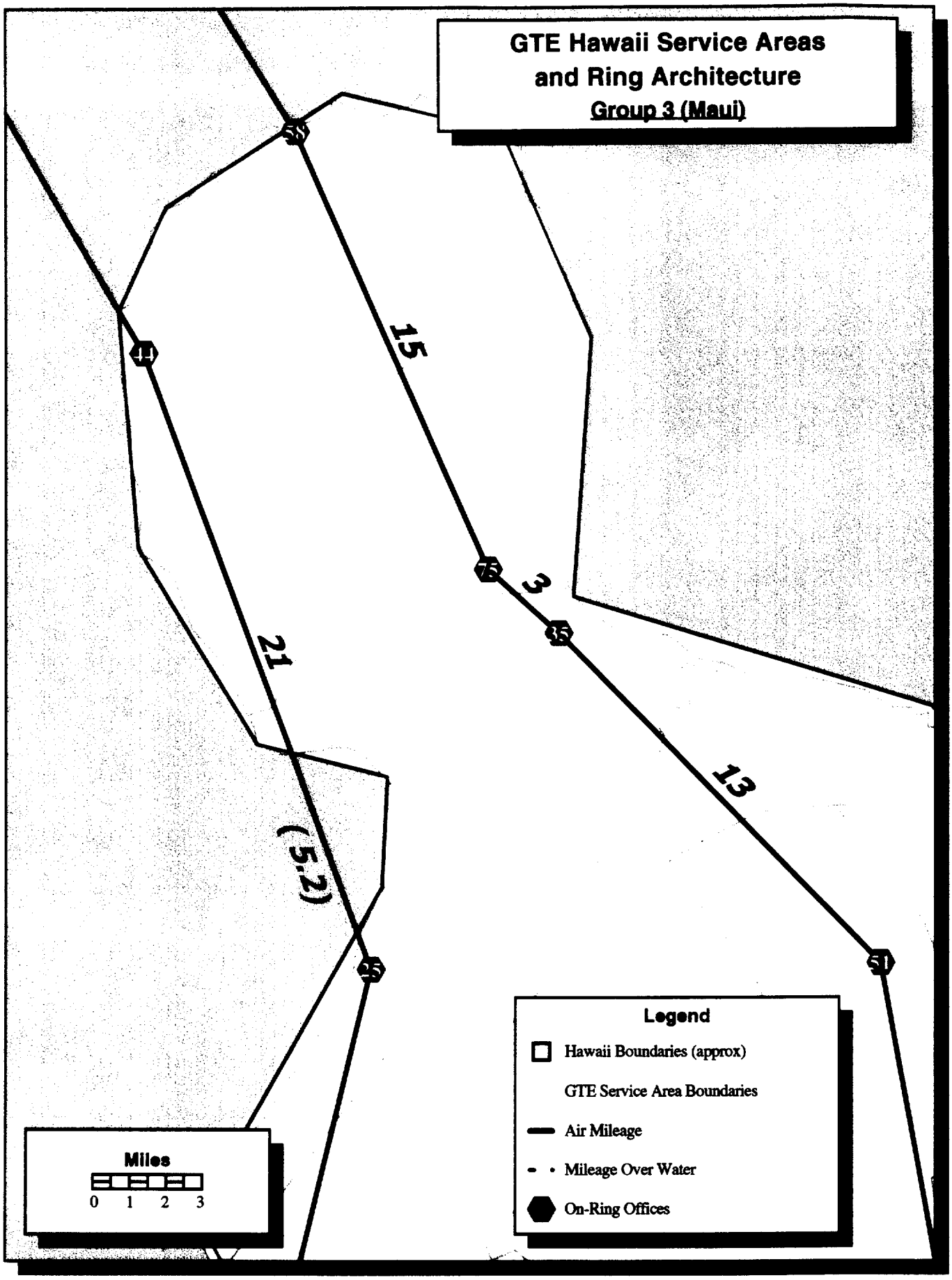
Total Route Miles for all on- & off-ring offices = 145
Total Air Miles for all on- & off-ring offices = 110.7
the resultant R/A ratio for all on- & off-ring offices = 145/110.7 = 1.31

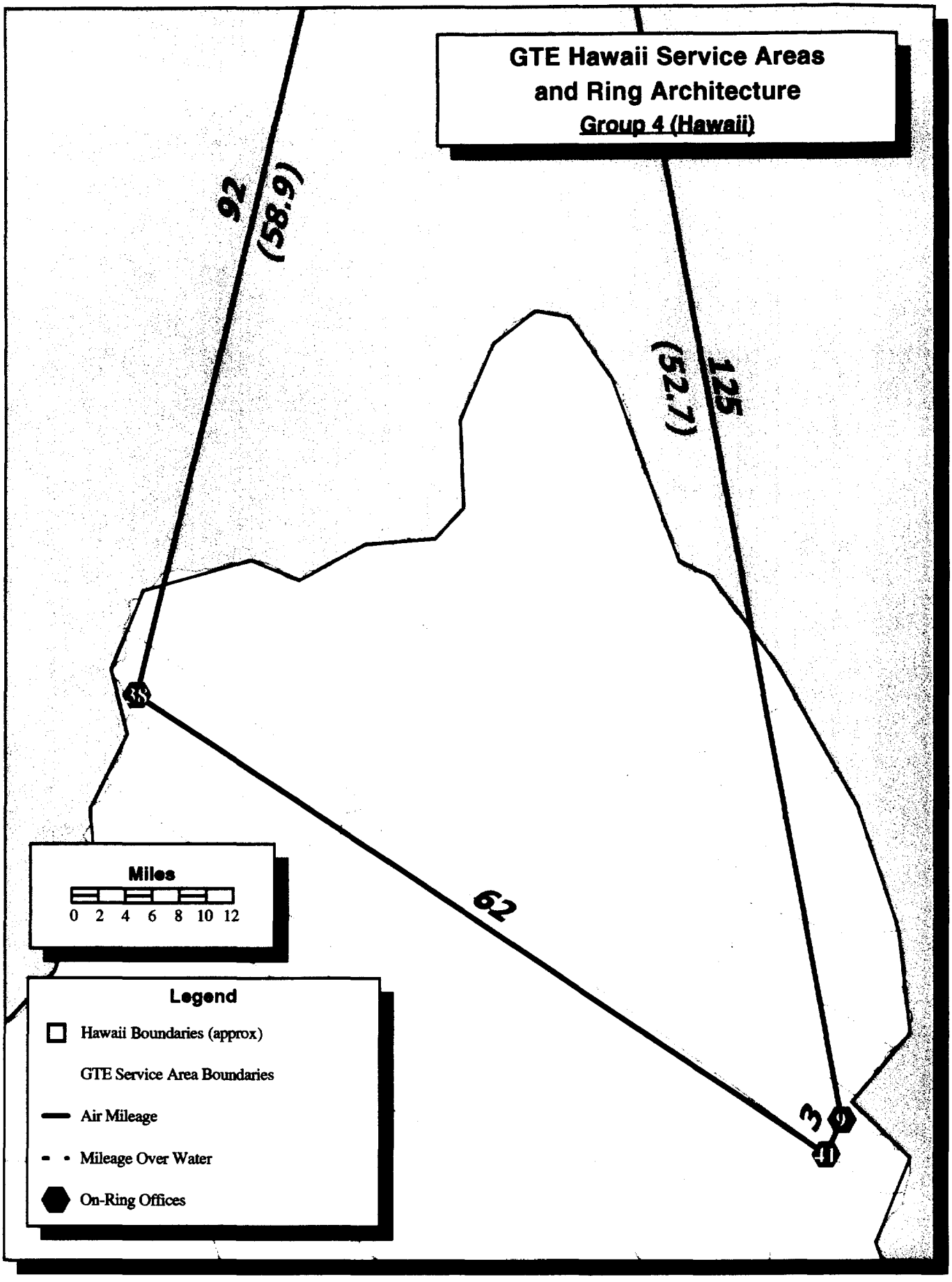
ATTACHMENT B

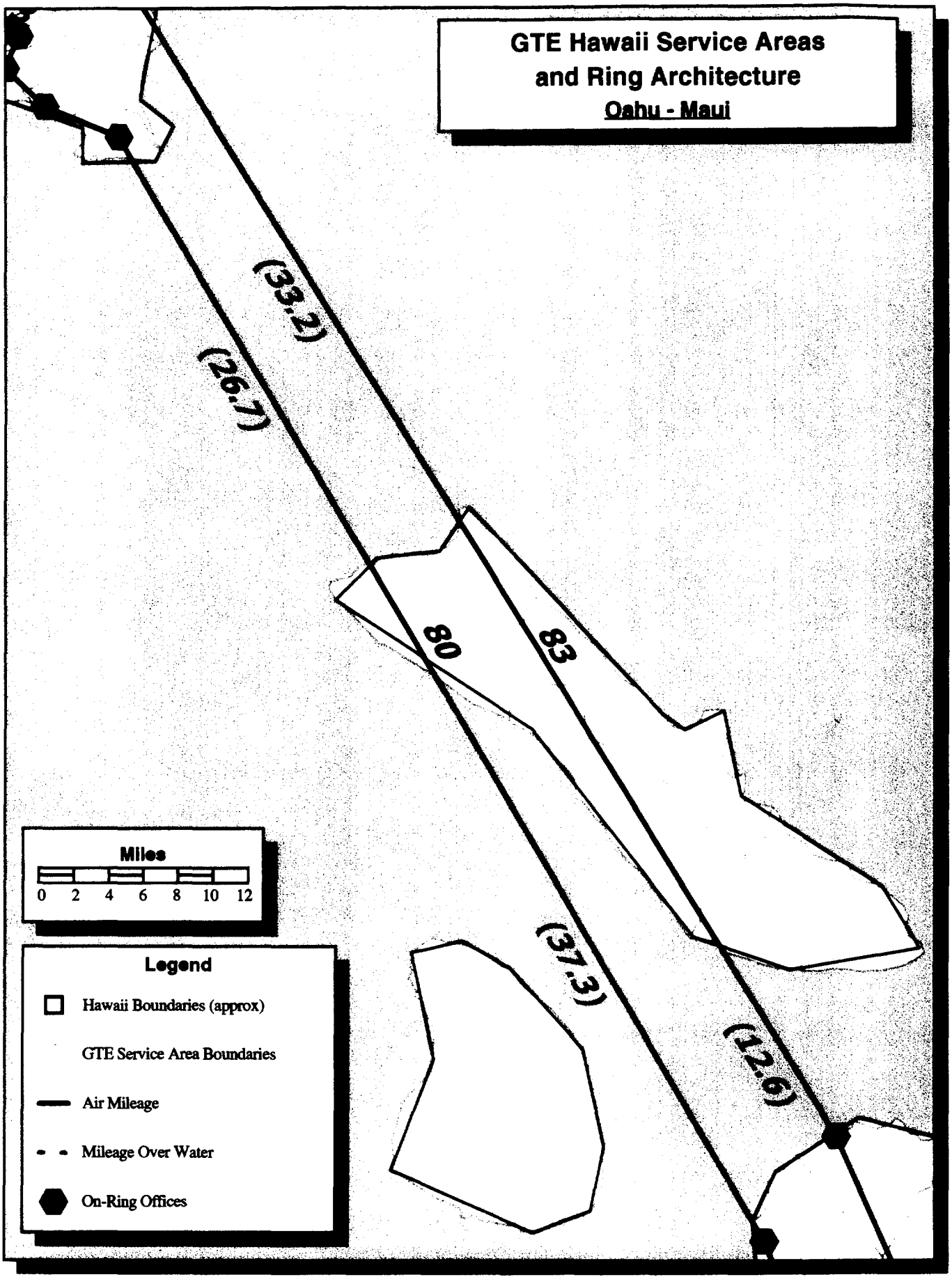

GTE Hawaii Service Areas
and Ring Architecture
HM 3.1 Route Miles: 335.9
Actual Air Miles: 790.3
Route-to-Air Ratio: 0.425
Air Miles Over Land: 390.9
Air Miles Over Water: 399.4
Percent Air Miles Over Water: 50.5
Kauai
Oahu
Maui
Hawaii
Miles
0 10 20 30 40 50 60
Legend
Hawaii Boundaries (approx)
GTE Service Area Boundaries
Air Mileage
Mileage Over Water

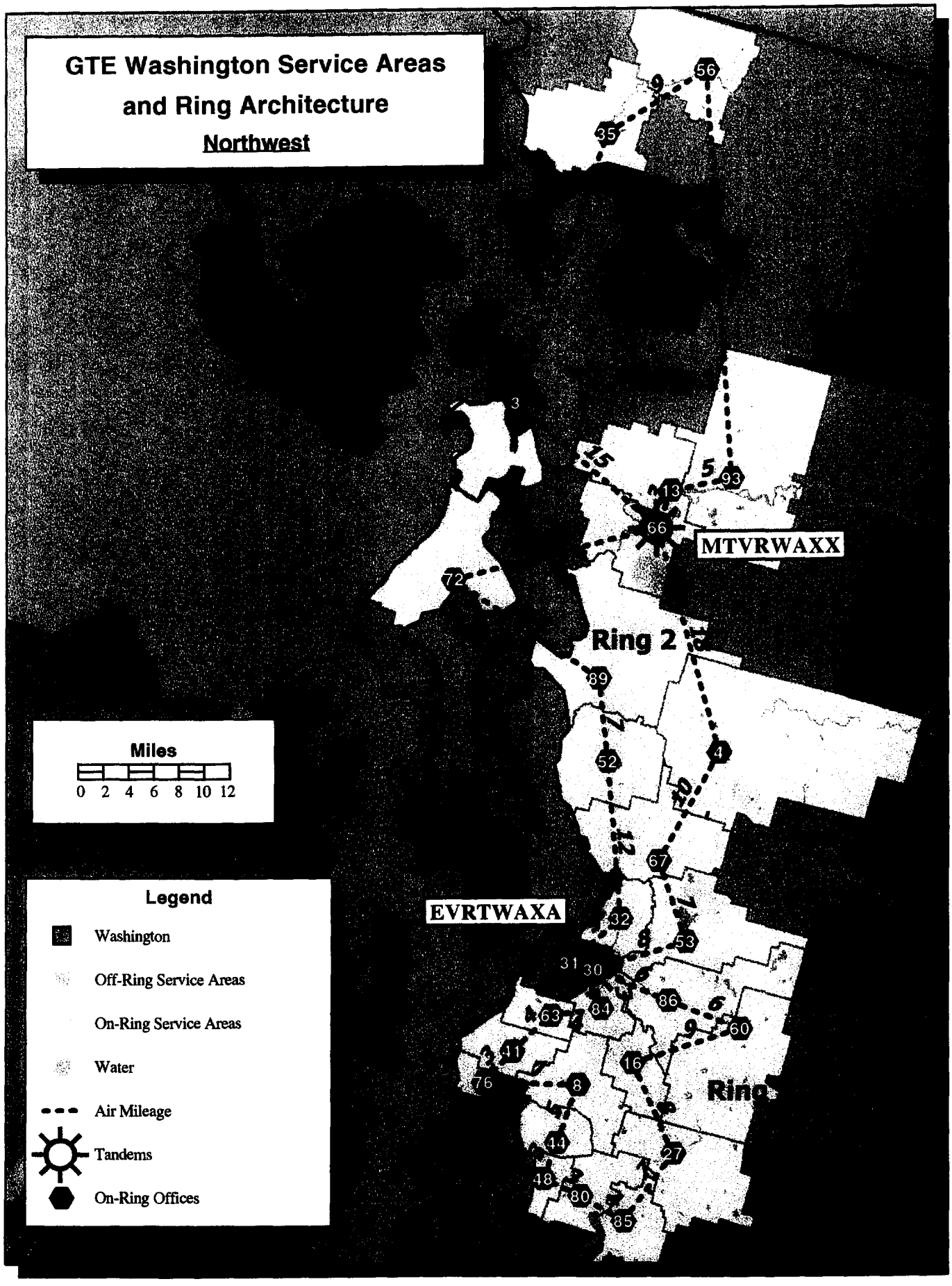

GTE Hawaii Service Areas
and Ring Architecture
Group 1 (Kauai)
8
39
45
95
(84.5)
94
(81.2)
Miles
0 1 2 3 4 5 6
Legend
Hawaii Boundaries (approx)
GTE Service Area Boundaries
Air Mileage
Mileage Over Water
On-Ring Offices


GTE Hawaii Service Areas
and Ring Architecture
Group 2 (Oahu)
Miles
0 1 2 3
Legend
Hawaii Boundaries (approx)
GTE Service Area Boundaries
Air Mileage
Mileage Over Water
On-Ring Offices
76
79
72
47
80
68
1
6
63
52
30
65
12
A
13
64
73
54
18
2
37
23
19
50
17
14
9
3
6
5
10
(5.5)
(1.6)
4
2


GTE Hawaii Service Areas
and Ring Architecture
Group 3 (Maui)
58
44
15
75
3
35
21
13
(5.2)
25
51
Legend
Hawaii Boundaries (approx)
GTE Service Area Boundaries
Air Mileage
Mileage Over Water
On-Ring Offices
Miles
0 1 2 3


GTE Hawaii Service Areas
and Ring Architecture
Group 4 (Hawaii)
92
(58.9)
125
(52.7)
62
3S
3
Miles
0 2 4 6 8 10 12
Legend
Hawaii Boundaries (approx)
GTE Service Area Boundaries
Air Mileage
Mileage Over Water
On-Ring Offices


GTE Hawaii Service Areas
and Ring Architecture
Oahu - Maui
(33.2)
(26.7)
80
83
(37.3)
(12.6)
Miles
0 2 4 6 8 10 12
Legend
Hawaii Boundaries (approx)
GTE Service Area Boundaries
Air Mileage
Mileage Over Water
On-Ring Offices


GTE Washington Service Areas
and Ring Architecture
Northwest
MTVRWAXX
Ring 2
EVRTWAXA
Miles
0 2 4 6 8 10 12
Legend
Washington
Off-Ring Service Areas
On-Ring Service Areas
Water
Air Mileage
Tandems
On-Ring Offices

GTE Washington Service Areas and Ring Architecture

Southwest

Miles

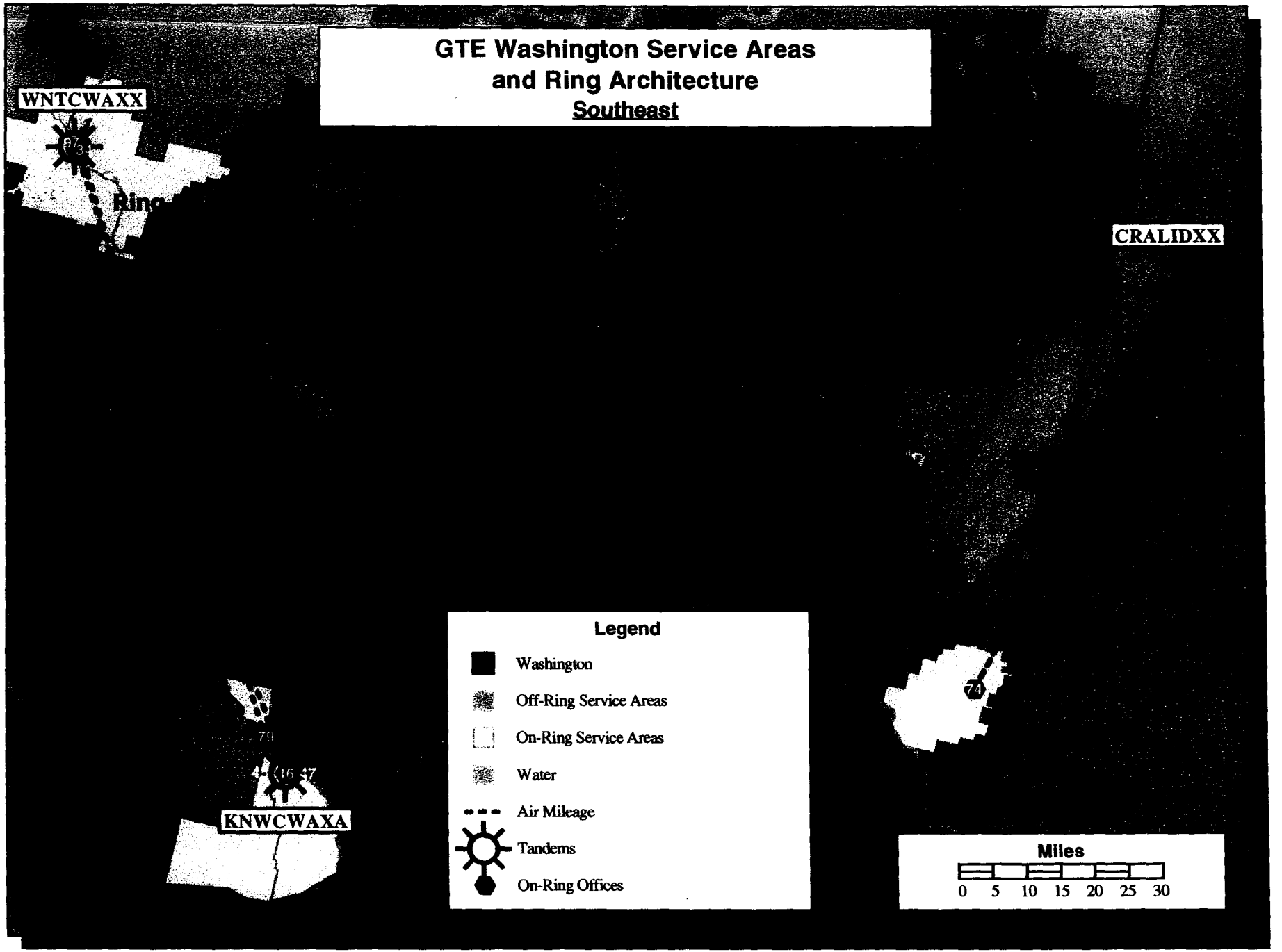
0 2 4 6 8 10 12

Legend

- Washington
- Off-Ring Service Areas
- On-Ring Service Areas
- Water
- Air Mileage
- Tandems
- On-Ring Offices

GTE Washington Service Areas and Ring Architecture

Southeast



APPENDIX 1

The Hatfield Model's Switching Platform Design Is Fundamentally Flawed in Numerous Critical Respects

The switching platform of the Hatfield Model is fraught with erroneous assumptions, and therefore does not accurately predict forward-looking switching costs. In particular, the Hatfield Model employs an inadequate and spurious mathematical function as the foundation for its end office switching investment calculations. It disregards accepted switch engineering guidelines, fails to model all significant switching components, excludes appropriate element costs, incorrectly uses data, and ultimately fails to produce results that reflect the required investment for switching services. The omission of important switching components and distortion of common engineering rules are significant and cannot be ignored as a "reasonable" consequence of simplification due to modeling. These shortcomings with the switching component of the Hatfield Model, which are highlighted below, compel rejection of the model as a means of estimating the forward-looking costs of providing universal service.

A. The Hatfield Model Fails to Model Different Switch Types.

In order accurately to predict the costs of a forward-looking network, different switch types must be incorporated into the analysis. This is of particular significance to GTE because approximately 60% of the switches in GTE's territory are remotes. In fact, industry sources estimate that by the year 2000, approximately 60% of the

switches in the United States will be remote.[1] Given the prevalence of remote switch types, these must be taken into account in the adopted mechanism in order for it to produce meaningful results.

Because remote switches contain considerably less switching equipment than do hosts or stand-alone switches, it is logical to conclude that the cost of the remote switch is less than the total cost of a stand-alone/host switch of comparable size. The savings gained from using the host/remote arrangement are realized through the connection of the remote switch to the host switch and the utilization of the shared resources installed only at the host office switch. The shared resources of the host office provide many necessary functions such as billing, vertical features, interoffice routing, and connections to other parties not served by the remote office.

It is customary to include the remote office module counts in with the host office for determining capacity and thus the overall cost per line. Since Hatfield does not model the host/remote architecture, it does not have the capability to perform this calculation. So, essentially, it produces no price difference on a cost per line basis because the total cost of lines served by a host, including all subtending remotes, is divided by the total lines to determine the cost per line. On an individual basis, one must consider both the remote switching equipment and the host resources utilized and associated investment in switching equipment, in order to calculate the cost per remote line. It is doubtful that there would be any significant difference in switching equipment.

---

[1] Northern Business Information, US Central Office Equipment Market: 1996 Edition, p.66.

The difference may be realized in more efficient trunking with all network traffic being aggregated and switched at the host office.

B. The Hatfield Model Fails to Include Start-Up Switching Costs.

The switching costs developed by the adopted mechanism must represent all the costs associated with the switch. The Hatfield Model clearly does not produce switching costs that are all inclusive. In the case of small offices, it often includes an unrealistic number of lines per switch, and a correspondingly unrealistic level of investment. To illustrate this point, switching investment included in the Hatfield Model for three offices is displayed below:

OFFICE	#LINES	HATFIELD SWITCH INVESTMENT
OJCLNM	15	$5,448
STPSWA	12	$4,408
OLNCCA	25	$6,973

Switching investment amounts such as those above are nonsensical. The Joint Board validates this concern in recommending that switching costs should include a start-up cost in addition to a cost per line.[2] In addition, it is small offices such as the ones highlighted above that would be likely to receive a Universal Service Fund

[2] In the Matter of Federal-State Joint Board on Universal Service, CC Docket No. 96-45, State Members' Second Report on the Use of Cost Proxy Models, Appendix A, April 21,1997.