

EASTERN POWER DISTRIBUTION COMPANY OF ANDHRA PRADESH LIMITED

**CONVERSION OF EXISTING OVERHEAD POWER DISTRIBUTION NETWORK TO UNDER GROUND CABLING SYSTEM OF
VISA KHAPATNAM CITY UNDER ANDHRA PRADESH DISASTER RECOVERY PROJECT (APDRP)**

**Environmental Screening Report for Package-II
Volume I**

Updated as on November, 2016



Submitted by
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Sl. No	TABLE OF CONTENTS	Page
1	INTRODUCTION	1
2	RESILIENT ELECTRICAL NETWORK UG CABLE PROJECT (PACKAGE 2)	1
3	OPERATIONAL AREA/CORRIDOR OF IMPACT	1
4	ENVIRONMENTAL SCREENING OF REN/UG PROJECT – PACKAGE 2 AREA	2
4.1	Summary of Environmental Screening within 10 Km Radius of Package 2 Area	2
4.2	Summary of Environmental Screening of Corridor of Impact & Project Influence Area	2
4.3	Underground Pre-existing Infrastructure within Operational Area	3
	LIST OF TABLES	
1	Substation Area wise Type & Length of Cable Trenches under Package 2	1
2	Enumeration of Poles along Cable Route Corridor under Package 2 Area	3
3	Enumeration of Trees along cable Route Corridor under REN/UG Cable Project – Package 2 Area	3
4	List of Sensitive Receptors & Other Structures along Cable Route Corridor	3
5	Heritage Sites in Package 2 Area	3
6	Details of Structures likely to be Impacted under Package 2 Area	4
7	Category wise Details of Squatters Structures Impacted under Package 2 Area	4
	LIST OF FIGURES	
1	Barricaded Operational Area/Corridor of Impact for UG Cable Laying Operations	1
	LIST OF ANNEXURES	
1	Environmental Screening as per Formats Provided in ESMF, APDRP	5
2	Environmental Screening of Corridor of Impact & Project Influence Area Through Transect Walk & Enumeration of Environmental Features	20

1. INTRODUCTION

Eastern Power Distribution Company of Andhra Pradesh Limited (APEPDCL) is the designated project implementing unit (PIU) for implementation of the Resilient Electrical Network (REN) or Underground (UG) Cable Project under the Andhra Pradesh Disaster Recovery Project (APDRP) under funding assistance of the World Bank.

The REN/UG cable project is one of the seven components under APDRP and constitutes conversion of all existing 33kV, 11 kV and 415 volts overhead (OH) lines into underground cable network within the municipal limits of Visakhapatnam city.

2. RESILIENT ELECTRICAL NETWORK/ UG CABLE PROJECT (Package 2)

The REN/UG cable project has been divided into four packages for operational requirements. The Package 2 of REN/UG cable project has Seven substation areas namely Pandurangapuram, RK Beach, Kailasametta, Vidyut Sakha, TSR Complex, Dondaparty Indoor and Maddilapalem and is spread over an area of 5.19 sq.km. The cumulative length of cable trenches (including RCC duct) under Package 2 is 92.15 km and the substation wise length of cable trenches is given in **Table 1**.

Table 1: Substation Area wise Type and Length of cable Trenches under Package 2									
S.No	Trench Configuration (Width X Depth in mm)	VIDYUT SAKHA	RK BEACH	KAILASAMETTA	TSR COMPLEX	DONDAPARTY	MADDILAPALEM	PANDURANGAPURAM	Total length (kms)
1	Type 1: 1000mm X 1250mm	5.5	0.81	1.63	3.8	0.6	5.82	0	18.16
2	Type 2: 600m X 1000mm	7.67	3.24	2.44	11.28	5.86	9.48	3	42.97
3	Type 3: 600mm X 1000mm	2.18	1.09	0.77	2.52	2.49	1.26	1.83	12.14
4	Type 4: 500 X 850mm	4.66	0.81	0.25	2.69	0.91	2	3.02	14.34
5	Total Trench Length	20.01	5.95	5.09	20.29	9.86	18.56	7.85	87.61
6	RCC Duct	1.37	0.2	0.41	0.95	0.15	1.46	0	4.54
7	Total	21.380	6.150	5.500	21.240	10.010	20.020	7.850	92.15

Administratively, Package 2 area covers part of GVMC municipal covers part wards number 8,10 and 13-18 of Zone 2, part wards number 19-21, 29-30 of Zone 3 and part wards number 31 and 44 of Zone 4. The GVMC municipal area has been demarcated into 72 wards, grouped into 6 zones for administrative purposes, spread over 682 sq.km

3. OPERATIONAL AREA/CORRIDOR OF IMPACT

The underground cables under the REN/UG project are envisaged to be laid alongside of the roads as per the alignment/routes finalised during project preparation. However, almost all roads under Package 2 area has pre-existing road side over ground infrastructure like electric/ telecom/street light poles, road side trees and underground OFC cables laid by multi telecom operators.

Most of the pre-existing road side infrastructure/utilities are within a maximum of 0.45 metre from the foot path or road edge, towards the roadside. Therefore, trench for the REN/UG cable project has to be essentially at least 0.45 metre away from the footpath or road edge, towards roadside, in order to avoid fouling of cable trenches under REN/UG project with other pre-existing infrastructure/utilities and roadside trees. However, this strip of 0.45 metre can serve as space for requirements like stacking of material etc and thus can be included within the operational area for REN/UG cable project. Field assessments have indicated that in smaller or narrower roads, this 0.45 metre can reduce to even 0.3 metre and can be included within operational area.

Hence, it is considered to demarcate a 2.5 m wide strip as operational area, one side of strip being footpath or road edge, and other side of strip extending towards the other side of road or median, in case of dual carriageway (including 0.45 metre wide strip with pre-existing infrastructure).

This 2.5 metre wide strip is bare minimum space required as operational area to mechanically excavate required size of trenches, stacking and handling of all materials, cable pullout and lowering operations, backfilling of trenches, construction of inspection chambers and road restoration works.

During the cable laying, this operational area is to be barricaded on both sides, with intermediate access provided to buildings, wherever required and all cable laying operations are to be limited to this barricaded operational area. Thus, the barricaded operational area will also be the direct Corridor of Impact (COI), as a consequence of cable laying operations. The entire road width (in case of single carriage way) or up to median (in case of divided carriageway) along cable routes is considered as Project Influence Area, which will be subjected to some incidental construction phase impacts and inconveniences like increased dust, noise levels and traffic disruptions due to constricted carriageway due to barricading of operational area among others.

The barricaded operational area/corridor of impact for cable laying operations is shown in **Figure 1**.

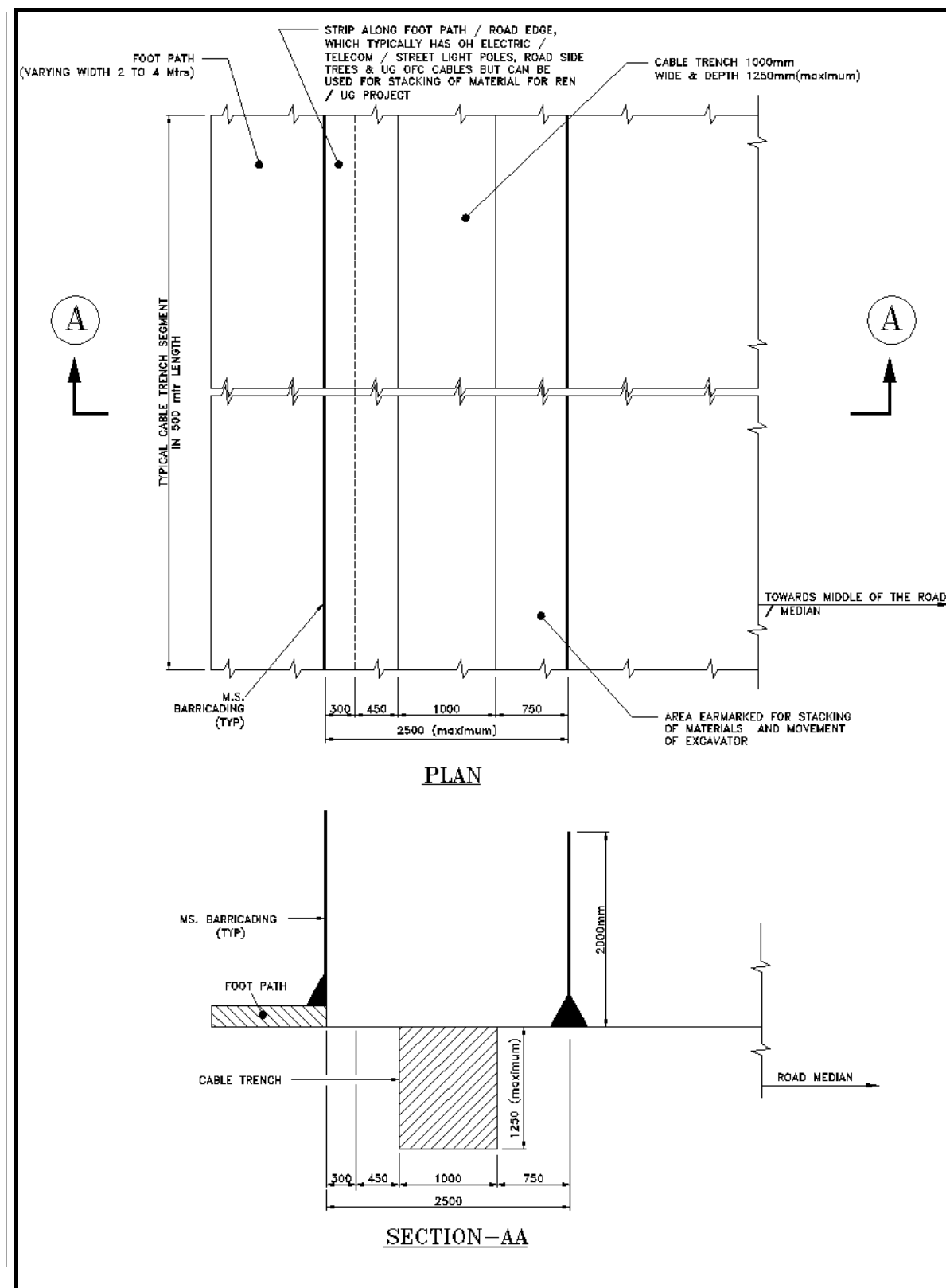


Figure 1: Barricaded operational area/corridor of impact for UG cable laying operations

4. ENVIRONMENTAL SCREENING OF REN/UG PROJECT- PACKAGE 2 AREA

As part of the baseline assessment, an environmental screening of the Package 2 area covered under REN/UG cable project was carried out during 1st to 20th February 2016 comprising;

- Environmental screening within a 10 km radius of Package 2 area of REN/UG cable project. Screening formats as per ESMF under APDRP was used. The screening was carried based on latest secondary data base available in public domain, supplemented by field visits for ground truth verification, wherever required
- Environmental screening of corridor of impact and project influence area, in order to prepare an inventory of environmental features, sensitive receptors and physical cultural resources along the cable routes. The screening was carried out through transect walks and the features along cable routes were captured in specially prepared strip plans as well as formats for enumeration of sensitive receptors and physical cultural resources. A videograph of the corridor of impact area was also completed during this screening exercise.

4.1. Summary of Environmental screening within 10 km radius of Package 2 area

The findings of the environmental screening surrounding the Package 2 area, up to 10km radius are;

- There are no biosphere reserves, national parks, tiger/elephant reserves, coastal areas with coral reefs, wetlands, important bird areas and/or any other ecologically sensitive areas within a radius of 10km of the Package 2 area of REN/UG cable project
- The Kambalakonda wild life sanctuary, Kambalakonda eco-tourism park and Indira Gandhi Zoological Park are at an aerial distance of 3 km from outer edge of Package 2 area.
- The coastline along Visakhapatnam between R K beach and Bheemili is known to have sporadic nesting sites for Olive Ridley turtles (*Lepidochelys olivacea*), which are protected under Schedule I of Wildlife Protection Act and listed as vulnerable in IUCN list. However, the nesting site within the Package 2 area is Yoga village, where VSPCA has an ex-situ hatchery facility, due to excessive beach front activities on like tourism, heavy lighting, pollution and predators such as crows, eagles, jackals and beach dogs. Cable routes under REN/UG project are along city roads through fully developed areas and do not extend into coastal sands (beach areas).
- The Package 2 area of REN/UG cable project skirts within 500 metres from High Tide Line and thus will be under the purview of CRZ Notification. The landward area of REN/UG cable project, which is within 500 metres from HTL is in municipal limits, fully developed and has been provided with drainage and approach roads. As per the notification, such areas are classified under CRZ-II areas. Laying of underground cables under REN/UG cable project will be limited to these roads, which are pre-existing to the date of CRZ notification and does not extend into sand and/or beach areas (shoreline) along coastline.

The filled in environmental screening formats as per ESMF under APDRP along with location maps of above mentioned sensitive areas with respect to Package 2 area are given in Annexure I of **Volume I - Environmental Screening report**.

4.2. Summary of Environmental Screening within COI/Project Influence area

The environmental screening of the operational area/corridor of impact and project influence area along cable route corridors has indicated that cables under the REN/UG project can be laid along the proposed routes without resorting to shifting of any of the pre-existing road side over ground infrastructure and/or felling of road side poles and trees (all types and sizes). At all such locations, the

cable routes can be re-aligned with minor deviations, to avoid any such requirements.

The underground cable routes does pass through roads, which have sensitive receptors like hospitals, schools / educational institutions and temples, however none of them will be affected as cable routes are away from them and neither require shifting of any physical cultural resources. The construction phase impacts and inconveniences in terms of dust, noise levels and traffic disruptions at all such stretches are to be managed through appropriate management measures.

The REN/UG cable project will however require demolition of ramps/steps and part structure of shops/kiosks of street vendors, many of which are illegal and have been extended onto roads. During the screening survey, all such illegal extensions within the corridor of impact have been enumerated.

The summary of enumeration of features which will remain unaffected like trees, poles within the corridor of impact/operational area, sensitive receptors and heritage structures along the cable route alignment is given in **Table 2, 3, 4 & 5**. Also, the structures within the operational area/corridor of impact, which are likely to be affected during cable trench excavation is also summarized in the **Tables 6 & 7**.

4.3. Underground Pre-Existing Infrastructure within Operational Area

The pre-existing underground infrastructure along the roads, in which cable routes have been aligned have been captured (in terms of location of manhole chambers) during environmental screening surveys and are shown in strip plans of respective substation wise maps in **Annexure II**.

This apart, information about any other underground infrastructure like water supply pipes, sanitary and drainage pipes laid across the corridor of impact /operational area could not be captured since, no physical evidence or marking is available/visible at road surface level. Interactions with GVMC officials at respective ward levels indicated it is nearly impossible for them to provide street /road wise information on such existing underground utilities, particularly relating to water, sanitary/drainage connections to individual buildings either in commercial or in residential areas.

Table 2: Enumeration of Poles along Cable Route Corridor under Package 2 Area		
S.No.	Sub Station Area	Poles (All Types & Sizes)
1	Kailasametta & Vidyut Sakha	81
2	R K Beach & Pandurangapuram	116
3	Maddilapalem	57
4	Indoor Dondaparty	70
5	TSR Complex	105
Total		429

Source: Environmental Screening Survey, Feb 1 – 20, 2016

Table 3: Enumeration of Trees along Cable Route Corridor under - Package 2 Area					
S.No.	Sub Station Area	DBH <0.3m	DBH: 0.03m - 0.45m	DBH > 0.45m	Total
1	Kailasametta & Vidyut Sakha	3	13	8	23
2	R K Beach & Pandurangapuram	15	15	52	82
3	Maddilapalem	4	11	6	21
4	Indoor Dondaparty	20	11	18	49
5	TSR Complex	12	12	8	32
Total		54	62	92	208

Table 4: List of Sensitive Receptors & Other Structures along Cable Route Corridor									
S.No	Category of Receptors	Hospitals*		Educational Institutions		Public Utility Buildings**		Substation wise Total	
		On same road side of cable route	On opposite road side of cable route	On same road side of cable route	On opposite road side of cable route	On same road side of cable route	On opposite road side of cable route	On same road side of cable route	On opposite road side of cable route
1	Indoor Dondaparty	8	0	7	2	7	2	22	4
2	Kailasametta	1	1	4	2	1	2	6	5
3	Maddilapalem	5	2	6	14	7	2	18	18
4	TSR Complex	1	2	8	6	4	1	13	9
5	Pandurangapuram	1	0	4	4	3	3	8	7
6	RK Beach	7	7	7	3	4	2	18	12
7	Vidyut Sakha	16	6	12	8	5	4	33	18
Total		39	18	48	39	41	16	118	73

* includes Govt. hospitals, private hospitals, clinics/diagnostic centres/pathologies/blood banks etc

**includes parks, function hall, clubs etc

Source: Environmental Screening Survey, Feb 1 – 20, 2016

Table 5: Heritage Sites in Package 2 Area		
S.No	Name of Heritage Site	Substation Area
1	St Paul's Church	Pandurangapuram
2	Railway Guest House	Pandurangapuram
3	Railway Bungalows	TSR Complex
4	Light House	Pandurangapuram

Table 5: Heritage Sites in Package 2 Area		
S.No	Name of Heritage Site	Substation Area
5	Visakha Museum	Pandurangapuram
6	District Collector's Office	RK Beach
7	Hawa Mahal	RK Beach
8	King George Hospital	RK Beach
9	Tikkaravarapu Laxmi Narayana Reddy Sabha	Pandurangapuram

Table 6: Ownership wise Number and Area of Impacted Structures										
S.NO	Substation	Type of Structure								
		Encroachers							Govt. Structures/Common Property Resources	
		Ramp			Steps			Total Area of Private Structures (Sq.m)	Others*	
		No.	No. of Owner	Area (Sq.mt.)	No.	No. of Owner	Area (Sq.mt.)		No.	Area (Sq.mt.)
1	TSR Complex	173	173	2041	97	97	138.78	1192.505	111	2887.82
2	Dondaparty Indoor	312	312	3244	66	66	141.75	1801.155	129	3326.7
3	CMR Maddilapalem	367	367	3508	25	25	39.96	1830.558	94	1872.78
4	Vidyut Sakha	104	104	1206	7	7	18	635.997	34	1409.46
5	RK Beach	77	77	794	6	6	11.79	416.104	54	155.54
6	Pandurangapuram	185	185	2022	49	49	109.71	1145.129	177	7387.2
7	Kailasametta	79	79	831	8	8	17.64	459.696	60	970.5
	Total	1297	1297	13646	258	258	477.63	7481.144	422	18010
Source: Socio-Economic Survey, Feb 1-20, 2016										
Note: * Indicate other structures like base of hand pump, water tank, part of small walls of extended shops, signboards, boundary walls of public utilities etc.										

Table 7: Category wise details of Squatter's Structures, impacted under -Package 2								
Category of Structure	SUBSTATION							Total
	TSR Complex	Dondaparty Indoor	CMR Maddila palem	Vidyut Sakha	RK Beach	Pandu-rangapuram	Kailasa-metta	
Tiffin/Tea Stall	0	1	0	0	2	0	0	3
Dhobi/ Iron Shop	3	0	1	0	0	0	1	5
Vegetables/ Fruits	3	0	0	0	0	0	1	4
Tailor shop	0	0	0	0	1	0	0	1
Pan/ Cigarette Shop	3	0	3	0	4	1	0	11
Mechanic Shop	0	0	0	1	1	0	0	2
Butcher/meat/fish Shop	2	0	0	1	0	0	0	3
STD/ Recharge	0	0	0	0	1	0	0	1
Shoe Maker	0	1	0	0	1	0	0	2
Total	11	2	4	2	10	1	2	32
Source: Socio-Economic Survey, Feb 1-20, 2016								

ANNEXURE I

ENVIRONMENTAL SCREENING AS PER FORMATS PROVIDED IN ESMF, APDRP

Environment Screening Form

REN/UG Cable Project- Package 2 Area in Visakhapatnam, Andhra Pradesh

Part A: General Information	
1. Name of the District	VISAKHAPATNAM District
2. Type of proposed sub-project activity (tick the applicable option)	
■ Cyclone Shelter	—
■ Underground Electrical Cabling Works	✓
■ Roads/Bridges/Culverts	—
■ Shelter Belt Plantation	—
■ Plantation of Mangroves	—
■ Beach development work	—
■ Any Other (Please Specify)	—
3. Location of the sub-project	
■ Village	The Package 2 area is within GVMC municipal part wards number 8,10 and 13-18 of Zone 2, part wards number 19-21, 29-30 of Zone 3 and part wards number 31 and 44 of Zone 4. The GVMC municipal area is spread over 682 Sq. Km and has been demarcated into 72 wards, grouped into 6 zones for administrative purposes.
■ Taluka	Visakhapatnam City
4. Size of the sub-project (approx. area in sq. mt/hac or length in mt/km, as relevant)	5.19 Sq.km
5. Land Requirement (in hac./sq. mt.)	
■ Total Requirement	Nil. Underground cables are proposed to be laid in one metre wide trenches along one edge of city roads, under the jurisdiction of GVMC. All the existing utilities, disrupted if any during cable laying operations route will be restored to its previous condition. No land acquisition of land (of any type) will be required for this component
■ Private Land	-Nil-
■ Govt. Land	-Nil-
■ Forest Land	-Nil-

6. Implementing Agency Details (sub-project level)			
■ Name of the Department/Agency	Eastern Power Distribution Company of Andhra Pradesh Limited (APEPDCL)		
■ Name of the designated contact person			
■ Designation	ED/World Bank Projects & QC		
■ Contact Number			
■ E-mail Id	apdrp@apeasternpower.com ; epdclpiu@gmail.com		
7. Details about the Screening Exercise			
■ Date	1 st Feb 2016 to 20 th Feb 2016		
■ Name of the Person	HARI PRAKASH, Environmental Expert, SEIA Team Dinesh Godiyal, Social Expert, SEIA team		
■ Contact Number	9810533235		
■ E-mail Id	hari@deccan.org.in		
Part B (1): Environment Screening			
Question	Yes	No	Details
1. Is the sub-project located in whole or part within the Coastal Regulation Zone?			The Package 2 area of REN/UG cable project extends into landward area, which is within 500 metres from High Tide Line (HTL), and thus will be under the purview of CRZ Notification.
		✓	The landward area of REN/UG cable project, which is within 500 metres from HTL is in municipal limits, developed area and has been provided with drainage and approach roads.
			As per the notification, such areas are classified under CRZ-II areas and will NOT require regulatory clearances for underground cable laying operations from MoEF& CC and/or APCRZMA (Andhra Pradesh Coastal Regulation Zone Management Authority) (Refer Figure 1).
2. Is the sub-project located in whole or part in/near any of the following environmentally sensitive areas? ¹⁹			
a. Biosphere Reserve		✓	—
b. National Park		✓	
c. Wildlife/Bird Sanctuary	✓		The Kambalakonda Wildlife Sanctuary, spread over an area of 70.70 sq. km, between latitudes

			of 17.34° N to 17.47° N and longitudes of 83.04° E to 83.20° E is located at an aerial distance (as crow fly) of 3 km from the outer edge of the Package 2 area of REN/UG Project (Refer Figure 2).
d. Tiger Reserve/Elephant Reserve		✓	—
e. Wetland		✓	—
f. Important Bird Areas (IBAs)		✓	—
g. Coastal area with corals		✓	—
h. Mangrove area		✓	—
i. Estuary with mangroves		✓	—
j. Natural Lakes			
k. Swamps/Mudflats			
l. Habitat of migratory birds (outside protected areas)		✓	—
m. Migratory Route of Wild Animals/Birds		✓	—
n. Area with threatened/rare/endangered - fauna	✓		<p>The coastline of Visakhapatnam between RK Beach and up to Bheemili, is known to have sporadic nesting sites for Olive Ridley Turtles (<i>Lepidochelys olivacea</i>), which are protected species in Schedule-I of Wildlife Protection Act, 1972 and listed as Vulnerable in IUCN red list).</p> <p>However, the nesting site within the package 2 area is Yoga village, where VSPCA has an exsitu hatchery facility, due to excessive beach front activities on like tourism, heavy lighting, pollution and predators such as crows, eagles, jackals and beach dogs. Cable routes under REN/UG project are along city roads through fully developed areas and do not extend into coastal sands (beach areas).</p> <p>The known turtle nesting sites along</p>

			Visakhapatnam coastline is shown in Figure 3 .
o. Area with threatened/rare/endangered flora (outside protected areas)		✓	—
p. Reserved/Protected Forest		✓	—
q. Zoological Park /Botanical Garden	✓		The Indira Gandhi Zoological Park, spread over 625 acres is one of the largest zoo located in the natural settings of a reserve forest is about 3 km from Package 2 area of RE/UG Project (Ref Figure 2).
3. Is the sub-project located within 500 meters from rivers, streams, estuaries or deltaic mouths?		✓	—
4. Is the sub-project located in whole or part near any of the following sensitive features? ²⁰			
a. World Heritage Sites		✓	—
b. Archaeological monuments/sites (under ASI's central/state list) ³		✓	—
c. Historic Places (not listed under ASI - central or state list but regionally/locally important)	✓		The Package 2 area has 9 heritage resources, and all of them are within well encased respective property boundaries, away from road/cable routes. The heritage resources are shown in Figure 4 and 5 .
d. Reservoirs/Dams		✓	—
e. Public Water Supply Areas from Rivers/Surface Water Bodies/ Ground Water Sources		✓	—
Part B (2): Result/Outcome of Environmental Screening Exercise			
1.	No Environment Impact Assessment Required	Not Required as per GoI Regulations	
2.	Environment Impact Assessment Required	YES. As per World Bank Requirements	
3.	CRZ clearance required	NO	
4.	Environmental Clearance Required	No	
5.	Forest Clearance Required	No	

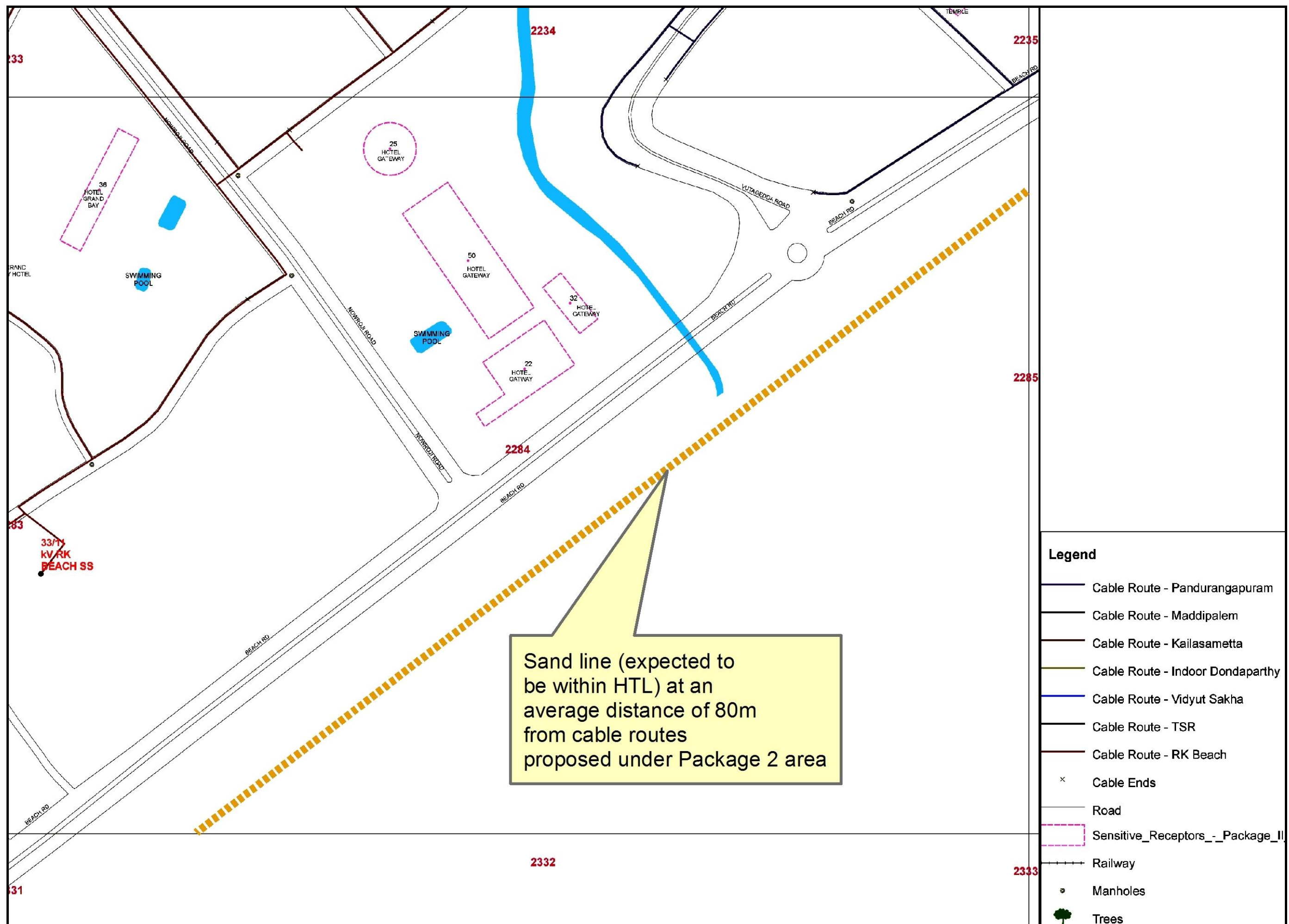


Figure 1a: Distance of the Shore/Sand line (expected to be within HTL) from Cable Routes Proposed under Package 2 Area

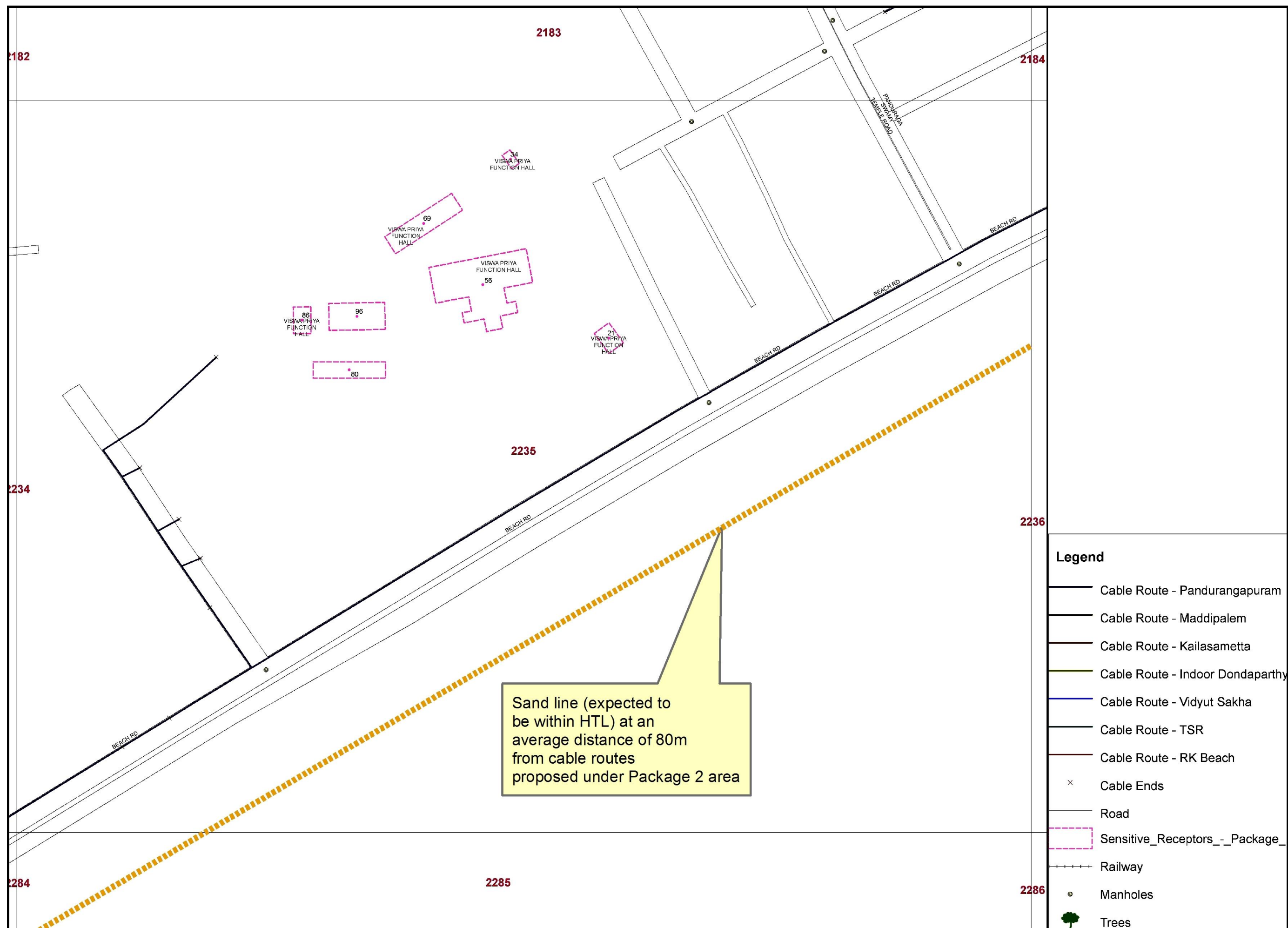


Figure 1b: Distance of the Shore/Sand line (expected to be within HTL) from Cable Routes Proposed under Package 2 Area

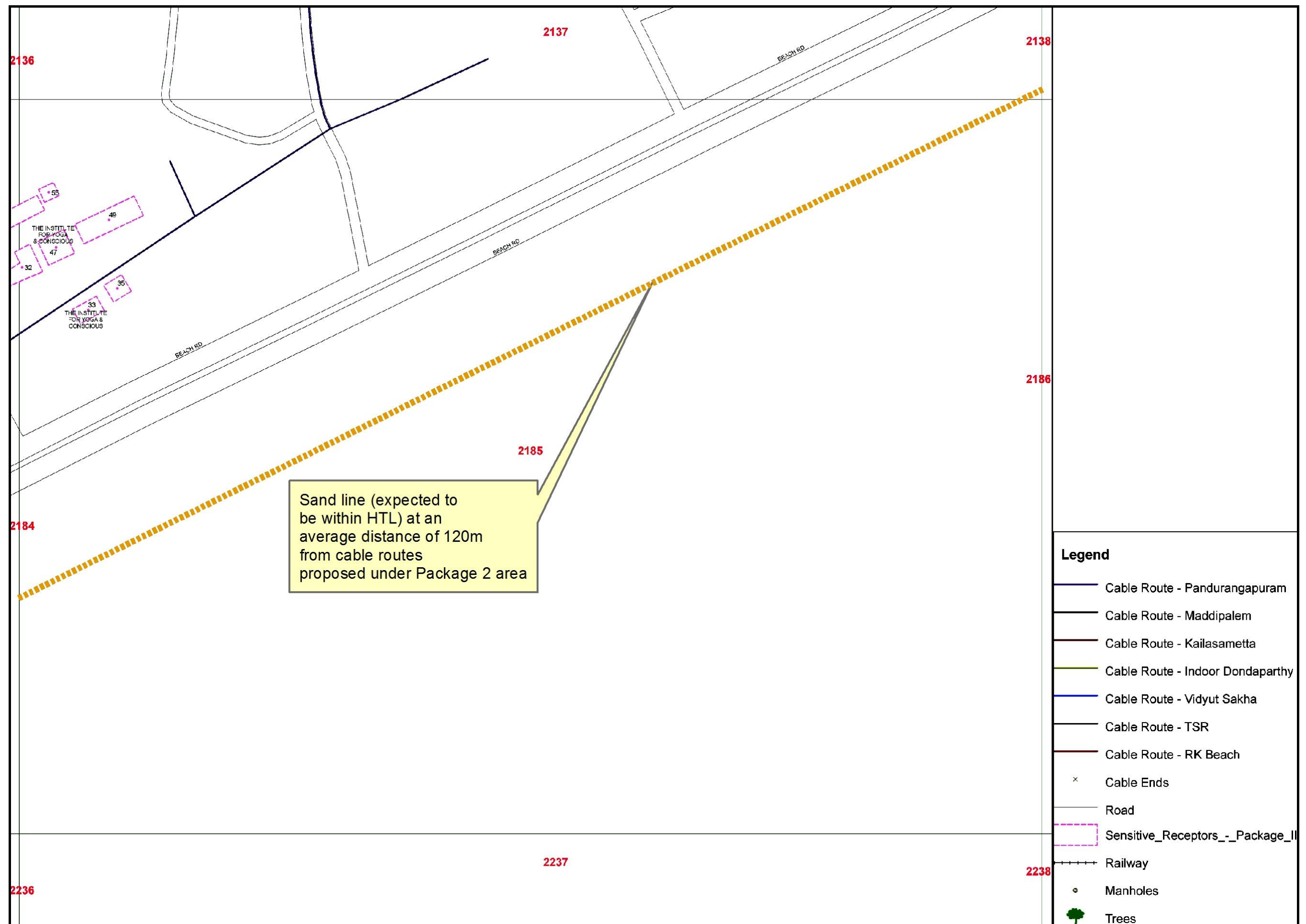


Figure 1c: Distance of the Shore/Sand line (expected to be within HTL) from Cable Routes Proposed under Package 2 Area

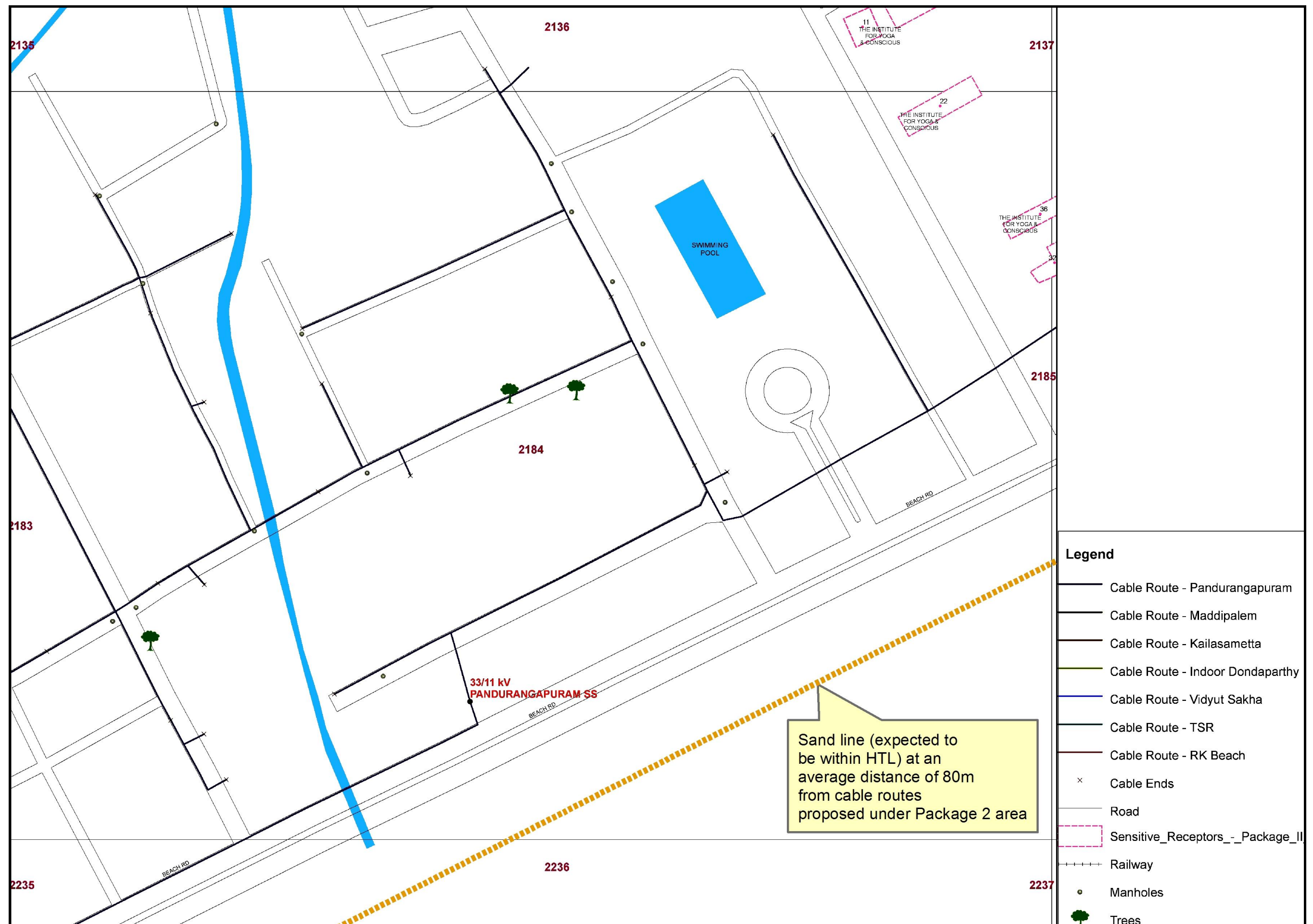


Figure 1d: Distance of the Shore/Sand line (expected to be within HTL) from Cable Routes Proposed under Package 2 Area

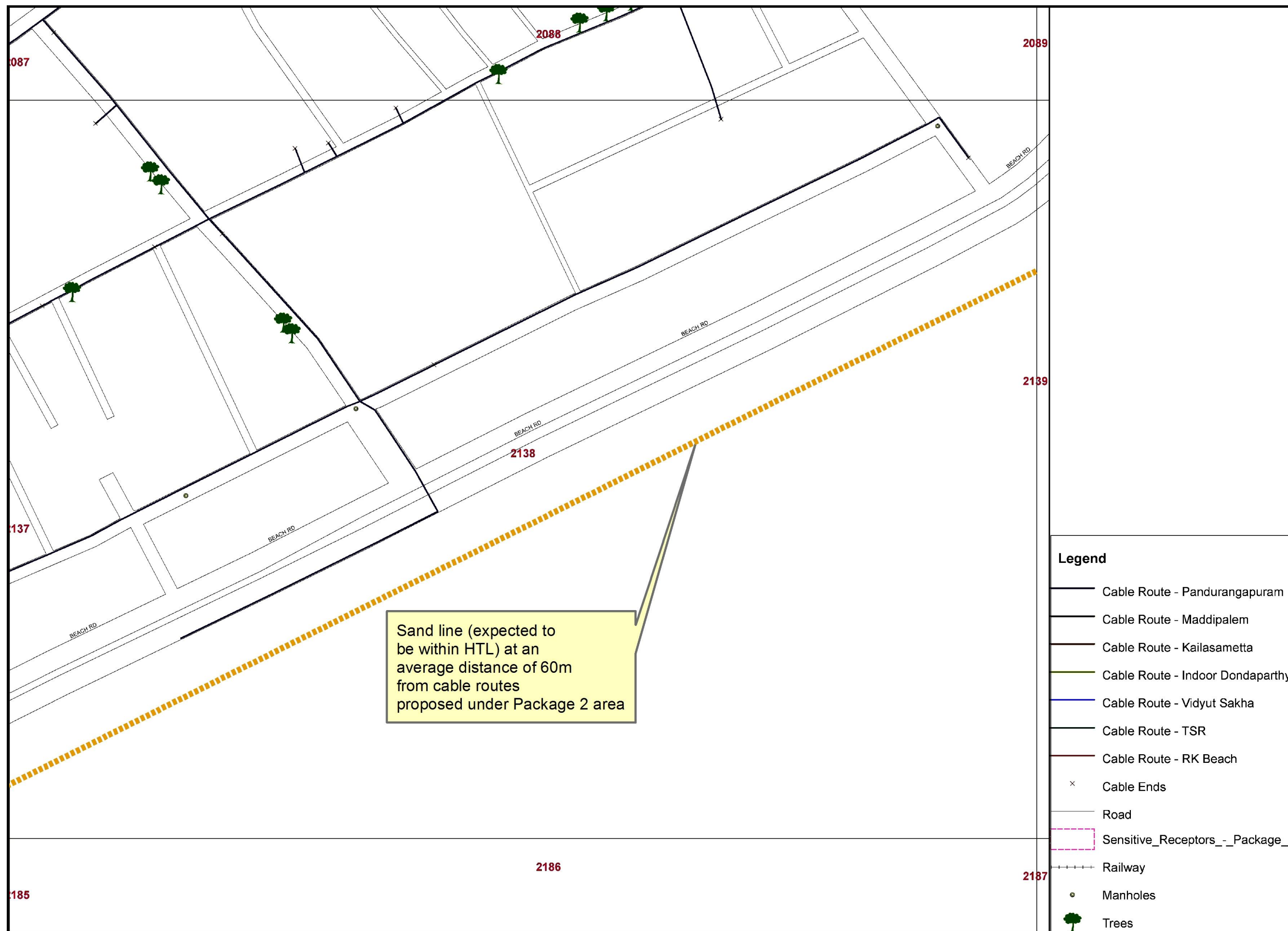


Figure 1e: Distance of the Shore/Sand line (expected to be within HTL) from Cable Routes Proposed under Package 2 Area

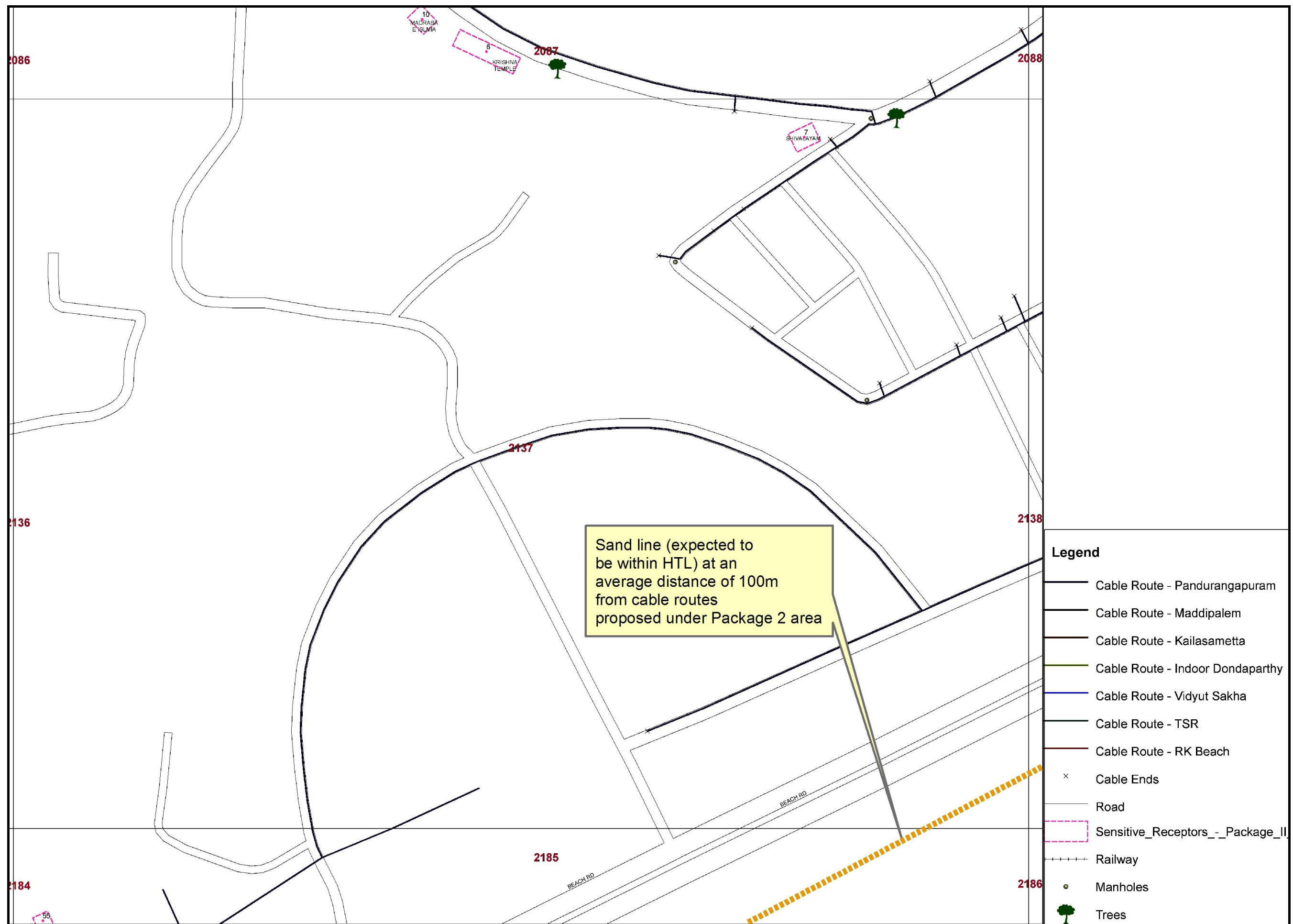


Figure 1f: Distance of the Shore/Sand line (expected to be within HTL) from Cable Routes Proposed under Package 2 Area

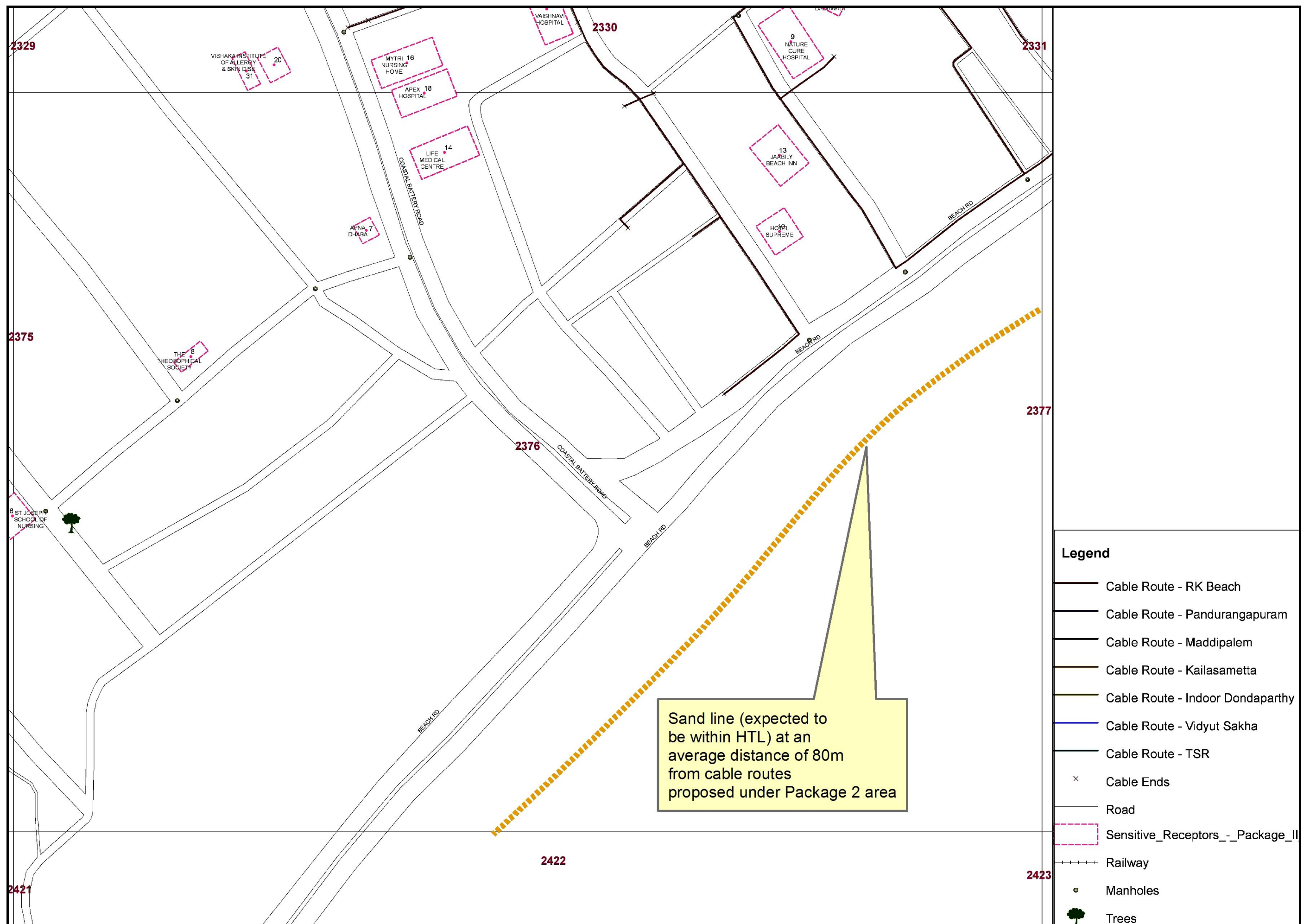


Figure 1g: Distance of the Shore/Sand line (expected to be within HTL) from Cable Routes Proposed under Package 2 Area

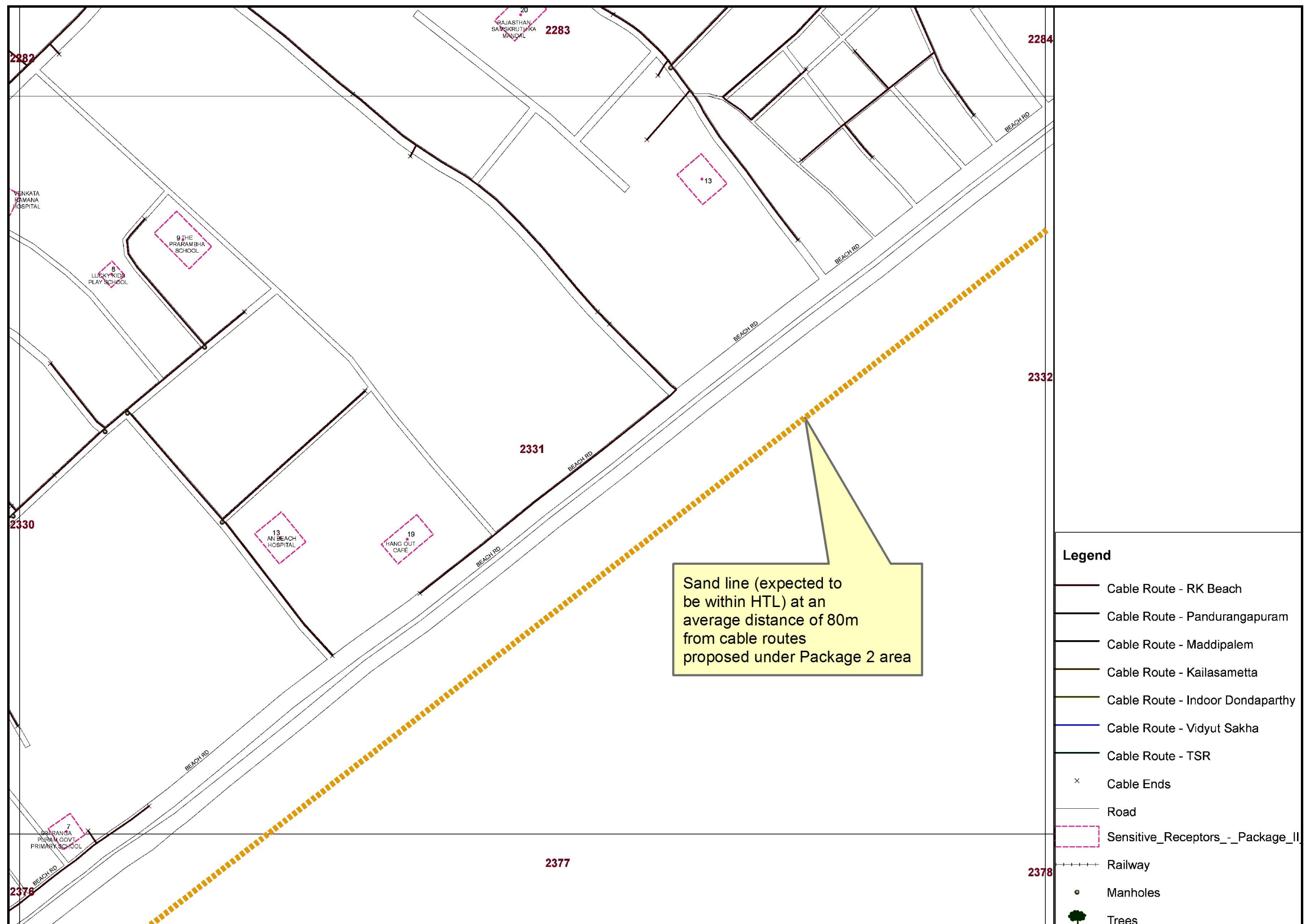


Figure 1h: Distance of the Shore/Sand line (expected to be within HTL) from Cable Routes Proposed under Package 2 Area



Figure 2: Kambalakonda Wild Life Sanctuary, Ecotourism Park & Zoological Park in Visakhapatnam



Figure 3: Location of Turtle Nesting Sites along coastline of Visakhapatnam



Figure 4: Locations of Heritage Resources within Package 2 Area

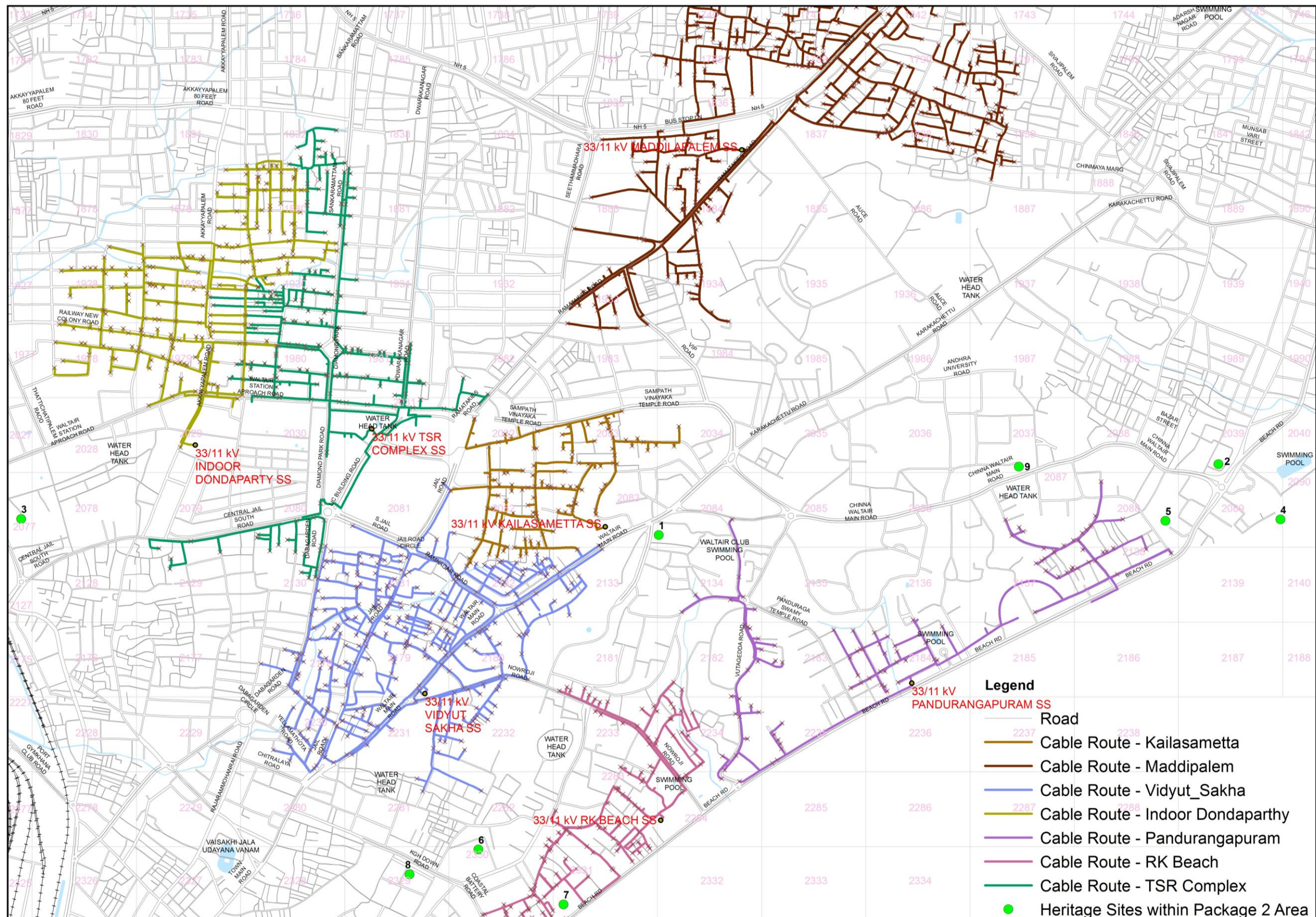
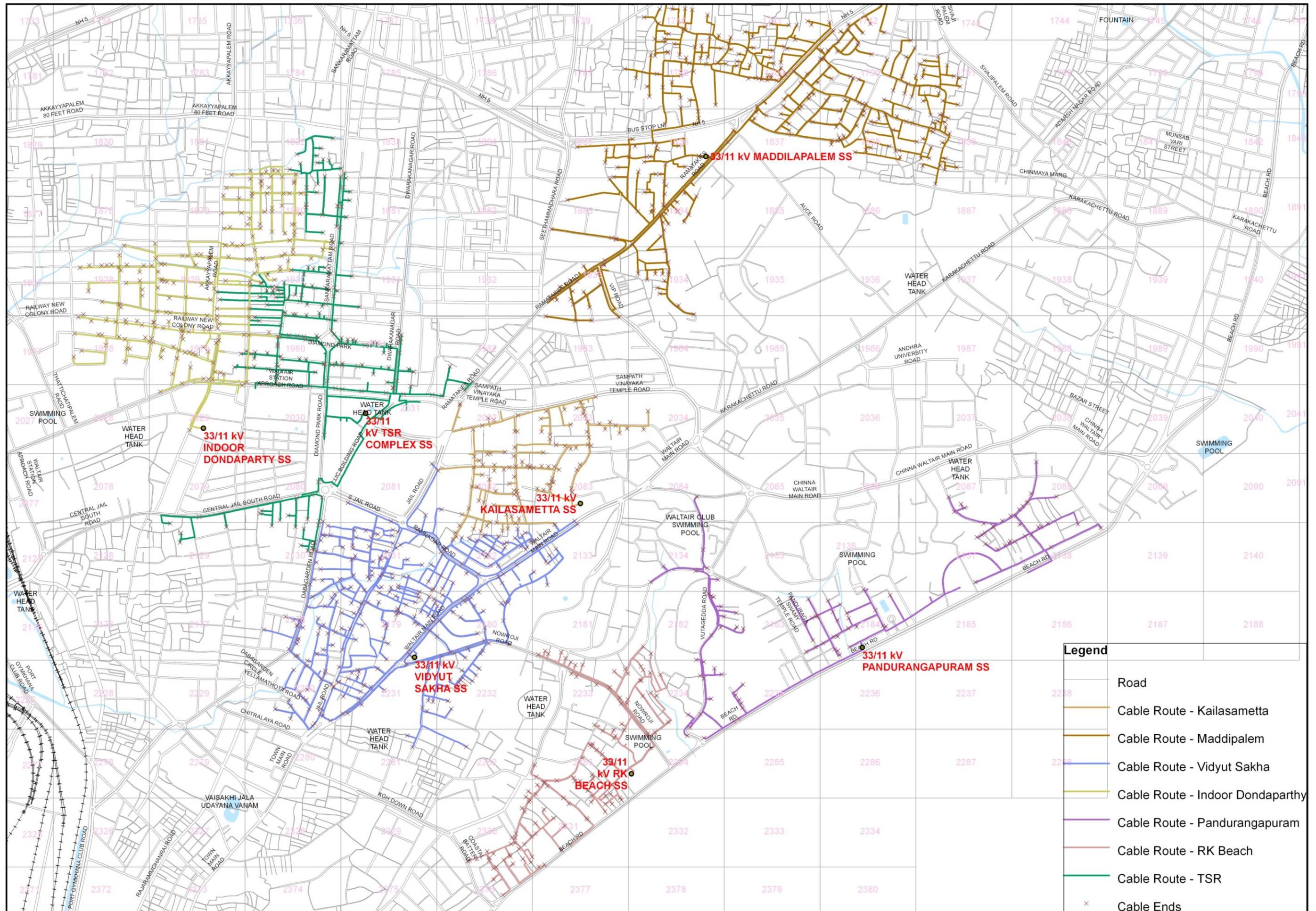


Figure 5: Locations of Heritage Resources within Package 2 Area (shown along with cable route)

ANNEXURE II

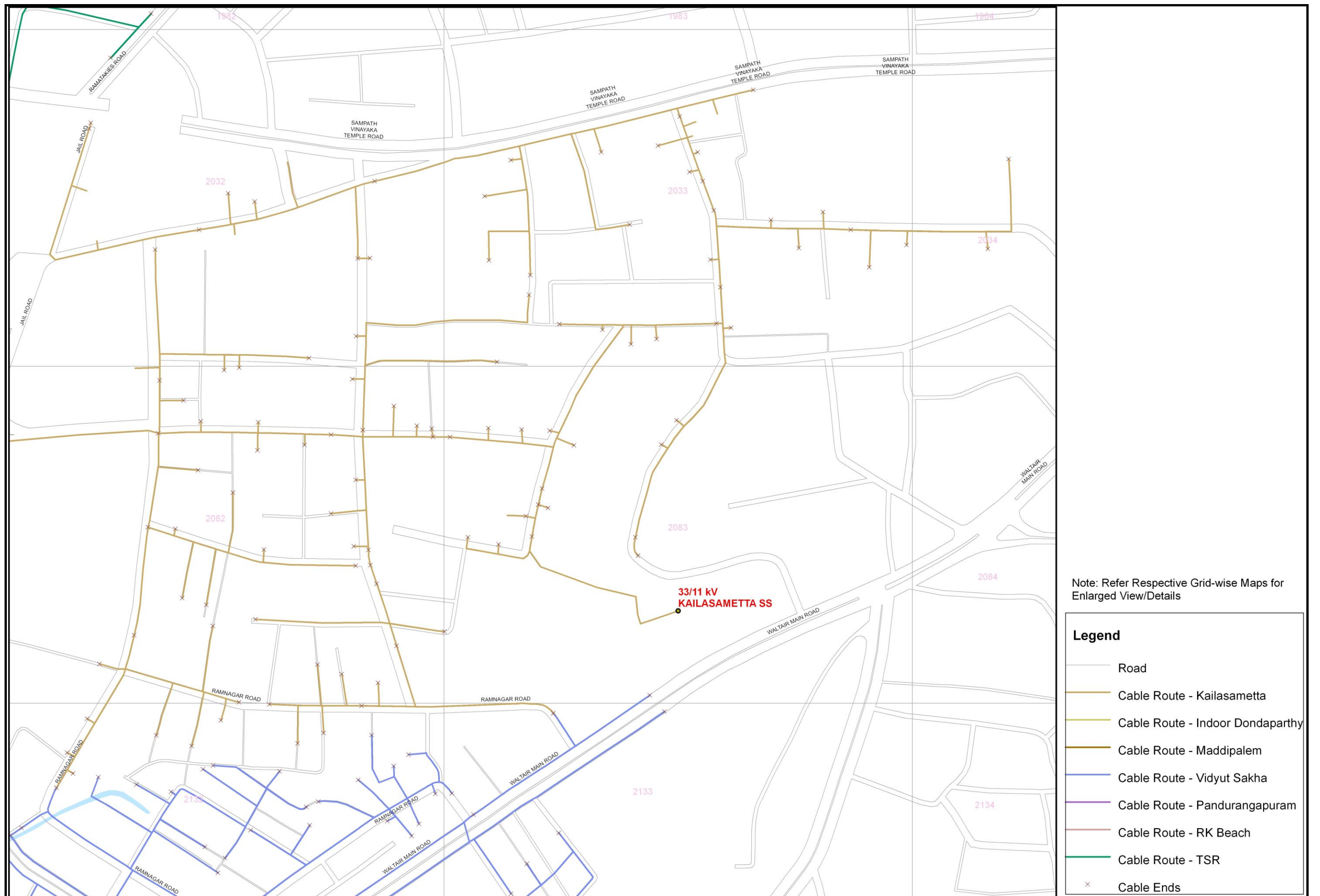
ENVIRONMENTAL SCREENING OF CORRIDOR OF IMPACT & PROJECT INFLUENCE AREA THROUGH TRANSECT WALK & ENUMERATION OF ENVIRONMENTAL FEATURES

**REN/UG Cable Route Alignment within Package 2 Area
(Substation wise)**



REN/UG Cable Route Alignment of all 7 Substations within Package 2 Area

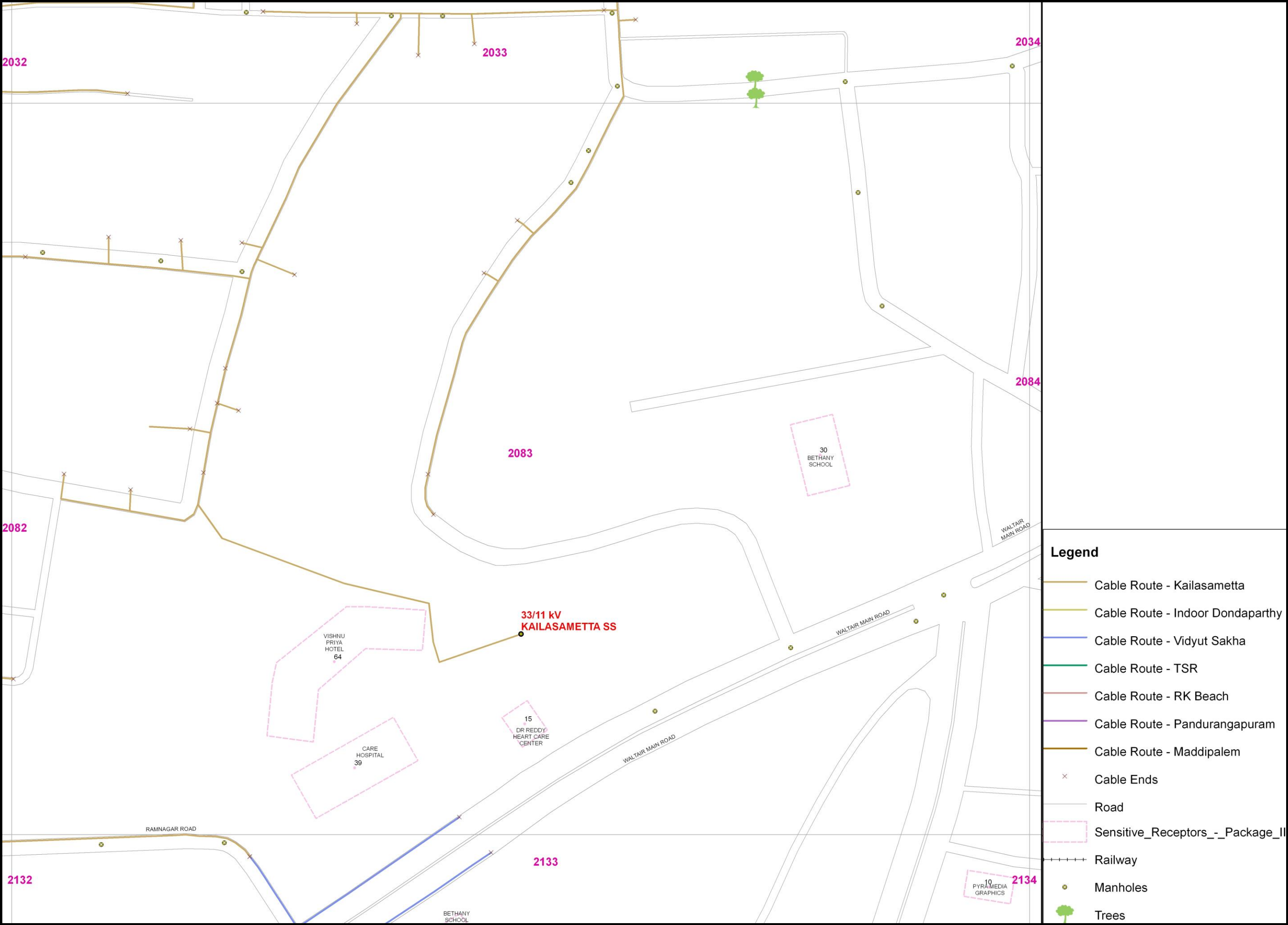
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Kailasametta Substation Area



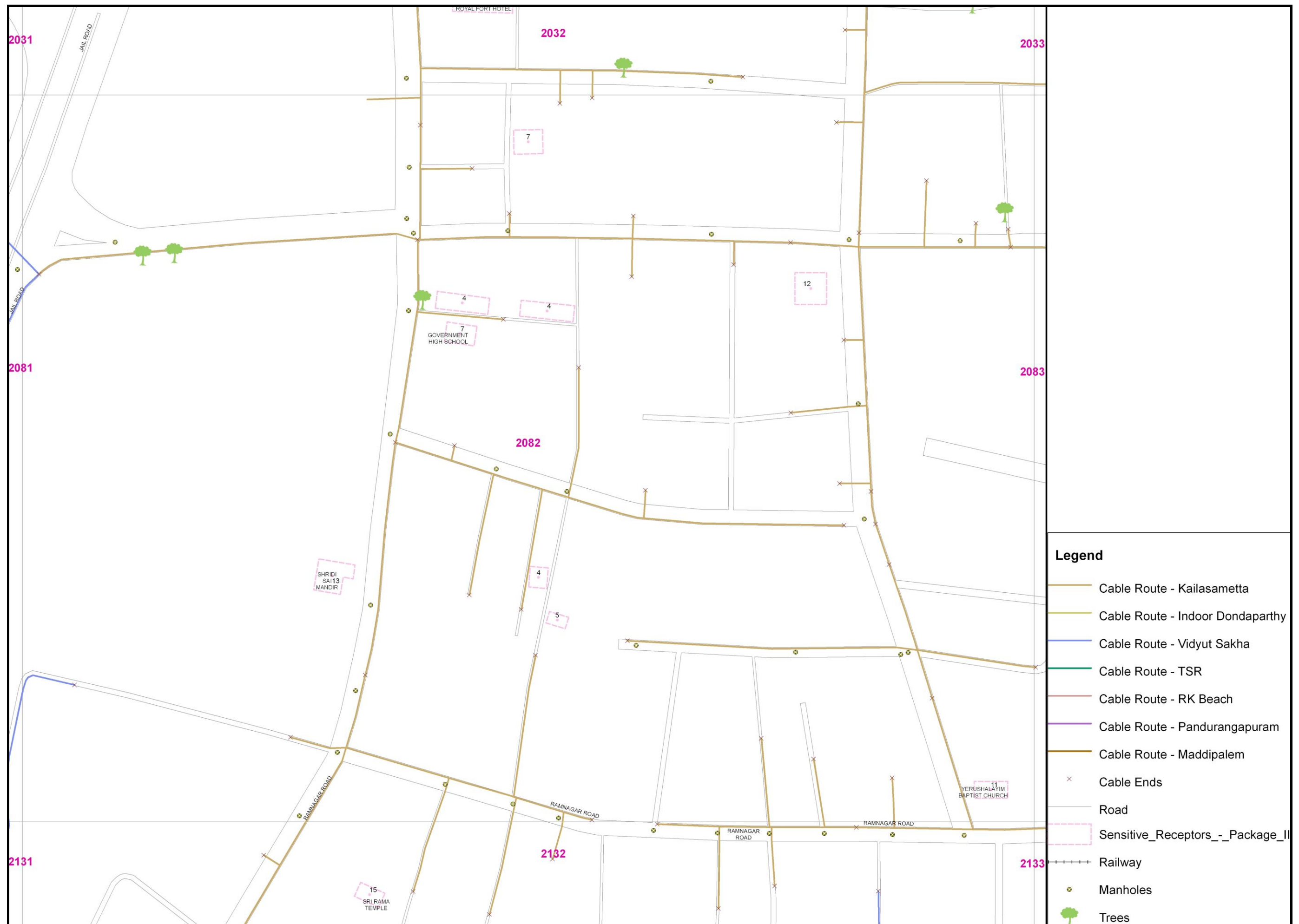
REN/UG Cable Route Alignment within Kailasametta Substation Area



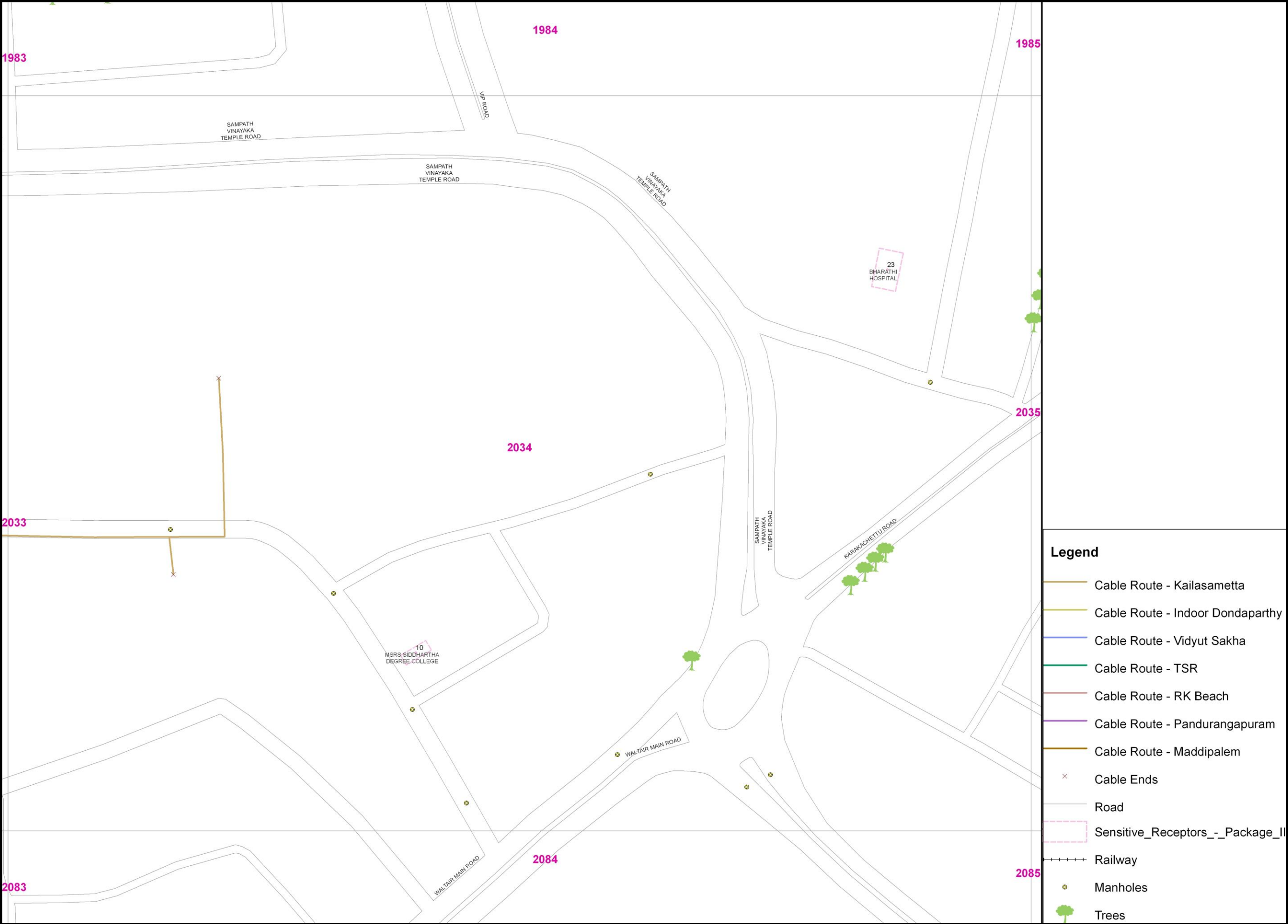
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Kailasametta Substation Area



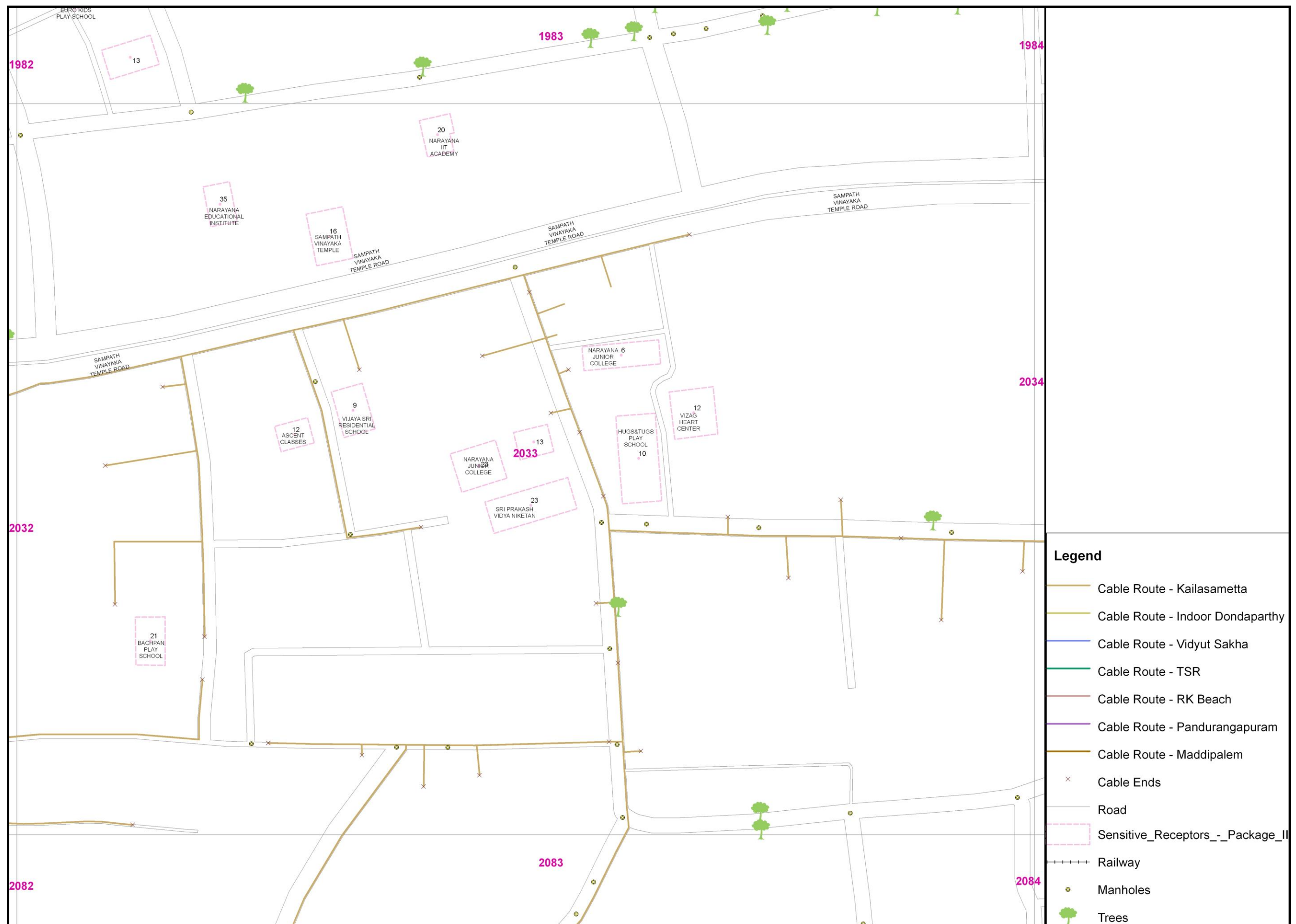
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Kailasametta Substation Area



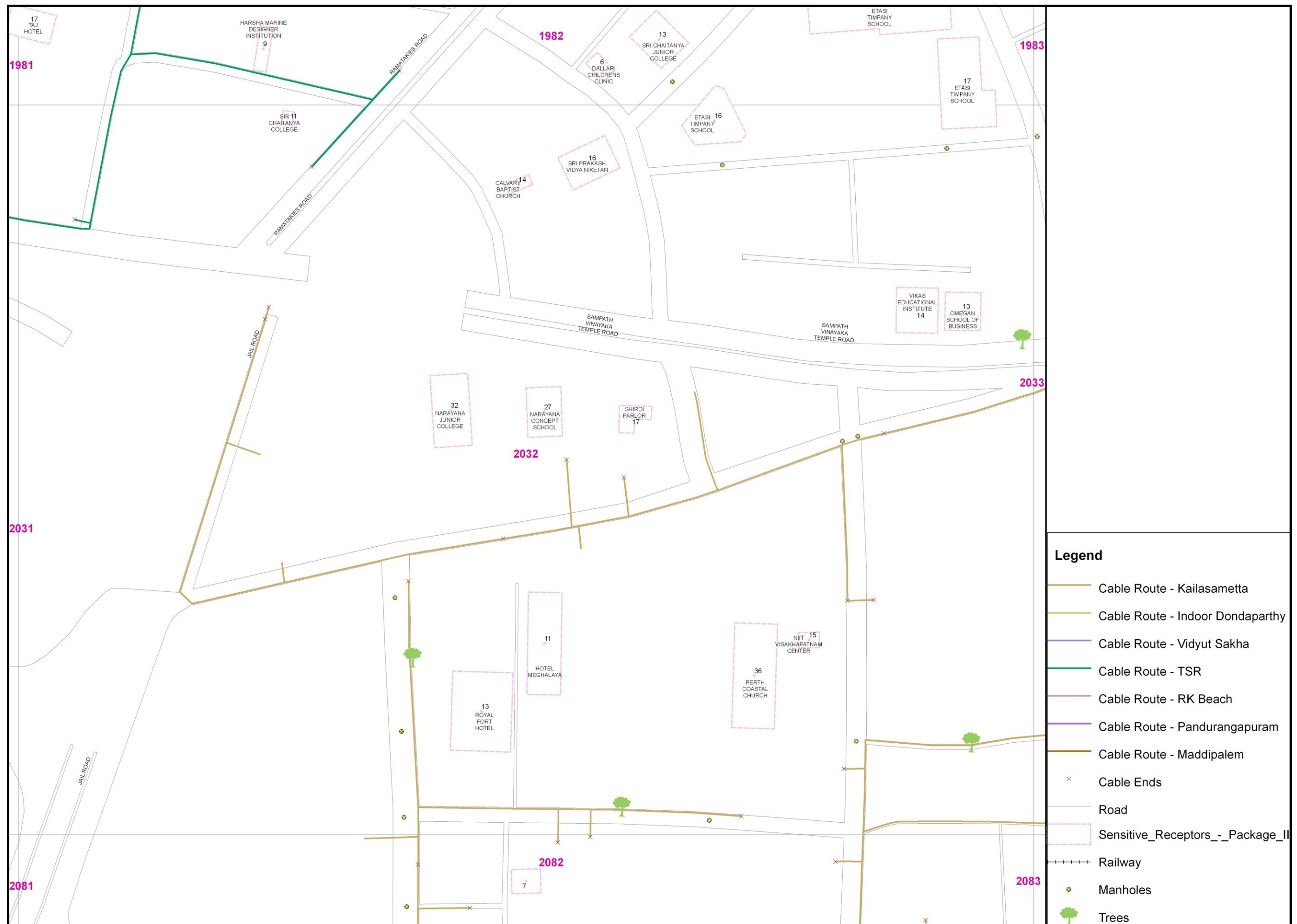
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Kailasametta Substation Area



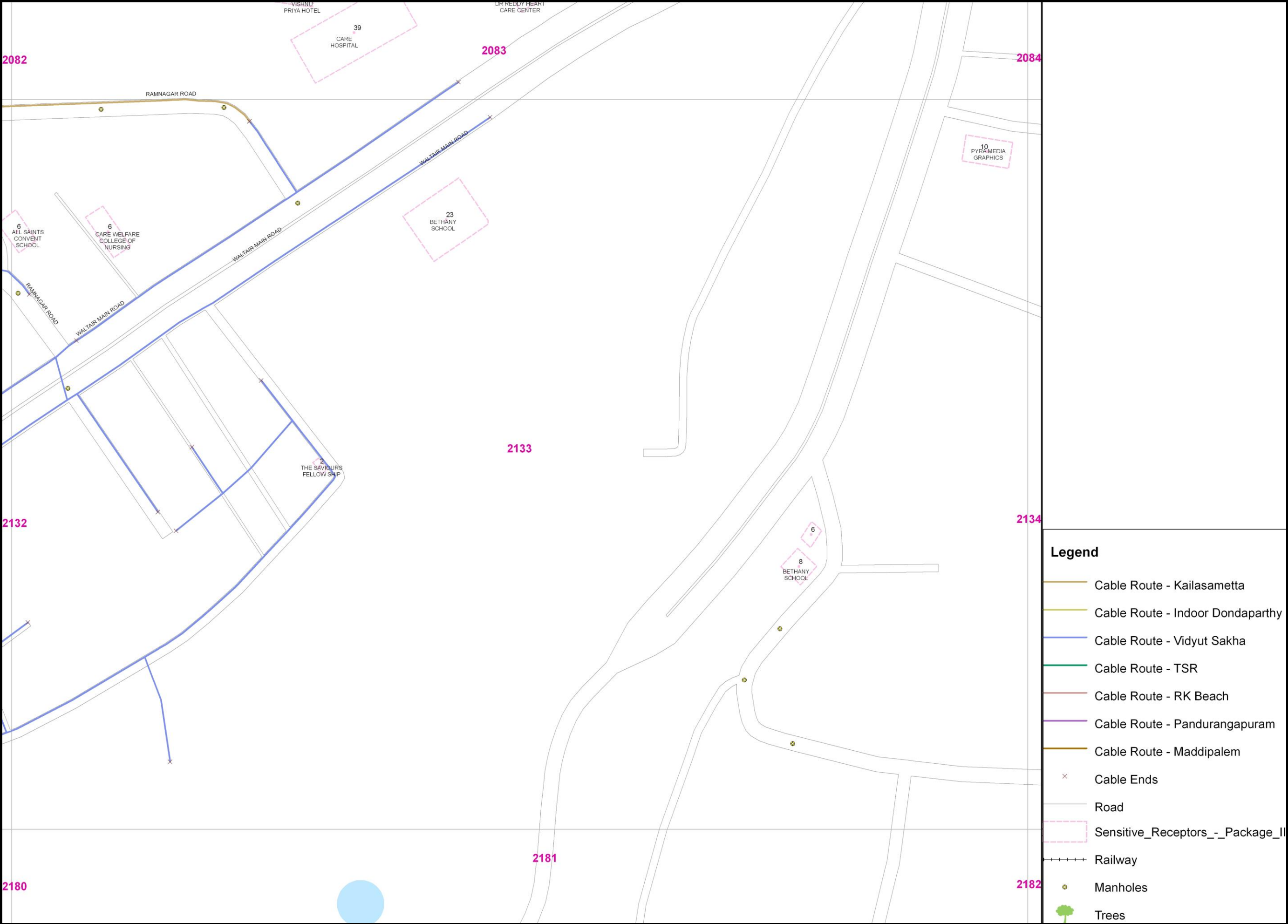
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Kailasametta Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Kailasametta Substation Area

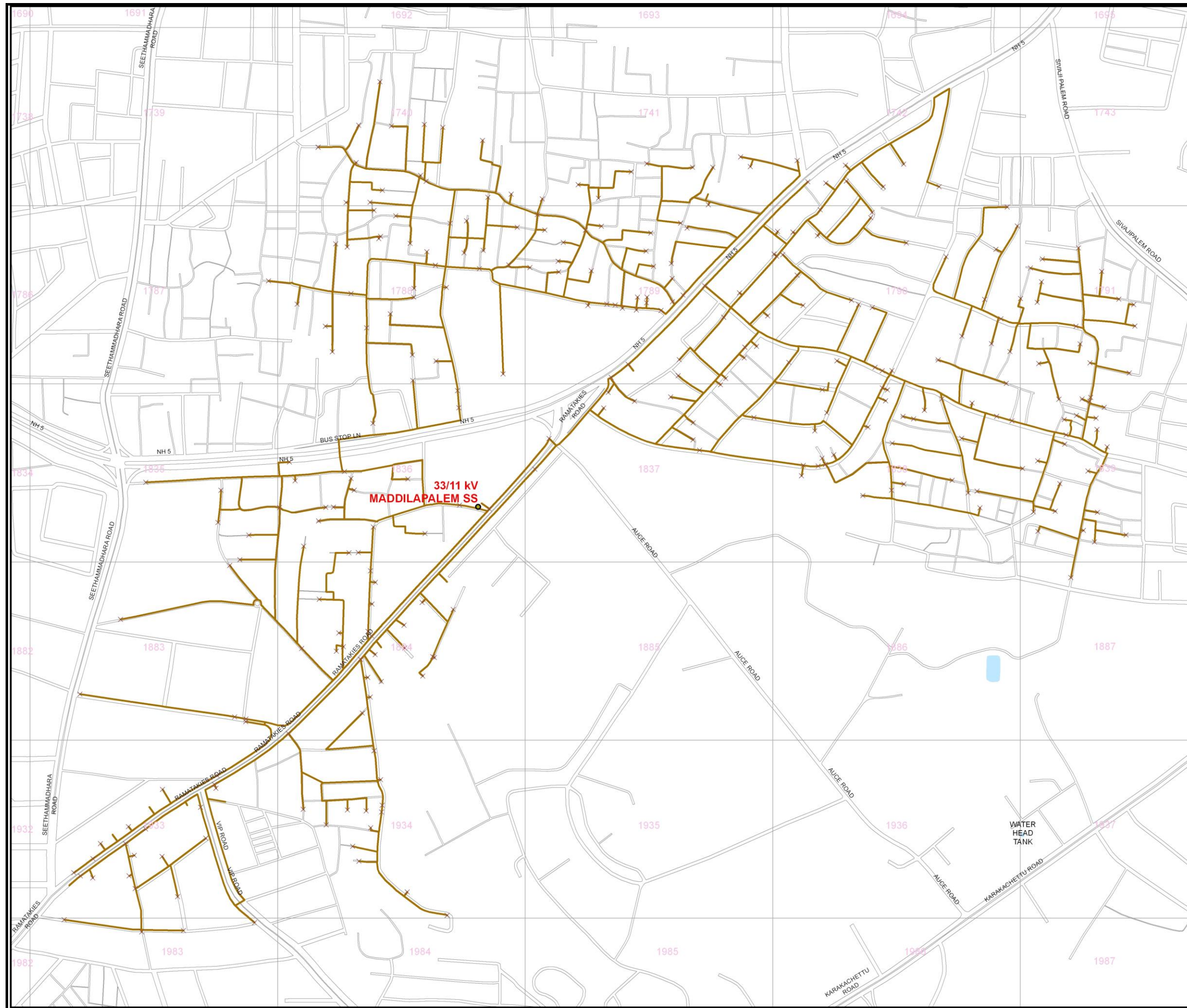


REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Kailasametta Substation Area












REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Kailasametta Substation Area

REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area

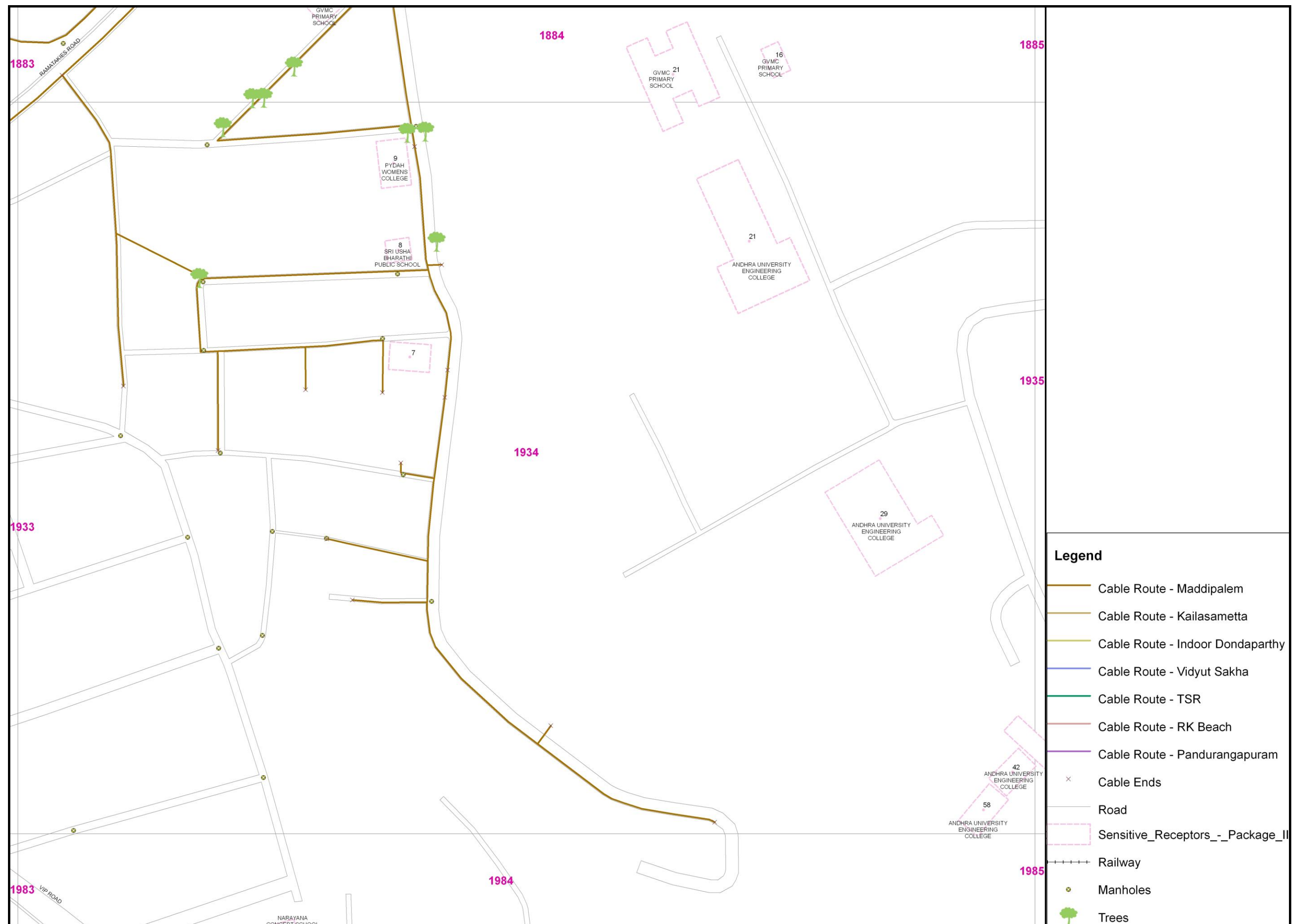


Note: Refer Respective Grid-wise Maps for Enlarged View/Details

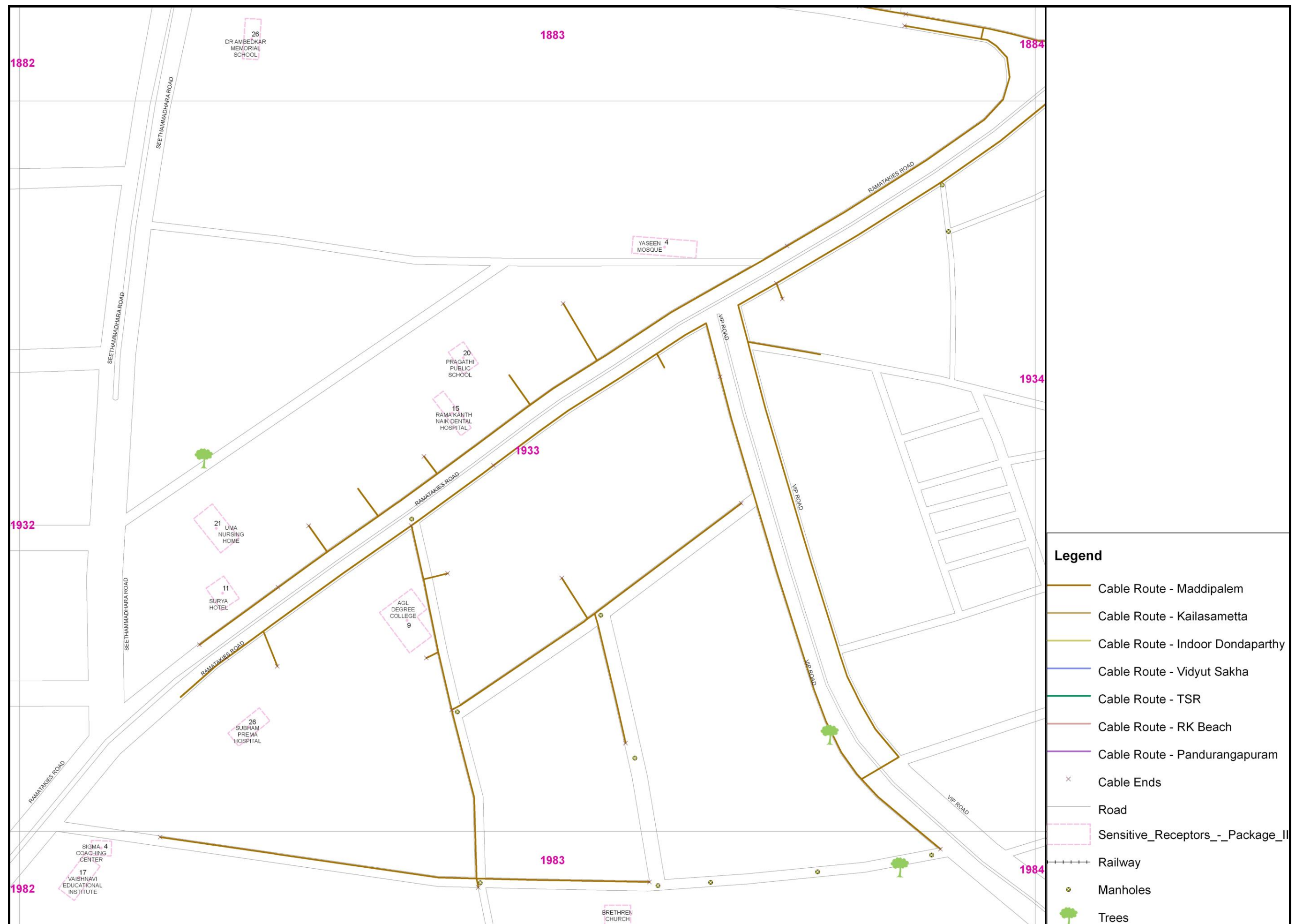
Legend

-  Road
-  Cable Route - Maddipalem
-  Cable Route - Indoor Dondaparthi
-  Cable Route - Kailasametta
-  Cable Route - Vidyut Sakha
-  Cable Route - Pandurangapuram
-  Cable Route - RK Beach
-  Cable Route - TSR
-  Cable Ends

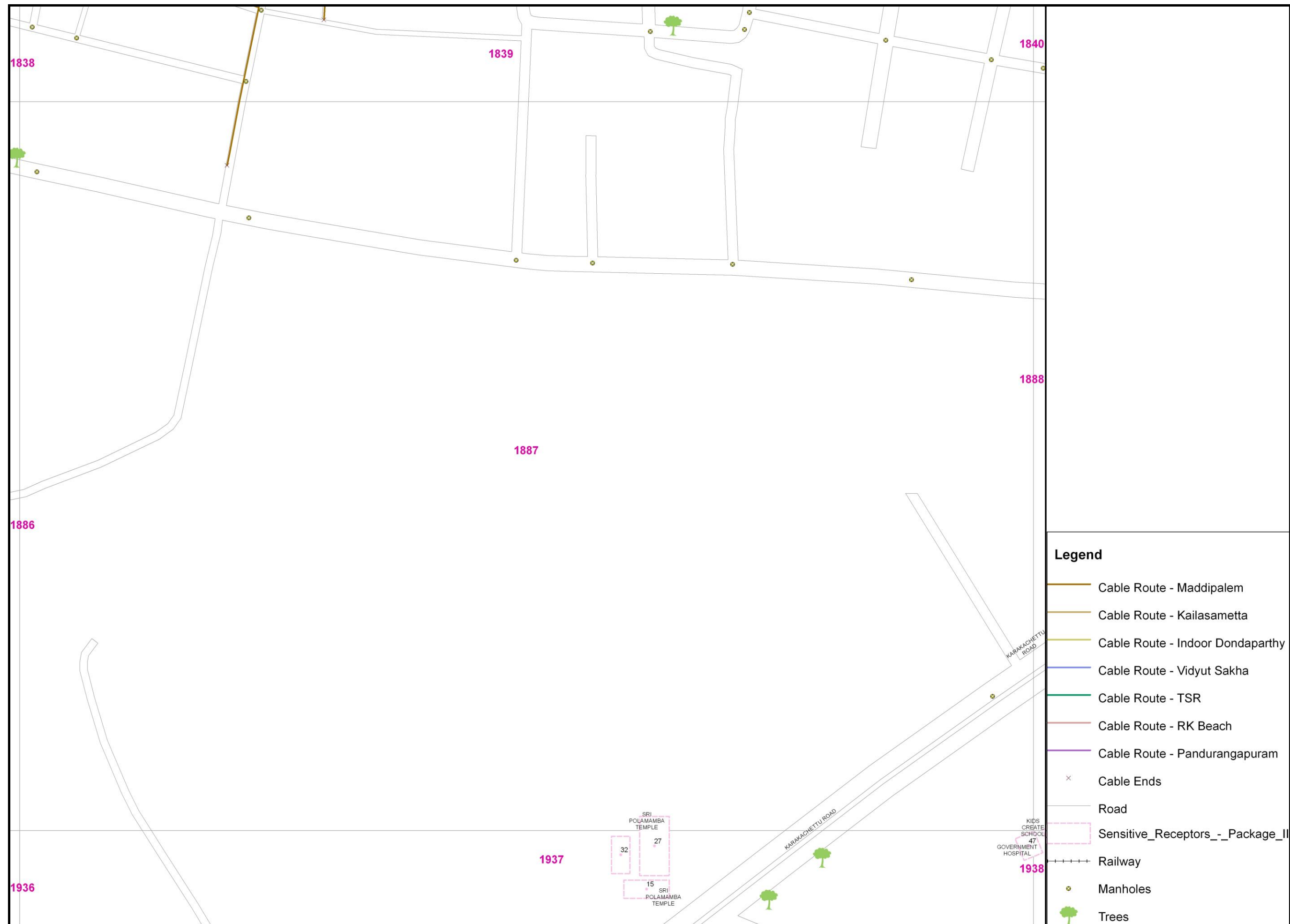
REN/UG Cable Route Alignment within Maddilapalem Substation Area



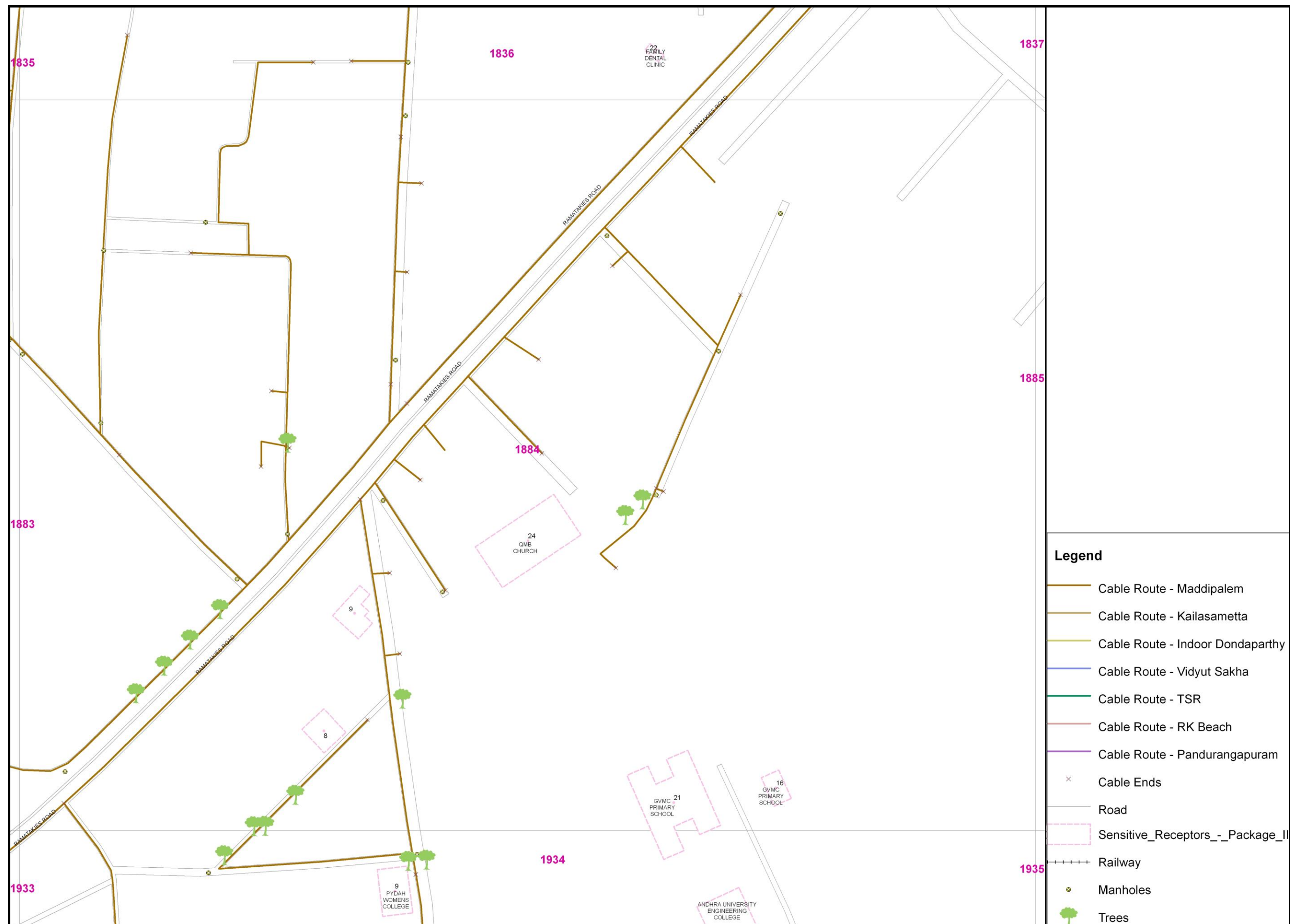
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



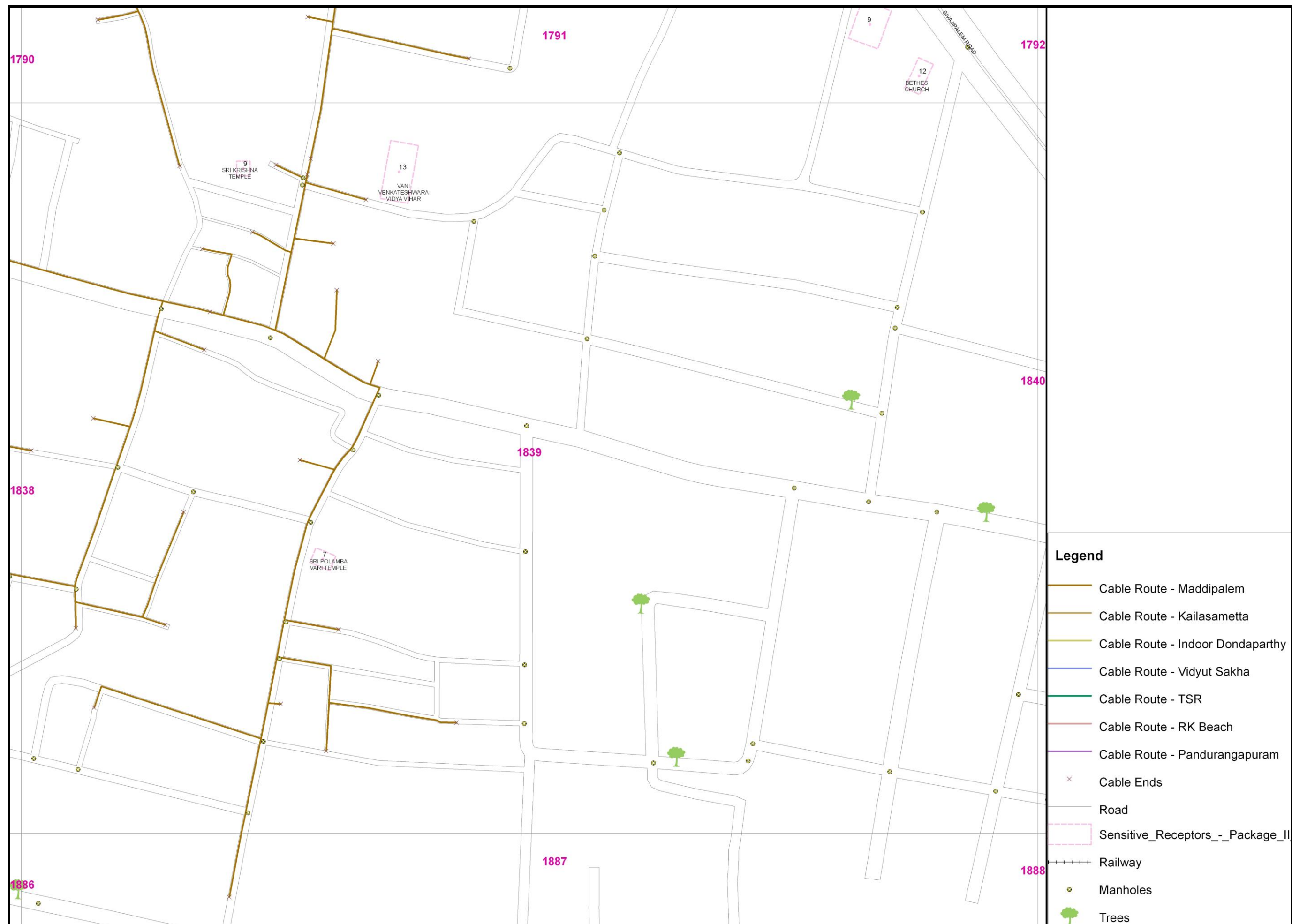
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



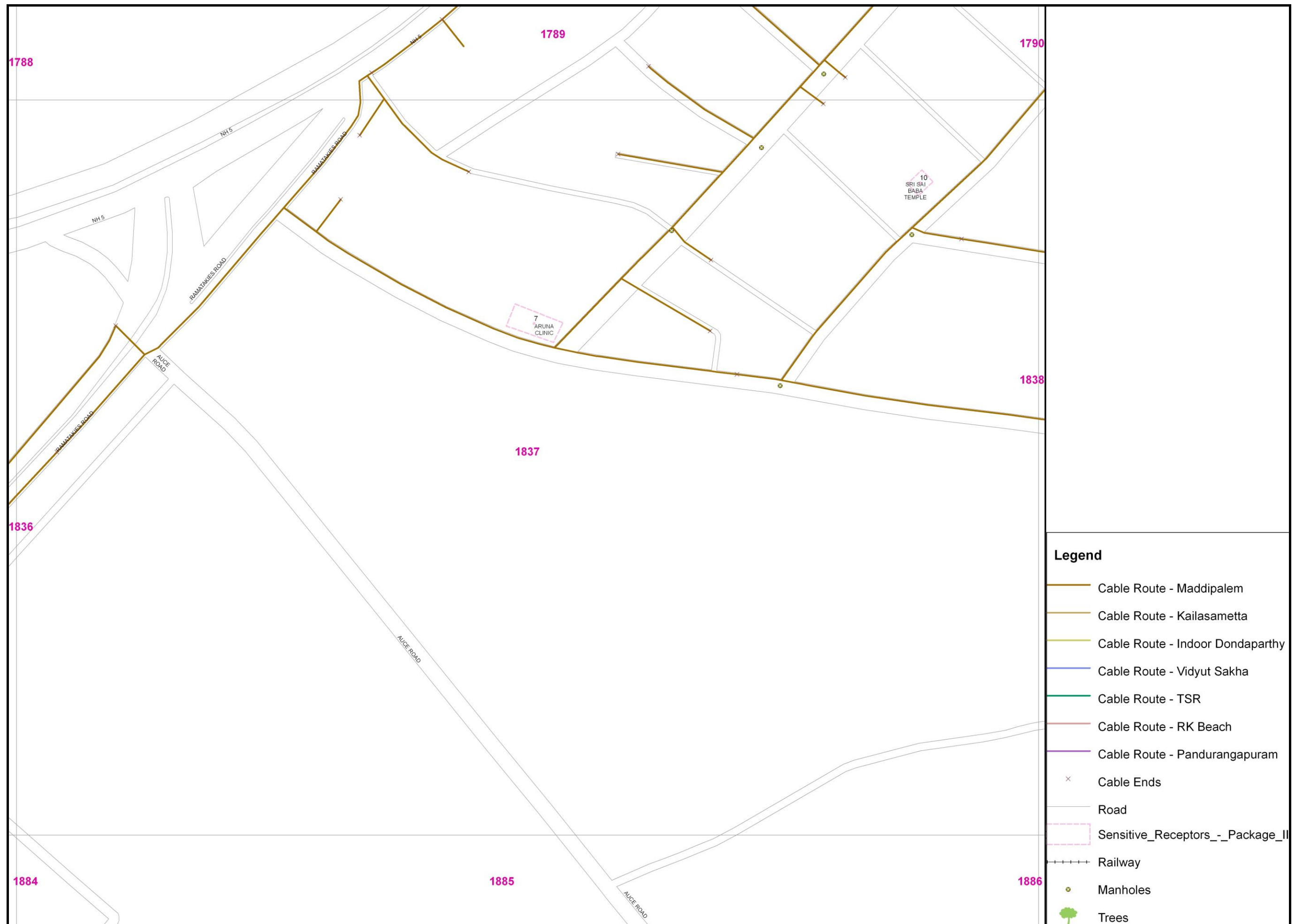
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



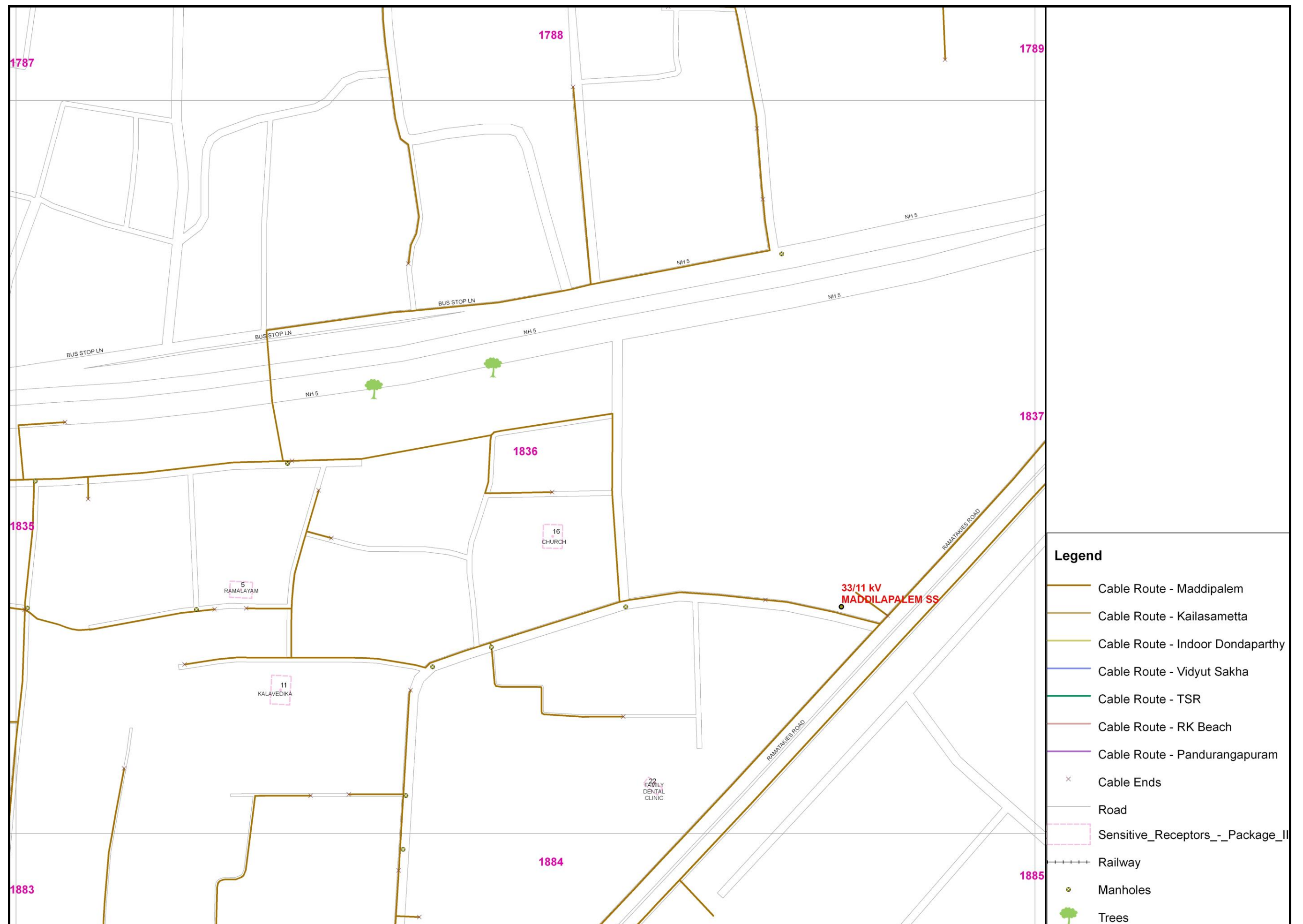
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



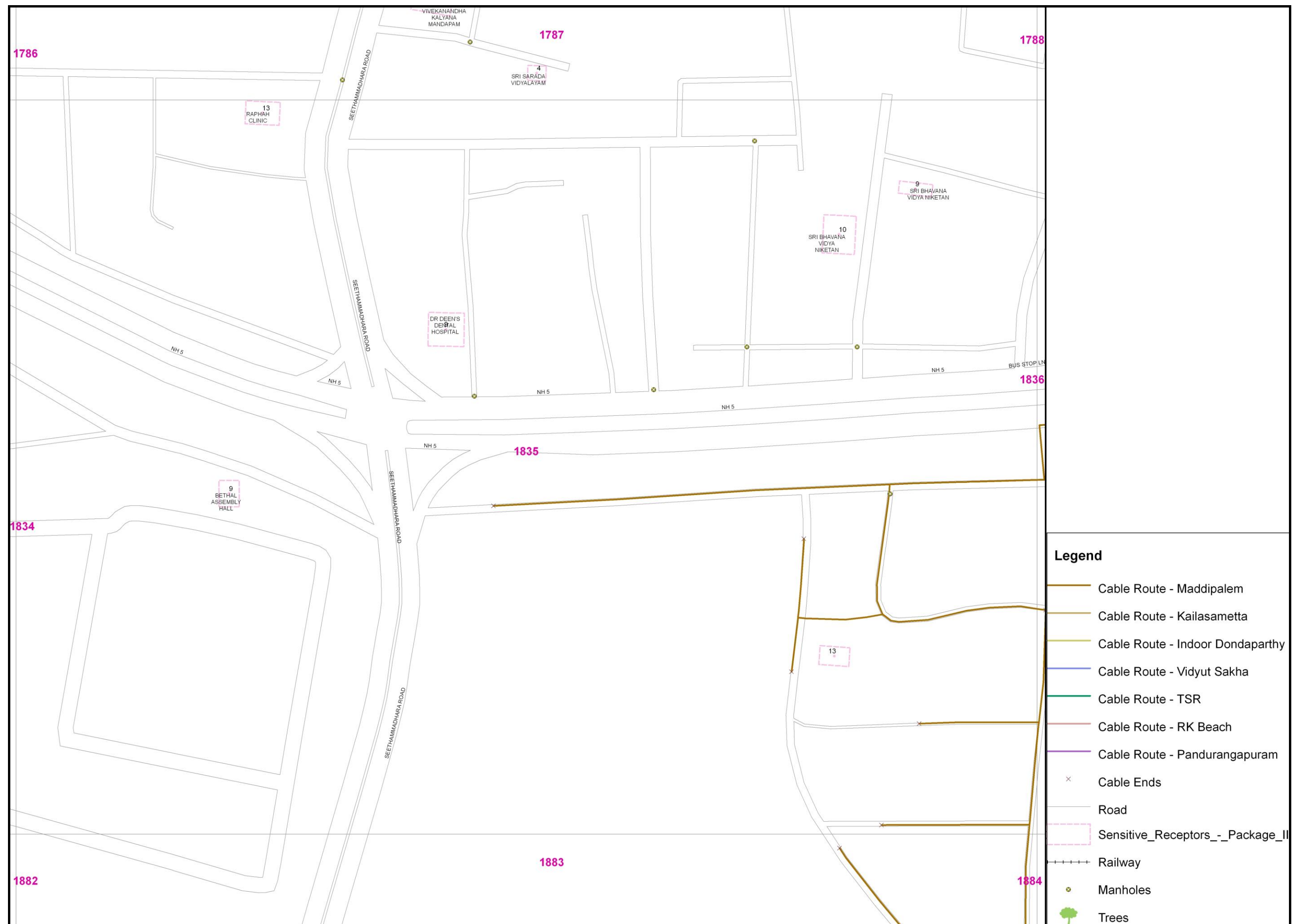
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



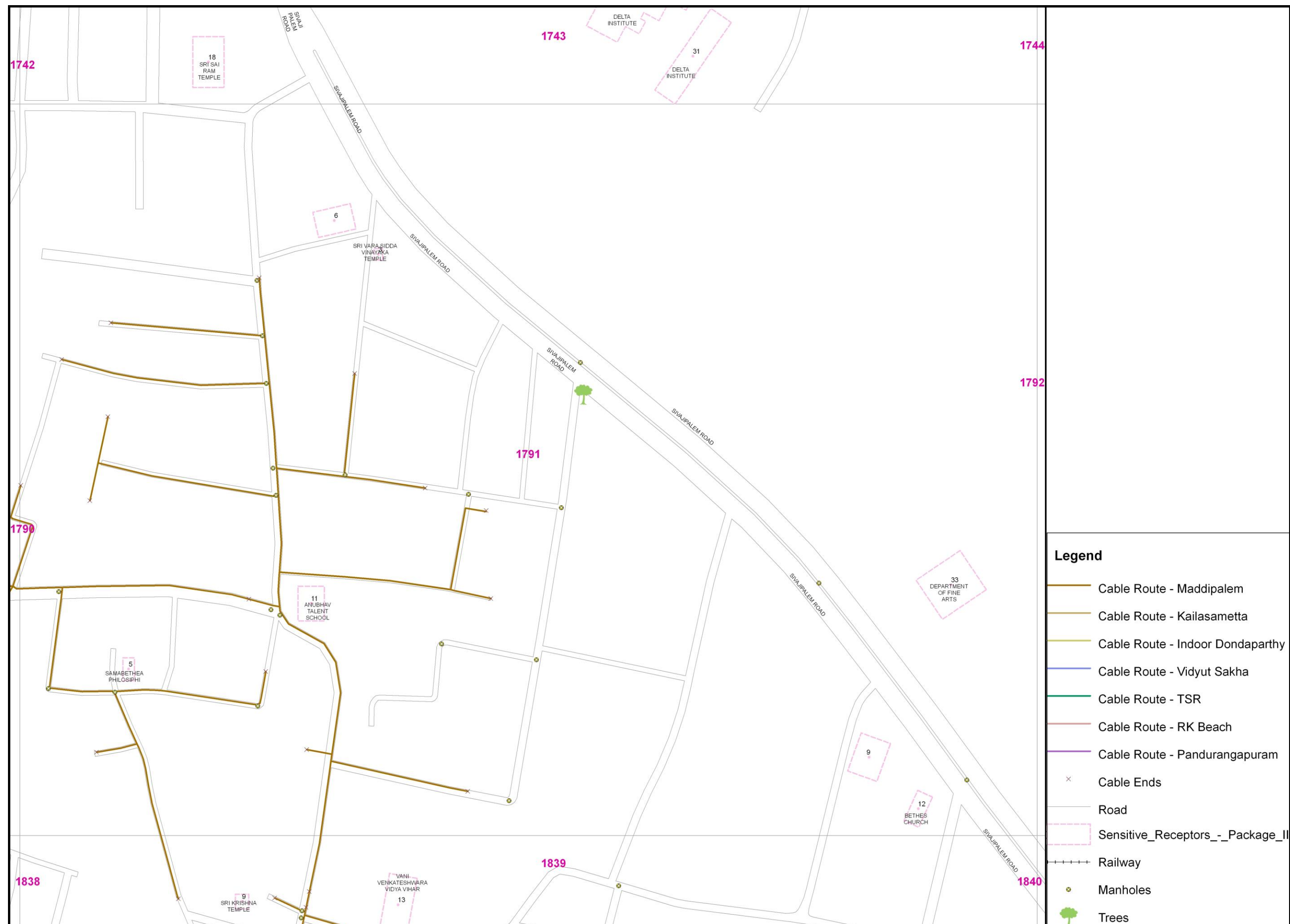
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



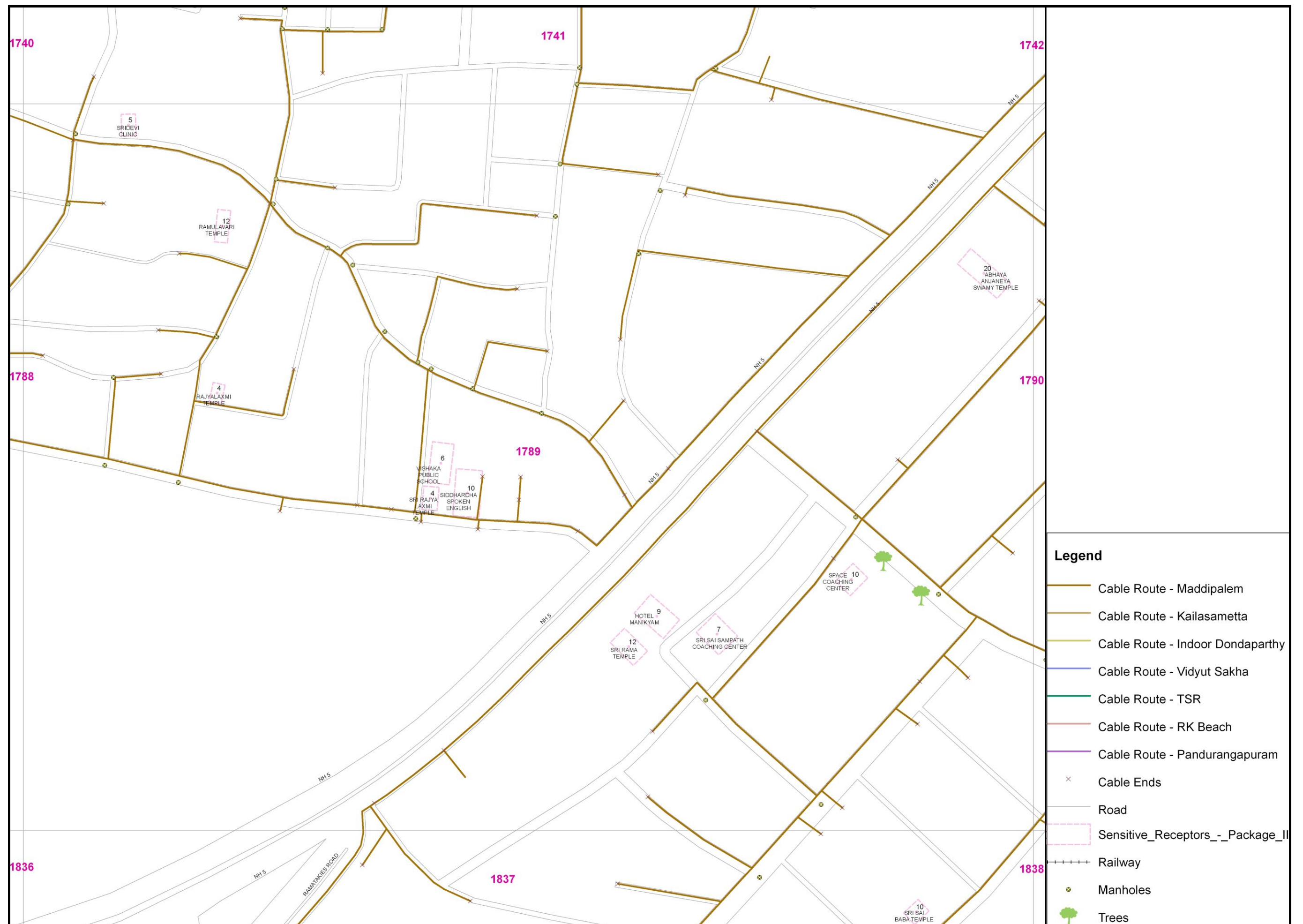
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



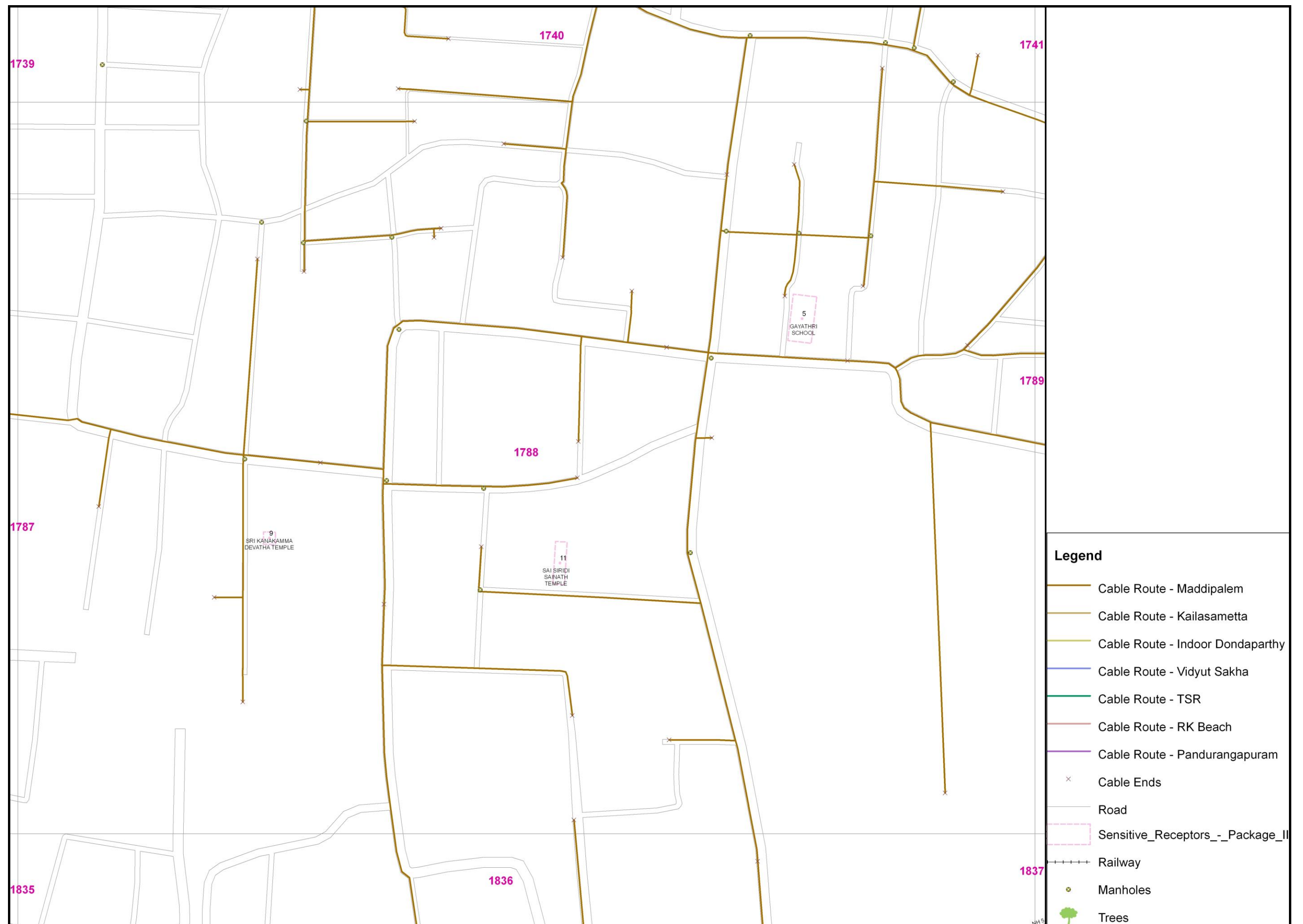
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



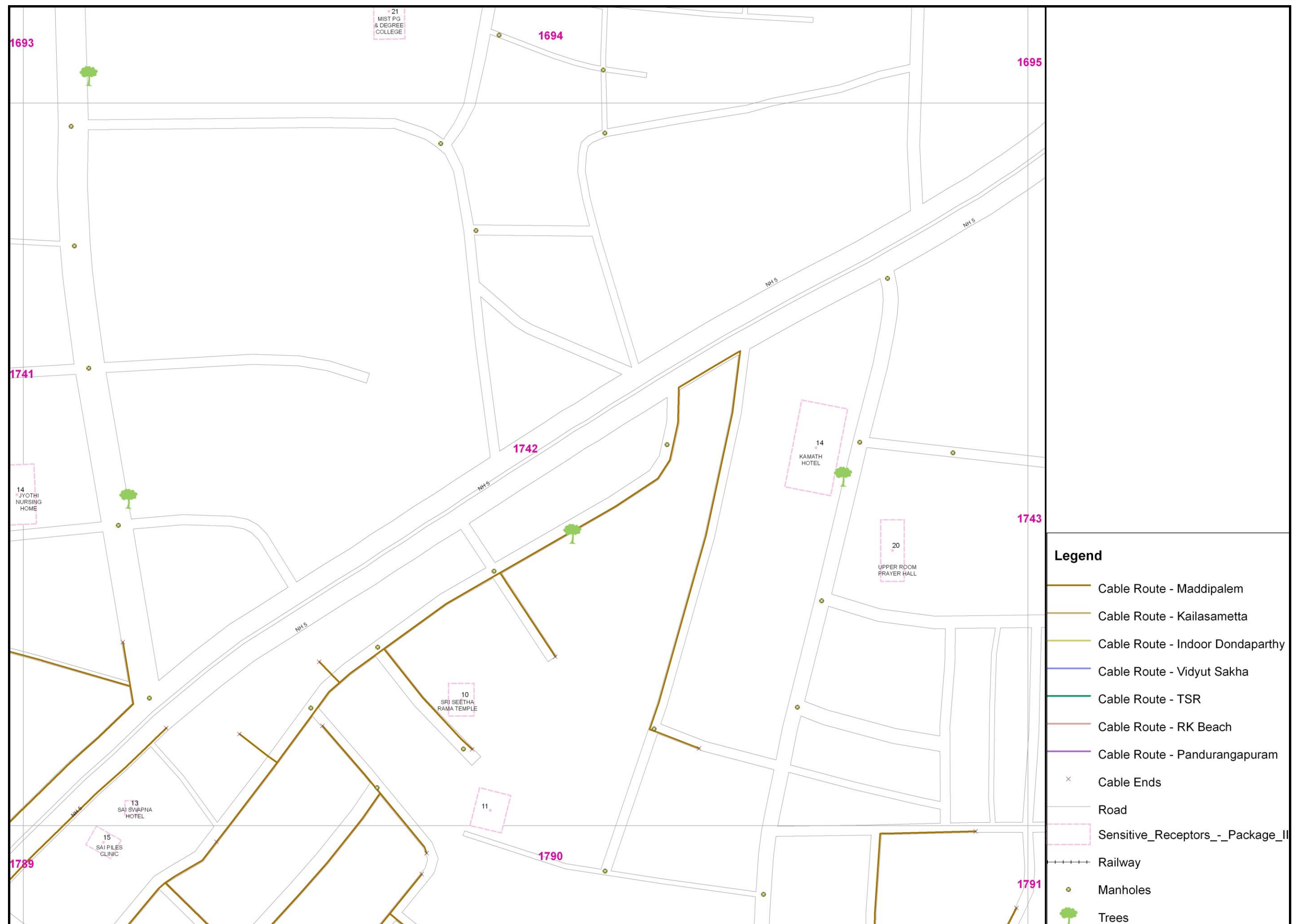
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



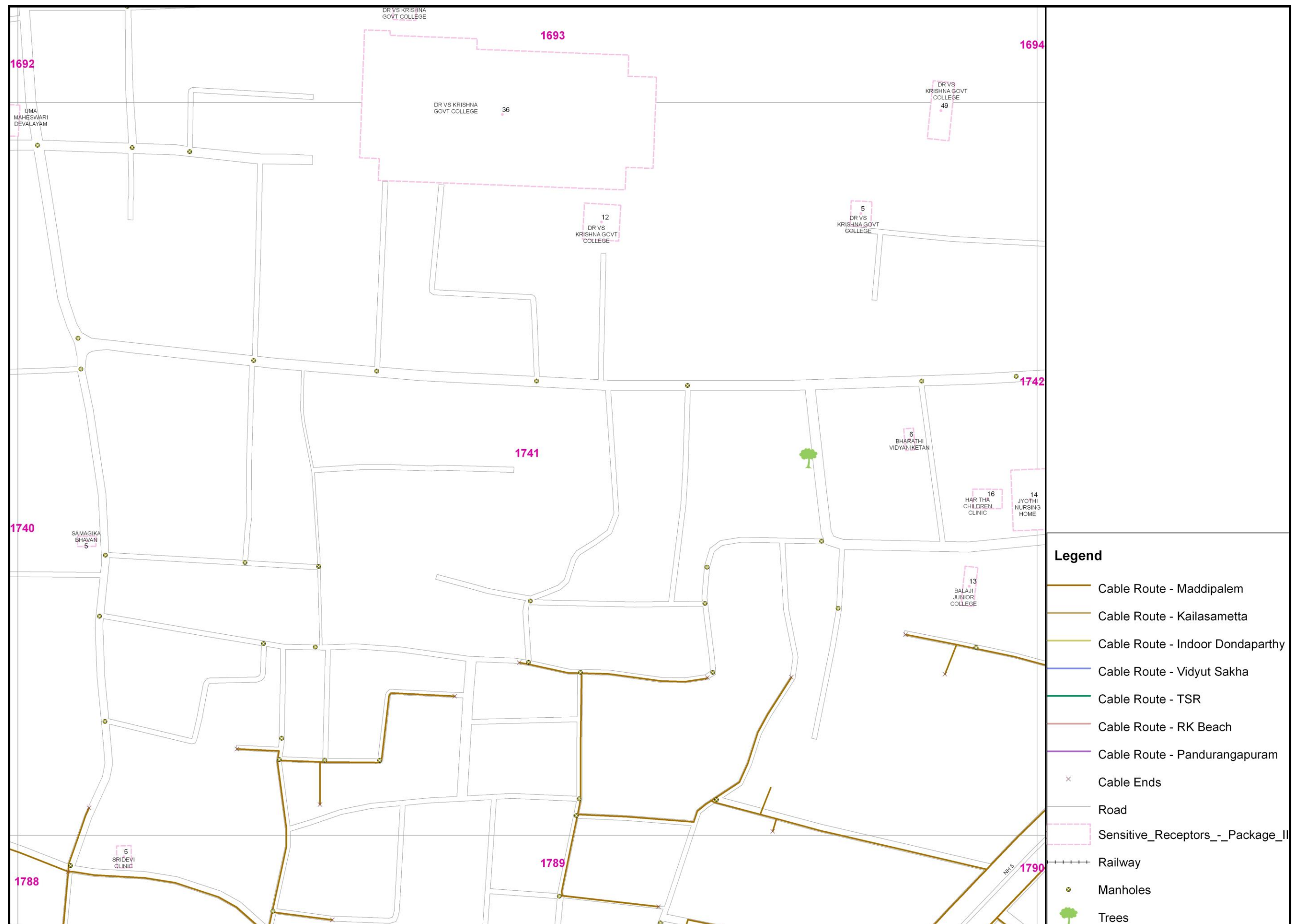
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



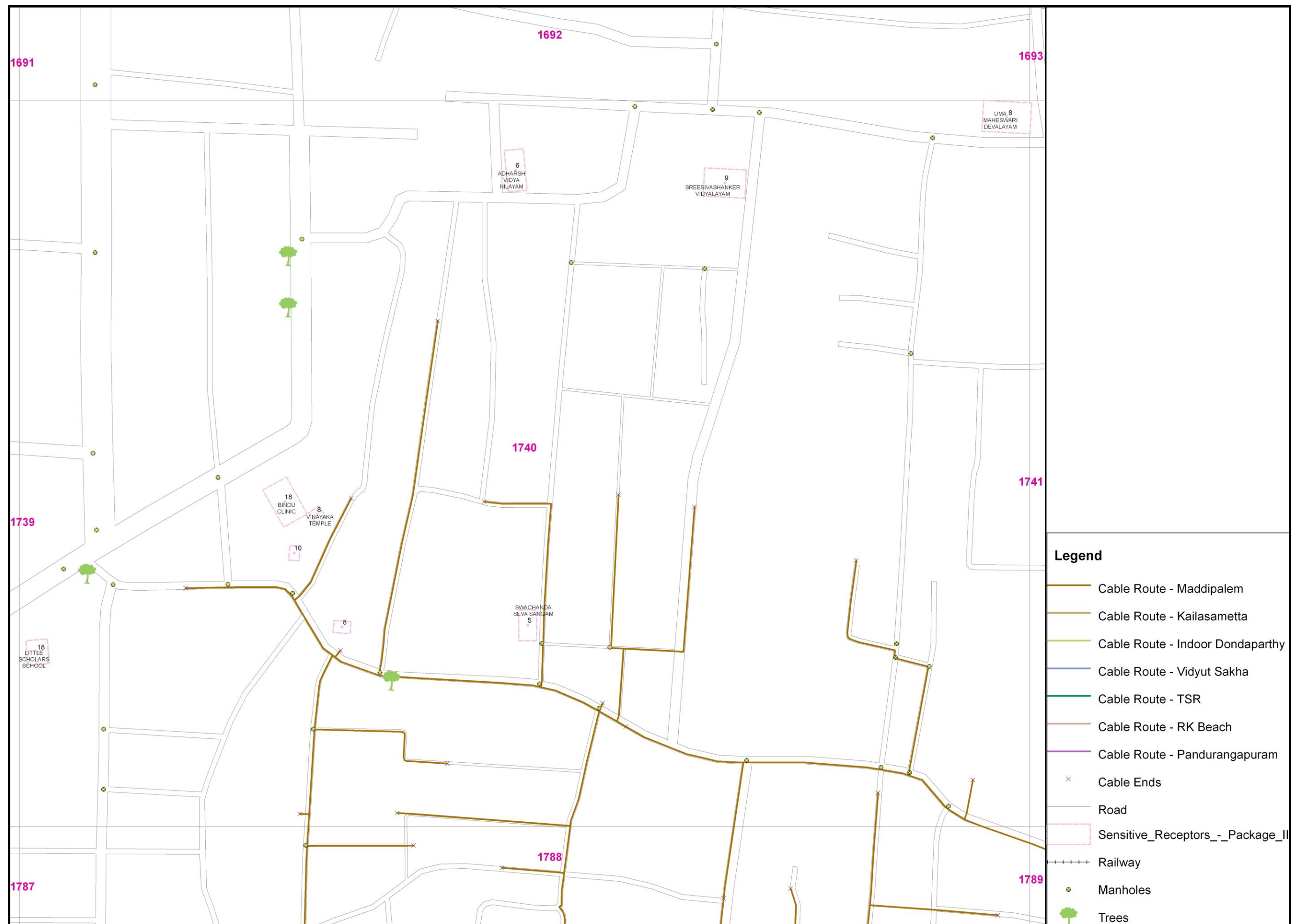
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



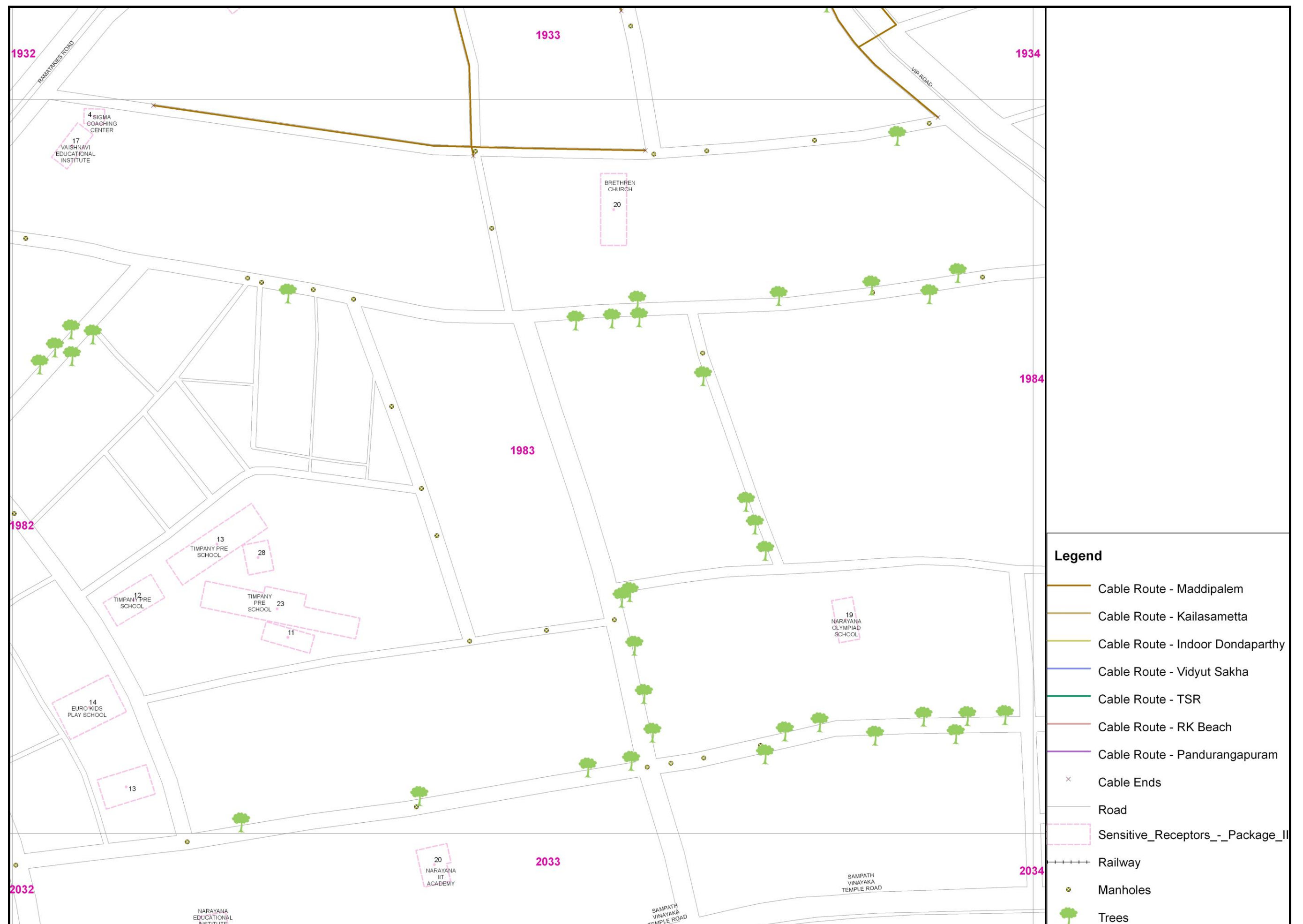
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area

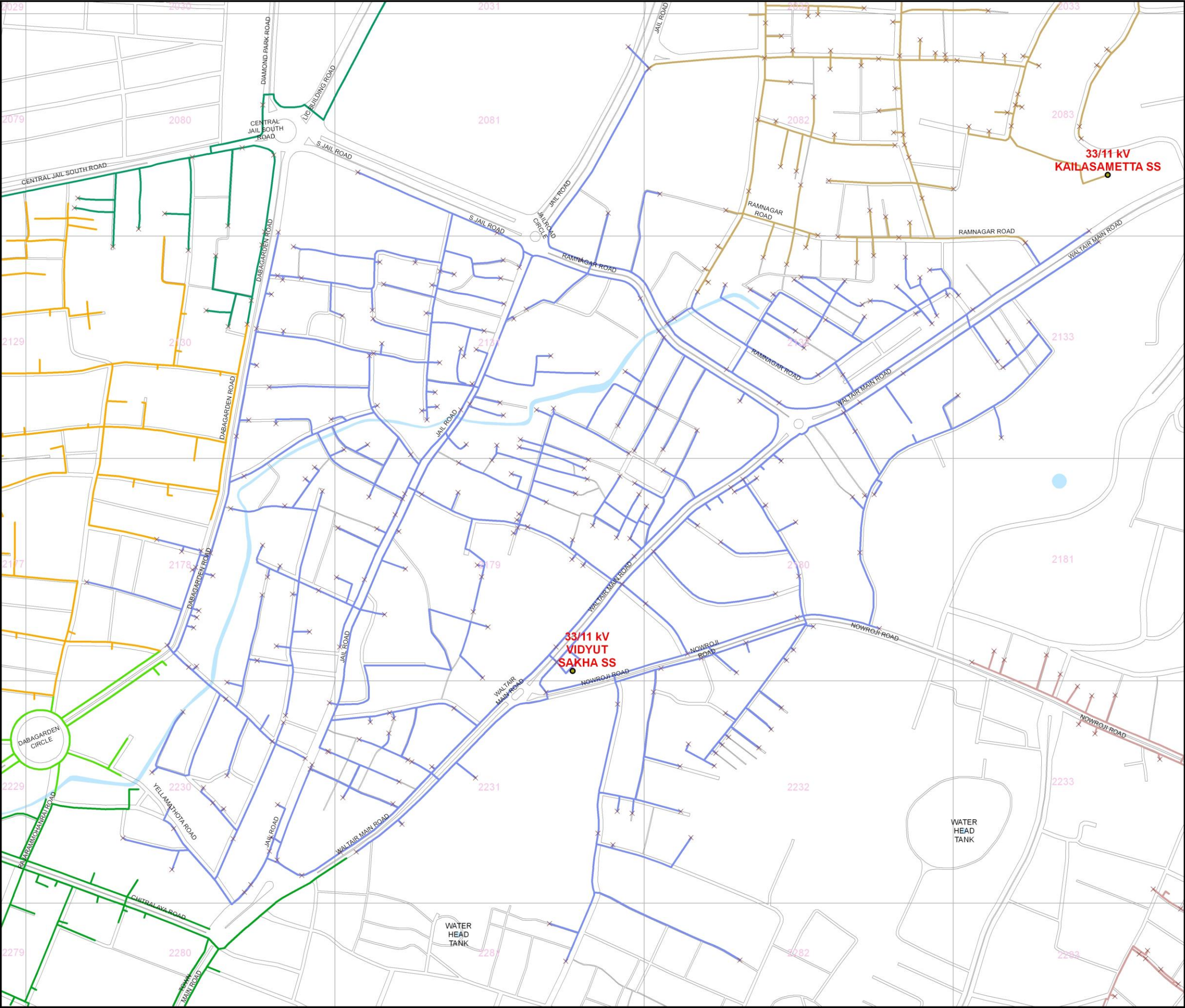


REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Maddilapalem Substation Area

REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



Note: Refer Respective Grid-wise Maps for Enlarged View/Details

Legend

Road

Cable Route - Vidyut Sakha

Cable Route - TSR

Cable Route - RK Beach

Cable Route - Pandurangapuram

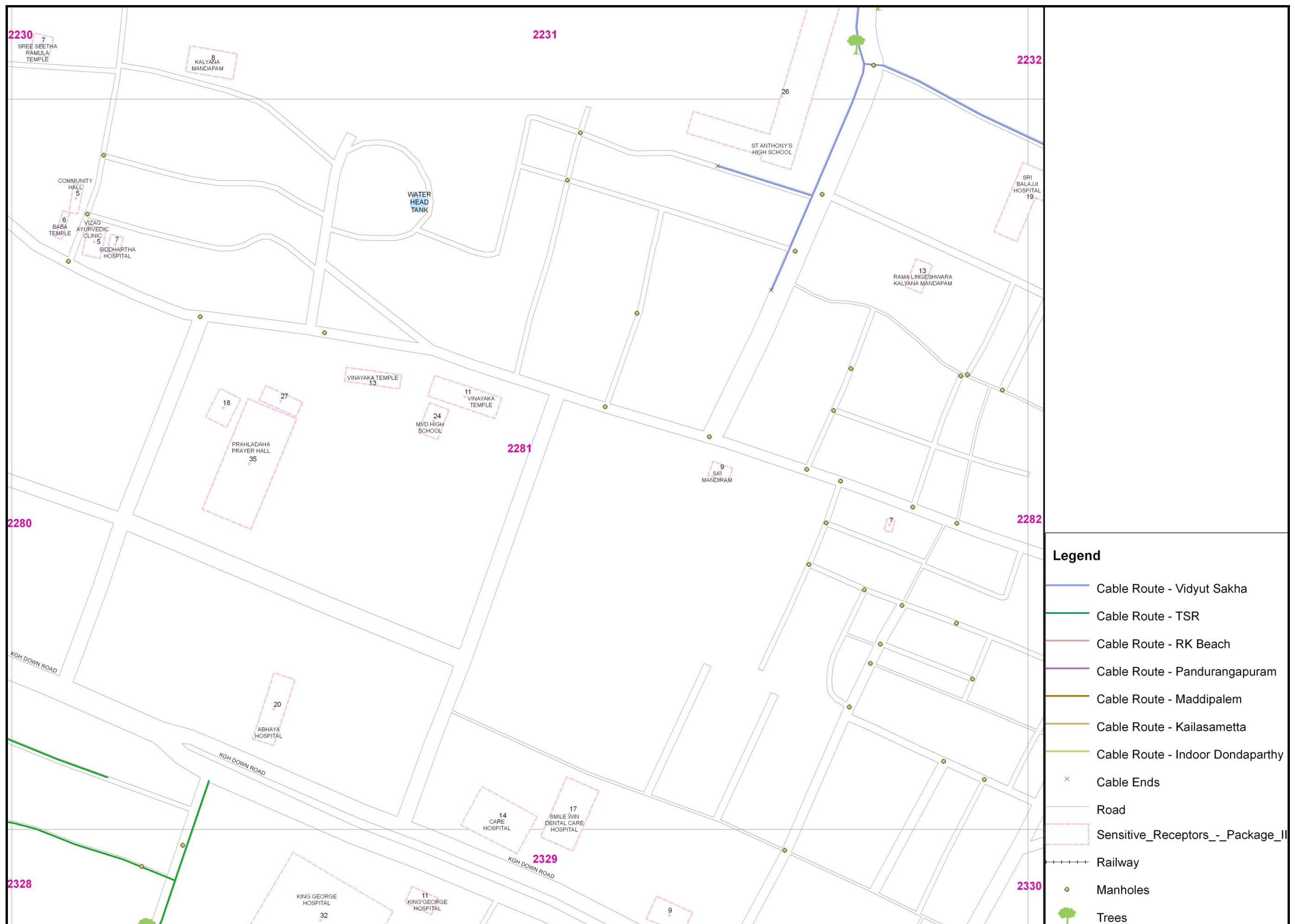
Cable Route - Maddipalem

Cable Route - Indoor Dondaparthi

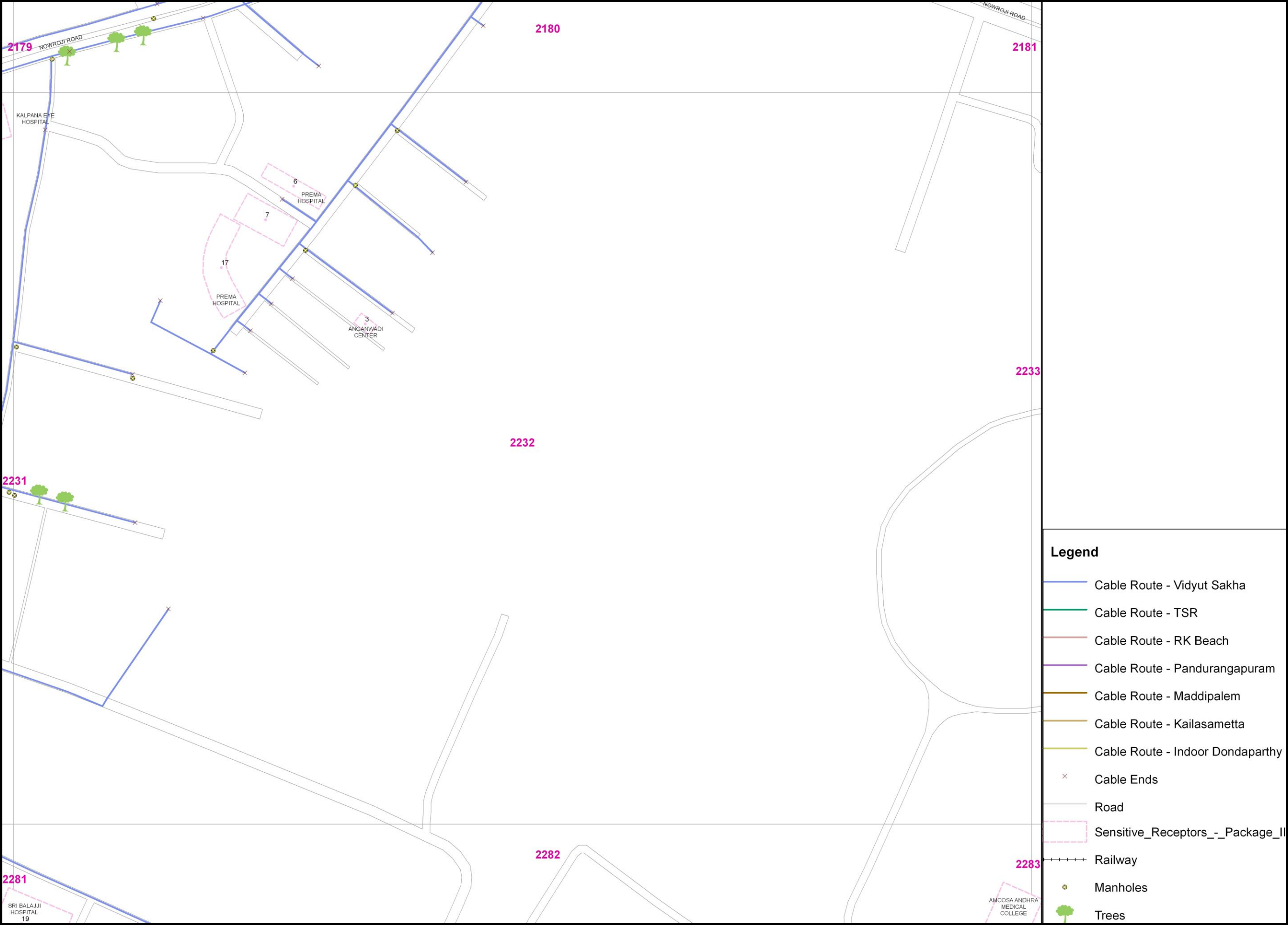
Cable Route - Kailasametta

Cable Ends

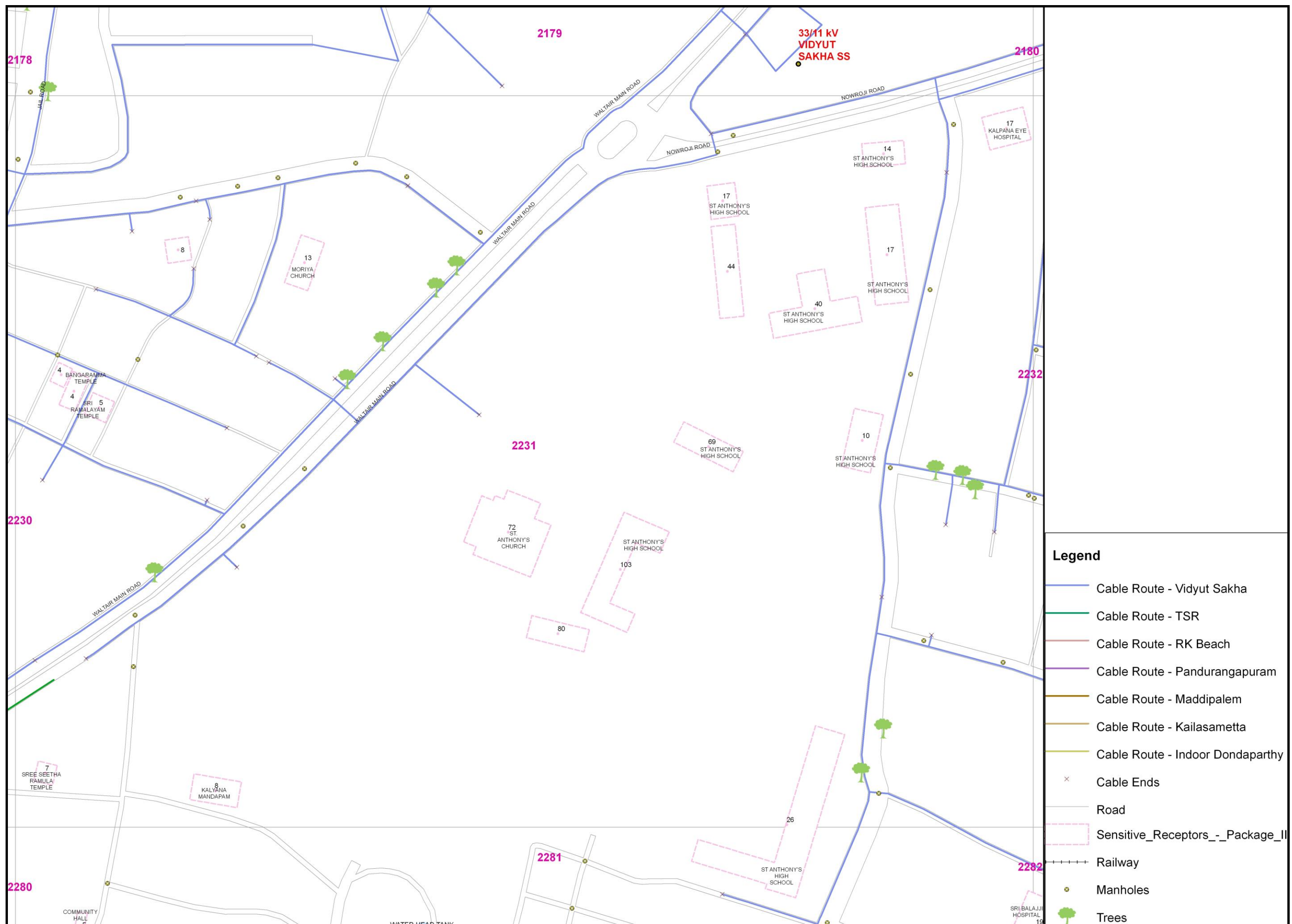
REN/UG Cable Route Alignment within Vidyut Sakha Substation Area



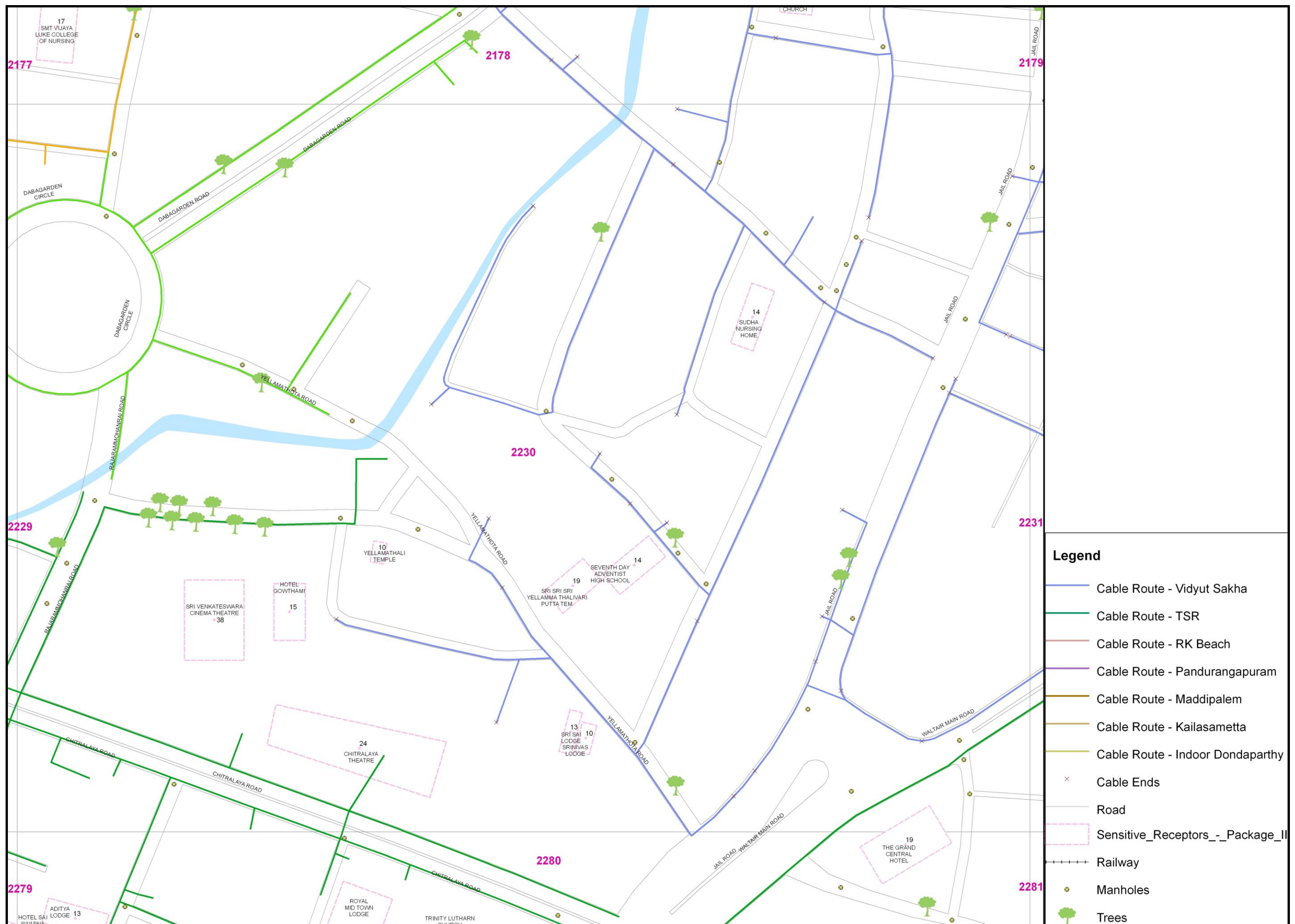
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



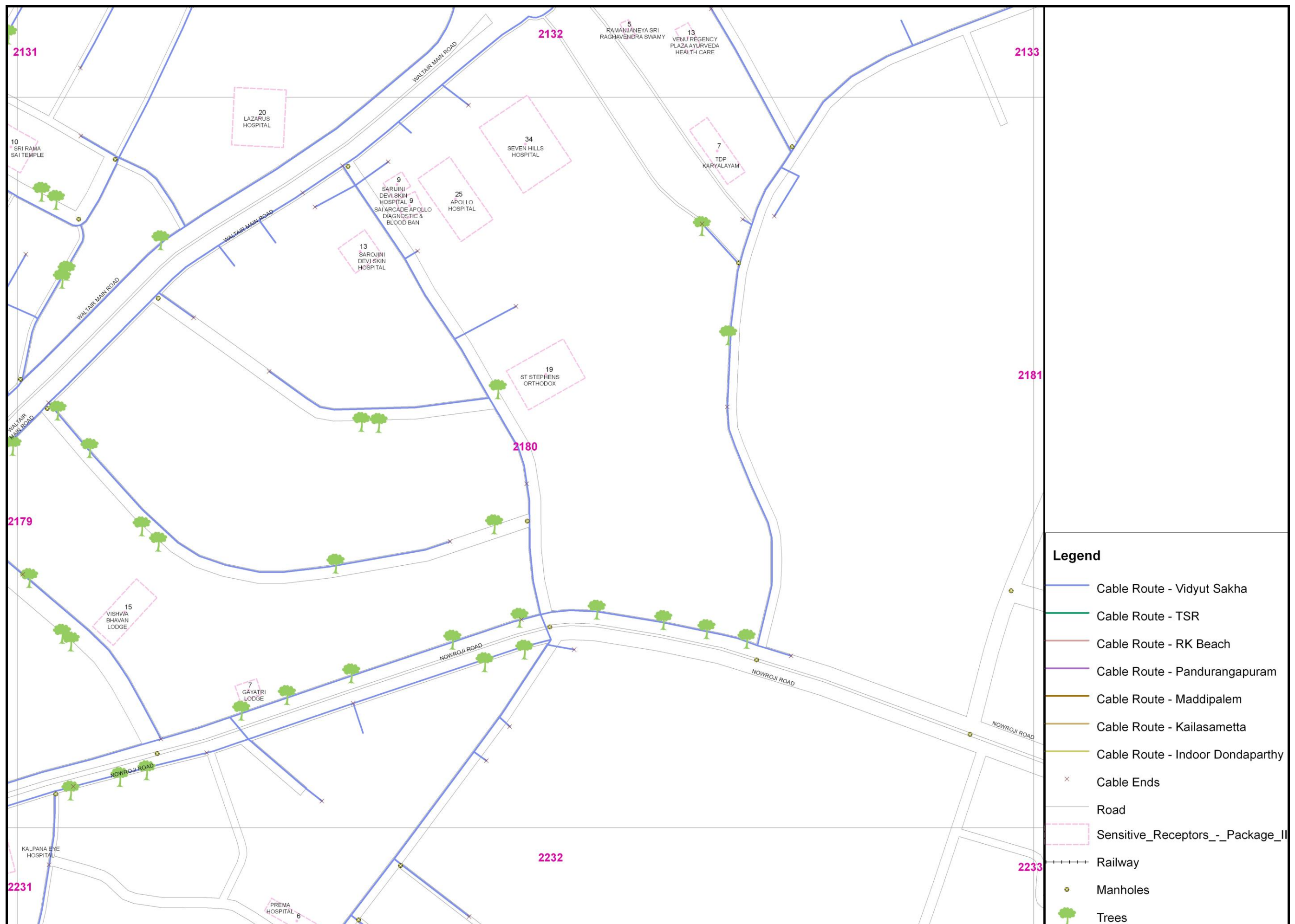
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



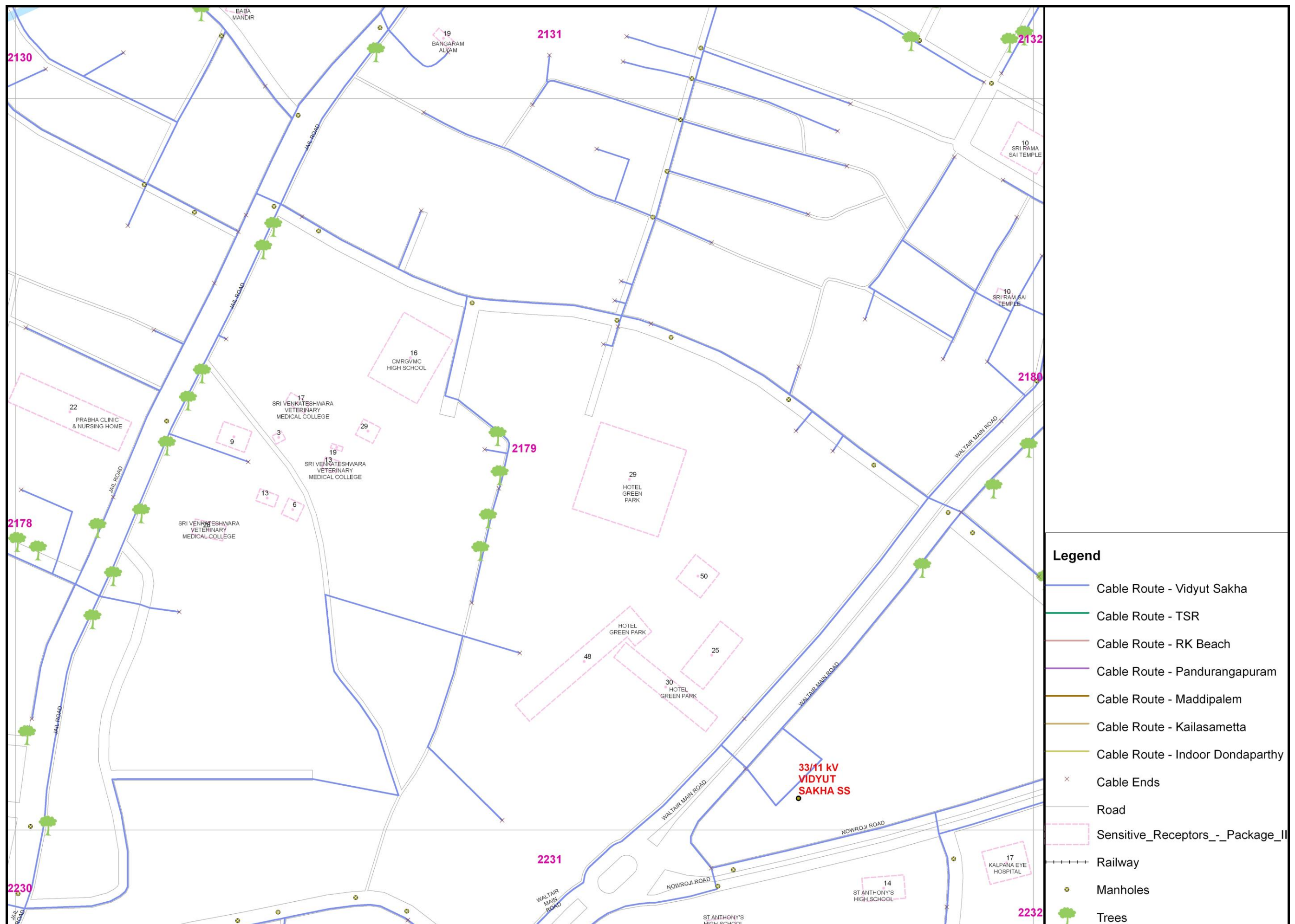
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



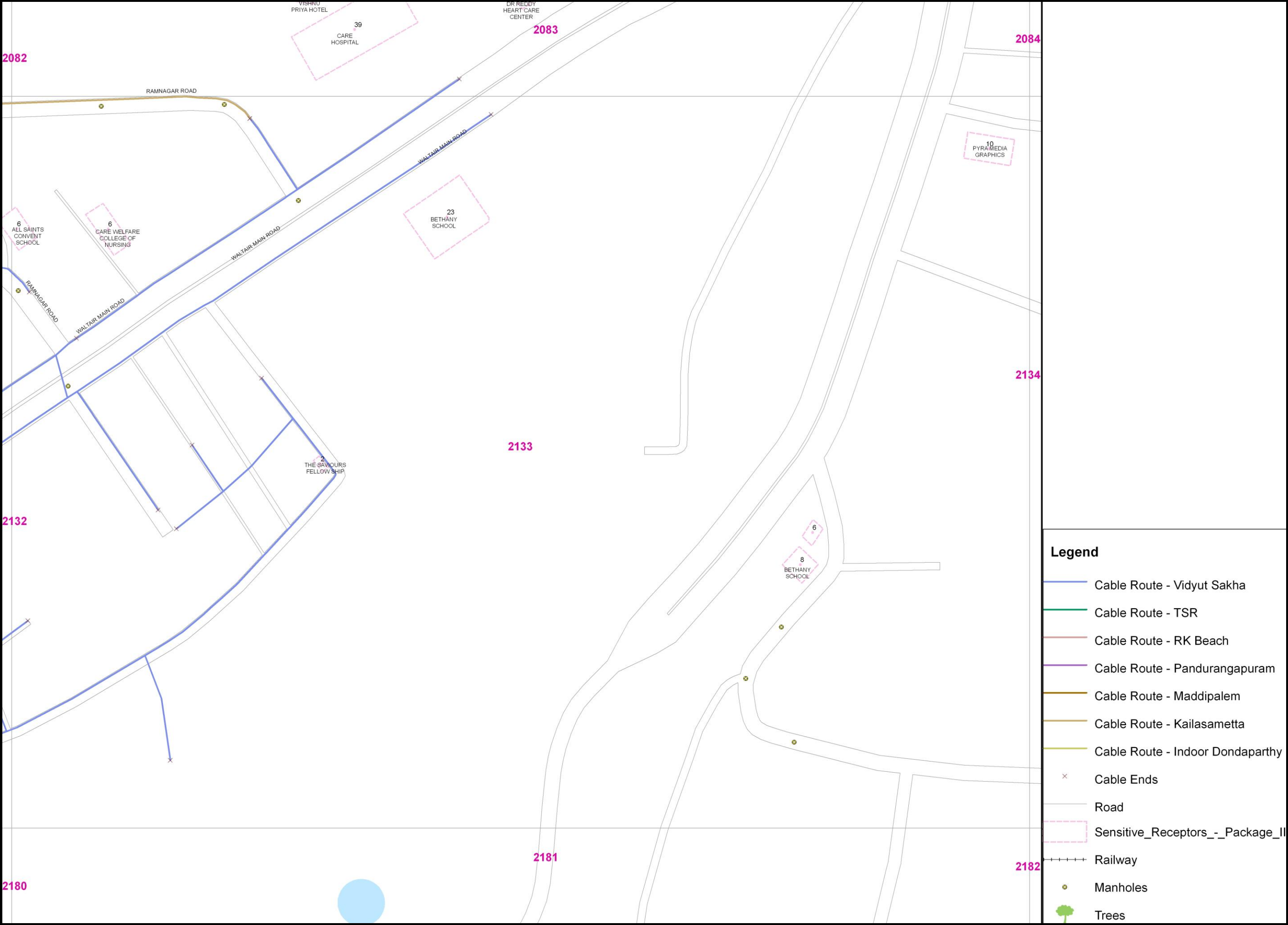
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



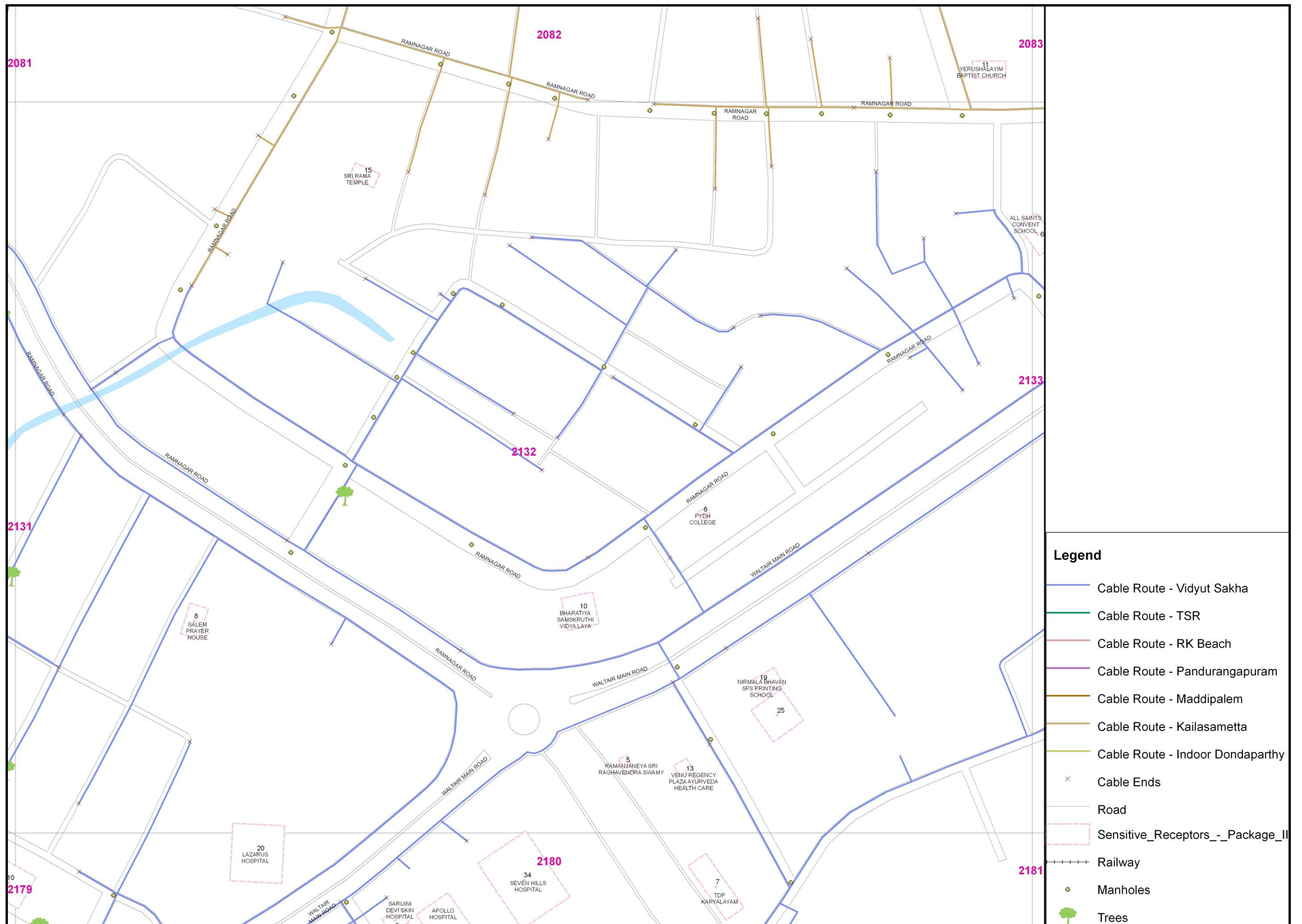
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



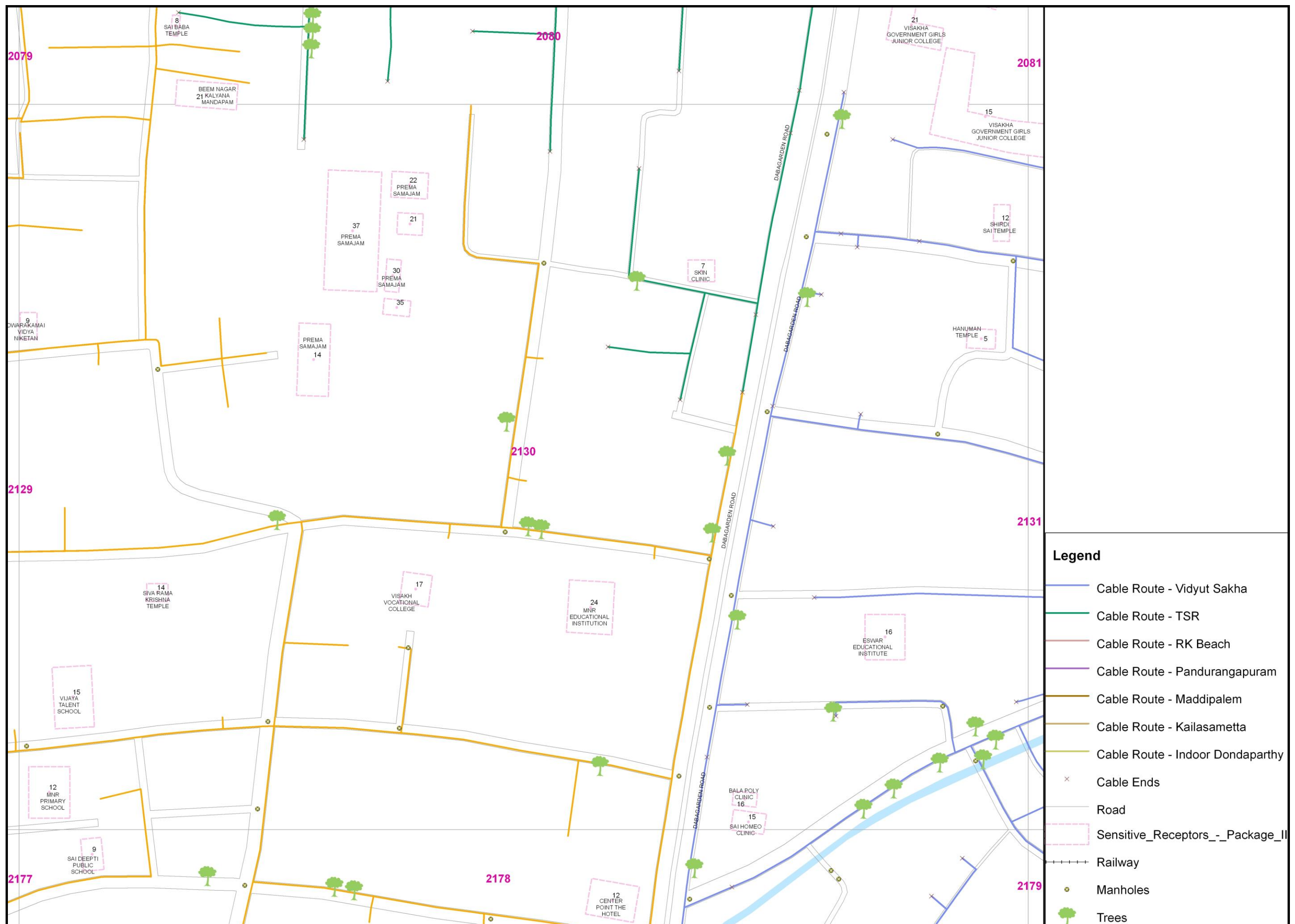
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



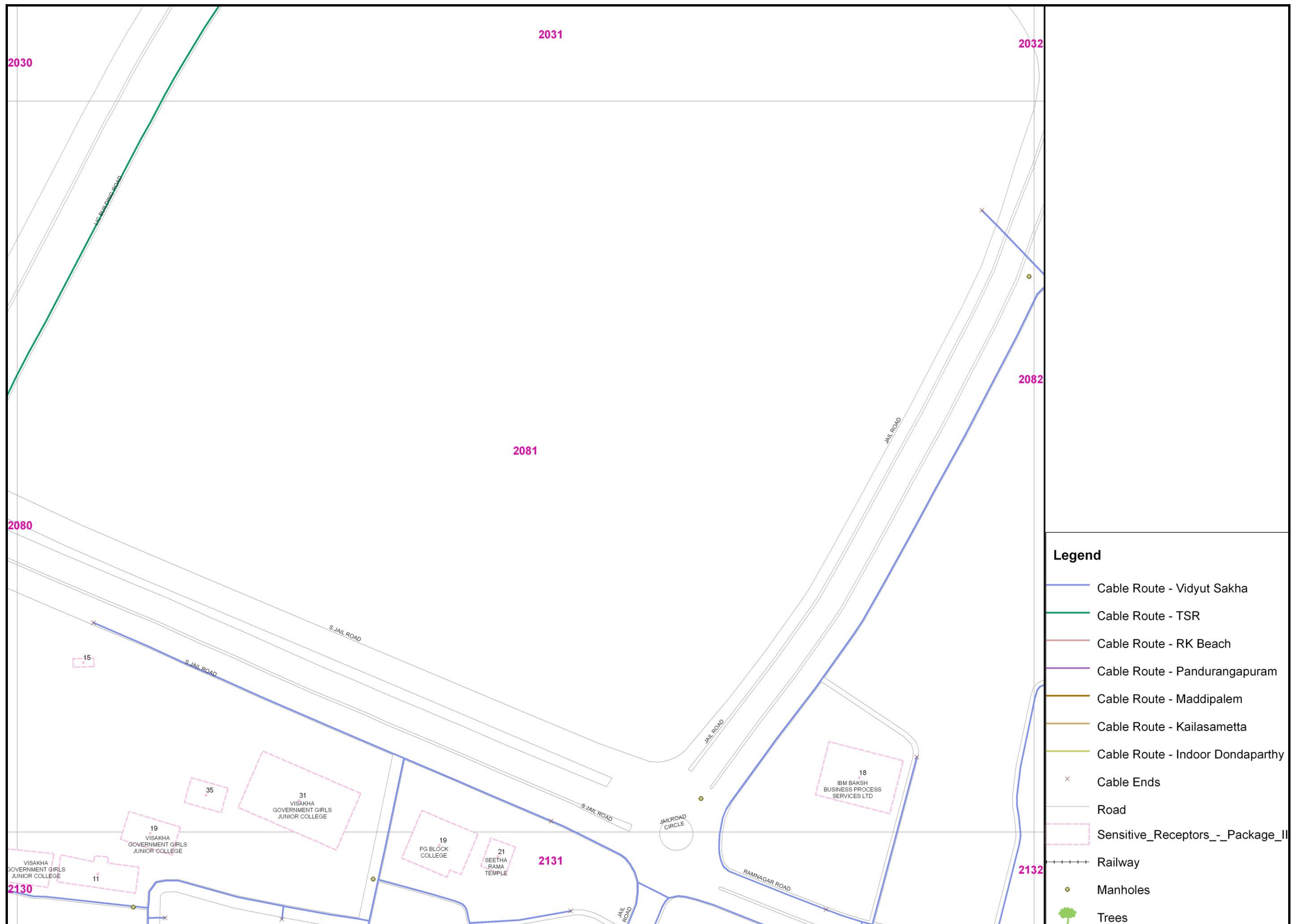
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



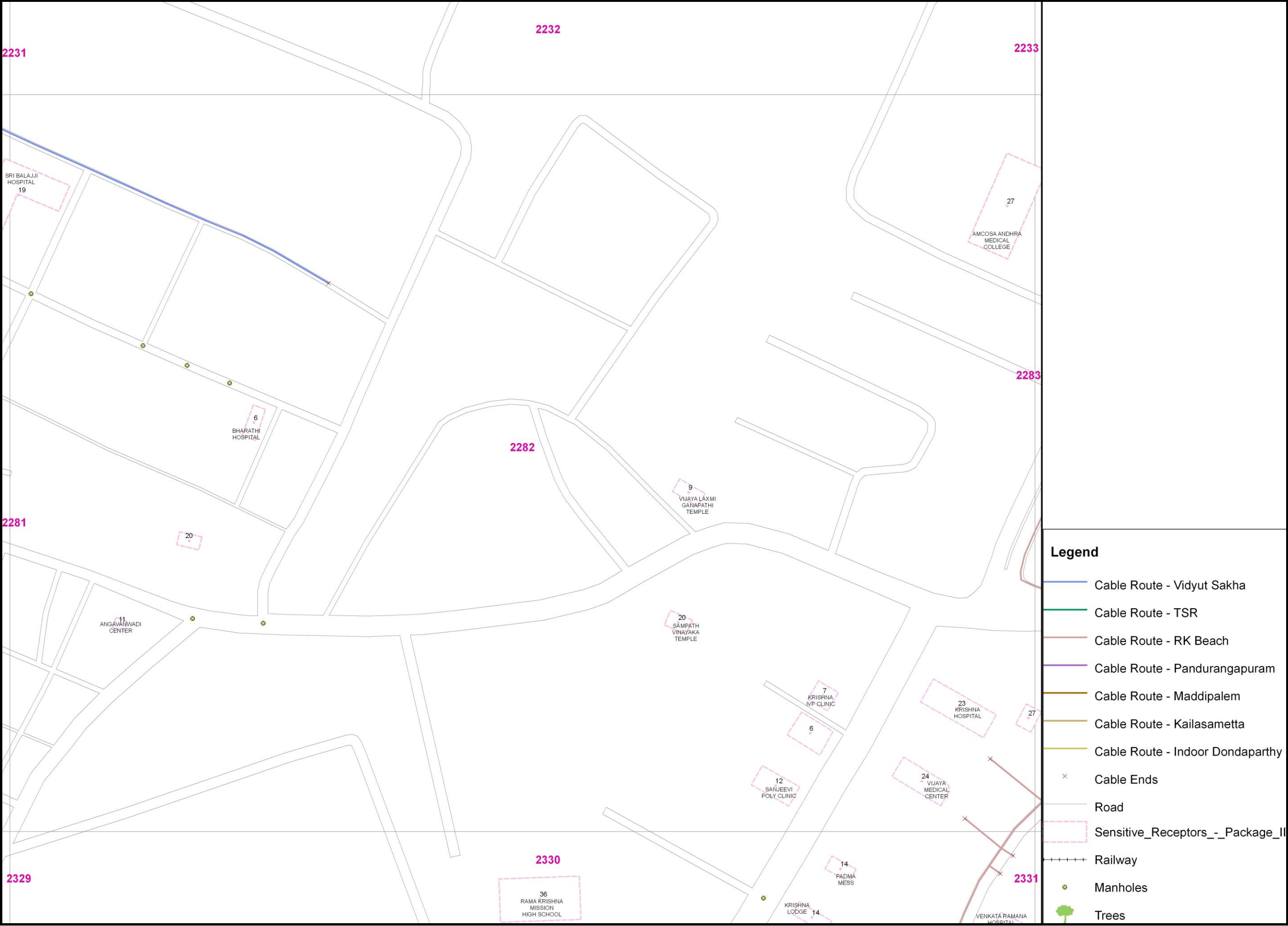
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area

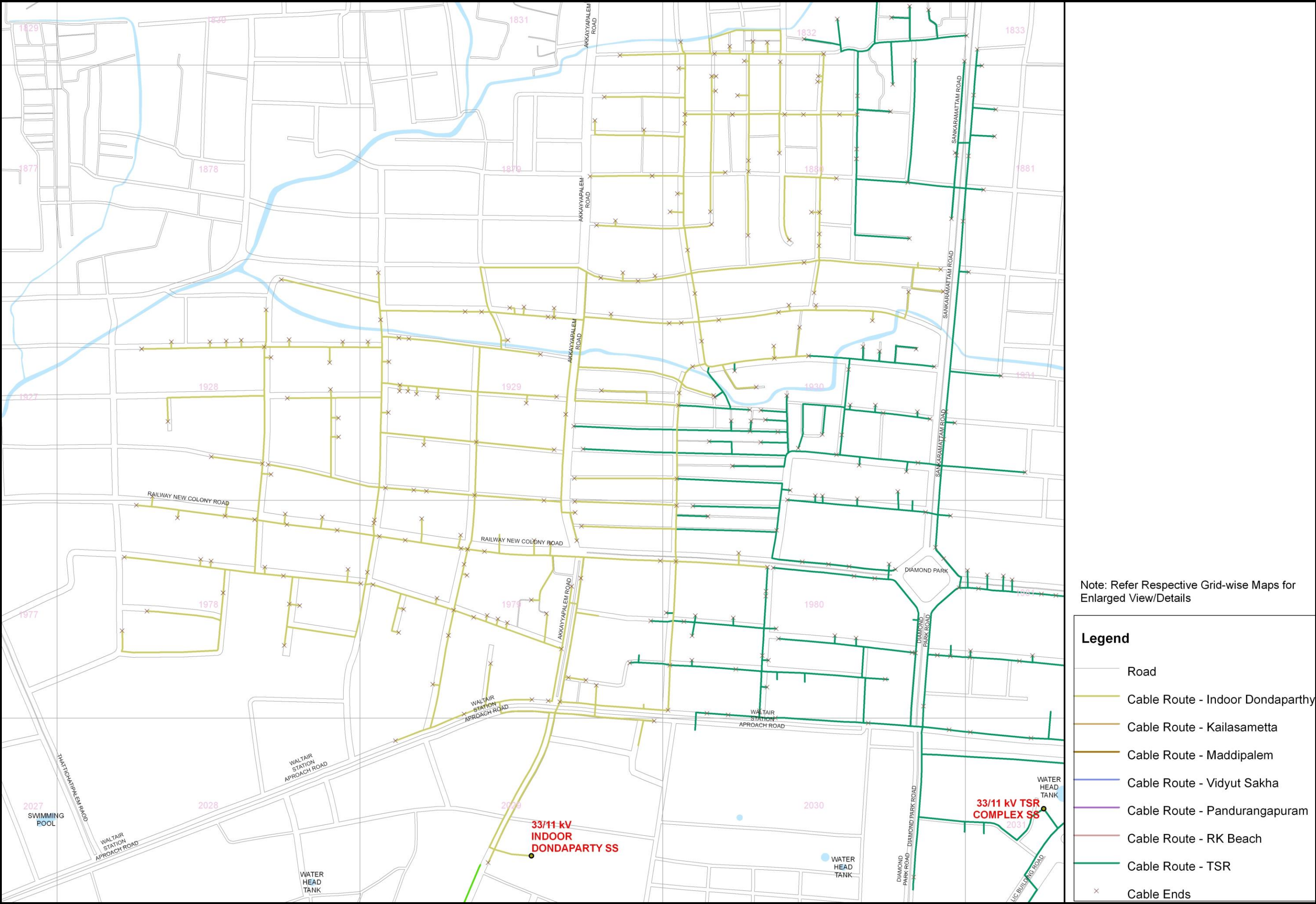


REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidyut Sakha Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Vidut Sakha Substation Area

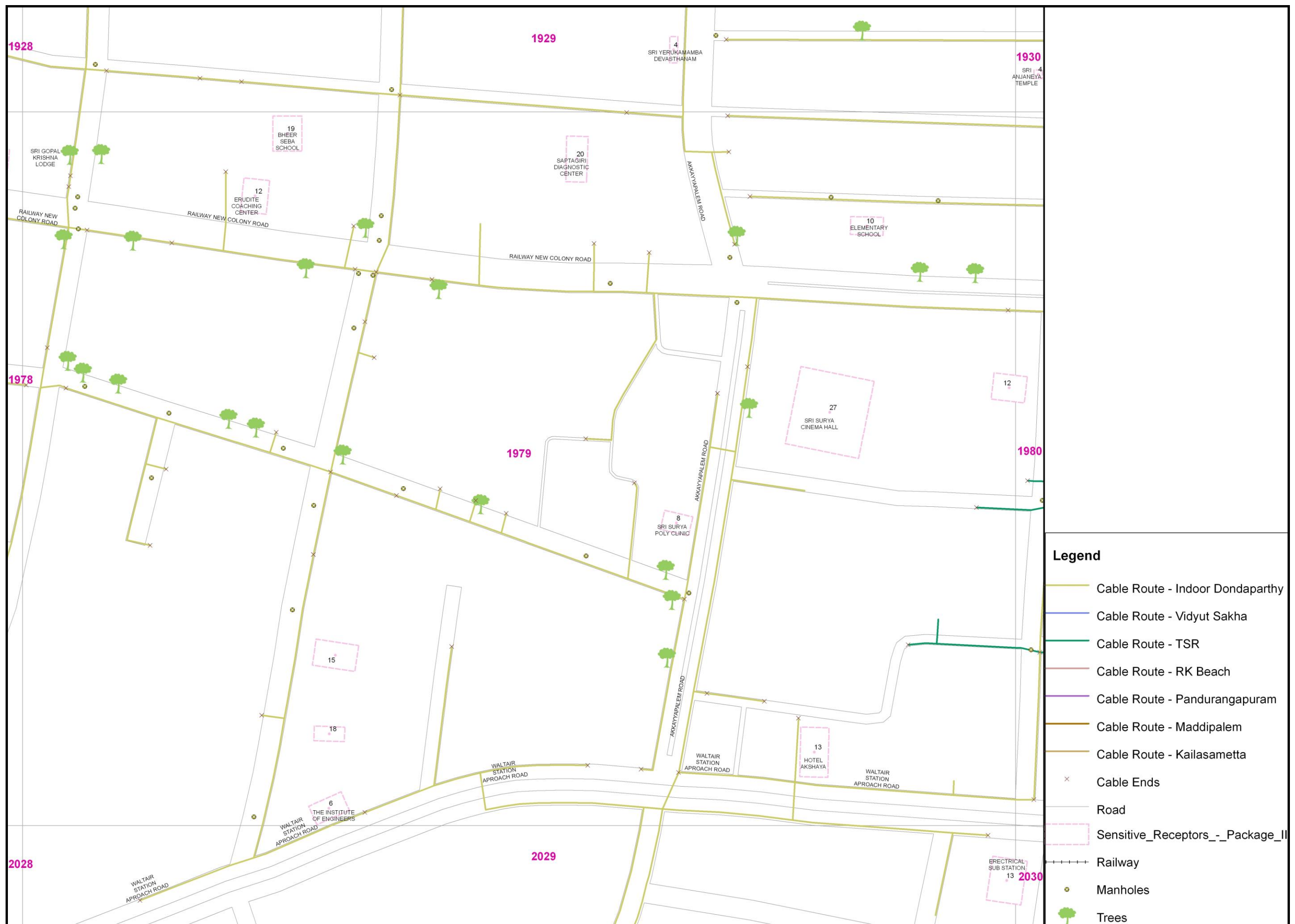
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area



REN/UG Cable Route Alignment within Indoor Dondaparty Substation Area



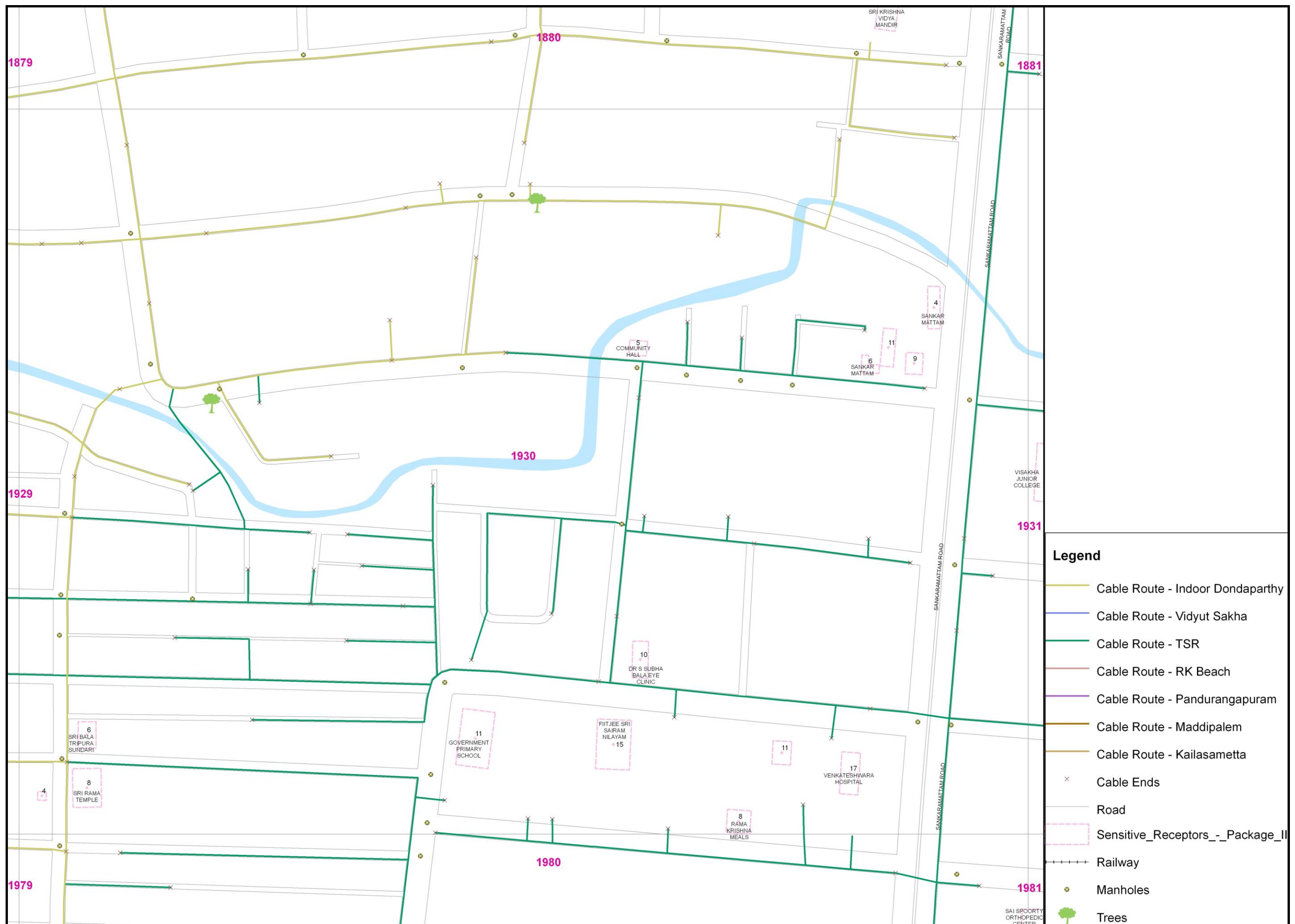
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area



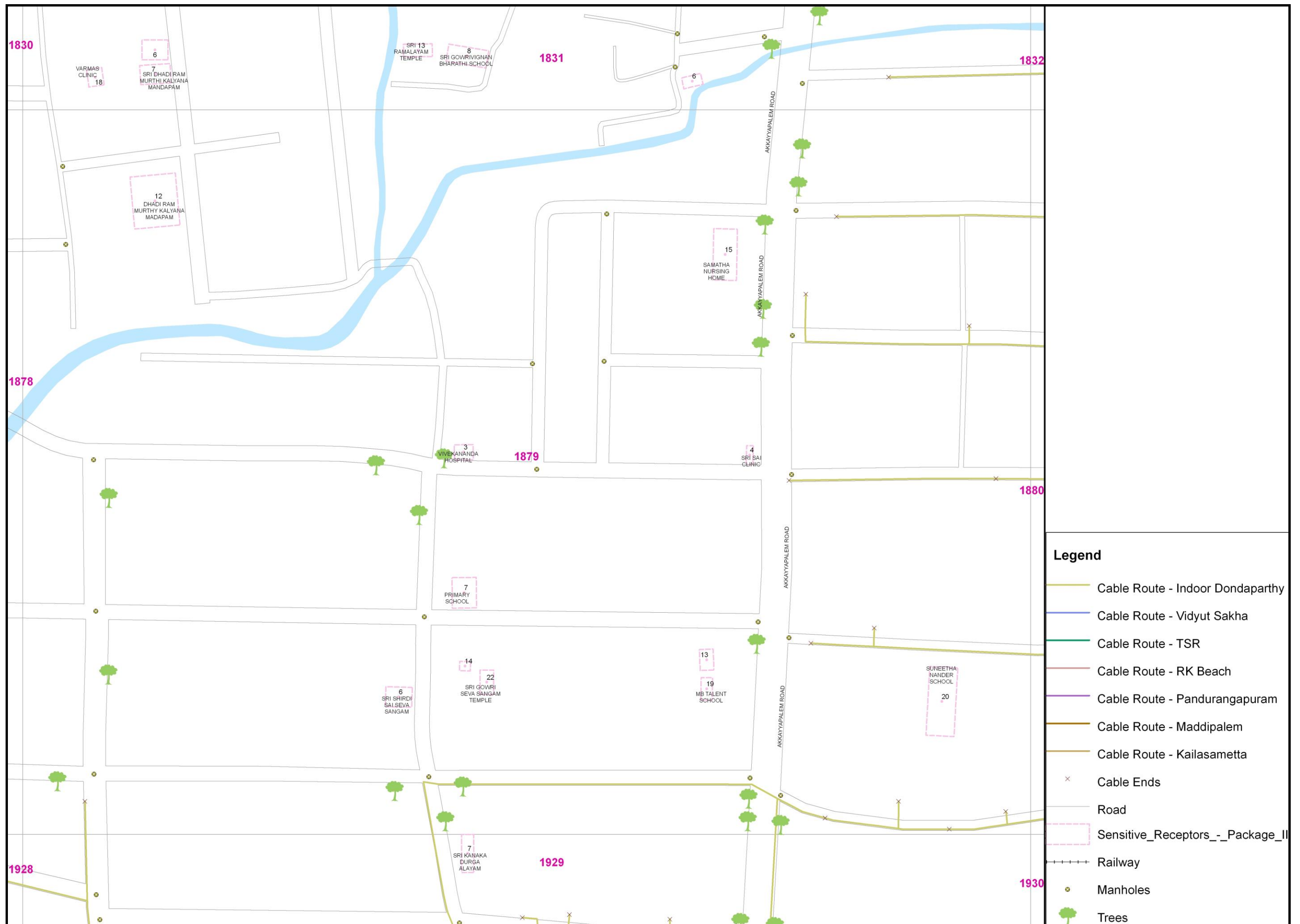
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area



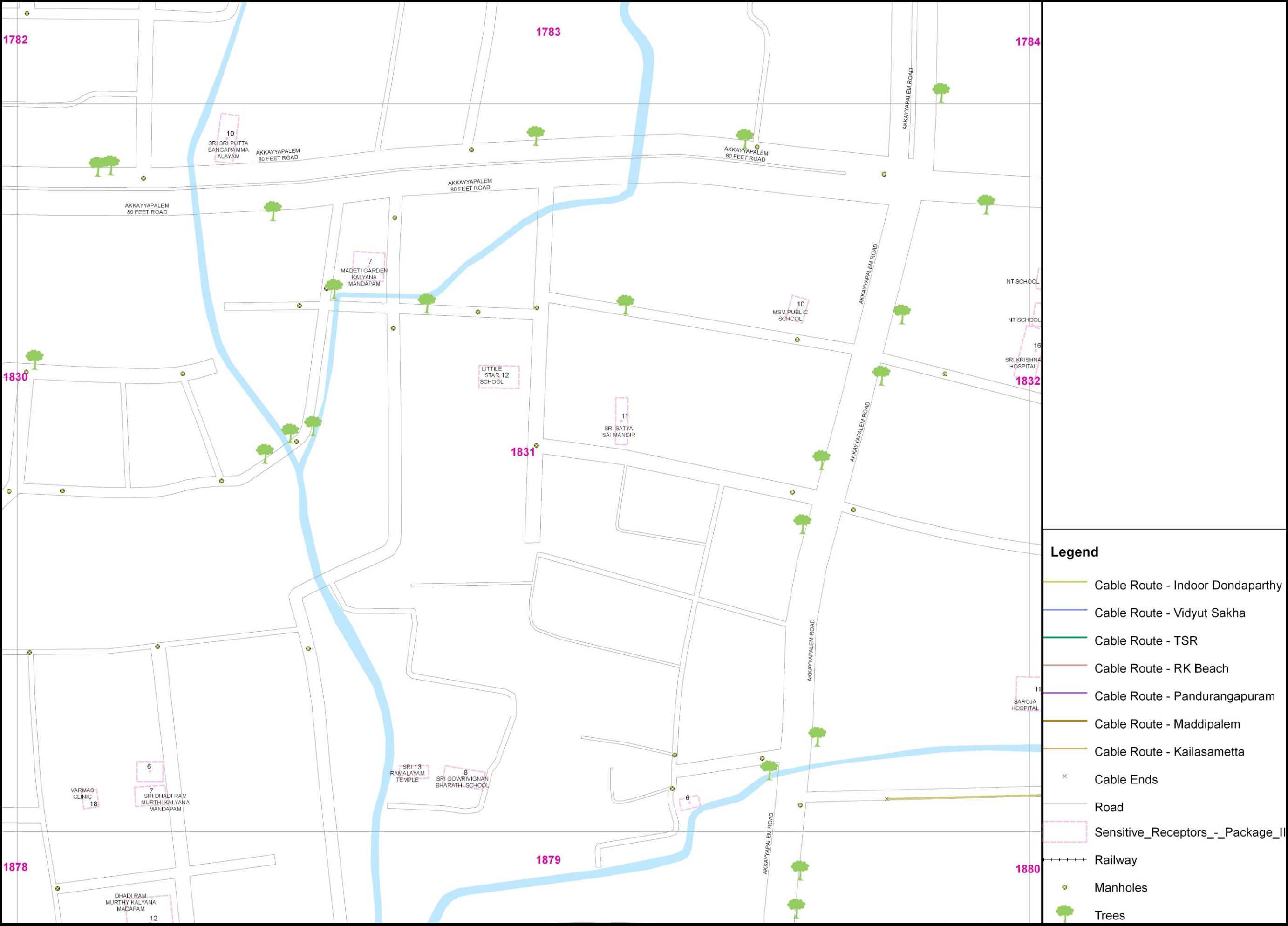
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area



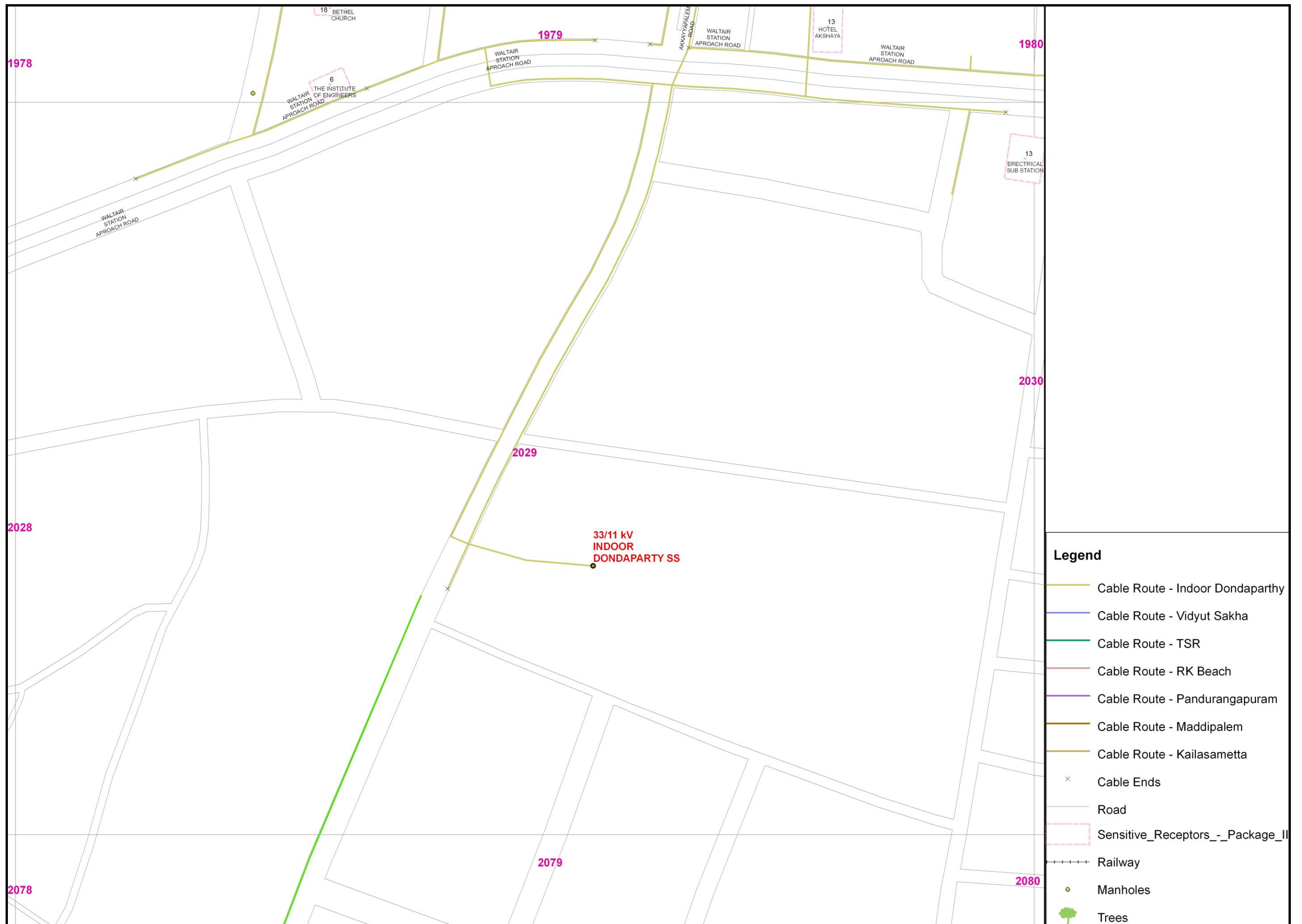
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area

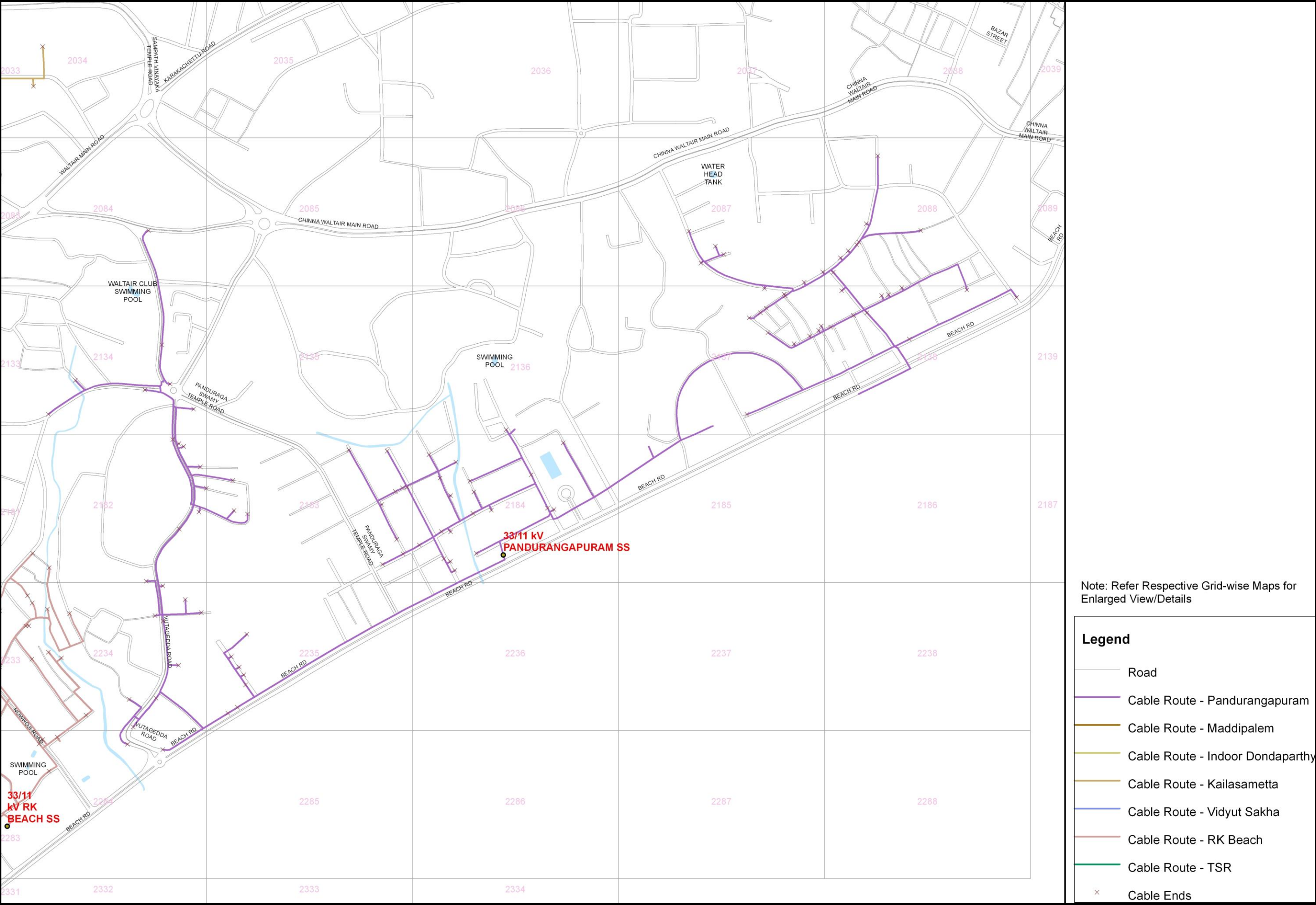


REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area

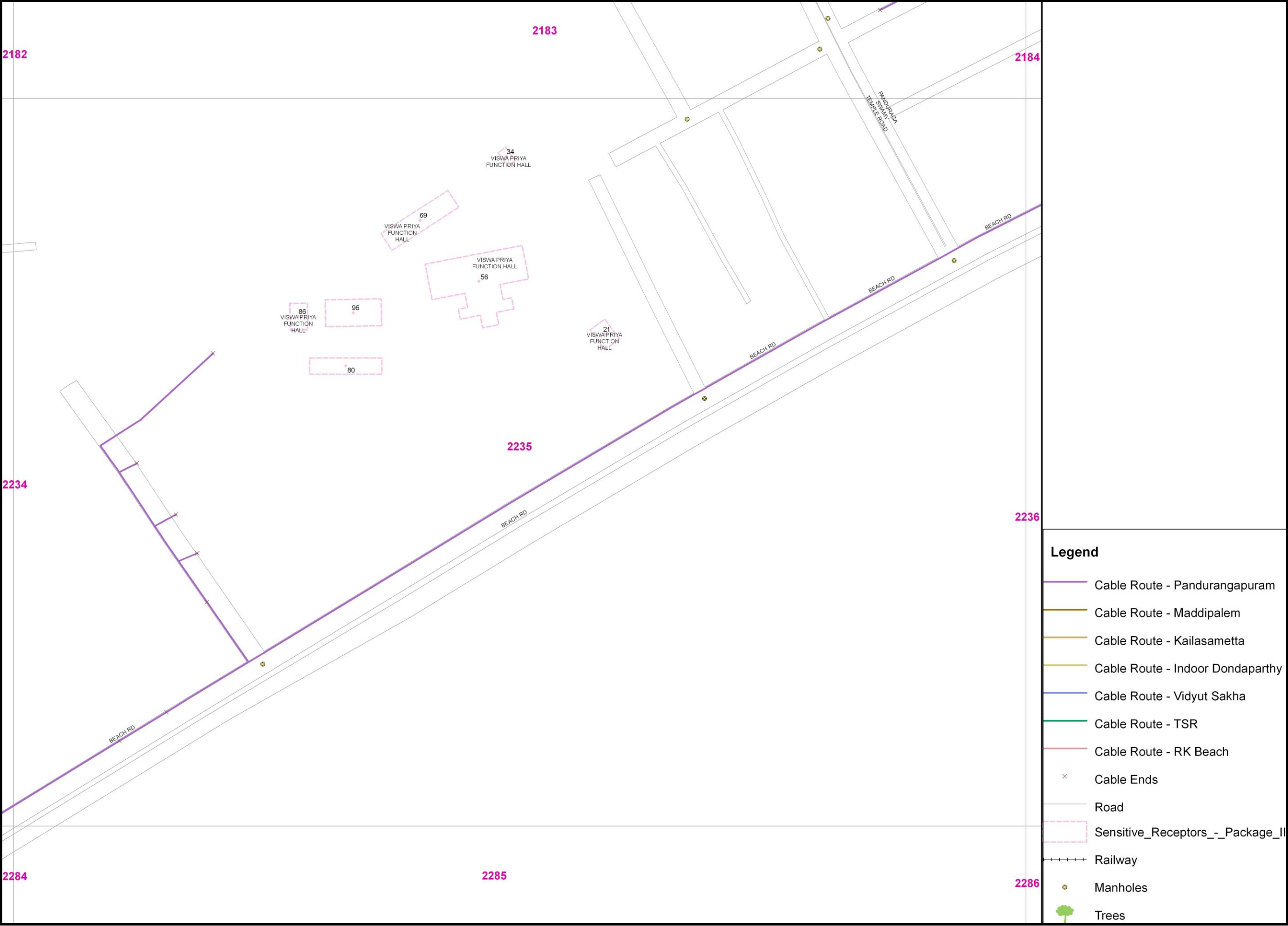


REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Indoor Dondaparty Substation Area

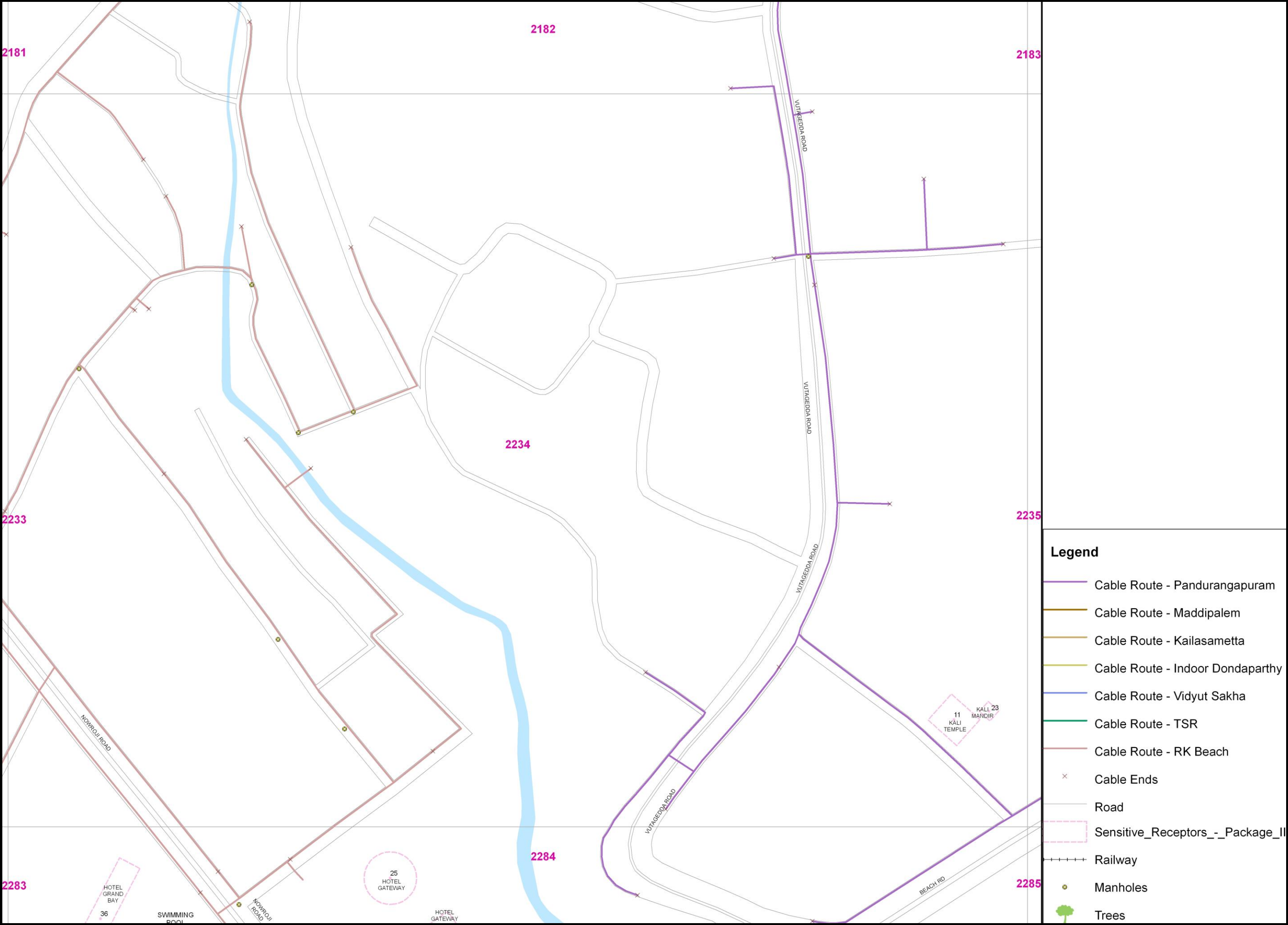
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



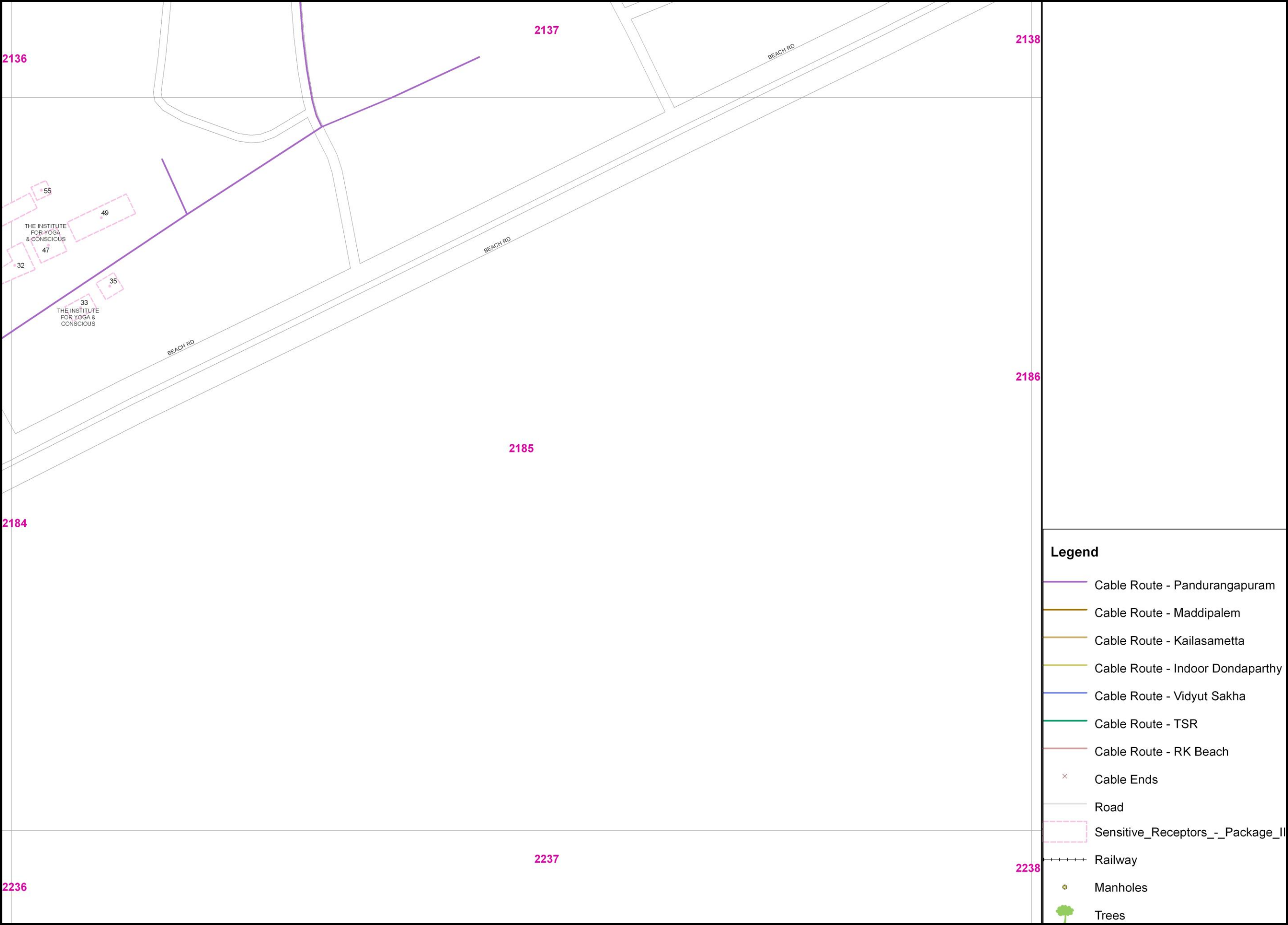
REN/UG Cable Route Alignment within Pandurangapuram Substation Area



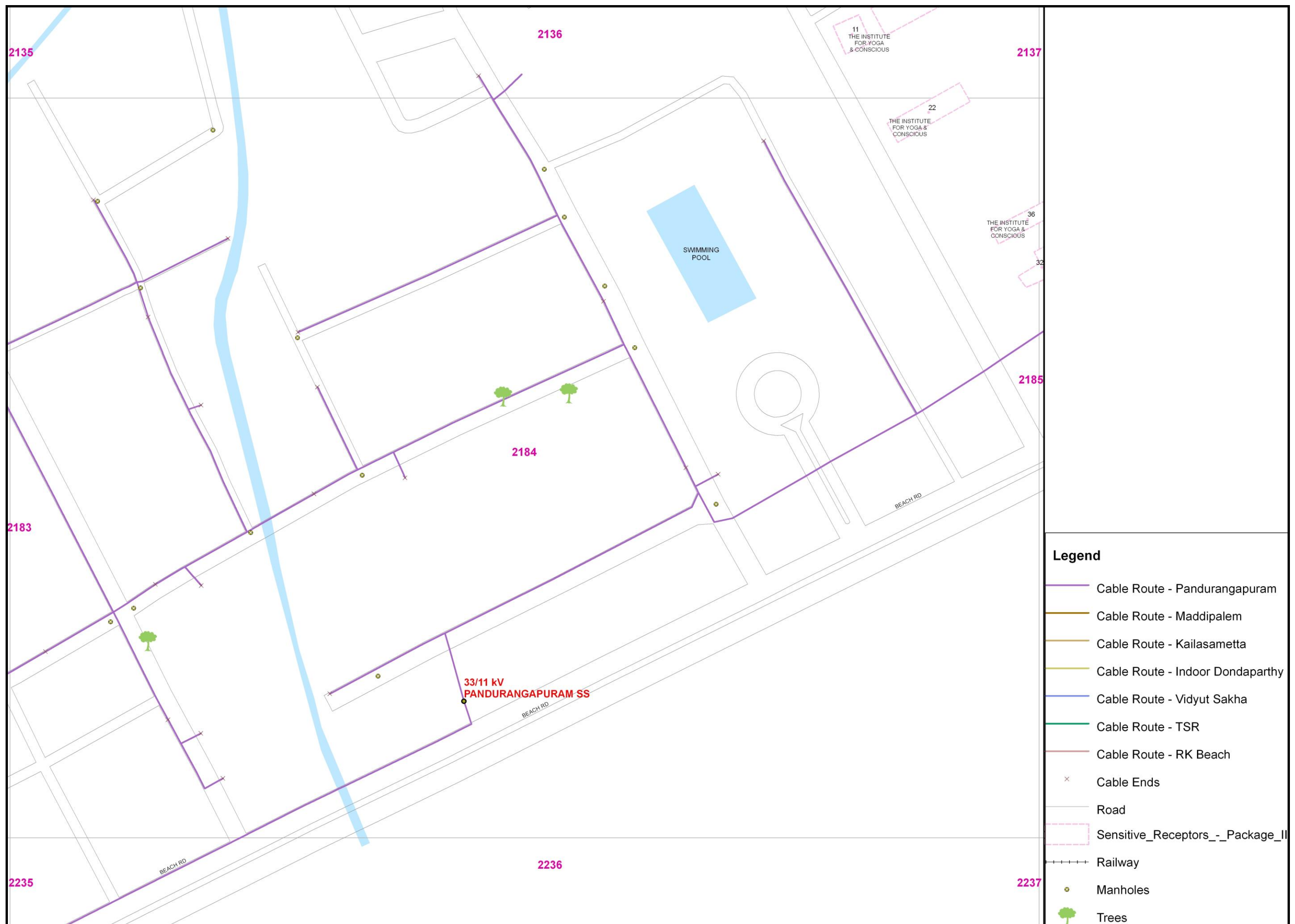
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



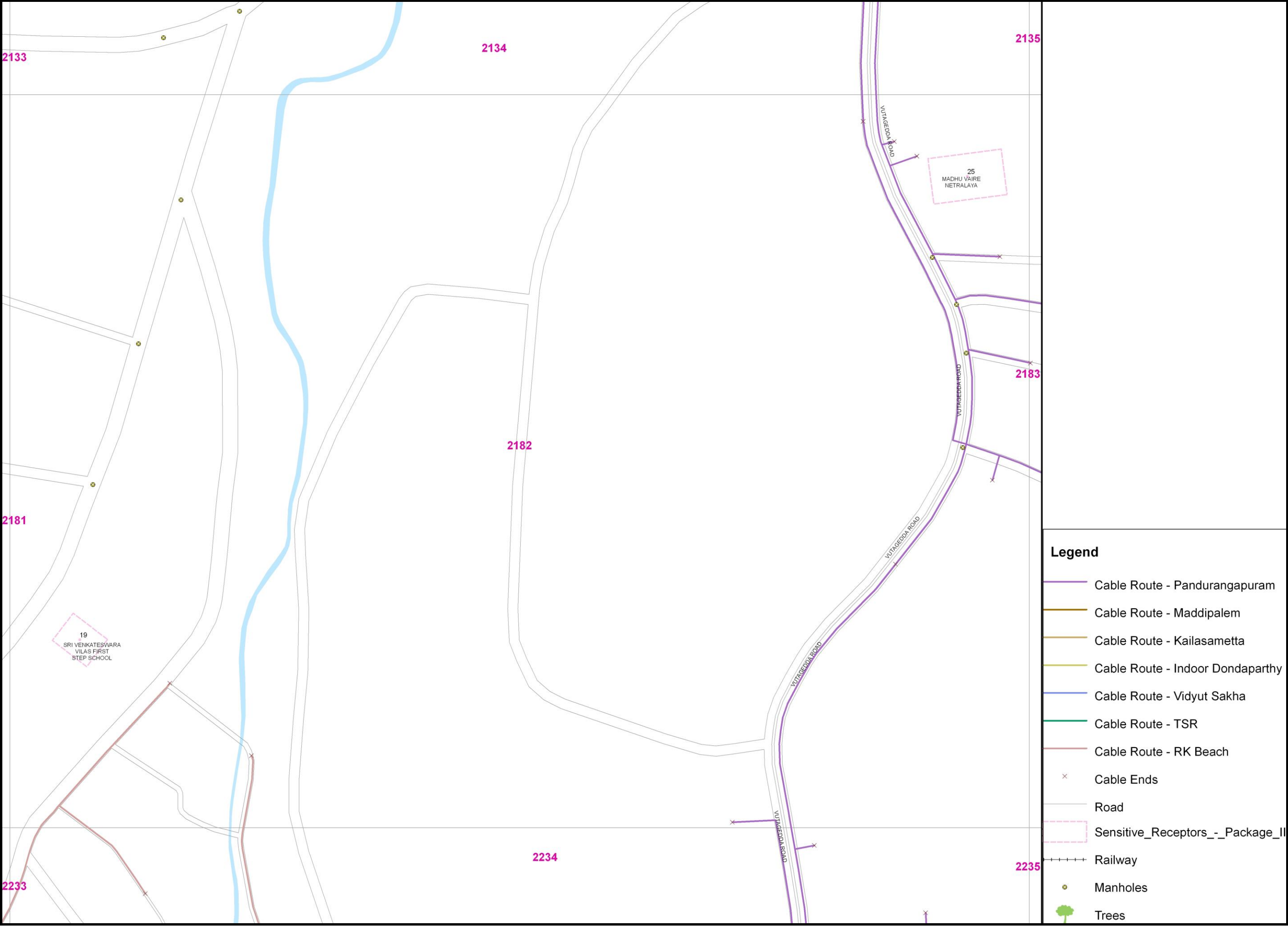
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



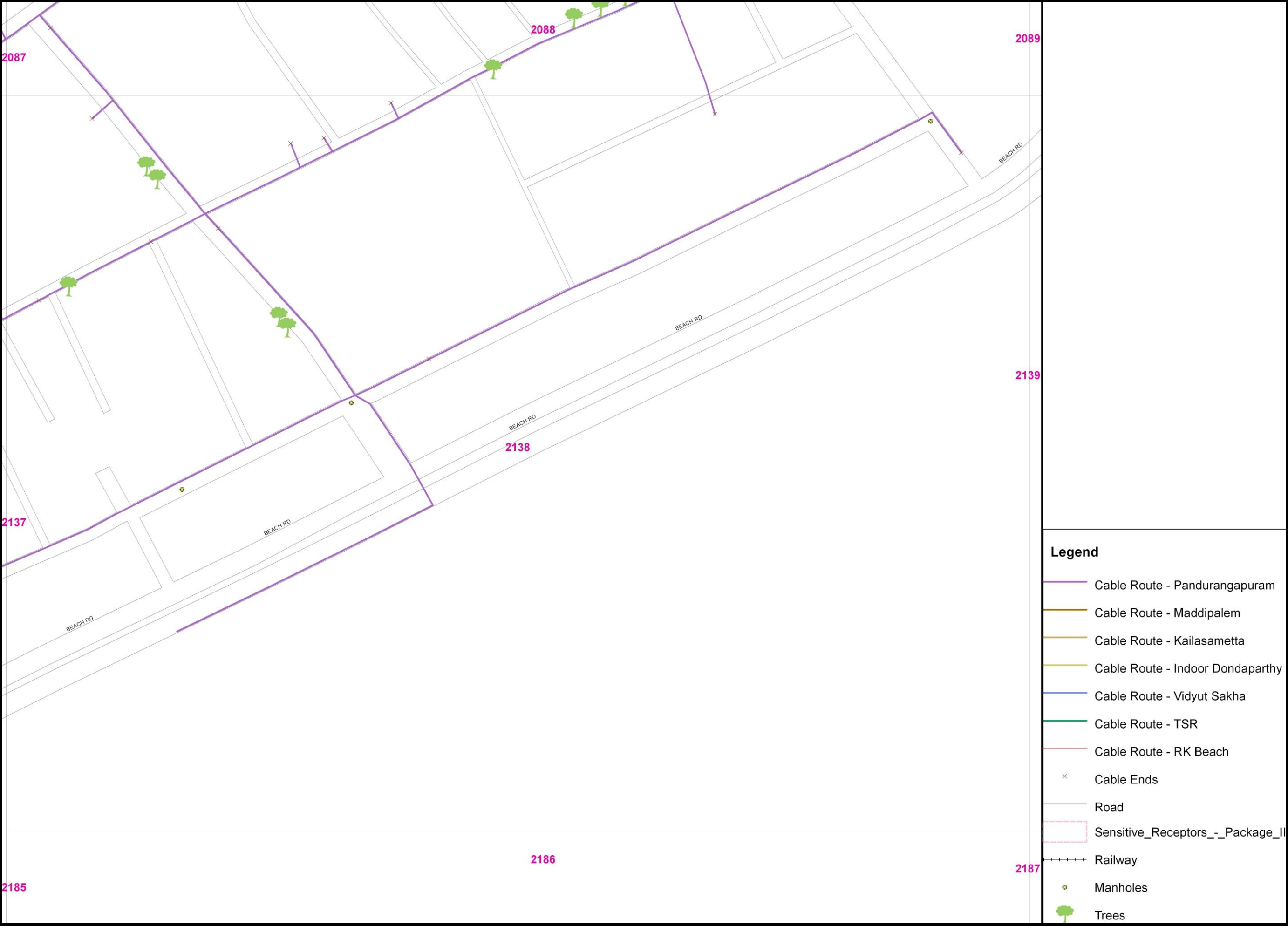
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



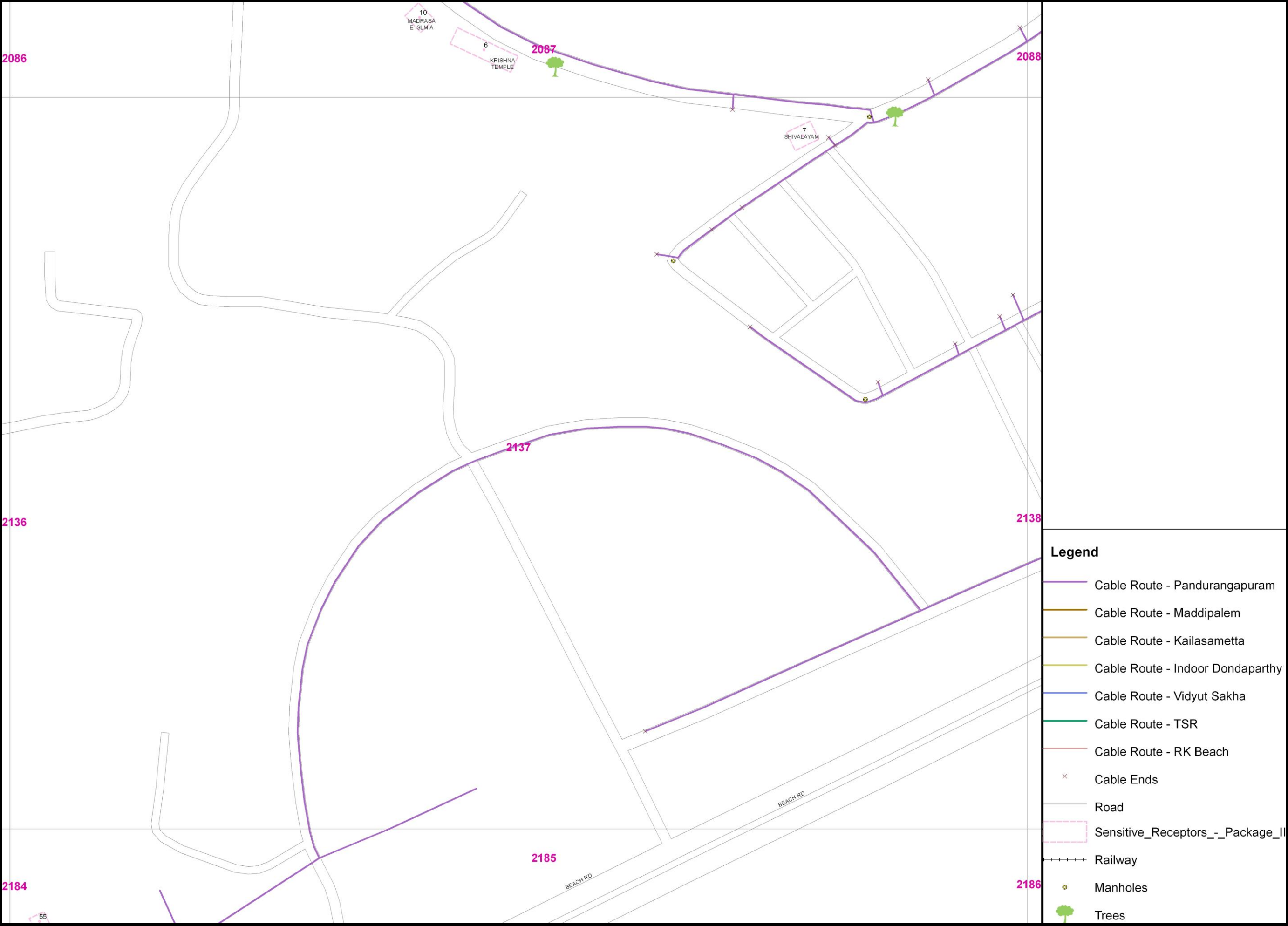
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



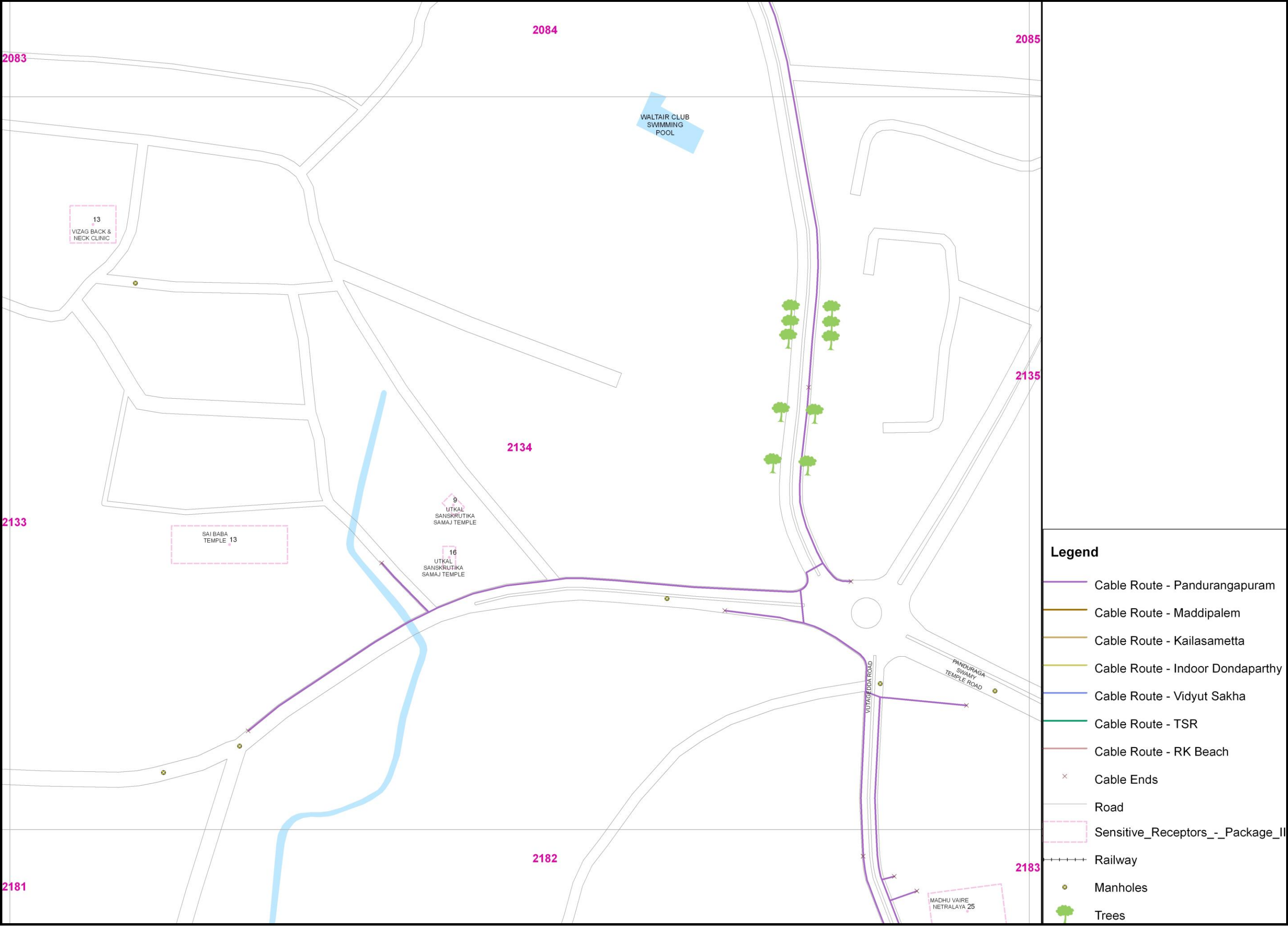
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



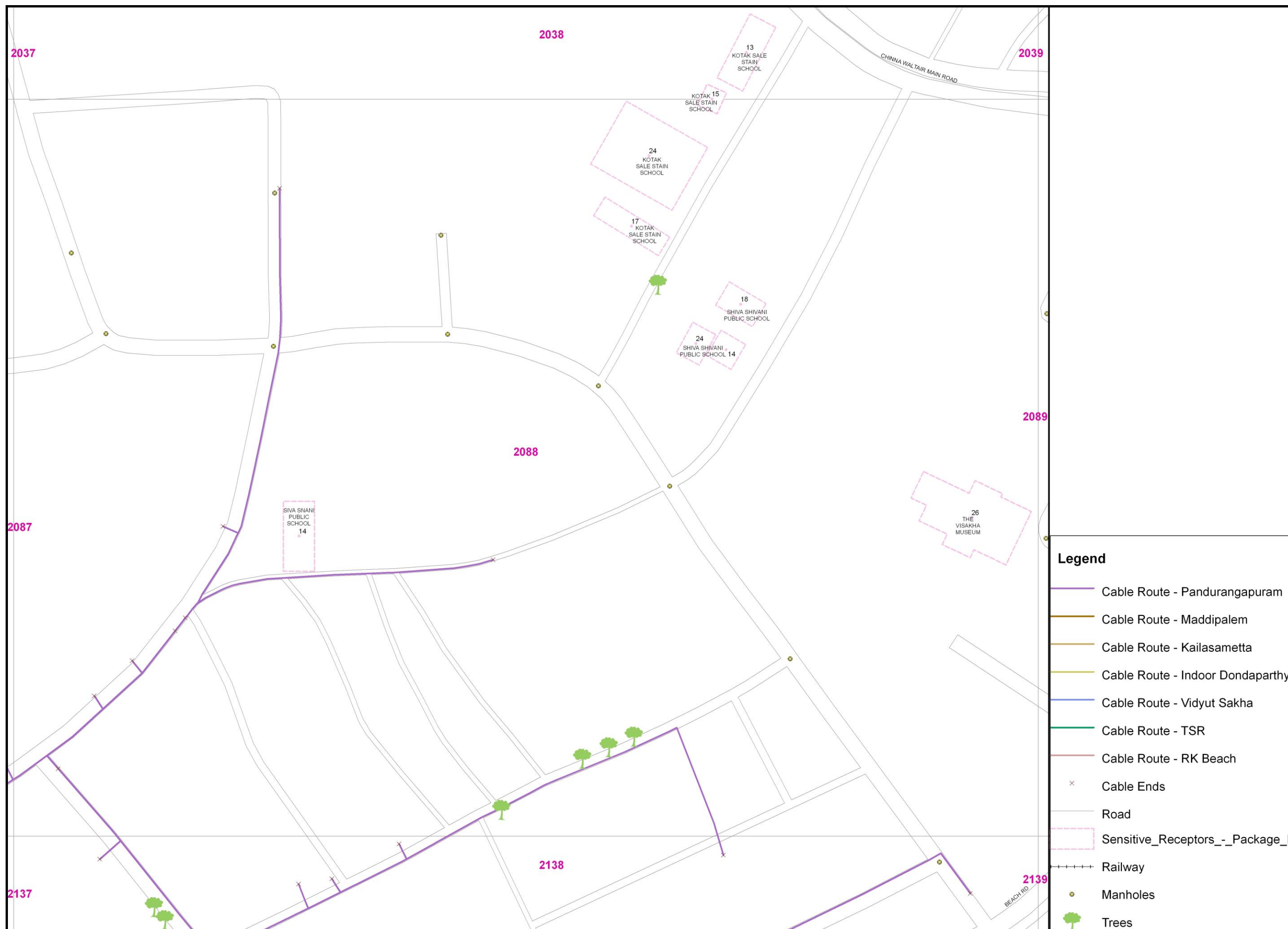
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



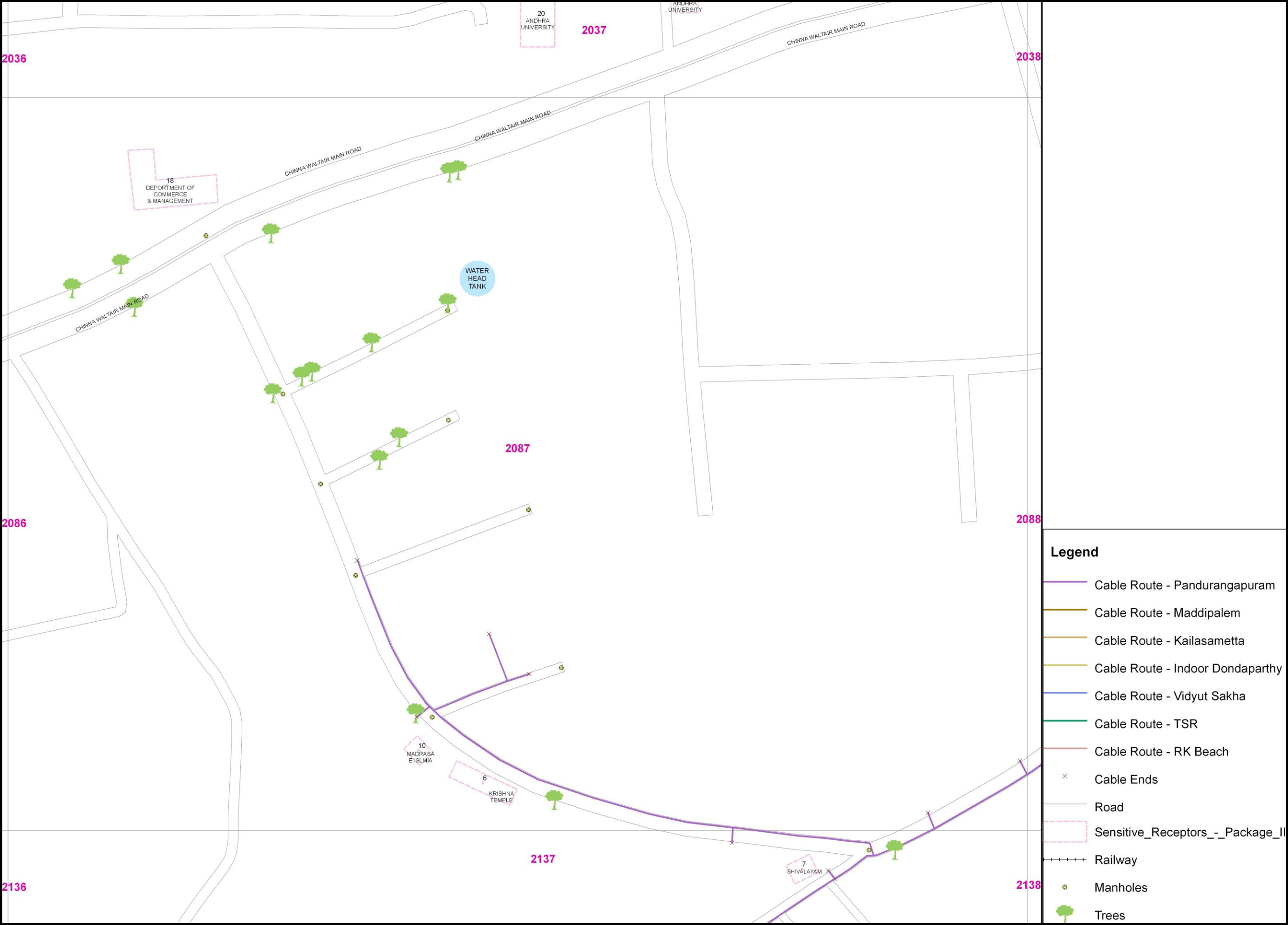
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



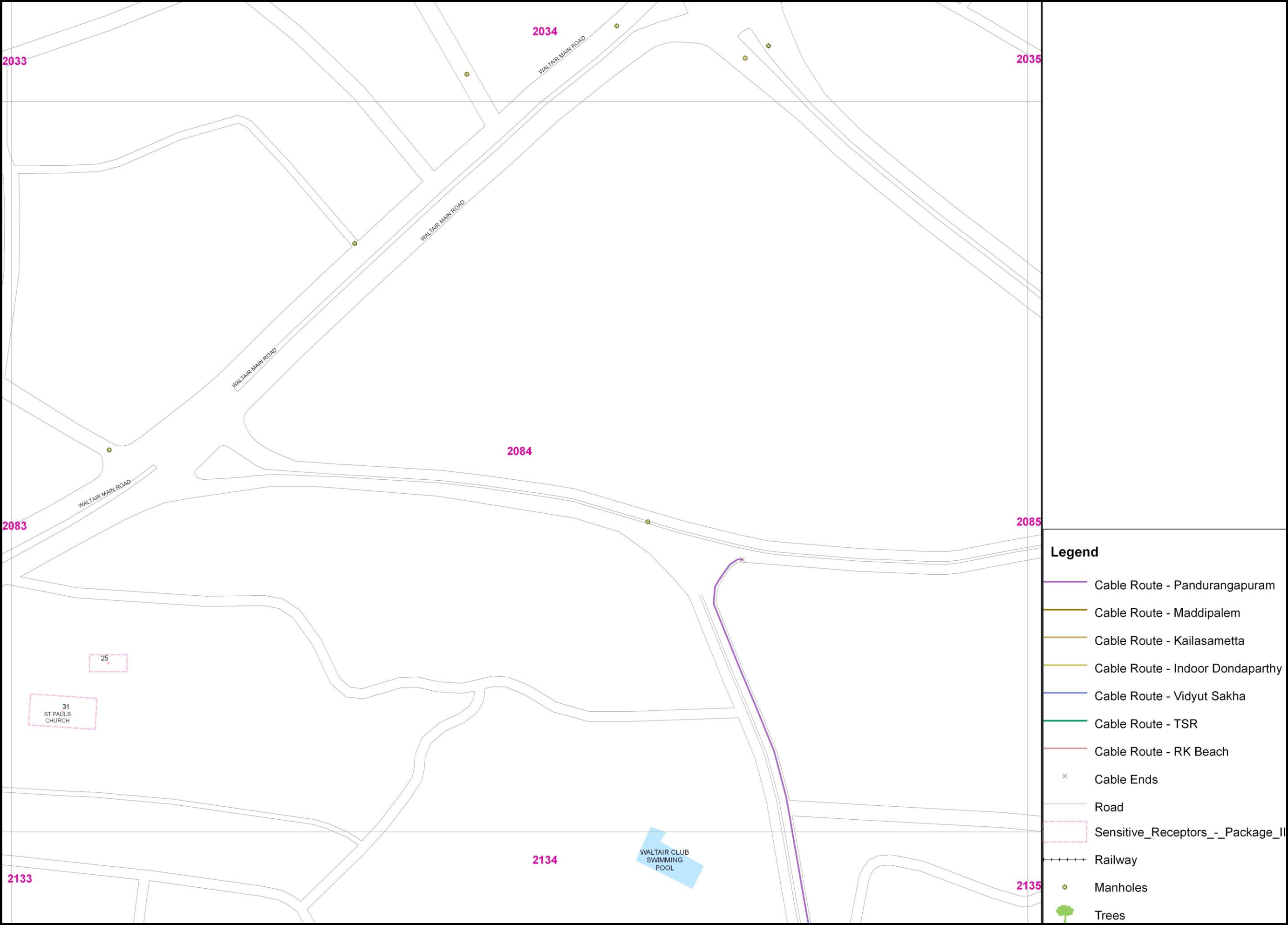
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



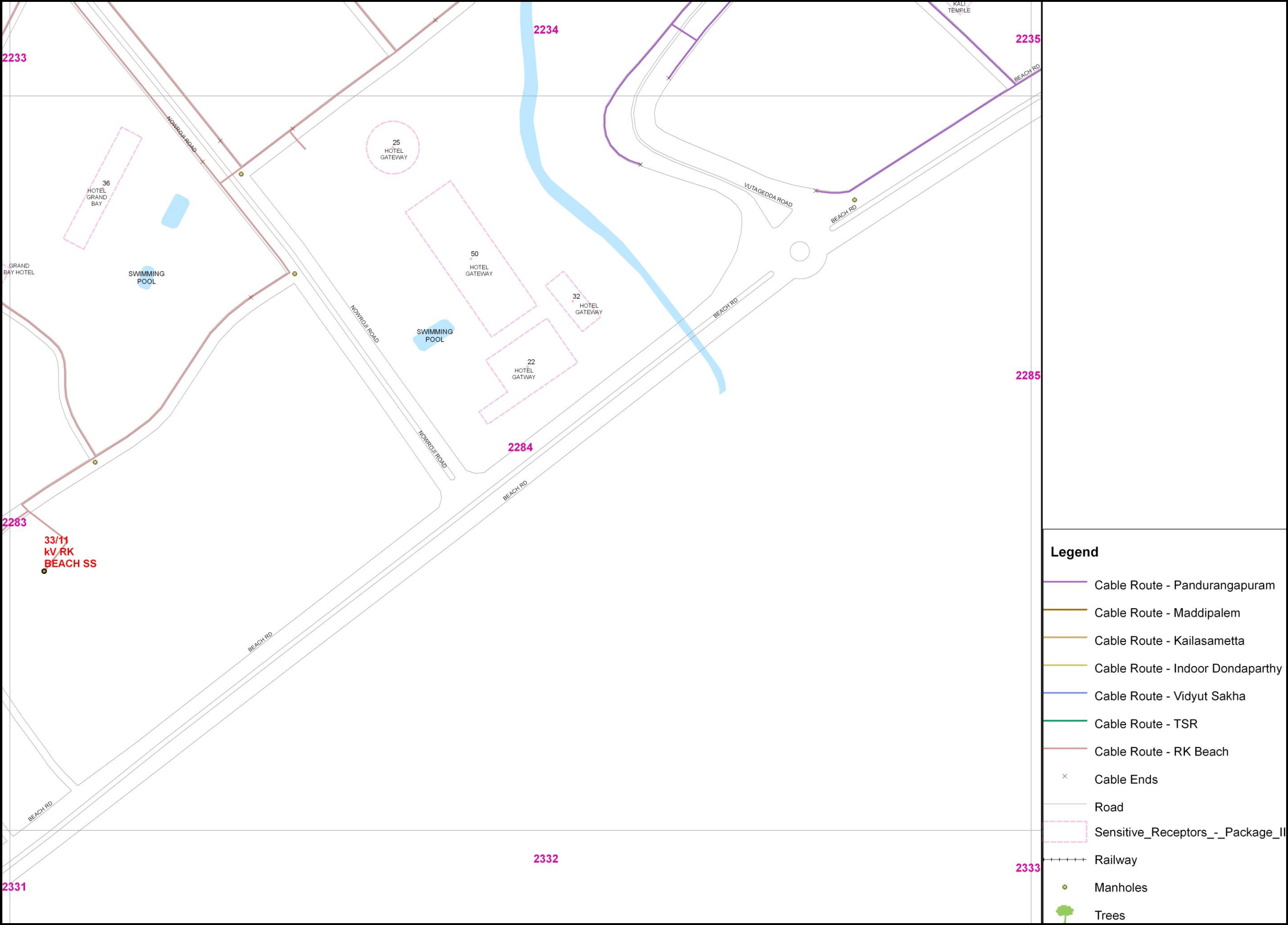
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area

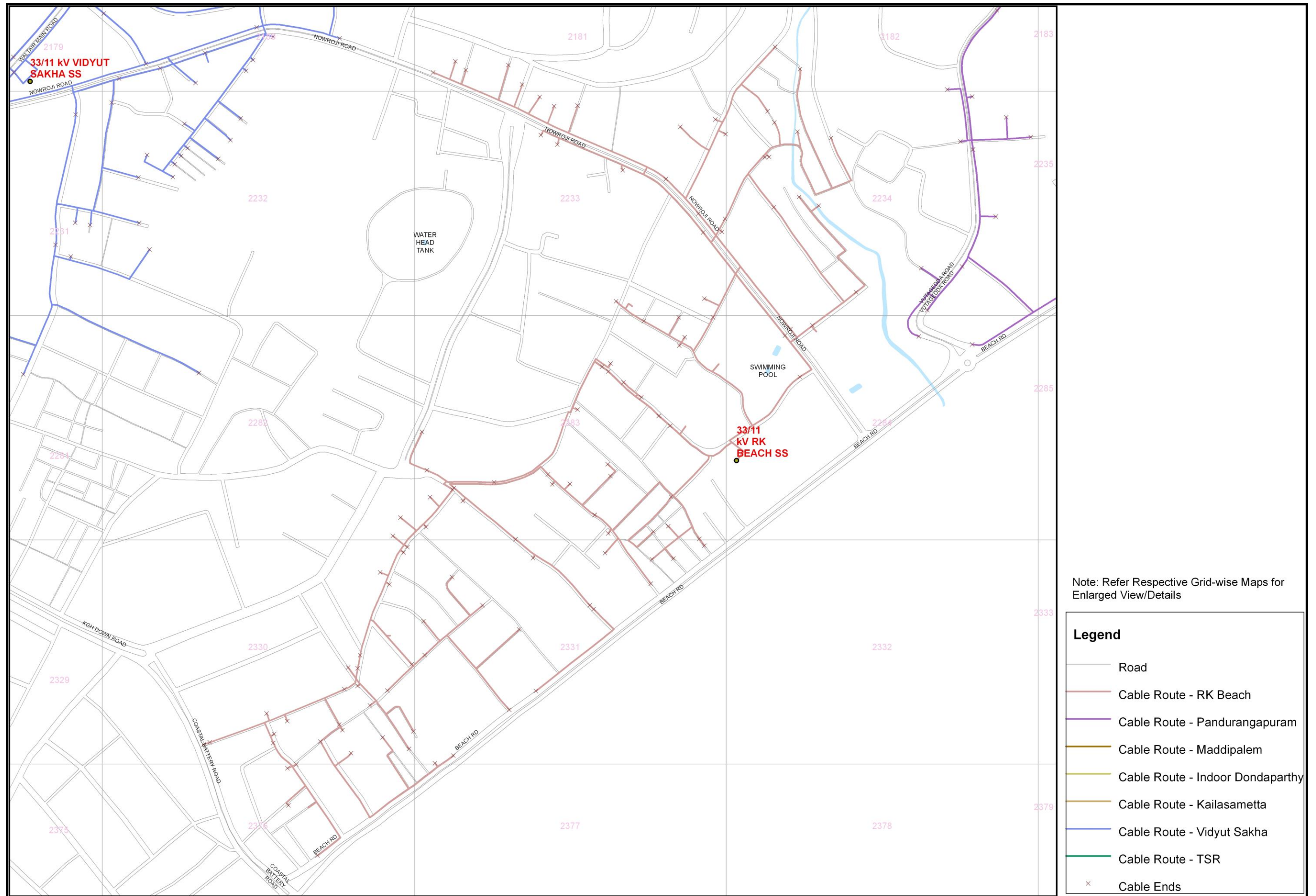


REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within Pandurangapuram Substation Area

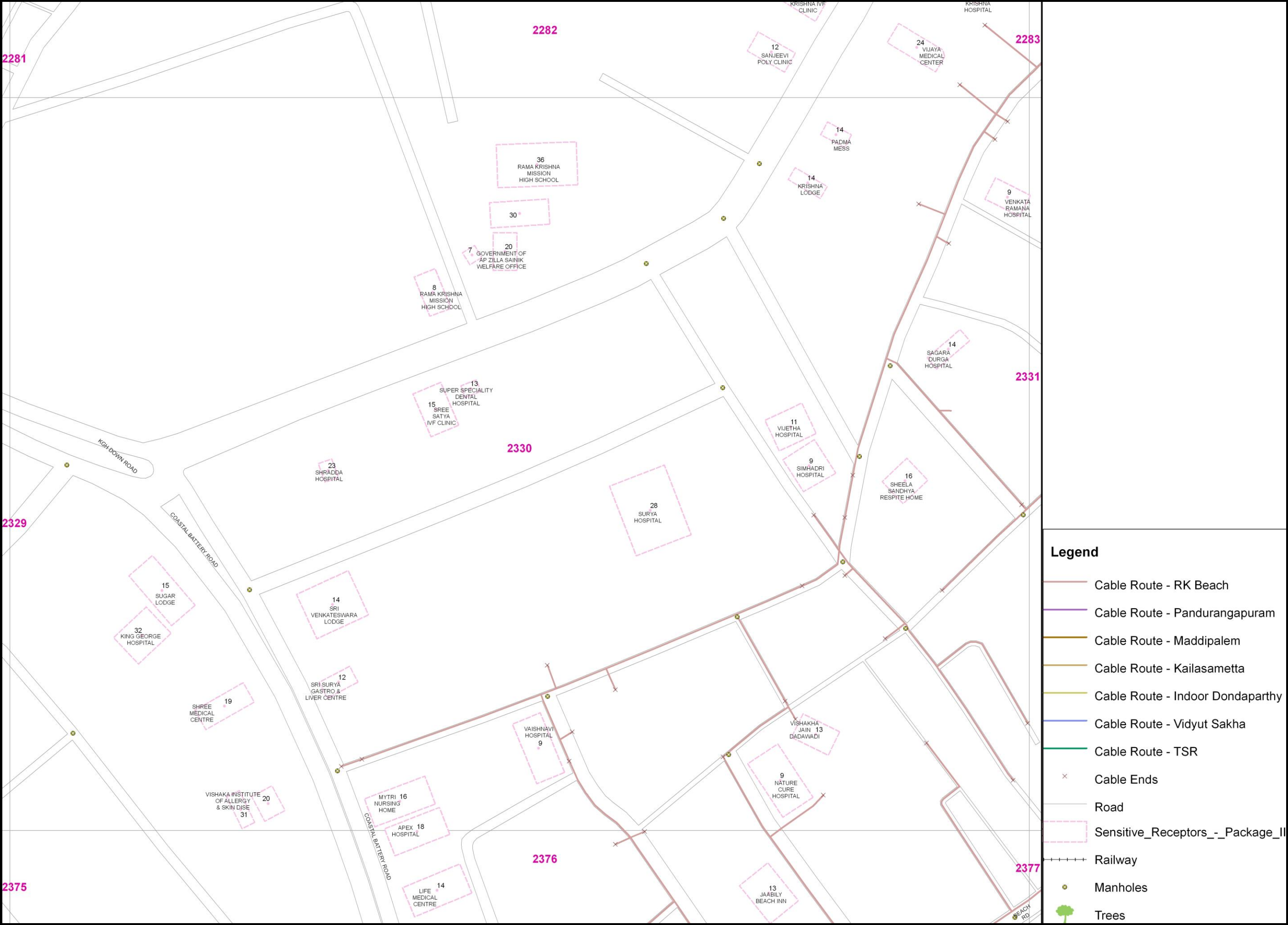
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within RK Beach Substation Area



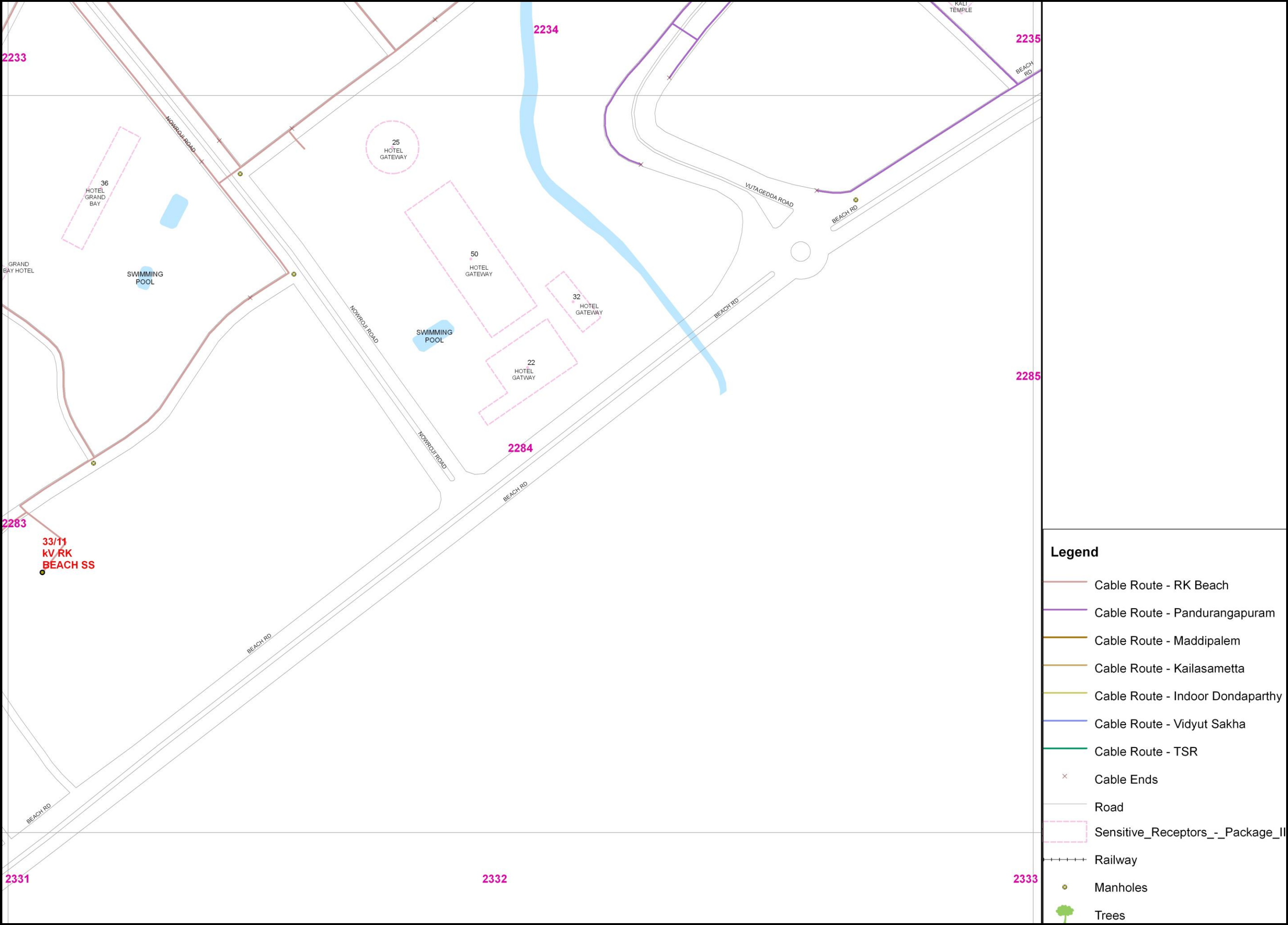
REN/UG Cable Route Alignment within RK Beach Substation Area



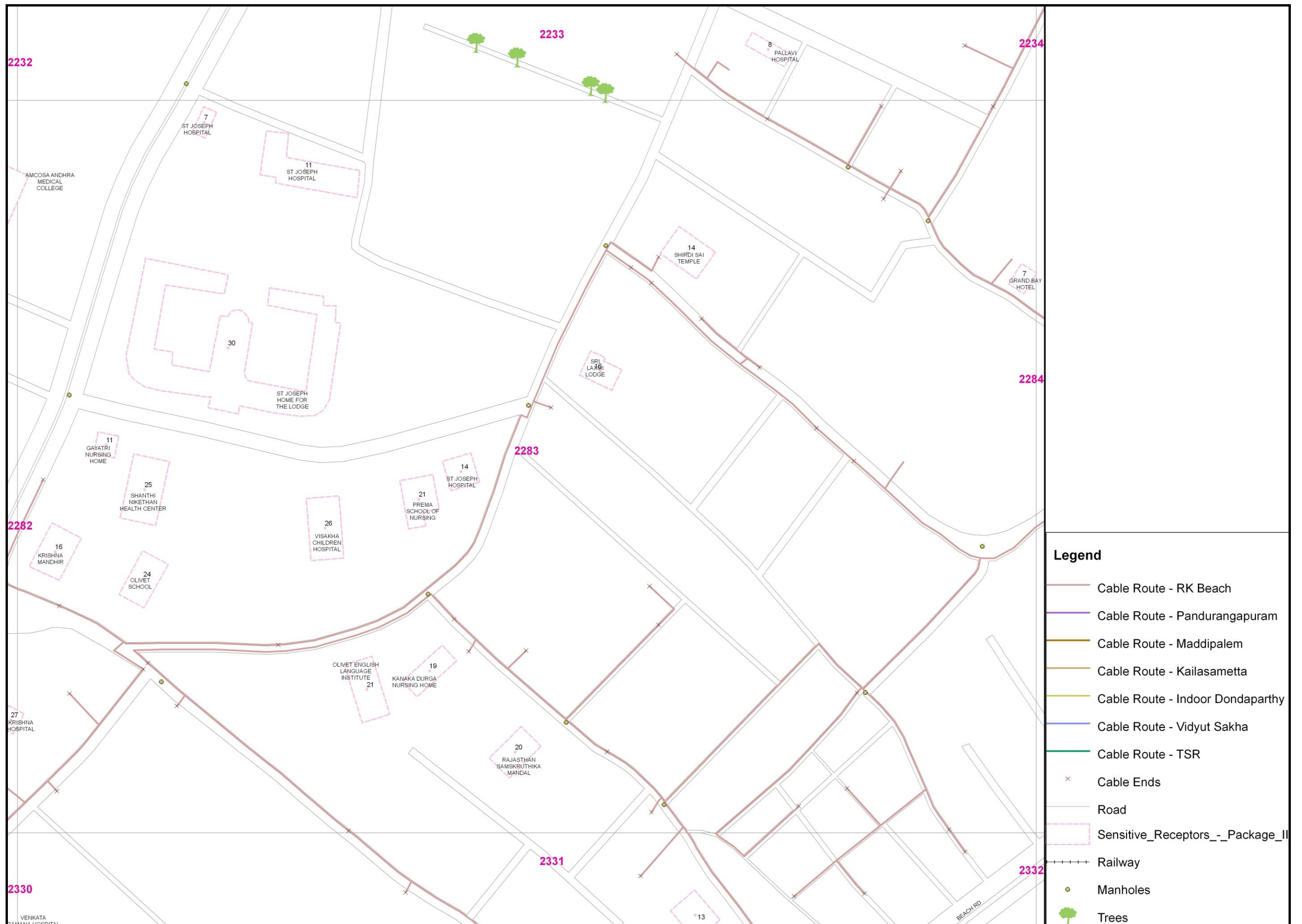
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within RK Beach Substation Area



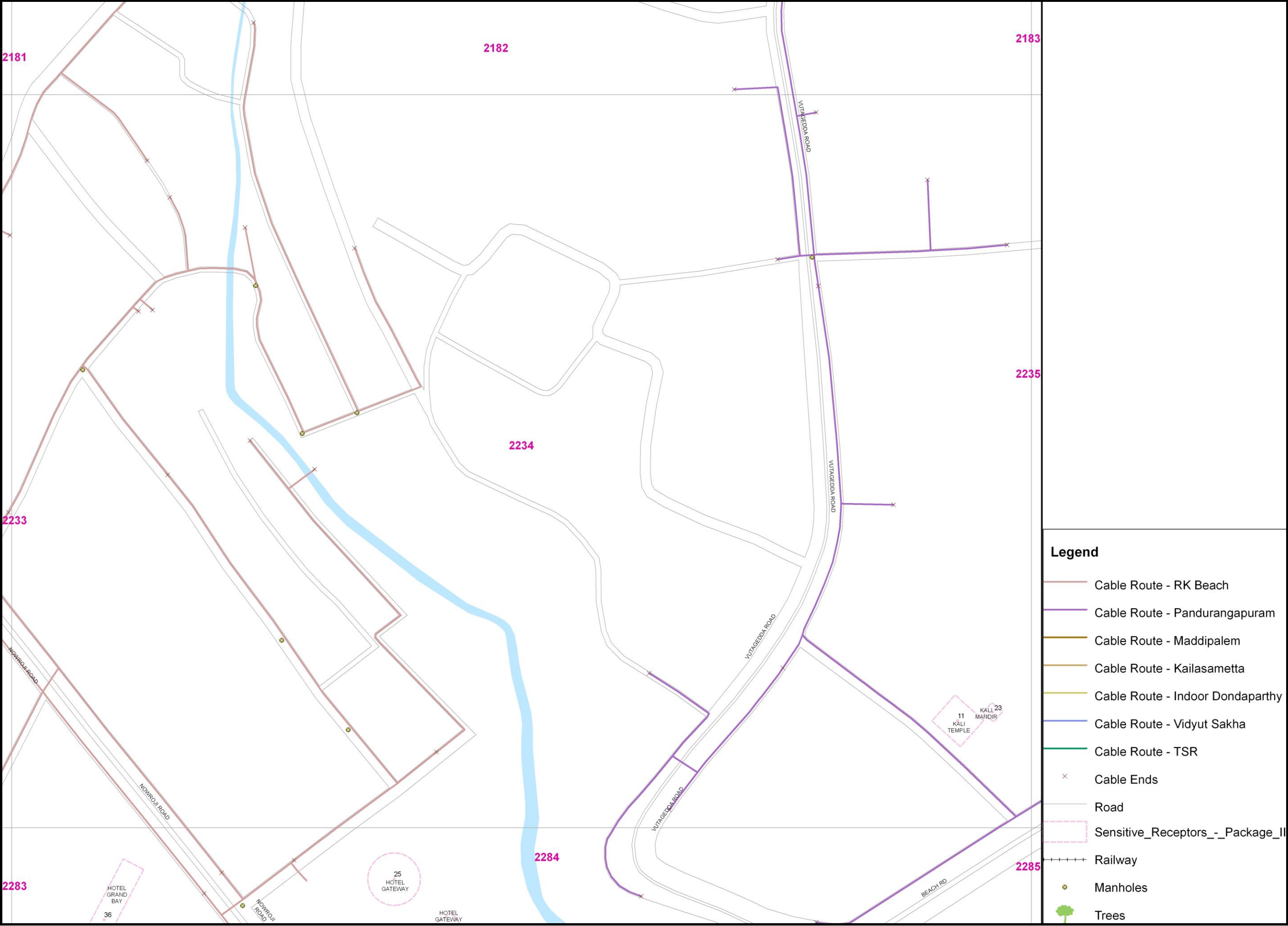
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within RK Beach Substation Area



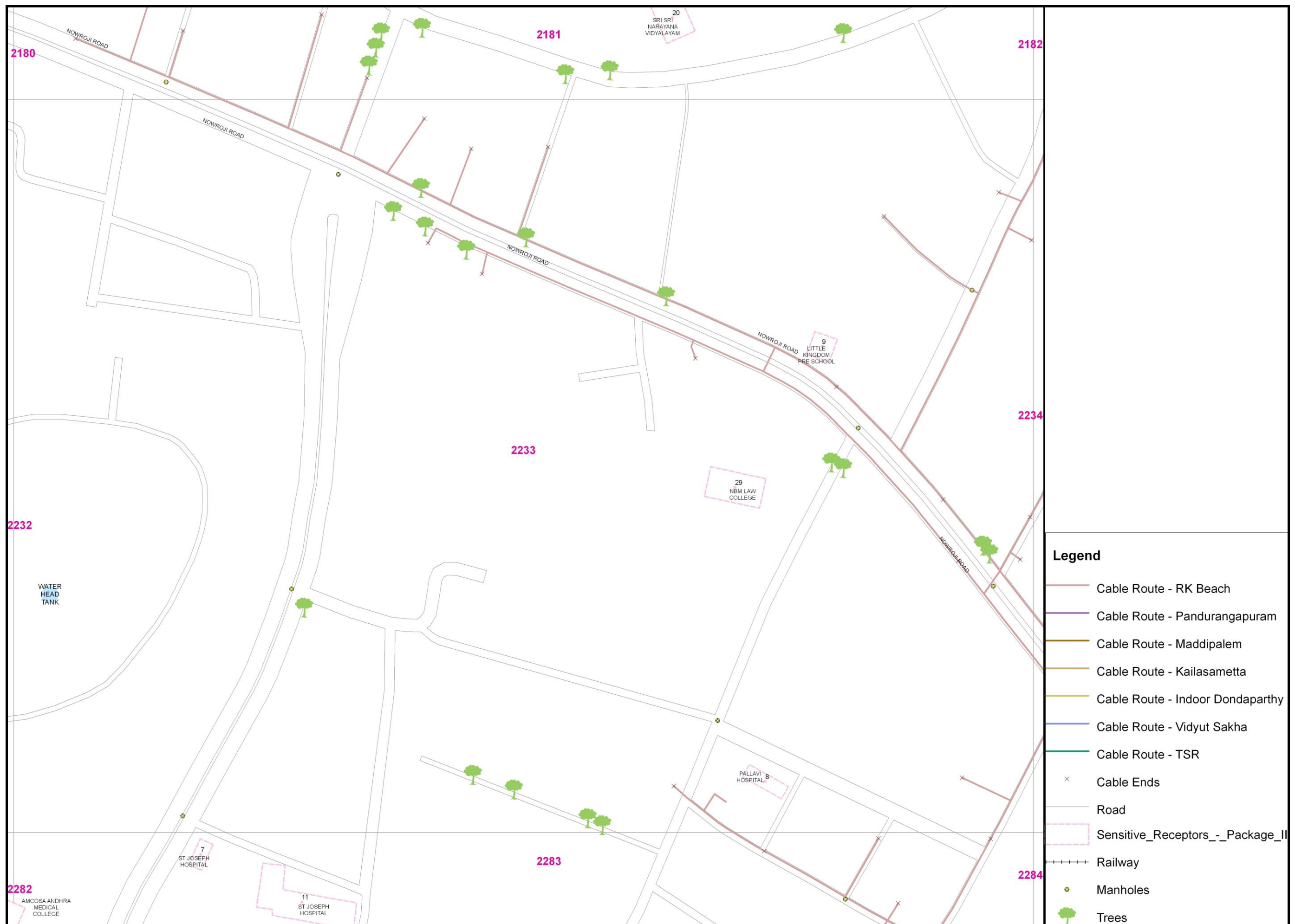
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within RK Beach Substation Area



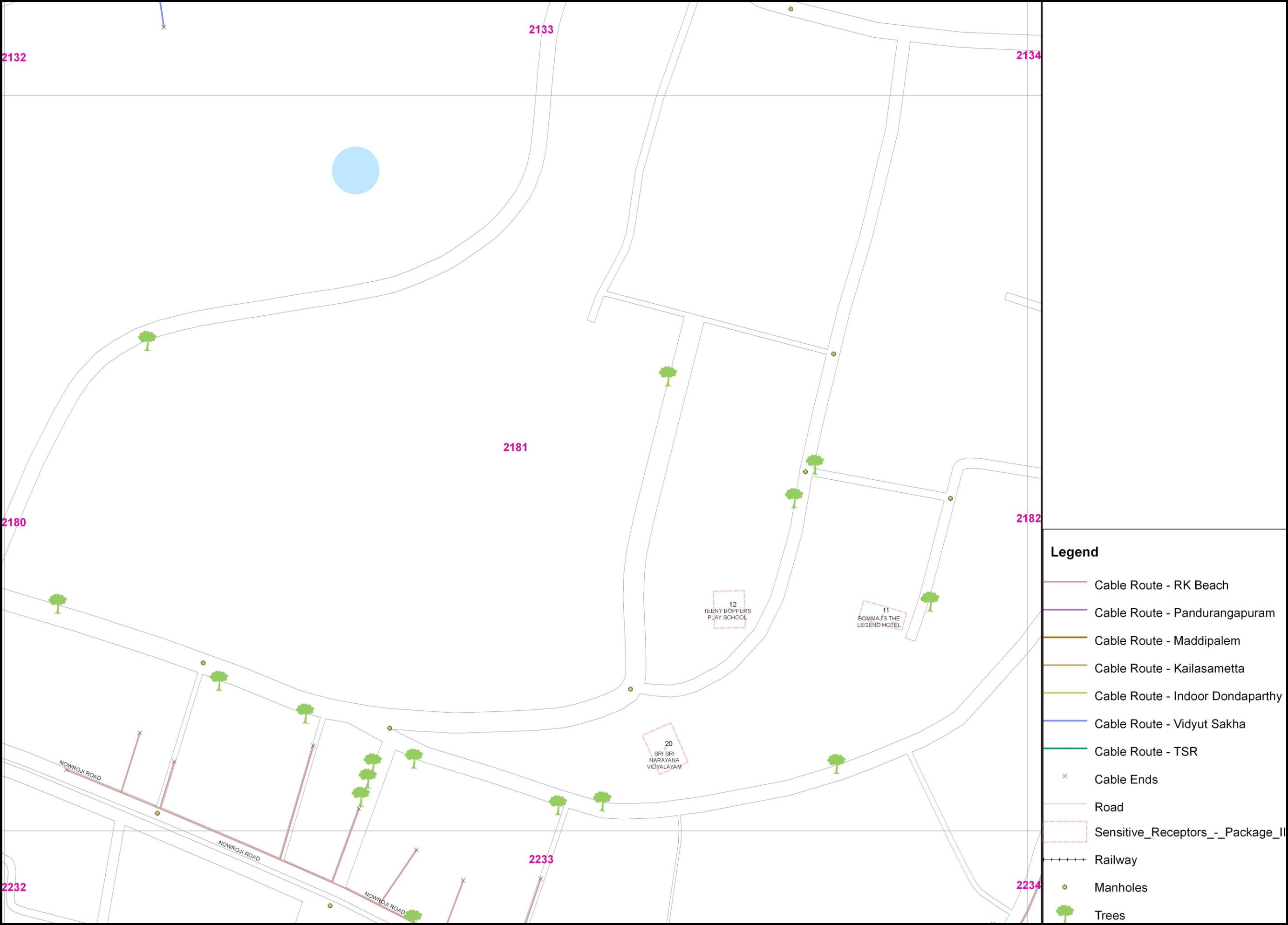
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within RK Beach Substation Area



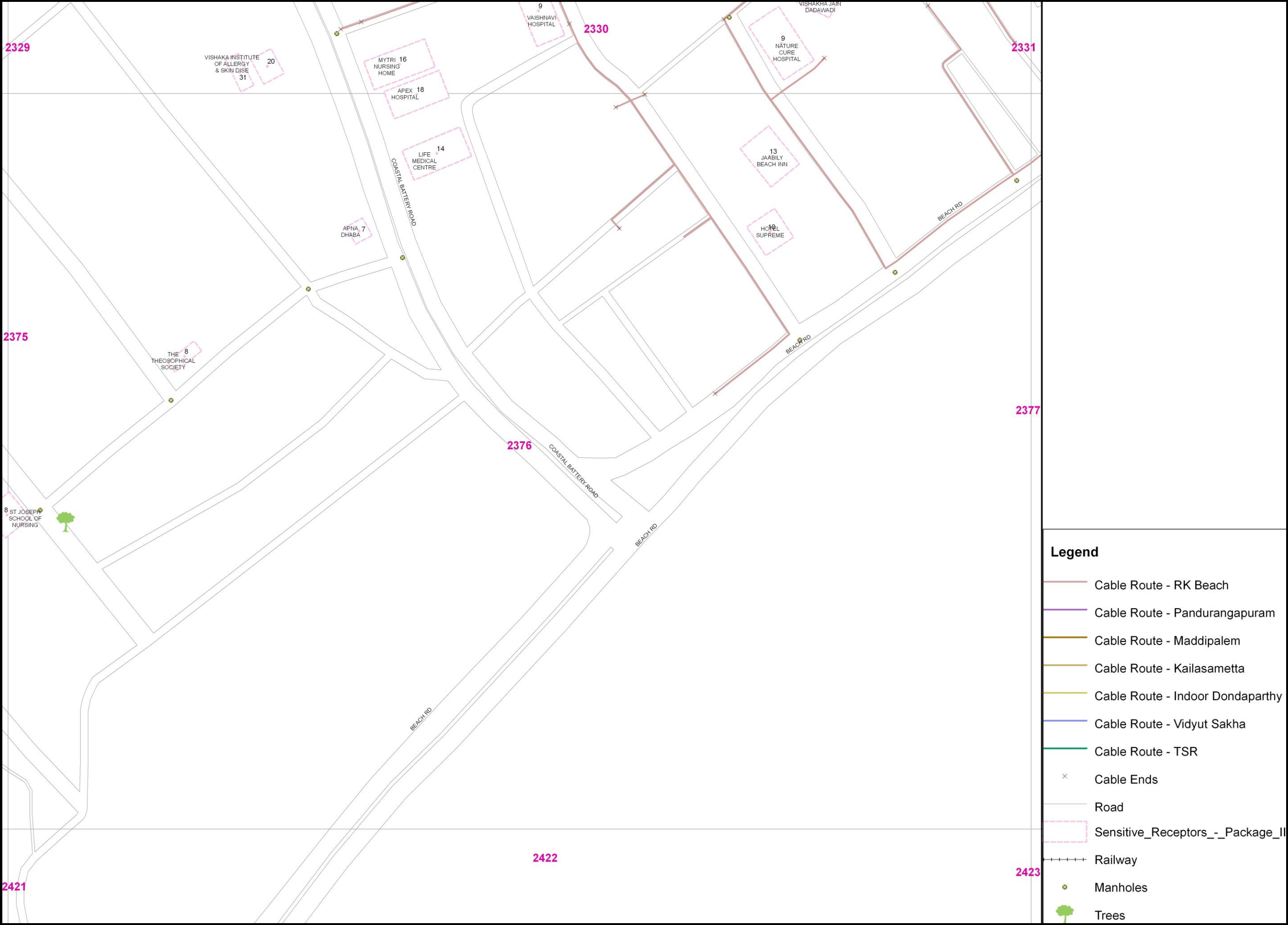
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within RK Beach Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within RK Beach Substation Area

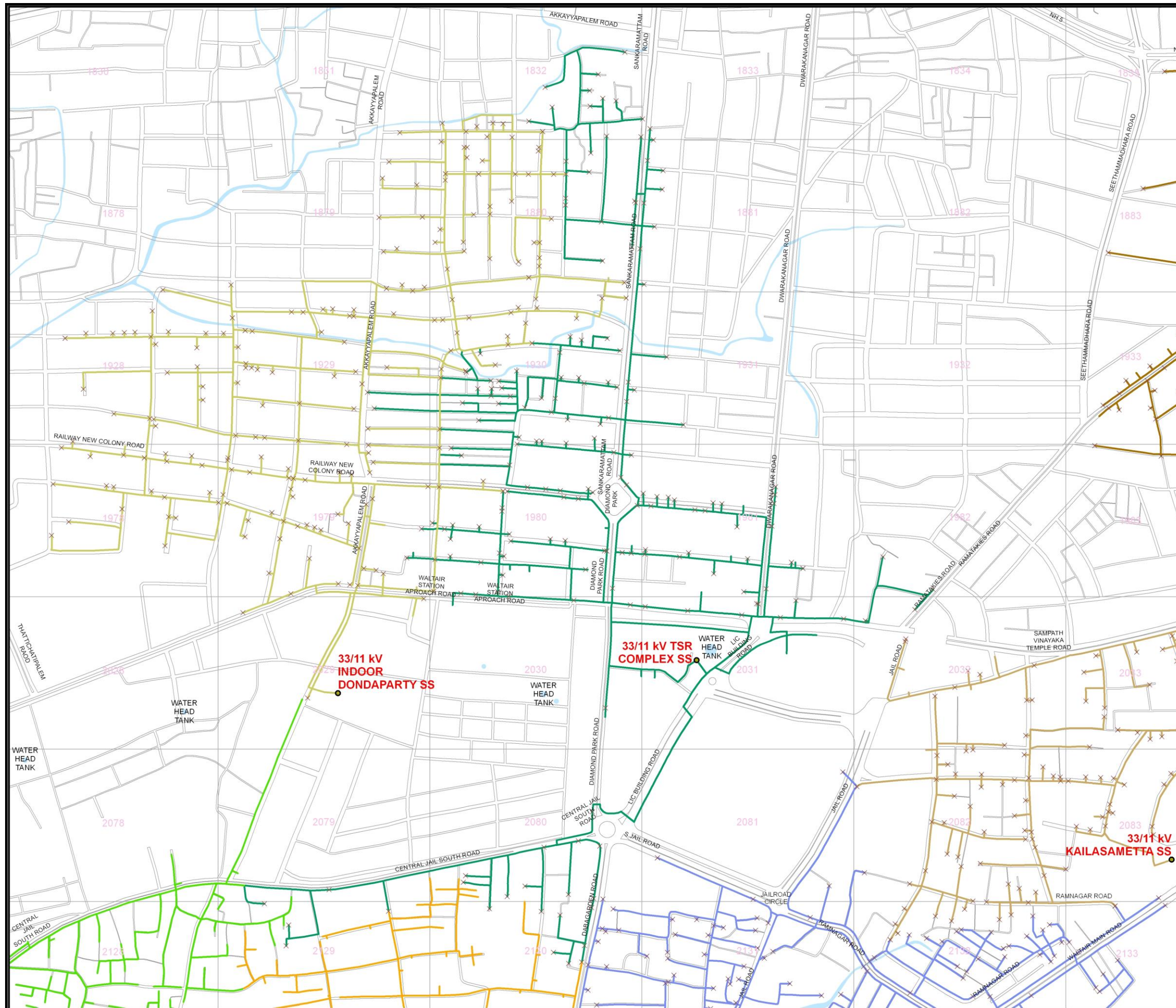


REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within RK Beach Substation Area



REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within RK Beach Substation Area

REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within TSR Complex Substation Area

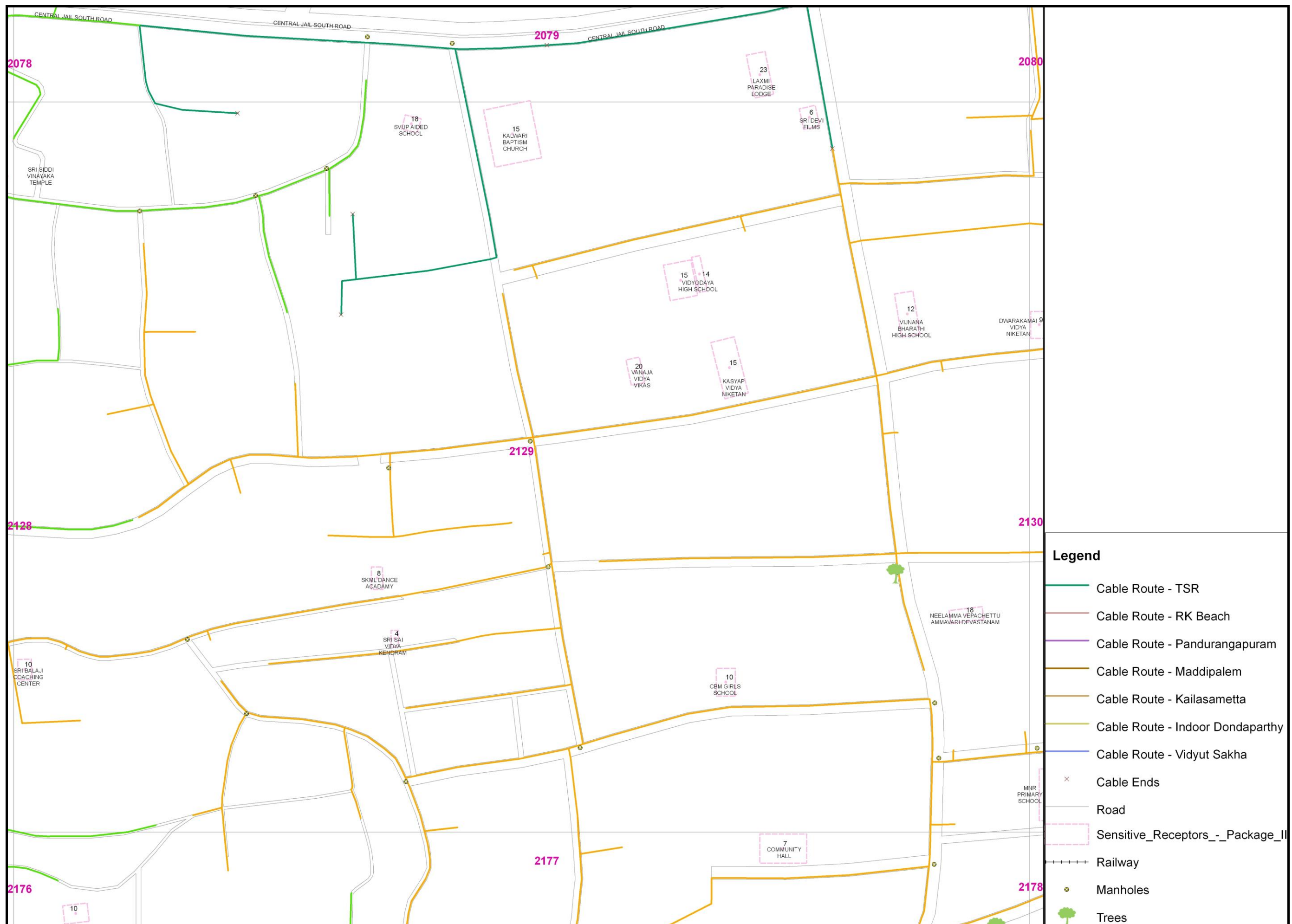


Note: Refer Respective Grid-wise Maps for Enlarged View/Details

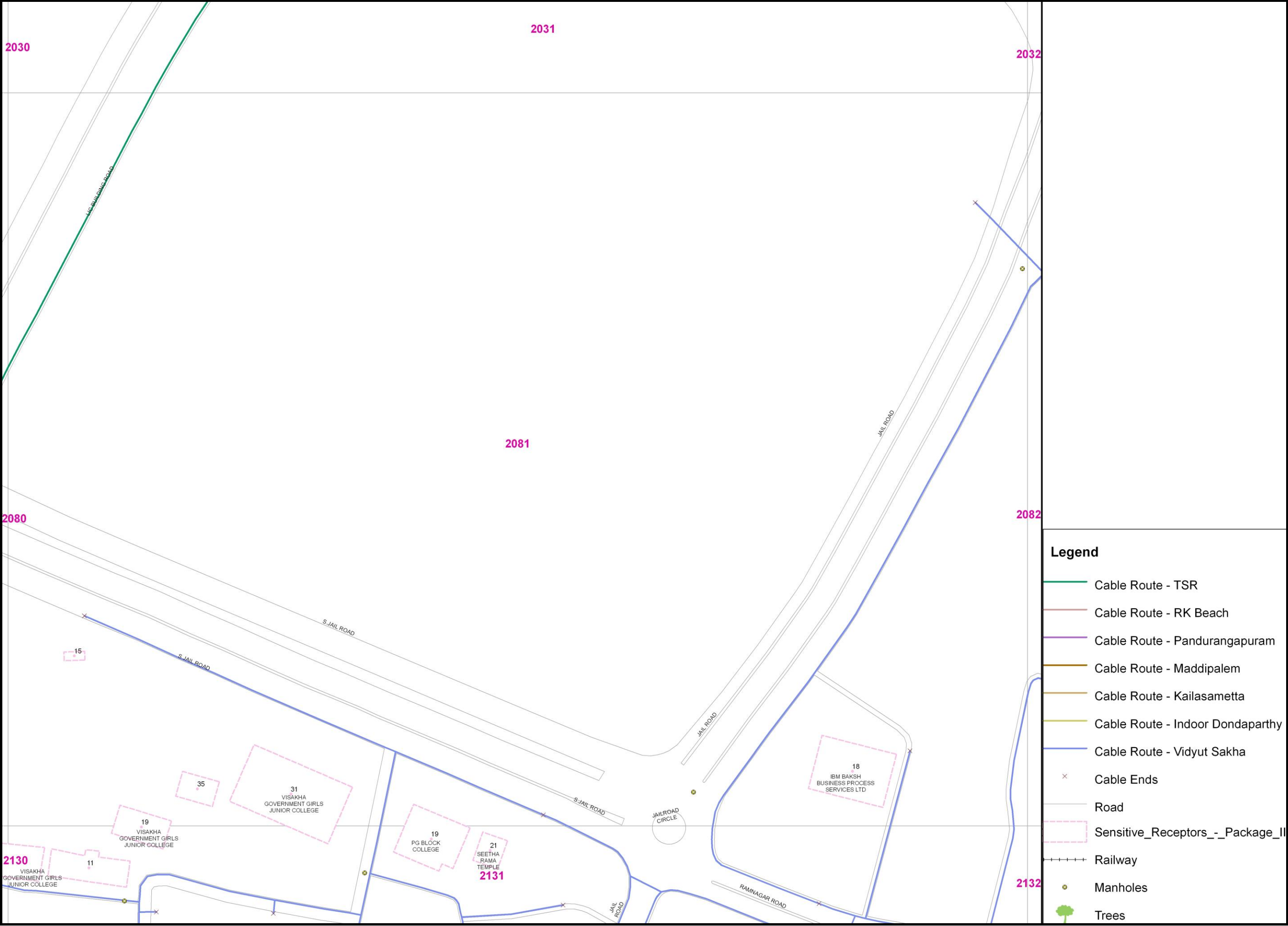
Legend

- Road
- Cable Route - TSR
- Cable Route - RK Beach
- Cable Route - Pandurangapuram
- Cable Route - Maddipalem
- Cable Route - Indoor Dondaparthi
- Cable Route - Kailasametta
- Cable Route - Vidyut Sakha
- × Cable Ends

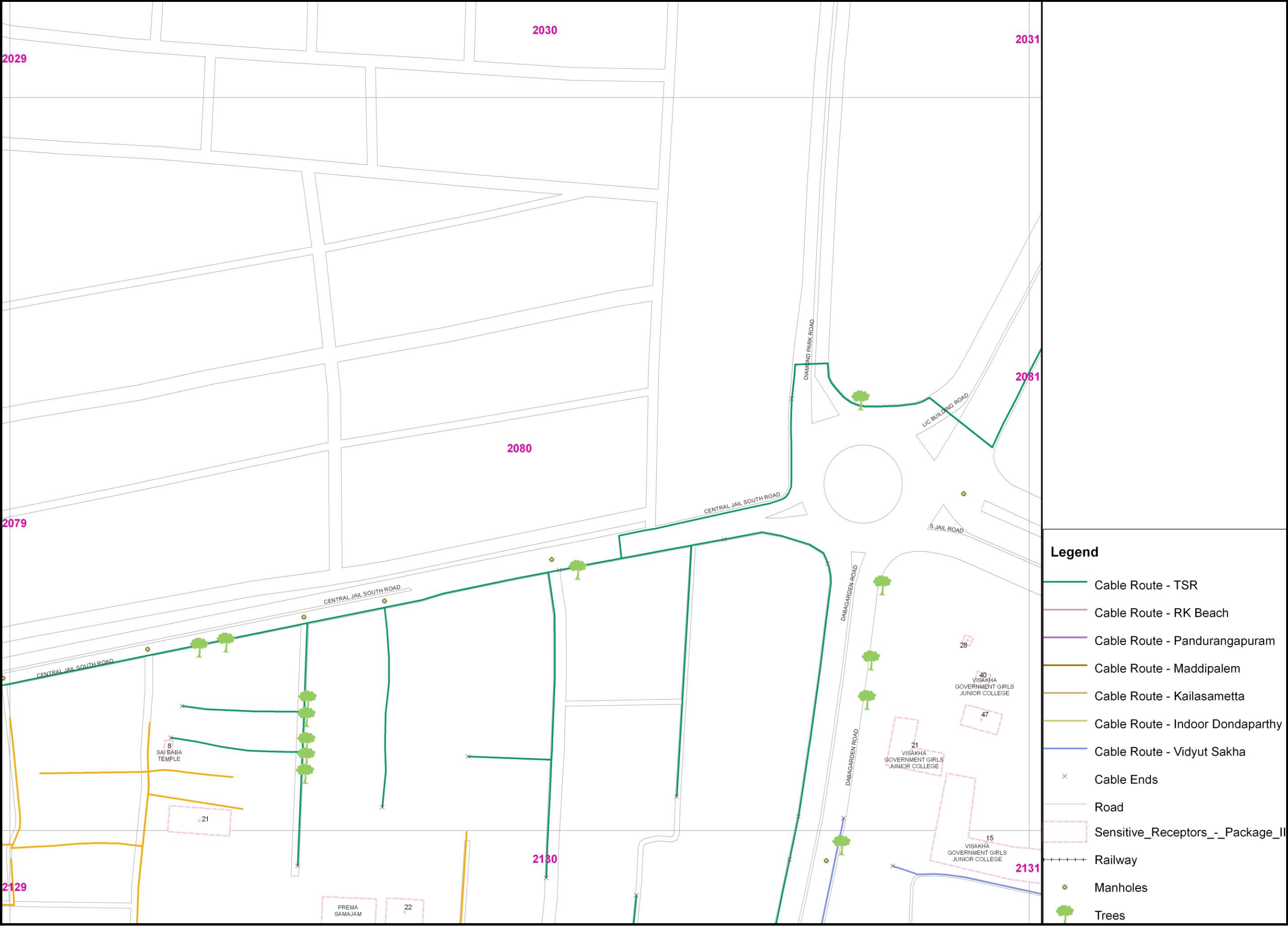
REN/UG Cable Route Alignment within TSR Complex Substation Area



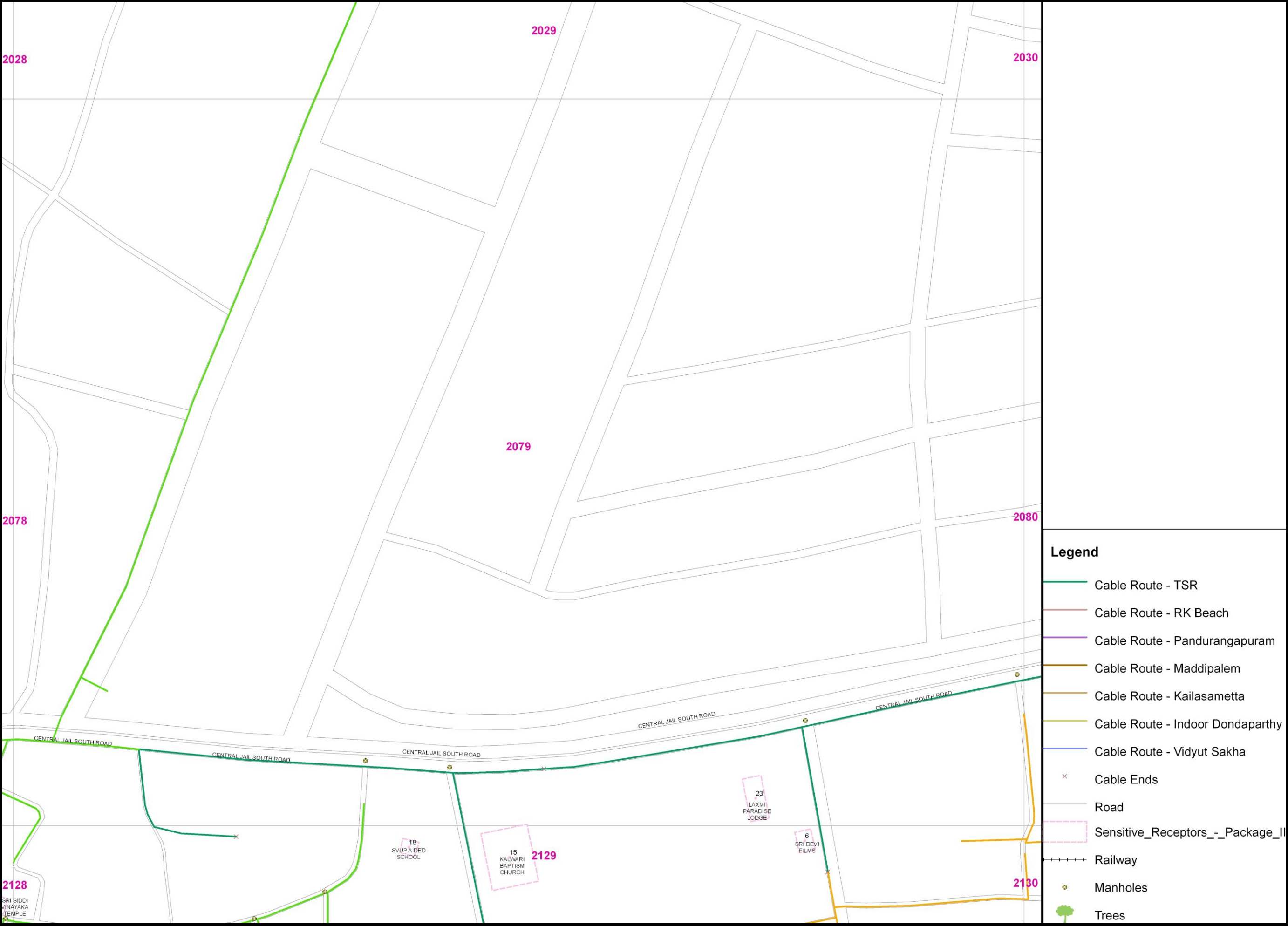
REN/UG Cable Route Alignment Showing Sensitive Receptors & Other Important Features (Grid wise) within TSR Complex Substation Area



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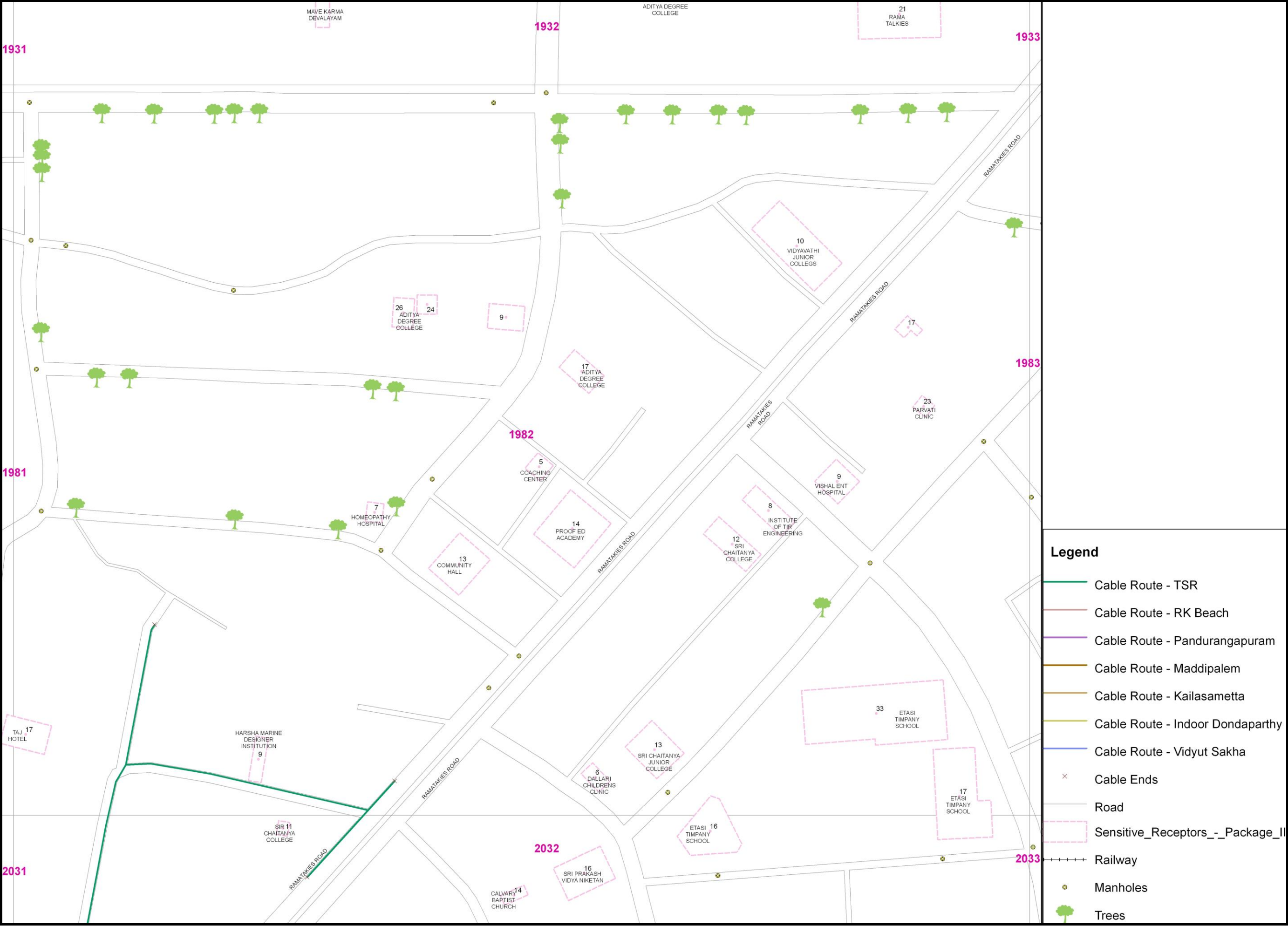
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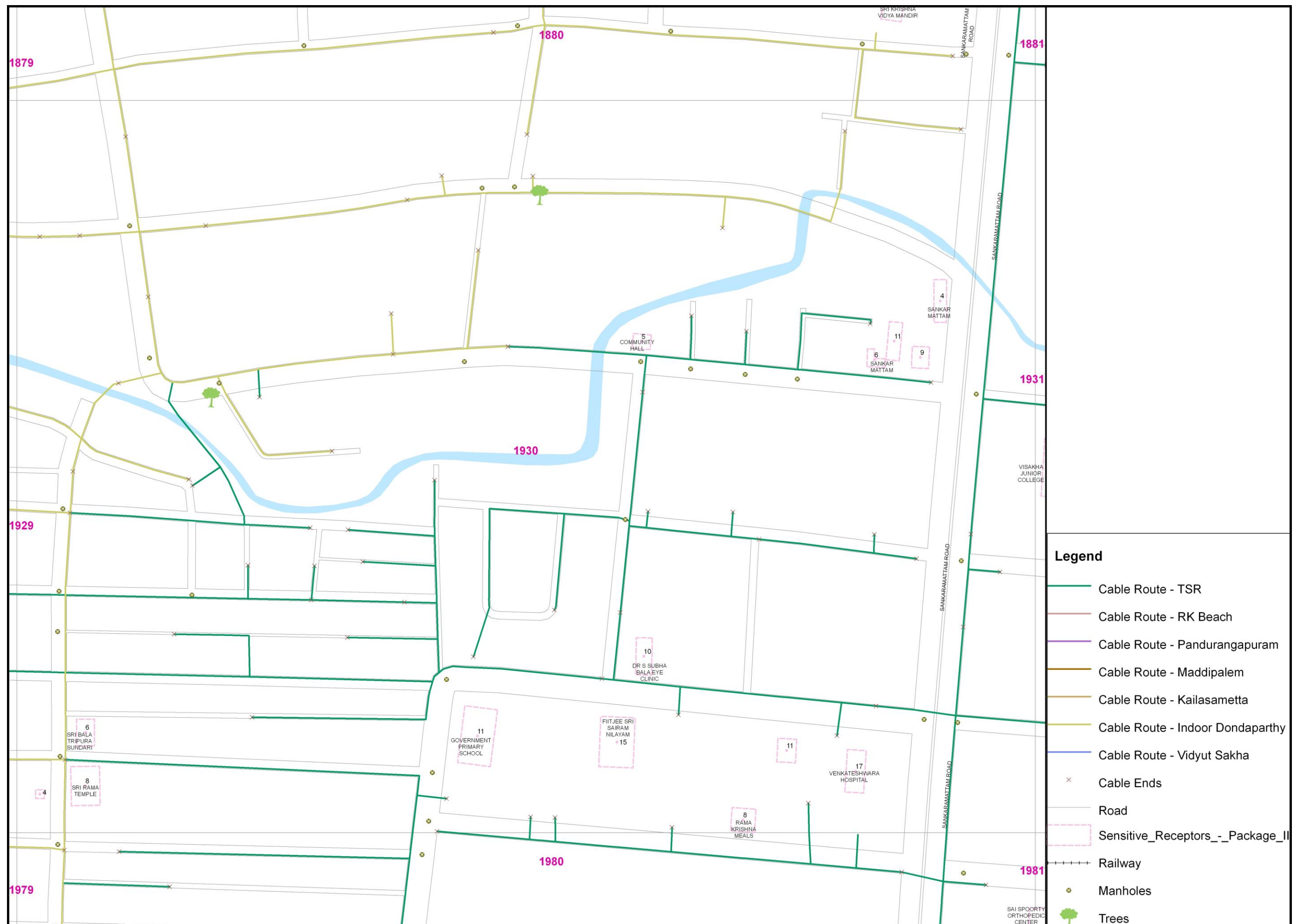
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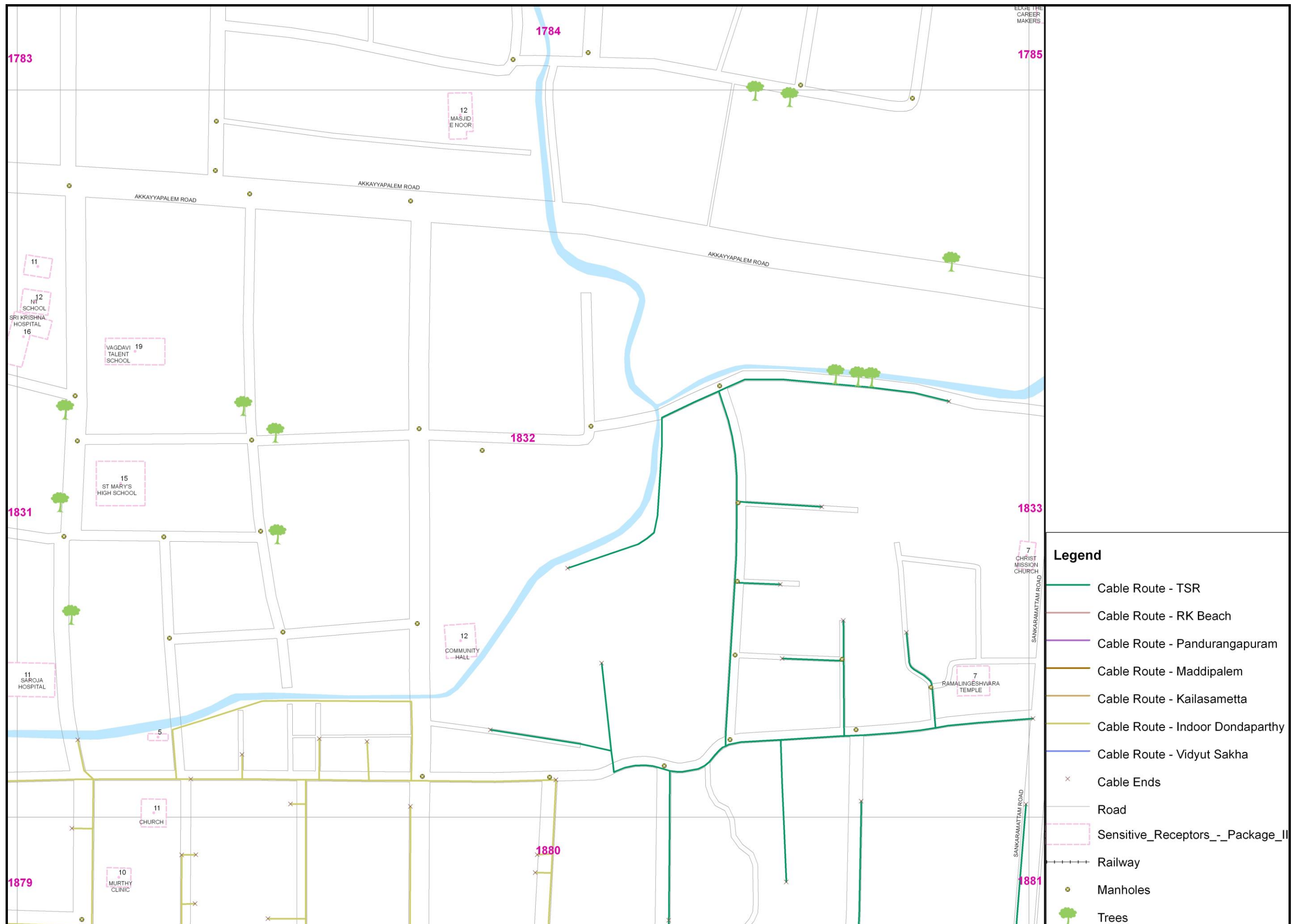
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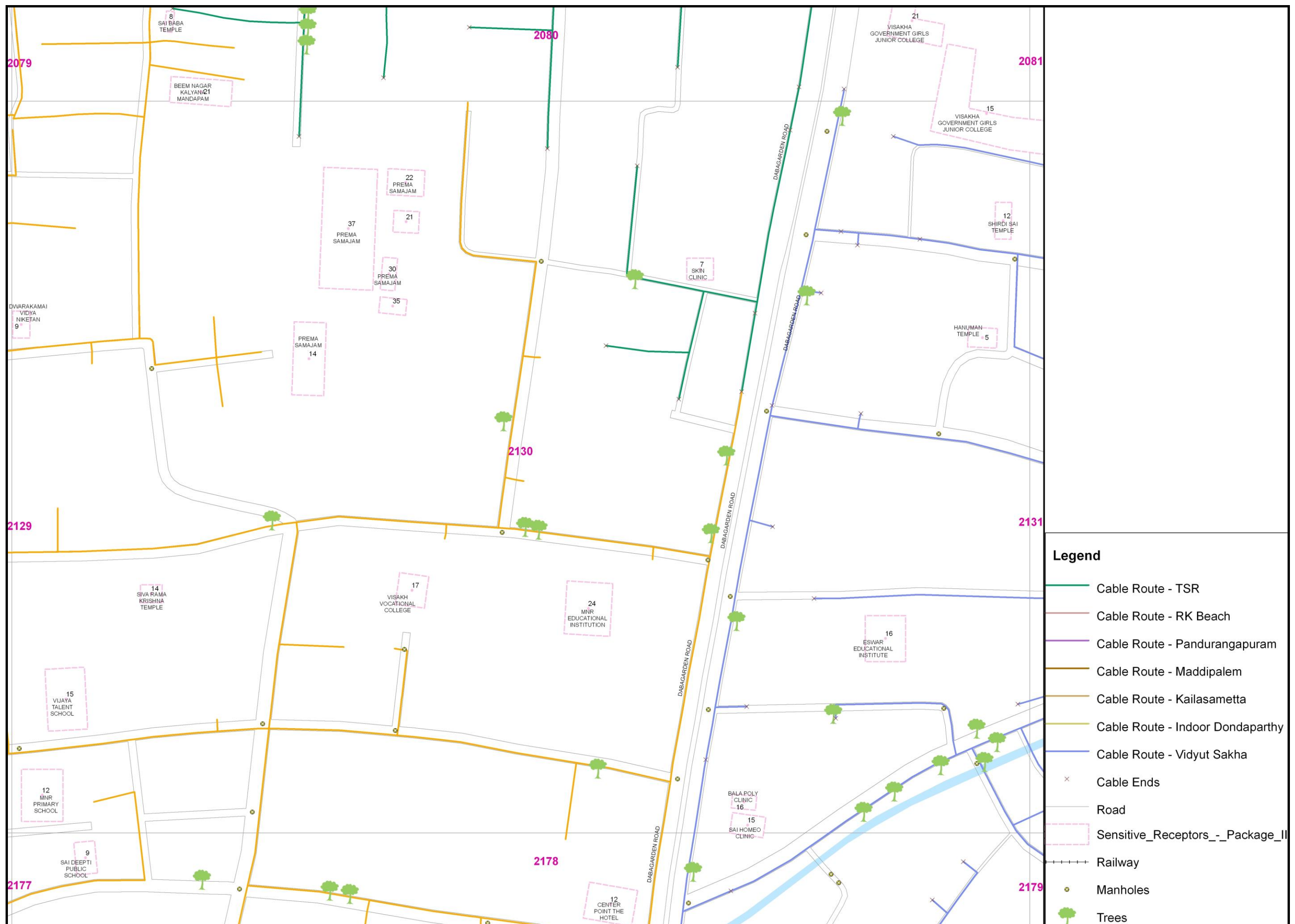
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