

4.8 Wetlands

4.8.1 No-Action Alternative, Wetlands

Under the No-Action Alternative, no roadway improvements would occur and thus no wetlands or waterbodies would be impacted.

4.8.2 Action Alternatives, Wetlands

Most wetlands within the study area are associated predominantly with the Millstone River and Little Bear Brook, and study area wetlands comprise a total of approximately 245.13 acres. All Action Alternatives include widening Route 1 and replacing the existing bridge over the Millstone River. Replacing this structure would result in direct (footings, fill) and indirect (shading) impacts to wetlands on the Millstone River. Wetland impacts due to each of the Action Alternatives have been minimized in the conceptual design through avoidance and by minimizing unavoidable wetland or waterbody impacts to the greatest extent practicable. If implemented, replacement of the Route 1 bridge over the Millstone River would occur at the location of the existing structure and the new crossing of Little Bear Brook would occur at a location where the wetland fringe along the stream is narrowest.

Action Alternatives having a west-side connector roadway may impact wetlands associated with the Millstone River at Harrison Street. These wetlands are on the south side of Harrison Street and are hydrologically connected to the Millstone River via a culvert beneath the roadway. Physical impacts to the Canal, Carnegie Lake, or their adjacent wetlands would not occur due to any of the Action Alternatives.

Several Action Alternatives would include an east-side connector roadway that would cross Little Bear Brook. This new crossing would be situated on property that is currently owned by the Sarnoff Corporation, east of the existing main building. The new crossing would directly impact wetlands adjacent to Little Bear Brook. As well, shading of Little Bear Brook and adjacent wetlands directly under the new structure would occur.

Impacts to wetlands and waterbodies would require a permit from the NJDEP Land Use Regulation Program, in accordance with the New Jersey Freshwater Wetlands Protection Act Rules (NJAC 7:7A). To obtain a permit, it must be demonstrated that an Action Alternative would avoid or, where unavoidable, minimize wetland impacts. Wetland and waterbody impacts are shown on Figures 4-33 through 4-46.

Unavoidable wetland impacts have been minimized in the conceptual design wherever possible. These impacts would be further minimized through mitigation, as warranted by applicable regulations.

Table 4-28 summarizes wetland and waterbody impacts anticipated for each Action Alternative. The following subsection describes these impacts.

A Action Alternatives (A, A.1, A.2, A.3, A.4)

All the A Action Alternatives would directly impact wetlands and/or waterbodies adjacent to the Millstone River and Little Bear Brook. All the A Action Alternatives would impact a total of approximately 0.29 acres of wetlands, including 0.18 acres associated with the Millstone River and 0.11 acres adjacent to Little Bear Brook. These impacts comprise approximately 0.12% of total wetlands in the PSA. These impacts would be unavoidable to replace the existing bridge over the Millstone River with a wider span, construct a new crossing of Little Bear Brook for the east-side connector road, and extend the west-side connector road to Harrison Street.

In addition, impacts to these waterbodies would include approximately 0.08 acres of new shading for replacement of the Route 1 bridge over the Millstone River with a wider span. The new crossing of Little Bear Brook would also result in approximately 0.08 acres of shading over this waterbody.

B Action Alternatives (B, B.1, B.2)

All the B Action Alternatives would directly impact wetlands and/or waterbodies associated with the Millstone River and Little Bear Brook. All the B Action Alternatives would impact a total of approximately 0.31 acres of wetlands, including 0.20 acres associated with the Millstone River and 0.11 acres adjacent to Little Bear Brook. This comprises approximately 0.13% of total wetlands in the PSA. These Action Alternatives, if selected, would have the greatest wetland impacts of all the Action Alternatives. These impacts would be unavoidable to replace the existing bridge over the Millstone River with a wider span, construct a new crossing of Little Bear Brook for the east-side connector road, and extend the west-side connector road to Harrison Street.

In addition, impacts to these waterbodies would include approximately 0.08 acres of new shading for replacement of the Route 1 bridge over the Millstone River with a wider span. The new crossing of Little Bear Brook would also result in approximately 0.08 acres of shading over this waterbody.

C Action Alternatives (C, C.1)

Both the C Action Alternatives would impact approximately 0.06 acres of wetlands associated with the Millstone River, which comprises approximately 0.02% of total wetlands in the PSA. No other wetlands would be impacted by these Action Alternatives. These impacts would be unavoidable to replace the Route 1 bridge over the Millstone River with a wider span. In addition, impacts to the Millstone River would include approximately 0.08 acres of new shading.

D Action Alternatives (D, D.1, D.2)

Action Alternatives D and D.1 would impact wetlands and/or waterbodies associated with the Millstone River and Little Bear Brook. Action Alternatives D and D.1

would impact a total of approximately 0.19 acres of wetlands, including 0.08 acres associated with the Millstone River and 0.11 acres adjacent to Little Bear Brook. These impacts comprise approximately 0.08% of total wetlands in the PSA. Action Alternative D.2 would impact 0.08 acres of wetlands, or approximately 0.02% of total study area wetlands. These impacts would be unavoidable to replace the Route 1 bridge over the Millstone River with a wider span, construct a new crossing of Little Bear Brook for the east-side connector road (D and D.1 only), and extend the west-side connector road to Harrison Street.

In addition, D, D.1, and D.2 impacts to these waterbodies would include approximately 0.08 acres of new shading for replacement of the Route 1 bridge over the Millstone River with a wider span. The new crossing of Little Bear Brook would also result in approximately 0.08 acres of shading over this waterbody (D and D.1 only).

E Action Alternative

Action Alternative E would impact a total of approximately 0.17 acres of wetlands, including 0.06 acres adjacent to the Millstone River and 0.11 acres adjacent to Little Bear Brook. This comprises approximately 0.07% of total wetlands in the PSA. The impacts would be necessary to replace the Route 1 bridge over the Millstone River with a wider span and to build a new crossing of Little Bear Brook for the east-side connector road. These structures would also result in approximately 0.08 acres of additional shading of the Millstone River and 0.08 acres of new shading of Little Bear Brook.

F Action Alternatives (F, F.1)

Both F Action Alternatives would impact a total of approximately 0.29 acres of wetlands associated with the Millstone River and Little Bear Brook, or 0.12% of total wetlands in the PSA. These impacts comprise approximately 0.18 acres of wetlands adjacent to the Millstone River and 0.11 acres adjacent to Little Bear Brook. These impacts would be unavoidable to replace the Route 1 bridge over the Millstone River with a wider span, build a new crossing of Little Bear Brook for the east-side connector road, and extend the west-side connector road to Harrison Street. This would result in 0.08 acres of additional shading of the Millstone River and 0.08 acres of new shading of Little Bear Brook.

G Action Alternatives (G, G.1, G.2)

All the G Action Alternatives would impact approximately 0.10 acres of wetlands adjacent to the Millstone River, or 0.04% of total wetlands in the PSA. These impacts would be necessary to replace the Route 1 bridge with a wider span.

Vaughn Drive Connector Alternatives (1, 2 and 3)

None of the VDC Alternatives would directly impact surface waterbodies or wetlands within the study area.

Table 4-28
Summary of Wetland Impacts

Alternative	Wetlands				Waterbodies (Shading)		
	Millstone River	Little Bear Brook	Total	% of Total Study Area Wetlands in PSA (245.13)	Millstone River	Little Bear Brook	Total
A	0.18	0.11	0.29	0.12%	0.08	0.08	0.16
A.1	0.18	0.11	0.29	0.12%	0.08	0.08	0.16
A.2	0.18	0.11	0.29	0.12%	0.08	0.08	0.16
A.3	0.18	0.11	0.29	0.12%	0.08	0.08	0.16
A.4	0.18	0.11	0.29	0.12%	0.08	0.08	0.16
B	0.20	0.11	0.31	0.13%	0.08	0.08	0.16
B.1	0.20	0.11	0.31	0.13%	0.08	0.08	0.16
B.2	0.20	0.11	0.31	0.13%	0.08	0.08	0.16
C	0.06	-0-	0.06	0.02%	0.08	0.08	0.16
C.1	0.06	-0-	0.06	0.02%	0.08	0.08	0.16
D	0.08	0.11	0.19	0.08%	0.08	0.08	0.16
D.1	0.08	0.11	0.19	0.08%	0.08	0.08	0.16
D.2	0.08	0	0.08	0.02%	0.08	0	0.08
E	0.06	0.11	0.17	0.07%	0.08	0.08	0.16
F	0.18	0.11	0.29	0.12%	0.08	0.08	0.16
F.1	0.18	0.11	0.29	0.12%	0.08	0.08	0.16
G	0.10	-0-	0.10	0.04%	-0-	-0-	-0-
G.1	0.10	-0-	0.10	0.04%	-0-	-0-	-0-
G.2	0.10	-0-	0.10	0.04%	-0-	-0-	-0-
VDC 1	-0-	-0-	-0-	-0-	-0-	-0-	-0-
VDC 2	-0-	-0-	-0-	-0-	-0-	-0-	-0-
VDC 3	-0-	-0-	-0-	-0-	-0-	-0-	-0-
No-Action	-0-	-0-	-0-	-0-	-0-	-0-	-0-

Wetland Functions and Values Impacts

Wetland functions and values considered include hydrology, flood control, groundwater recharge and discharge, food chain support and nutrient cycling, and socioeconomics. It is important to note that potential impacts to these functions would occur on a localized basis at the point of impact by the various Action Alternatives, if one should be selected. Depending on the Action Alternative selected, wetland impacts could occur adjacent to the Millstone River and Little Bear Brook. As warranted by the New Jersey Freshwater Wetlands Protection Act Rules, wetland impacts would be mitigated if necessary to replace impacted functions within the Millstone River watershed. Should wetland impacts occur due to selection of an Action Alternative, large areas of remaining wetlands along the Millstone River and Little Bear Brook would remain and would continue to serve many valuable functions. A brief description of anticipated impacts to these functions is provided below.

Hydrology. The Action Alternatives are not anticipated to have an adverse impact on hydrology as existing flow of waterbodies in the study area would be maintained. Bridge replacement would not alter the existing hydrology or flow of the river. The

structures would be designed to accommodate the design flood elevations, and the existing river bed would not be altered.

Indirect impacts to hydrology would include increased runoff from additional impervious surfaces, should an Action Alternative be selected. Increased runoff entering downstream waterbodies could increase stream flow, thereby altering the natural hydrology of the wetlands. Wetlands serve to retain surface runoff and naturally release it slowly, thereby controlling flood flows. An Action Alternative would include the implementation of an appropriate stormwater management plan. This plan would control stormwater runoff entering downstream waterbodies so existing hydrology would not be altered. Thus, the Action Alternatives would not have an adverse impact on hydrology.

Flood Control. Wetlands serve a valuable flood control function. Filling the wetlands could reduce the flood-carrying capacity of a wetland system. However, wetland impacts have been minimized to the greatest extent practicable at the conceptual design level, and may be further minimized during design phases. An Action Alternative is not anticipated to have an adverse impact on the flood control function of wetlands in the study area.

Groundwater Recharge and Discharge. Most wetlands provide a groundwater discharge function as the groundwater table is commonly near the surface in wetlands and stream channels. As demonstrated in the groundwater recharge analysis conducted for the study area, the majority of wetlands are situated in areas of low recharge capability (Figure 3-25). Recharge enhancement strategies, discussed in Section 4.5.2.3, would be considered during design phases to mitigate localized recharge reduction due to new impervious surfaces. Encouraging recharge in this way may assist in ensuring that study area wetlands hydrology is maintained.

Food chain support and nutrient cycling. Impacts on this function would occur where direct wetland impacts occur. Filled wetlands cease to provide food chain support and nutrient cycling of aquatic resources. The calculated wetland impacts of Action Alternatives are small compared to the area of wetlands in the study area. The greatest wetland impact would occur from the B Action Alternatives and would comprise 0.31 acres or 0.13% of total study area wetlands. The remaining large expanses of wetlands in the study area would continue to serve these functions. Should wetland mitigation be warranted, successful wetland creation and enhancement may replace some or all of these functions in the watershed.

Habitat. The Action Alternatives would reduce the amount of wetlands in the study area that is available to wildlife. Wetland impacts from replacing the Route 1 bridge over the Millstone River, those occurring adjacent to Harrison Street, and those at the Little Bear Brook crossing would have an incremental impact on the habitat function of the larger wetlands of which these areas are a part. The Little Bear Brook crossing would create a point of constriction along the brook that may affect the movement of terrestrial fauna using the wetlands as a travel corridor. The potential to design the

crossing to enable such movements would be considered during the design and permitting phases, if an Action Alternative is selected. At the Millstone River crossing and adjacent to Harrison Street, habitat sensitivities are less of a concern as the proximity of human activity and disturbance currently limits the habitat value of the wetlands in these areas.

Socioeconomics. The Action Alternatives would not impact the consumptive uses of study area wetlands, as these wetlands do not currently serve this function. Non-consumptive wetland functions of study area wetlands and Action Alternative impacts on those functions were examined.

The wider span of the new Millstone River bridge would alter the current appearance of this structure. The new bridge would be designed in consideration of the aesthetic views of and from the Millstone River and the surrounding wetlands. Further, bridge replacement would not affect the use of adjacent wetlands for recreational or other uses that currently occur.

As with the Millstone River, the new crossing of Little Bear Brook would be designed considering views of and from the stream channel and the surrounding environs the visual appearance of the new crossing would be carefully planned to consider the aesthetic values of Little Bear Brook.

Construction of an east-side connector road would alter the relationship of the river corridor to the Penns Neck community in a way that may seem to isolate one from another. Amenities to be considered during design to overcome this change would include a pedestrian walkway or observation area. Depending on the Action Alternative selected, it may be possible to link this part of the river to other parks or natural areas in the study area by means of a bicycle and/or pedestrian path/route developed as part of the Commute Options Package.

Action Alternatives A, A.1, A.2, A.3, A.4, B, B.1, B.2, D, D.2, F, and F.1, that include the west-side connector, would straighten the roadway approach to the D&R canal crossing at Harrison Street, thereby increasing sight distance for park users and motorists. Although this conceptual design would alter the appearance of the Harrison Street/D&R Canal intersection, the potential for safer movements by both transportation modes is an over-shadowing benefit. This modified configuration would not affect the use of the park for recreational, educational, or other uses. Aesthetic impacts at this intersection could be further addressed in the design.

Overall, the Action Alternatives are not expected to have an adverse impact on the socioeconomic functions of study area wetlands that cannot be effectively mitigated.

4.8.3 Mitigation Measures, Wetlands

The Action Alternatives would result in up to 0.31 acres of fill in wetlands and 0.16 acres of shading of waterbodies, depending on the alternative selected (see Table 4-

28). An Action Alternative may require an individual freshwater wetland permit and 2:1 replacement for permanently impacted wetlands or payment to a mitigation bank at a rate adequate to enable construction of the required wetland replacement area. Mitigation in the form of wetland creation would occur at a ratio of two acres created for every one acre impacted.

4.9 Vegetation and Wildlife

The study area contains forested, agricultural, landscape/lawn, and developed land. In the conceptual development of the Action Alternatives, forested areas were avoided wherever possible. These forested areas were recognized as having a greater value relative to other upland vegetation in the study area. If selected, the Action Alternatives would result in the disturbance of varying amounts of these land types and associated vegetation. The majority of upland vegetation impacts would result from Action Alternatives that include east- and west-side connector roads. Specific upland vegetation impacts are described below for each Action Alternative and the No-Action Alternative. Impacts to upland vegetation communities as a result of each Action Alternative are shown on Figures 4-47 through 4-60.

In the following discussions, mention is made of Sarnoff's General Development Plan. In negotiations with West Windsor Township, Sarnoff Corporation has agreed to grant a greenbelt deed restriction to West Windsor as part of their approved General Development Plan. The greenbelt would encompass an area of approximately 14 acres on either side of Little Bear Brook, north of Washington Road. The boundaries of the greenbelt will be defined by Sarnoff after a Penns Neck Area EIS preferred alternative is selected.

4.9.1 No-Action Alternative, Vegetation and Wildlife

Under the No-Action Alternative, no roadway improvements would occur and thus no impacts to upland vegetation communities or wildlife would take place. It should be noted that the Township of West Windsor has approved Sarnoff Corporation's General Development Plan, which outlines a 3 million square foot office/research campus. By Design Year 2028, development according to the Plan could result in an additional 1.8 million square feet of office/research space and associated parking. This development will impact both landscape/lawn areas as well as forested areas on the Sarnoff Corporation property. In addition, Princeton University has future plans to develop a portion of its property between the D&R Canal and Route 1 within the study area. Development of these lands would alter the upland vegetation characteristics currently found in these areas.

4.9.2 Action Alternatives, Vegetation and Wildlife

An Action Alternative may have an impact on wildlife habitat in one location and a low or no impact elsewhere along its alignment. Action Alternatives including an east-side connector road over Little Bear Brook (A, A.1, A.2, A.3, A.4, B, B.1, B.2, D, D.1, E, F, and F.1) would have an impact on the Little Bear Brook wetland corridor and the adjacent upland forest. This roadway alignment would sever potential north-south travel routes of terrestrial and aquatic species using these resources. In order to maintain their routes, wildlife species would be required to cross the roadway or travel beneath the crossing of Little Bear Brook.

4.9.2.1 Vegetation

A Action Alternatives (A, A.1, A.2, A.3, A.4)

All A Action Alternatives would impact upland vegetation communities, with A.1 having the greatest impact, comprising a total of 12.93 acres. This would include 8.47 acres of landscape/lawn area. Approximately 2.09 acres or 1.1% of the total 195.77 acres of agricultural area within the study area would be impacted. Approximately 2.37 acres, or 1.9% of the total 127.65 acres of upland forest within the study area would be impacted.

Landscape/lawn impacts for all the A Action Alternatives are primarily associated with the east-side connector road on the Sarnoff Corporation property, associated ramps to Route 1, and eastern frontage roads. Agricultural impacts of all the A Action Alternatives would occur in association with the west-side connector road, associated ramps to Route 1, and western frontage roads. Upland forest impacts of the A Action Alternatives would occur adjacent to the Little Bear Brook wetland corridor for implementation of the east-side connector road. Upland vegetation impacts of the A Action Alternatives are shown on Figures 4-47 through 4-51.

B Action Alternatives (B, B.1, B.2)

All the B Action Alternatives would impact landscape/lawn, agricultural area, and upland forest. Action Alternative B.2 would impact the greatest amount of upland vegetation communities, totaling approximately 17.22 acres. This would encompass 8.19 acres of landscape/lawn. Approximately 5.61 acres or 2.6% of the total 195.77 acres of agricultural area within the study area would be impacted. Approximately 2.51 acres, or 2.0% of the total 127.65 acres of upland forest within the study area would be impacted. Approximately 0.91 acres of vacant/disturbed land would be impacted under Alternative B.2. Landscape/lawn impacts would occur primarily on Sarnoff Corporation property in association with the east-side connector road and Route 1 ramps. Agricultural impacts from Action Alternative B.2 would occur primarily from the west-side connector road and the connection between Washington Road and Alexander Road. These two roads would bisect agricultural fields.

Upland forest impacts from the B Action Alternatives would occur adjacent to the Little Bear Brook wetland corridor for implementation of the east-side connector road. Vacant/disturbed land impacts would occur from the connection between Washington Road and Alexander Road. It should be noted that Action Alternative B.2 would have the greatest upland vegetation impacts of all the Action Alternatives due to the inclusion of the connection between Washington Road and Alexander Road. Upland vegetation impacts from the B Action Alternatives are shown on Figure 4-52.

C Action Alternatives (C, C.1)

Action Alternatives C and C.1 would impact approximately 5.91 and 3.49 acres of upland vegetation communities, respectively. Action Alternative C would disturb approximately 2.73 acres of lawn/landscape area. Approximately 2.13 acres, or 1.1% of the total 195.77 acres of agricultural land within the study area would be impacted. Approximately 0.14 acres, or 0.11% of the total 127.65 acres of upland forest within the study area would be impacted. Approximately 0.91 acres of vacant/disturbed land would be impacted if Action Alternative C is selected. Lawn/landscape impacts would be associated with the eastern frontage roads on the Sarnoff Corporation property. Agricultural impacts would occur due to the western frontage road and from the connection between Washington Road and Alexander Road. Upland forest and vacant/disturbed land impacts would occur due to the connection between Washington Road and Alexander Road. Upland vegetation impacts from the C Action Alternatives are shown on Figure 4-53.

D Action Alternatives (D, D.1, D.2)

Action Alternatives D and D.1 would impact approximately 10.97 and 10.41 acres of upland vegetation communities, respectively. Action Alternative D would disturb approximately 6.13 acres of landscape/lawn area. Approximately 2.47 acres or 1.3% of the total 195.77 acres of agricultural area within the study area would be impacted. Approximately 2.37 acres, or 1.9% of the total 127.65 acres of upland forest within the study area would be impacted. Landscape/lawn impacts would be associated with implementation of the east-side connector road and eastern frontage roads on the Sarnoff Corporation property. Agricultural impacts would occur due to the west-side connector road and western frontage road, and upland forest impacts would occur adjacent to the Little Bear Brook wetland corridor to implement the east-side connector road. Upland vegetation impacts from the D and D.1 Action Alternatives are shown on Figures 4-54 and Figure 4-55.

Action Alternative D.2 would impact approximately 8.43 acres of upland vegetation communities: 2.73 acres of landscape/lawn, 2.47 acres of agricultural area, and 3.23 acres of upland forest.

E Action Alternative

Action Alternative E would impact a total of approximately 10.63 acres of upland vegetation communities. These impacts would comprise 5.01 acres of landscape/lawn area. Approximately 3.05 acres, or 1.6% of the total 195.77 acres agricultural area

within the study area would be impacted. Approximately 2.57 acres, or 2.0% of the total upland forest within the study area would be impacted. Landscape/lawn area impacts would occur primarily from implementing the east-side connector road and eastern frontage road on the Sarnoff Corporation property. Agricultural impacts would occur due to the west-side connector road, and upland forest impacts would be unavoidable to implement the east-side connector road. Upland forest impacts would occur adjacent to the Little Bear Brook wetland corridor. Upland vegetation impacts from Action Alternative E are shown on Figure 4-56.

F Action Alternatives (F, F.1)

Action Alternatives F and F.1 would impact approximately 12.11 and 13.70 acres of upland vegetation communities, respectively. Action Alternative F.1 would impact approximately 7.93 acres of landscape/lawn. Approximately 3.17 acres, or 1.6% of the total 195.77 acres of agricultural area within the study area would be impacted. Approximately 2.60 acres or 2.0% of the total 127.65 acres of upland forest within the study area would be impacted. Landscape/lawn impacts would occur primarily on the Sarnoff Corporation property associated with the east-side connector road and ramps connecting to Route 1. Agricultural impacts would occur due to the west-side connector road and western frontage roads. Upland forest impacts would occur from the east-side connector road adjacent to the Little Bear Brook wetland corridor. Upland vegetation impacts from the F Action Alternatives are shown on Figure 4-57.

G Action Alternatives (G, G.1, G.2)

Action Alternatives G, G.1, and G.2 would impact approximately 1.43, 1.63, and 1.34 acres of upland vegetation communities, respectively. Action Alternative G.1 would impact approximately 0.98 acres of landscape/lawn. Approximately 0.45 or 0.23% of the total 195.77 acres of agricultural area would be impacted by Action Alternative G.1. Approximately 0.20 acres, or 0.16% of the total 127.65 acres of upland forest within the study area would be impacted. Impacts to landscape/lawn would occur primarily on Sarnoff Corporation property associated with roadway widening at the Harrison Street intersection with Route 1. Upland forest impacts would occur in the southwest quadrant of the Washington Road/Route 1 intersection from implementing a loop ramp. Upland vegetation impacts from Action Alternatives G and G.1 are shown on Figure 4-58. Upland vegetation impacts from Action Alternative G.2 are shown on Figure 4-59.

Vaughn Drive Connector Alternatives (1, 2 and 3)

VDC Alternatives 1, 2, and 3 would impact approximately 2.74, 2.80, and 3.23 acres of upland vegetation communities, respectively. VDC 3 would impact approximately 3.23 acres, or 2.5% of the total 127.65 upland forest within the study area. Upland vegetation impacts from the VDC alternatives are shown on Figure 4-60. Table 4-29 summarizes impacts to upland vegetation communities.

Table 4-29
Summary of Upland Vegetation Impacts (Acres)

Alternative	Landscape/Lawn	Agricultural	Upland Forest	Disturbed/Cleared	Total
A	7.77	1.61	2.37	-0-	11.75
A.1	8.47	2.09	2.37	-0-	12.93
A.2	7.88	2.09	2.37	-0-	12.34
A.3	8.34	2.00	2.37	-0-	12.71
A.4	8.34	2.00	2.37	-0-	12.71
B	9.44	2.02	2.37	-0-	13.83
B.1	9.44	2.02	2.37	-0-	13.83
B.2	8.19	5.61	2.51	0.91	17.22
C	2.73	2.13	0.14	0.91	5.91
C.1	2.73	0.76	-0-	-0-	3.49
D	6.13	2.47	2.37	-0-	10.97
D.1	6.13	1.91	2.37	-0-	10.41
D.2	2.73	2.47	0	0	5.30
E	5.01	3.05	2.57	-0-	10.63
F	7.93	1.81	2.37	-0-	12.11
F.1	7.93	3.17	2.60	-0-	13.70
G	0.98	0.45	-0-	-0-	1.43
G.1	0.98	0.45	0.20	-0-	1.63
G.2	0.98	0.36	-0-	-0-	1.34
VDC 1	-0-	-0-	2.74	-0-	2.74
VDC 2	-0-	-0-	2.80	-0-	2.80
VDC 3	-0-	-0-	3.23	-0-	3.23
No-Action	-0-	-0-	-0-	-0-	-0-

4.9.2.2 Wildlife

Generally, a loss of vegetation translates to a loss of wildlife habitat. Forested and scrub/shrub-dominated areas provide more shelter for wildlife than agricultural fields or landscaped lawns. Agricultural and lawn areas are more homogenous in composition than forested and scrub/shrub areas. As such, they provide only fringe habitat and are not as valuable to wildlife as forested and scrub-shrub habitats.

The primary impacts to wildlife as a result of the Action Alternatives would be the reduction in the quantity and quality of habitat and changes in travel patterns among remaining habitats. Areas that are paved or disturbed during construction operations are typically lost as habitat. Temporarily disturbed areas that are subsequently seeded and mulched to restore vegetative cover usually provide a different and reduced habitat value than what previously existed. Roadway modifications also typically introduce traffic noise and other disturbances associated with new roadway use. Wildlife currently found within or adjacent to developed portions of the study area have already adapted to the impacts resulting from dust, noise, habitat disturbance, lighting, migratory route barriers, turbidity, and sedimentation associated with Route 1, Washington Road, other area roadways, and adjacent development.

The Action Alternatives would cause these same impacts on a portion of the undisturbed habitat located on the eastern portion of the Sarnoff Corporation property and the property west of Route 1 owned by Princeton University. The Action Alternatives, if one is selected, would displace wildlife to undisturbed areas. Negative changes in the quality or quantity of habitat could reduce wildlife diversity, population size, and reproductive success and cause behavioral changes.

Certain wildlife species require a specific niche and cannot survive in a habitat that does not meet their needs. Roadway rights-of-way would consist of grasses, low shrub vegetative communities, and trees planted within the right-of-way after construction. This type of habitat would be suitable for commonly occurring birds as well as small mammals and could compensate for a portion of lost landscaped habitat. Species that inhabit only forested areas, however, would not find new roadway rights-of-way suitable. Several birds, including the red-eyed vireo, towhee, tufted titmouse, woodthrush, scarlet tanager, and most woodpeckers, require forested areas for nesting and feeding and would therefore not inhabit new roadway rights-of-way created by the Action Alternatives. These birds, as well as other forest dependents, would have to search for suitable habitat elsewhere.

Operation and maintenance of an Action Alternative has the potential to impact wildlife through increased mortality (vehicle/animal collisions). Wildlife mortality is particularly high when a road interferes with the natural movements of wildlife among different habitats. As well, white-tailed deer and other mammals commonly use roadside edges as feeding and resting sites which can lead to increased mortality due to motor vehicle collisions.

In general, the greatest impacts to wildlife habitat are likely to result from Action Alternatives that include east- and west-side connector roads. These roads would traverse currently undeveloped lands, some of which include forested areas⁴. With regard to potential habitat fragmentation, the A, B, and F series alternatives, and the D, D.1 and E alternatives, would impact the Little Bear Brook wetland corridor and the adjacent upland forest. The location of the east-side connector road through these areas would sever potential north-south travel routes of land and water animals using these resources. To maintain these routes, wildlife species would be required to cross the roadway or travel beneath the crossing over Little Bear Brook. As such, these alternatives have the most potential for habitat fragmentation.

The west-side connector is more variable in terms of its alignment for each Action Alternative. Additionally, the west-side connector primarily would include impacts to agricultural areas. These areas are typically low to moderate in wildlife habitat value, as they provide limited shelter and are generally close in proximity to developed areas with an abundance of human activity. A portion of the forested area adjacent to Harrison Street would be impacted by A, B, and F series alternatives and the D and D.2 alternatives.

⁴ Both Sarnoff Corporation and Princeton University plan to develop their properties within the Design Year timeframe of this EIS. The vegetative and animal communities currently using these properties may change as a result of development.

Action Alternatives B, B.1 and B.2, which include a connection between Harrison Street and Washington Road, would impact some wildlife habitat associated with agricultural fields and upland forested areas. Action Alternatives B.2 and C, which include a connection between Washington Road and Alexander Road, would have some impact on wildlife using the agricultural field located between the Dinky and Alexander Road.

Action Alternative F.1 includes a western frontage road approximately 200 feet from Route 1. This would have a low or no impact on wildlife habitat associated with the adjacent agricultural field. Given the configuration of improvements anticipated as part of Alternatives C.1 and the G-series, these alternatives are not likely to result in habitat fragmentation. Remaining components of the above Action Alternatives would have a low or no impact on wildlife habitat.

4.9.3 Mitigation Measures, Vegetation and Wildlife

Unavoidable impacts to upland vegetation were minimized during the development of the conceptual alternatives wherever possible. If an Action Alternative is selected, further examination of new roadway alignments would be undertaken to refine and possibly further minimize vegetation impacts. The project would have to comply with the New Jersey No Net Loss Reforestation Act regarding unavoidable losses of forested areas. The Act mandates that the project replace disturbed forest. An assessment of the applicability of the project to the Act and development of a specific mitigation plan would be undertaken during design.

During construction, the following measures would be implemented to minimize vegetation impacts:

- Minimize the area disturbed by construction activities,
- Establish and implement an approved soil erosion and sedimentation control plan, and
- Incorporate appropriate landscaping practices to stabilize slopes, prevent erosion, and indirectly provide wildlife habitats.

A detailed landscaping plan would be developed and implemented for a selected Action Alternative. The plan would introduce tree, shrub, and groundcover plantings to complement the roadway design. Supplemental plantings would be provided where feasible to compensate for some of the upland vegetation loss. An emphasis would be placed on selecting native plant materials and their cultivars. Native materials are adapted to local climate and soil conditions, less prone to disease and pests than most non-native species, and provide food and shelter resources for local wildlife.

Wildlife occupying potential impact areas would be displaced. Many species would have to search for other suitable habitat. Disturbed rights-of-way would be revegetated following construction. As these vegetative materials mature, some wildlife species could be attracted to the new sources of food and shelter. The species

attracted would be those that are adapted to human proximity and find food and shelter in a variety of habitats. In this way, some mitigation for habitat impacts could be achieved.

Mitigation measures to minimize impacts to wildlife habitats in the design could include the following:

- Maintain the existing stream bed beneath new or replaced crossings to maintain migratory routes of terrestrial, aquatic, and fish species;
- Where feasible, use retaining walls along steep slopes to minimize cut and fill activities;
- Minimize shoulder widths; and,
- Confine vegetation clearing to the roadway or right-of-way width.

Design of an Action Alternative would explore ways to facilitate wildlife movements along the Little Bear Brook corridor. The extent to which the crossing of Little Bear Brook could be constructed with adequate dimensions to permit travel pathway for terrestrial species would be examined in the context of FHWA guidelines for animal crossing design, and NJDEP stream encroachment requirements.

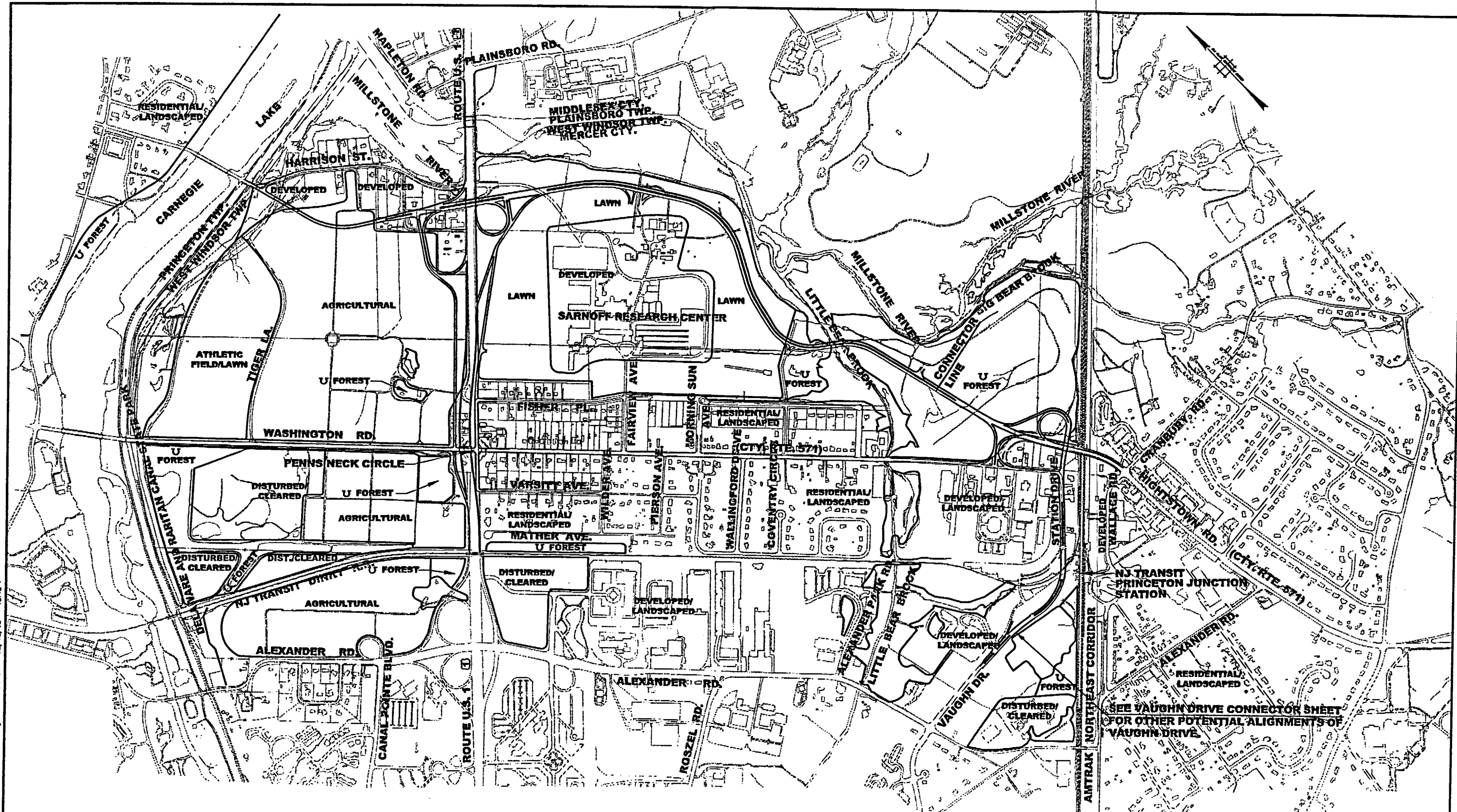
An examination of means to reduce the potential for vehicle-wildlife collisions on new roadways would be undertaken during design of an Action Alternative.



NOTE: IMPACTS FOR ALTERNATIVE A ONLY INCLUDE UP TO THE CONNECTOR LINE. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n.

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-47



LEGEND:

- PROPOSED IMPROVEMENTS
- - - EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/CLEARED	TOTAL
A.1	8.47	2.09	2.37	0.00	12.93

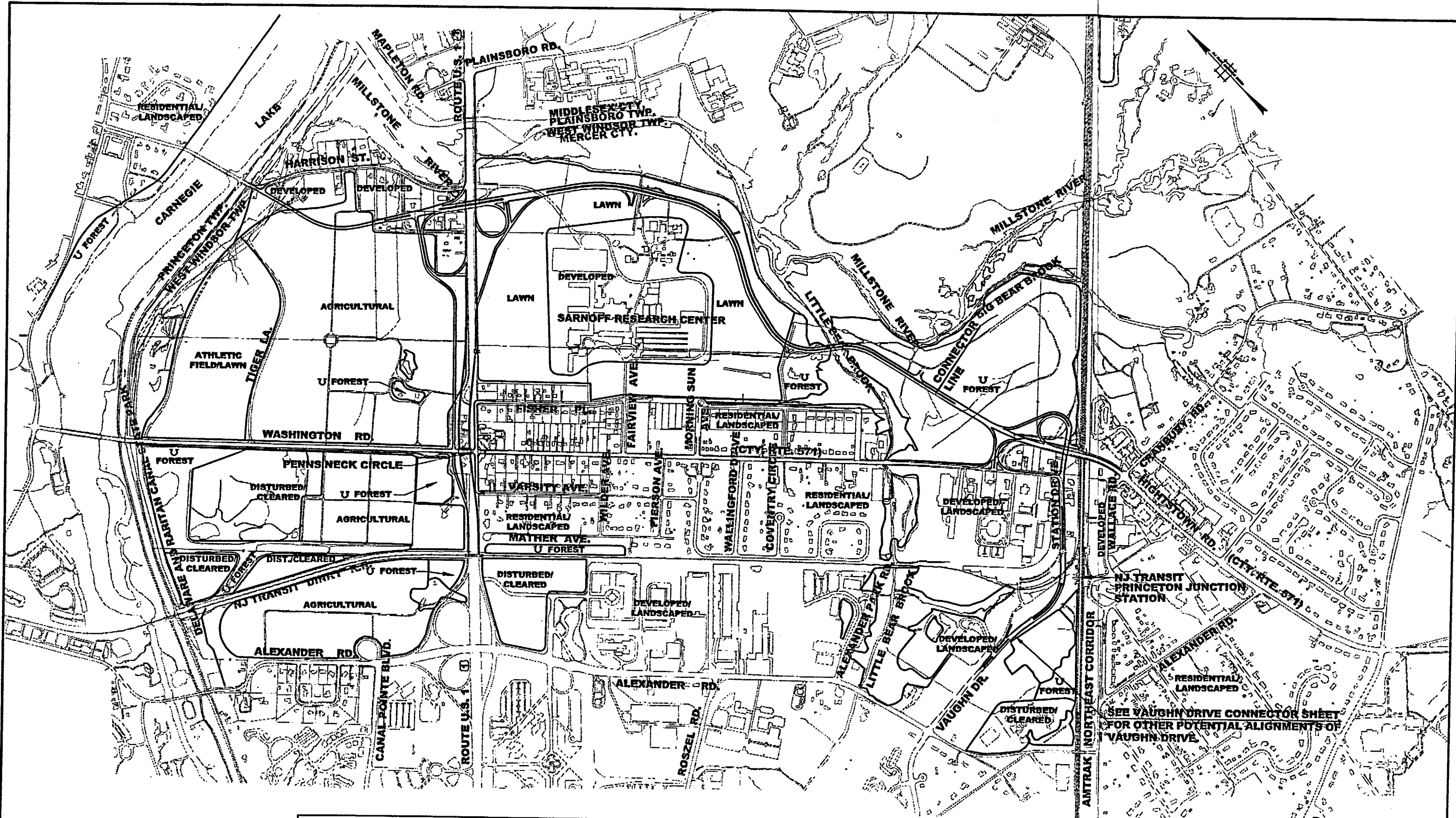
NOTE: IMPACTS FOR ALTERNATIVE A.1 ONLY INCLUDE UP TO THE CONNECTOR LINE. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n.

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT
UPLAND VEGETATION MAP
ACTION ALTERNATIVE A.1

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-48



LEGEND:

- PROPOSED IMPROVEMENTS
- - - EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/ LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/ CLEARED	TOTAL
A.2	7.88	2.09	2.37	0.00	12.34

NOTE: IMPACTS FOR ALTERNATIVE A.2 ONLY INCLUDE UP TO THE CONNECTOR LINE. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n.

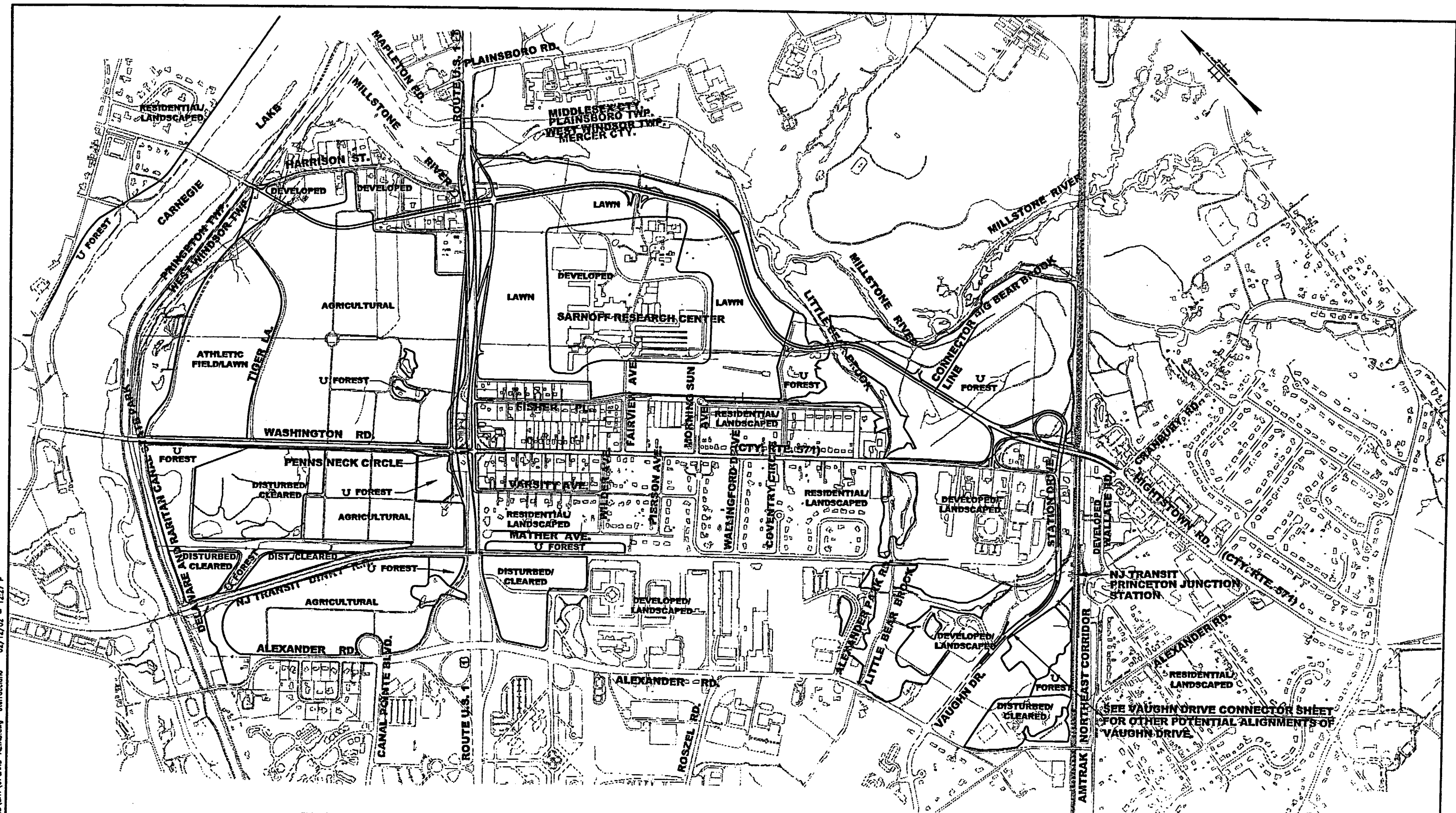
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
 ENVIRONMENTAL IMPACT STATEMENT
 UPLAND VEGETATION MAP
 ACTION ALTERNATIVE A.2

DATE: NOV. 2002
 SCALE: 1"=1000'

FIGURE 4-49

02/12/02 - 12:37 P
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LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/CLEARED	TOTAL
A.3	8.34	2.00	2.37	0.00	12.71

NOTE: IMPACTS FOR ALTERNATIVE A.3 ONLY INCLUDE UP TO THE CONNECTOR LINE. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n.

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT
UPLAND VEGETATION MAP
ACTION ALTERNATIVE A.3

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-50



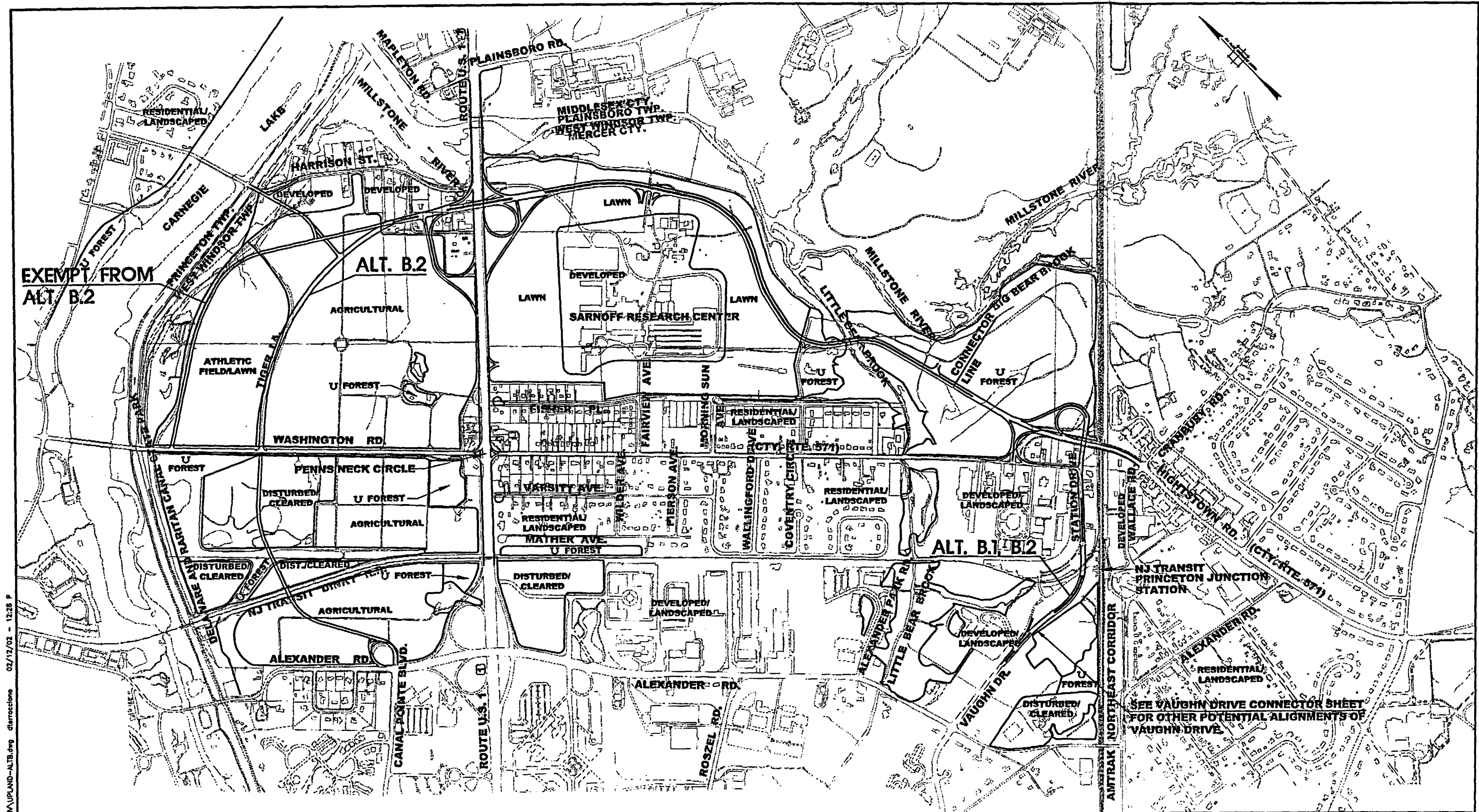
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT
UPLAND VEGETATION MAP
ACTION ALTERNATIVE A.4

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-51

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LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/CLEARED	TOTAL
B	9.44	2.02	2.37	0.00	13.83
B.1	9.44	2.02	2.37	0.00	13.83
B.2	8.19	5.61	2.51	0.91	17.22

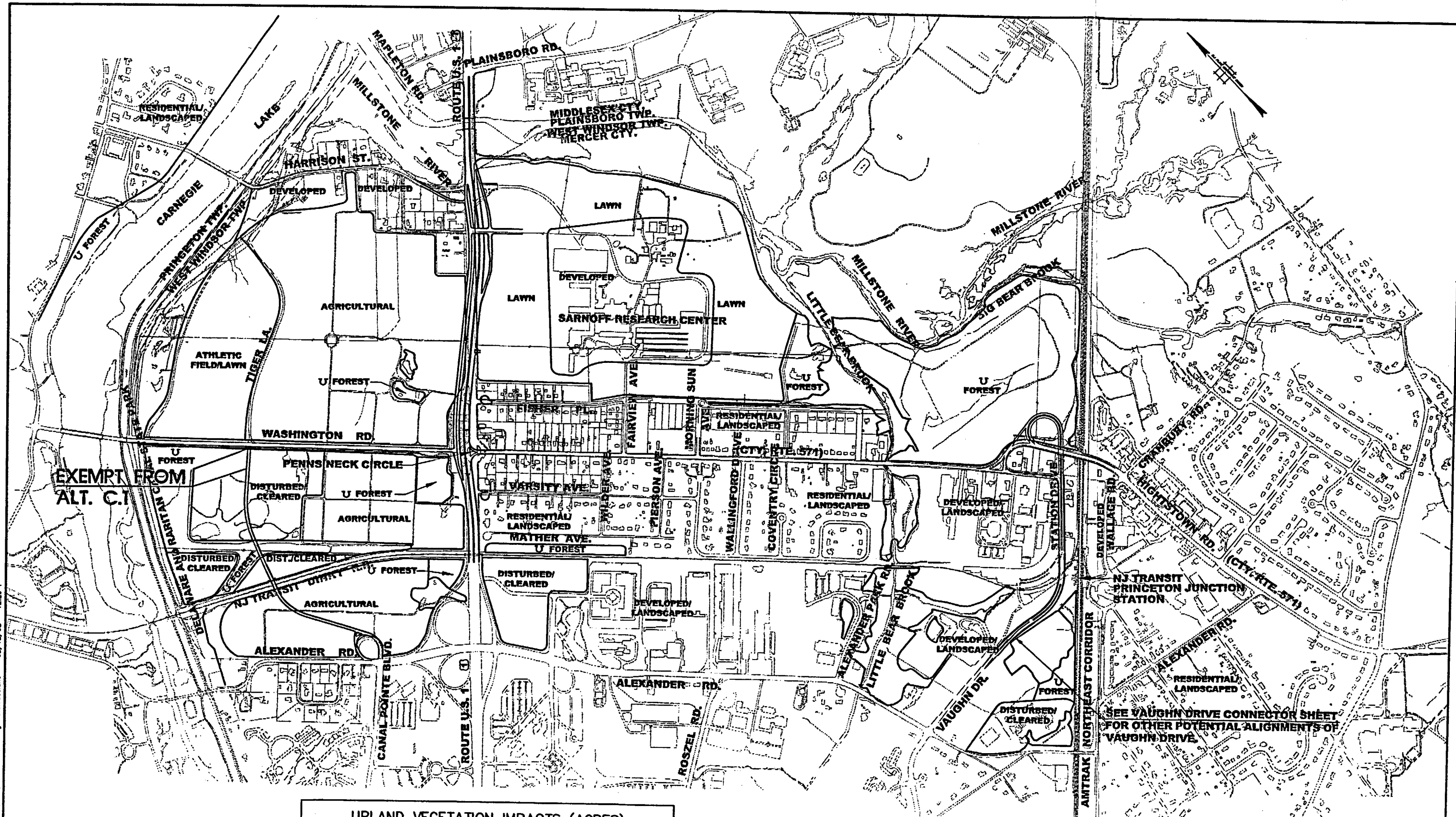
NOTE: ALTERNATIVE B, B.1 & B.2 IMPACTS ONLY INCLUDE UP TO THE CONNECTOR LINE. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n. ALTHOUGH THE VDC FOR ALTERNATIVE B STOPS AT WASHINGTON ROAD, IT WILL STILL RESULT IN THE SAME UPLAND IMPACTS AS THE VDC OF ALTERNATIVES B.1 & B.2.

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT
UPLAND VEGETATION MAP
ACTION ALTERNATIVE B, B.1, B.2

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-52



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/CLEARED	TOTAL
C	2.73	2.13	0.14	0.91	5.91
C.1	2.73	0.76	0.00	0.00	3.49

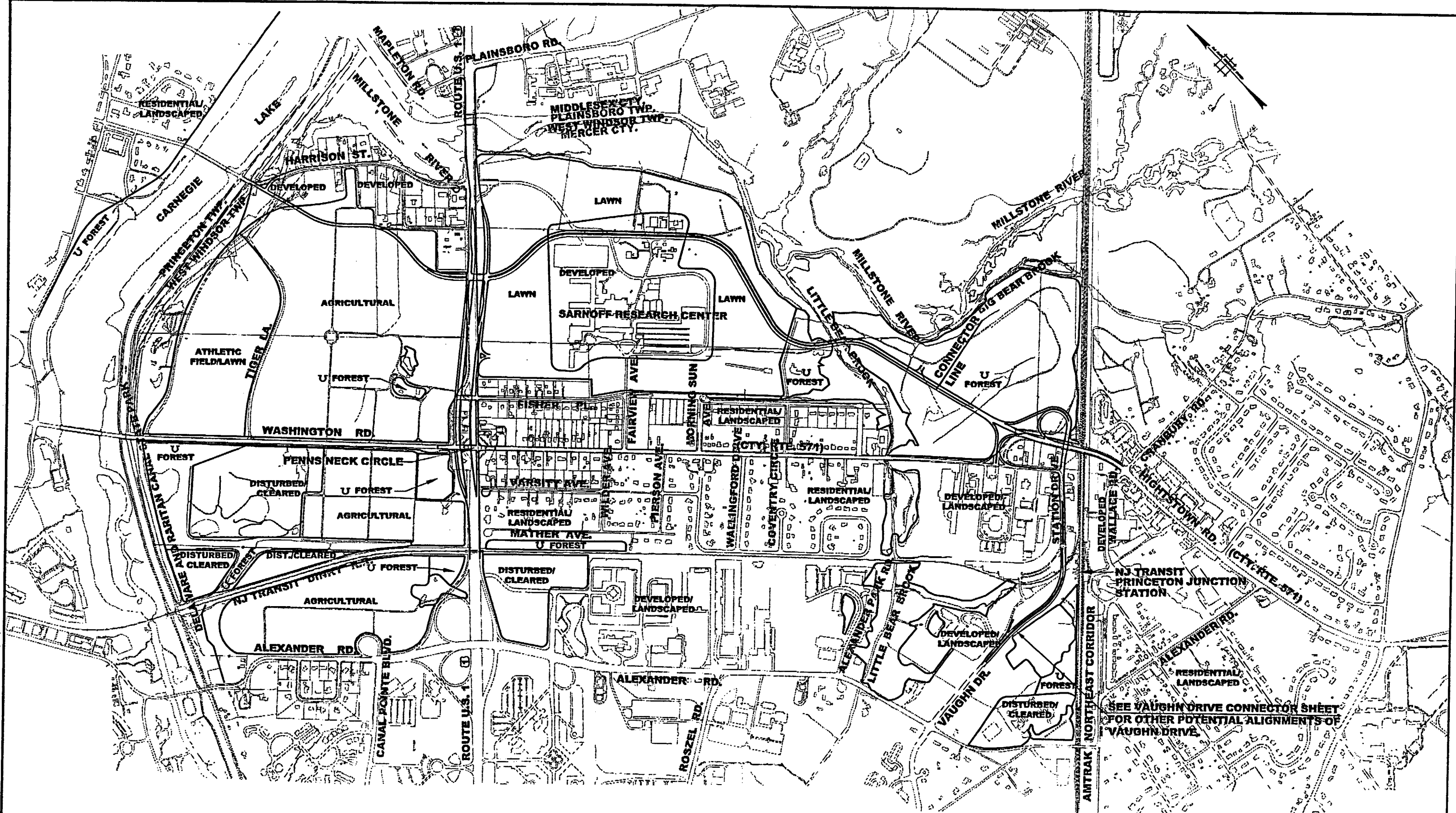
NOTE: IMPACTS FOR ALTERNATIVE C & C.1 DO NOT INCLUDE THE VAUGHN DRIVE CONNECTOR. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n.

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT
UPLAND VEGETATION MAP
ACTION ALTERNATIVE C, C.1

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-53



LEGEND:

- PROPOSED IMPROVEMENTS
- - - EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/CLEARED	TOTAL
D	6.13	2.47	2.37	0.00	10.97

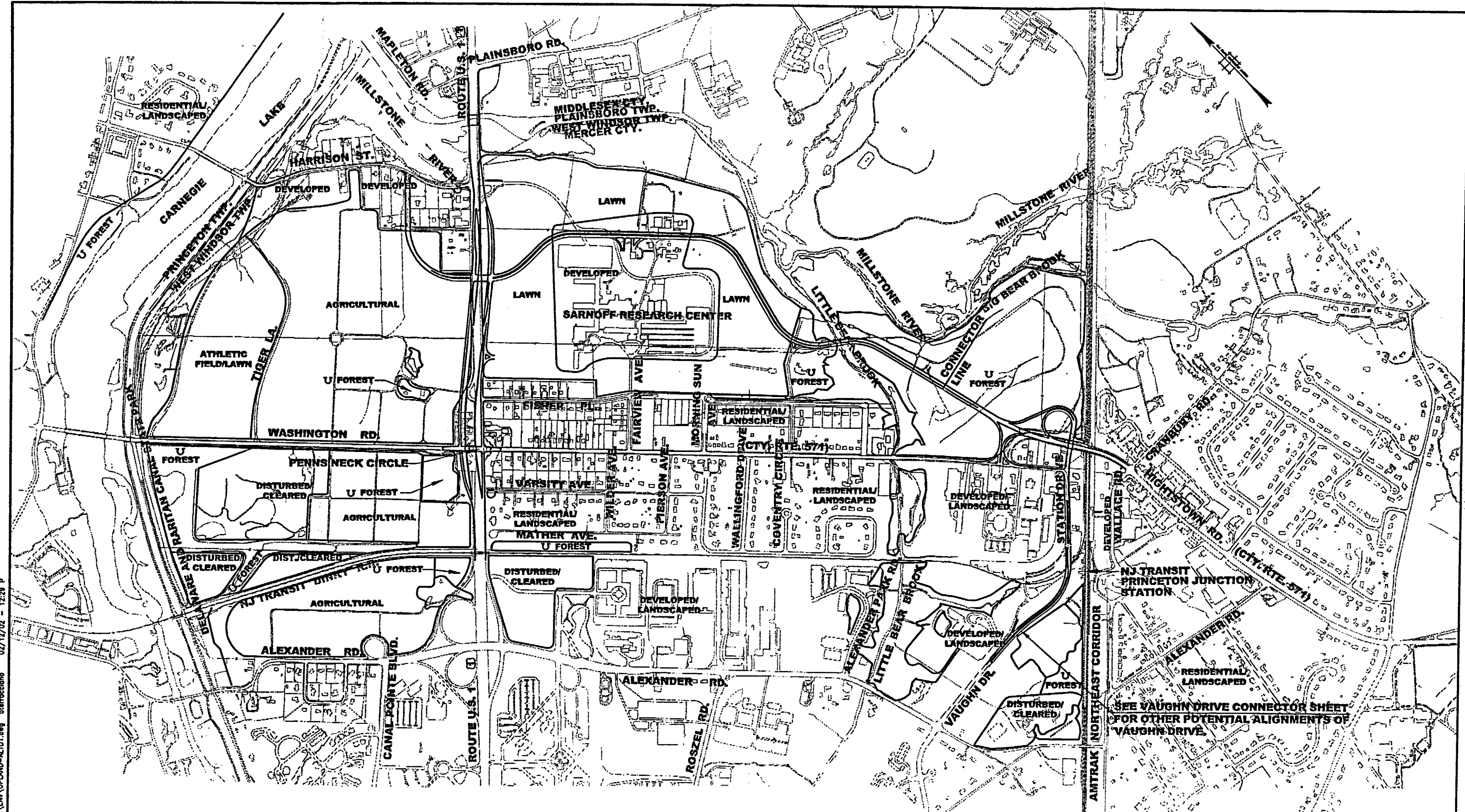
NOTE: IMPACTS FOR ALTERNATIVE D ONLY INCLUDE UP TO THE CONNECTOR LINE. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n.

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT
UPLAND VEGETATION MAP
ACTION ALTERNATIVE D

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-54



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/CLEARED	TOTAL
D.1	6.13	1.91	2.37	0.00	10.41

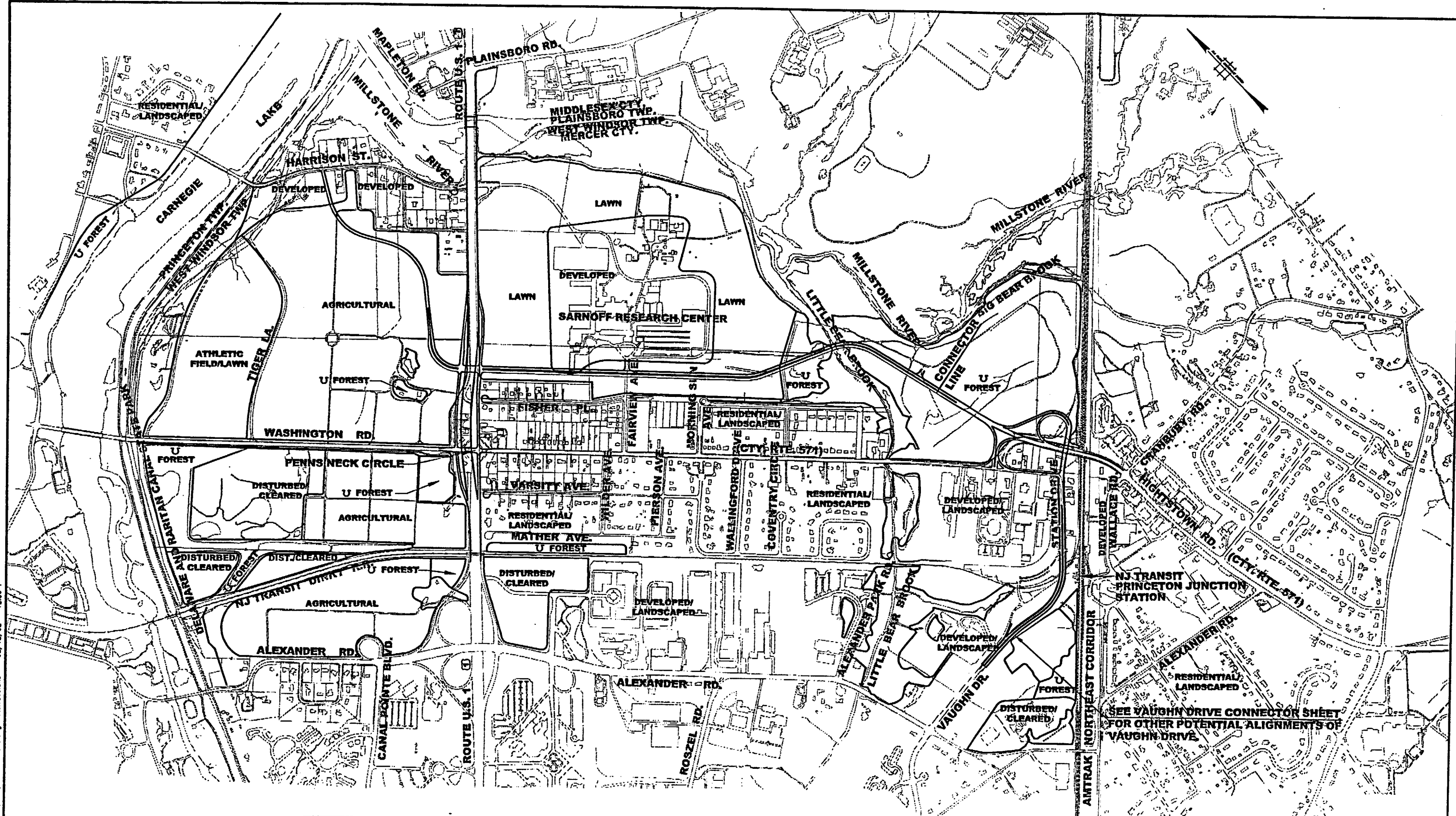
NOTE: IMPACTS FOR ALTERNATIVE D.1 ONLY INCLUDE UP TO THE CONNECTOR LINE. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n.

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT
UPLAND VEGETATION MAP
ACTION ALTERNATIVE D.1

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-55



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/CLEARED	TOTAL
E	5.01	3.05	2.57	0.00	10.63

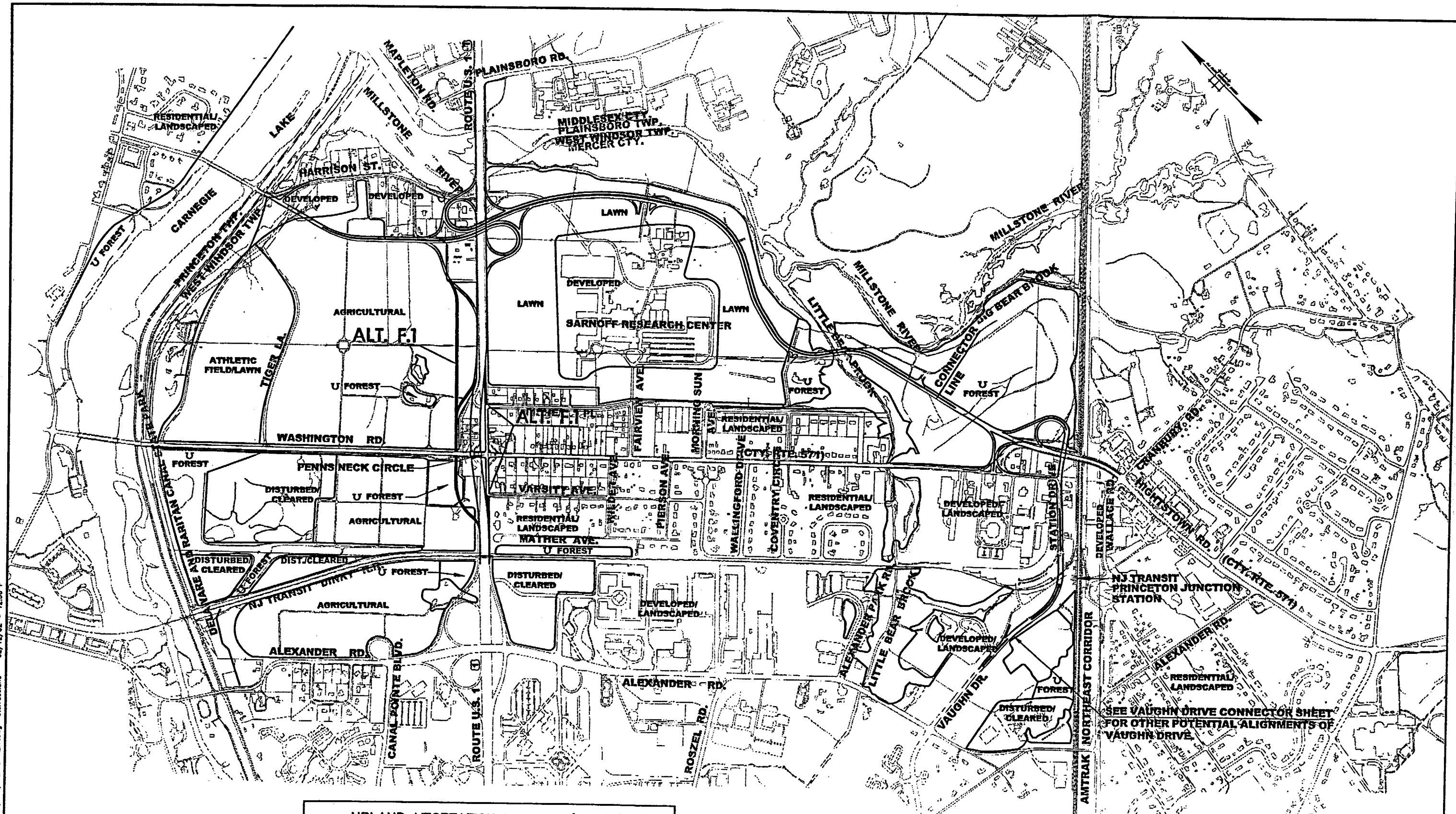
NOTE: IMPACTS FOR ALTERNATIVE E ONLY INCLUDE UP TO THE CONNECTOR LINE. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n.

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
 ENVIRONMENTAL IMPACT STATEMENT
 UPLAND VEGETATION MAP
 ACTION ALTERNATIVE E

DATE: NOV. 2002
 SCALE: 1"=1000'

FIGURE 4-56



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/CLEARED	TOTAL
F	7.93	1.81	2.37	0.00	12.11
F.1	7.93	3.17	2.60	0.00	13.70

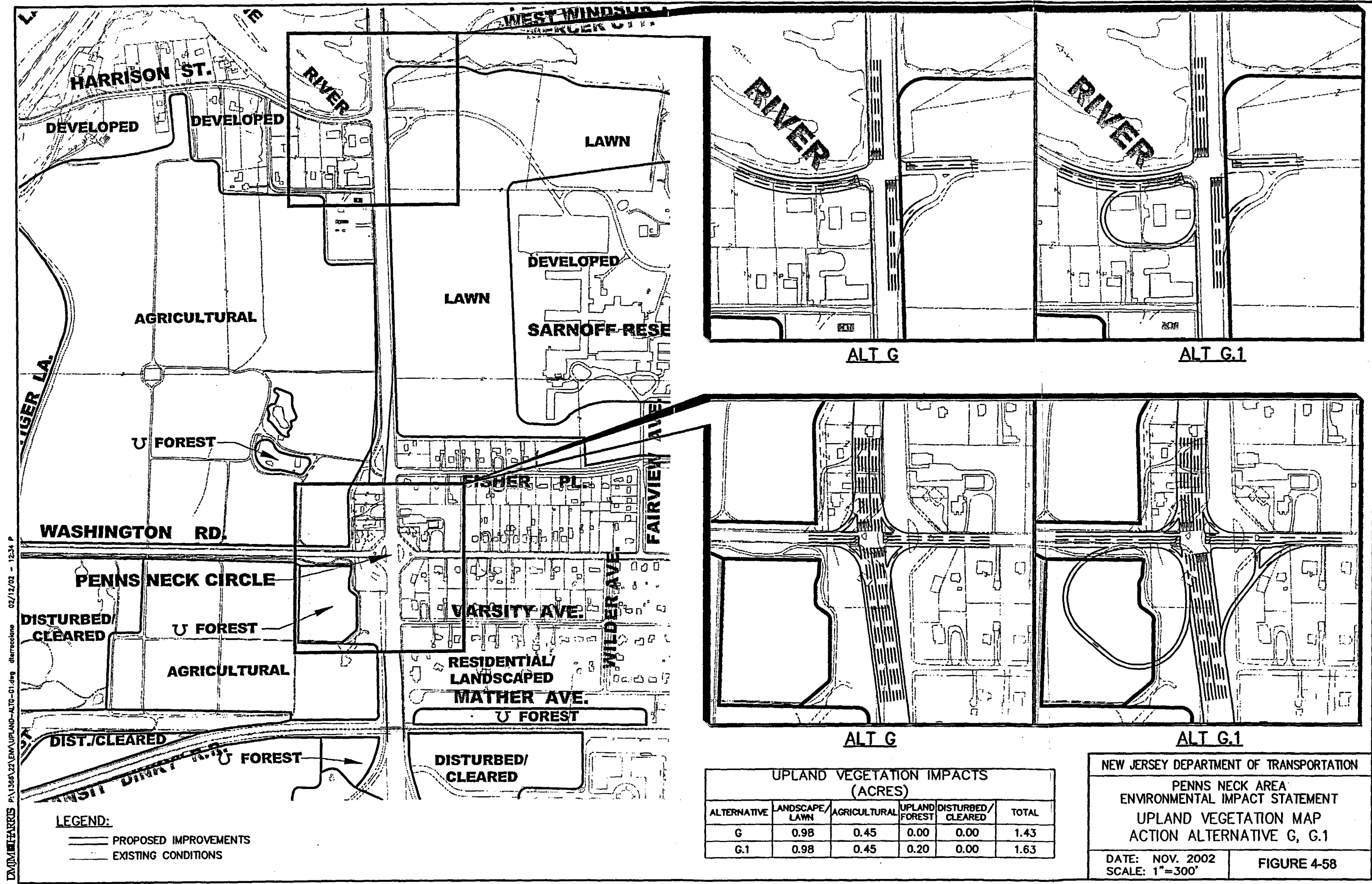
NOTE: IMPACTS FOR ALTERNATIVE F & F.1 ONLY INCLUDE UP TO THE CONNECTOR LINE. IMPACTS ASSOCIATED WITH THE VAUGHN DRIVE CONNECTOR ALIGNMENTS ARE SHOWN SEPARATELY ON FIG. 5-3n.

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT
UPLAND VEGETATION MAP
ACTION ALTERNATIVE F, F.1

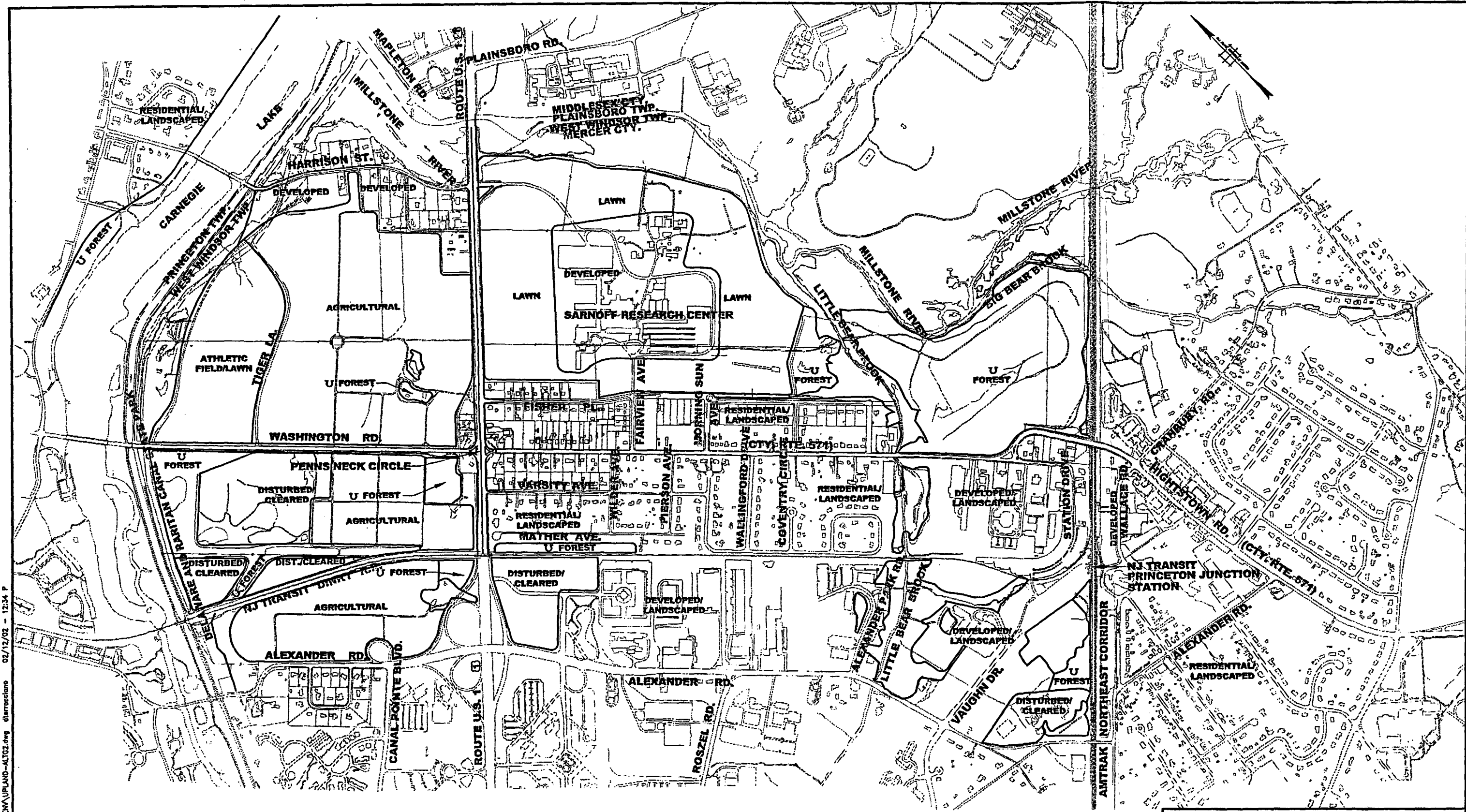
DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-57



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UPLAND VEGETATION IMPACTS (ACRES)					
ALTERNATIVE	LANDSCAPE/LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/CLEARED	TOTAL
G.2	0.98	0.36	0.00	0.00	1.34

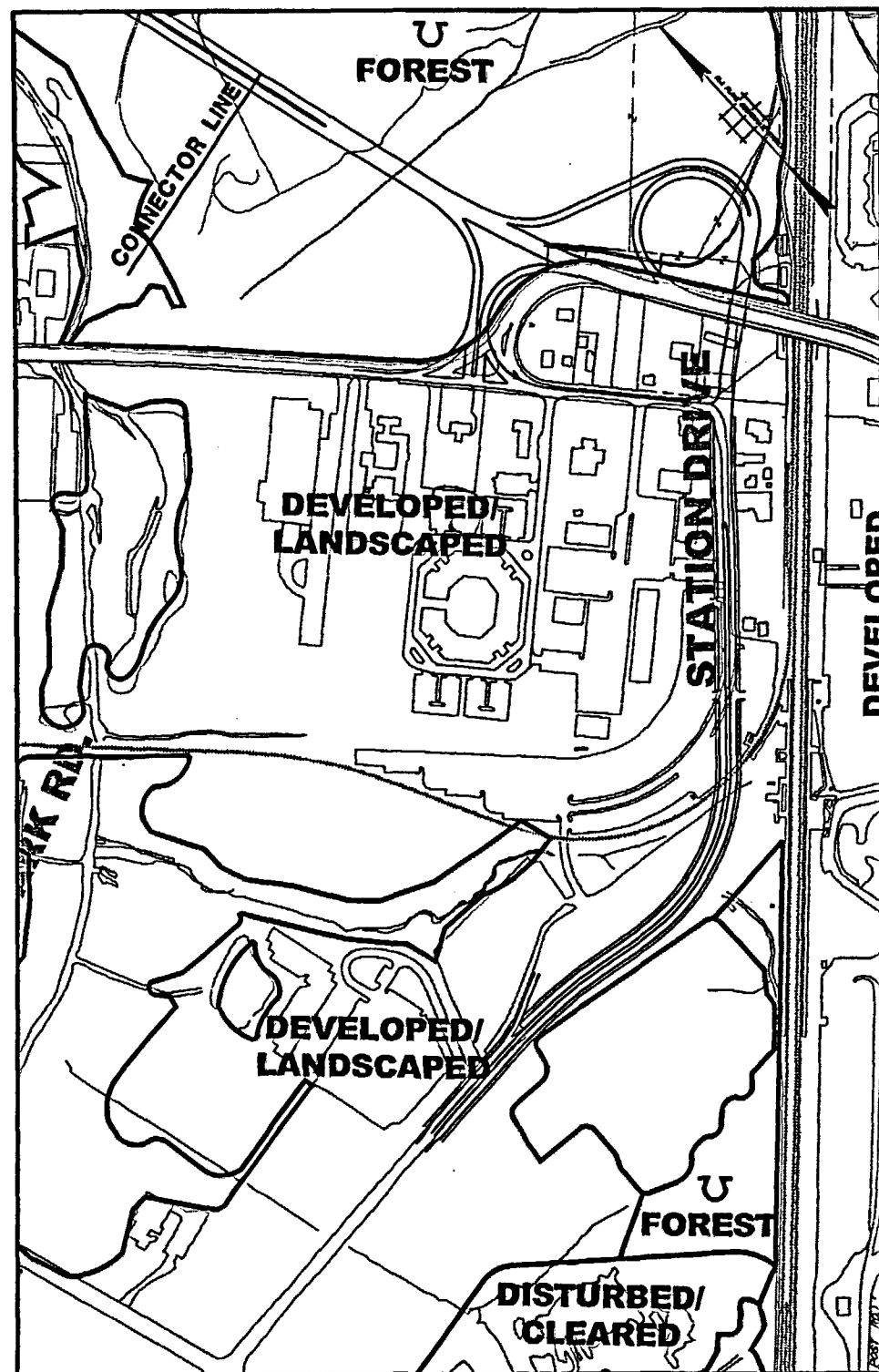
LEGEND:
—— PROPOSED IMPROVEMENTS
- - - EXISTING CONDITIONS

NEW JERSEY DEPARTMENT OF TRANSPORTATION

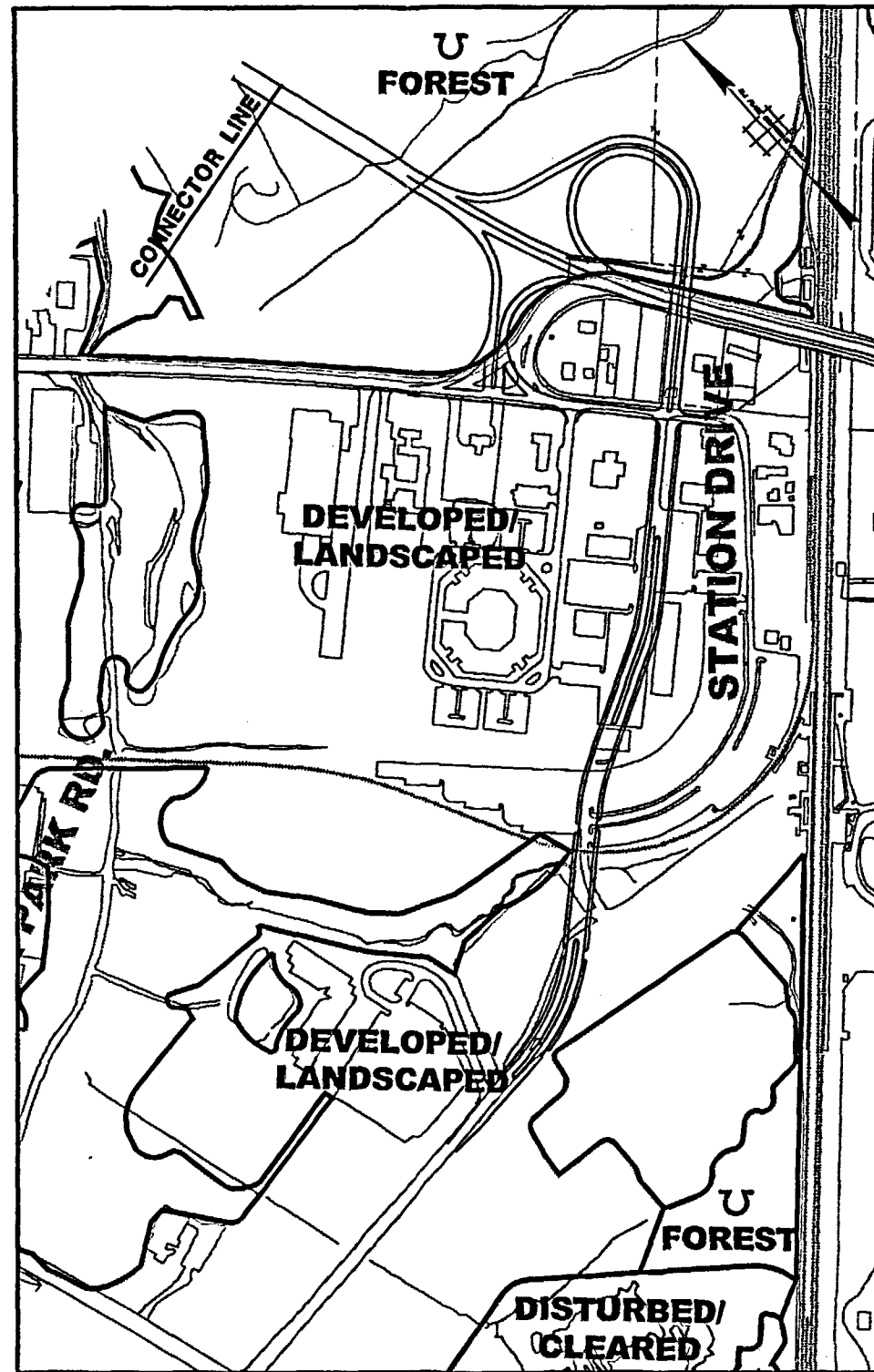
PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT
UPLAND VEGETATION MAP
ACTION ALTERNATIVE G.2

DATE: NOV. 2002
SCALE: 1"=1000'

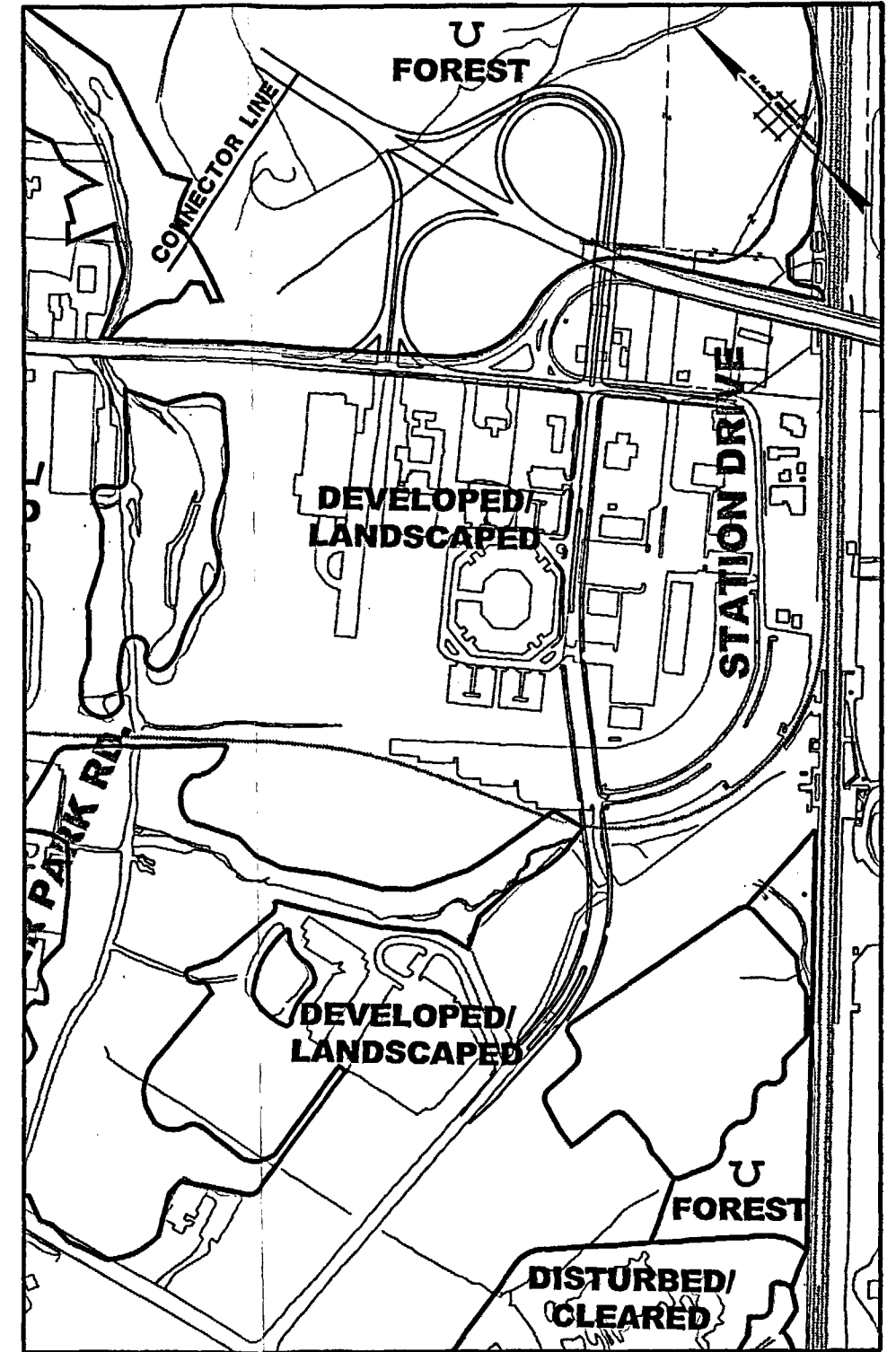
FIGURE 4-59



ALIGNMENT 1



ALIGNMENT 2



ALIGNMENT 3

LEGEND:

- PROPOSED IMPROVEMENTS
 EXISTING CONDITIONS

UPLAND VEGETATION IMPACTS (ACRES)						
	ALTERNATIVE	LANDSCAPE/ LAWN	AGRICULTURAL	UPLAND FOREST	DISTURBED/ CLEARED	TOTAL
VDC 1	ESC & EB RAMPS	0.00	0.00	1.64	0.00	1.64
	VDC ROAD & WB RAMPS	0.00	0.00	1.10	0.00	1.10
VDC 2	ESC & EB RAMPS	0.00	0.00	1.64	0.00	1.64
	VDC ROAD & WB RAMPS	0.00	0.00	1.16	0.00	1.16
VDC 3	ESC & EB RAMPS	0.00	0.00	2.01	0.00	2.01
	VDC ROAD & WB RAMPS	0.00	0.00	1.22	0.00	1.22

NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
 ENVIRONMENTAL IMPACT STATEMENT
 VAUGHN DRIVE CONNECTORS 1, 2, 3
 UPLAND VEGETATION MAP

DATE: NOV. 2002
 SCALE: 1"=500'

FIGURE 4-60