Report of:

Geology and Field Reconnaissance
Portsmouth Bypass
Project SCI-823-0.00
Phase 3 – Stage I
Scioto County, Ohio

Prepared for:

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PID 77366

November 16, 2007

Prepared by:

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REPORT OF

GEOLOGY AND FIELD RECONNAISSANCE

FOR

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PHASE 3 – STAGE I

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1.0 INTRODUCTION

This report presents the findings of the field reconnaissance performed by DLZ Ohio, Inc. for the Phase 3 section of the Portsmouth Bypass in Scioto County, Ohio. The Phase 3 section of the project begins at Station 54+11 and ends at Station 352+00. The proposed Phase 3 alignment extends north for approximately 6.5 miles from the existing US 52, just east of the existing SR 140 and US 52 interchange. The proposed Phase 3 section of the SCI-823 alignment connects with the Phase 1 section just south of the SR 335 / Shumway Hollow Road Interchange. The location of the proposed Phase 3 alignment is illustrated on the location map in Appendix A.

This work was performed in conjunction with the subsurface investigation for the project performed by DLZ Ohio, Inc. The information contained in this report was compiled from conversations with property owners, field observations, GPS data collection, and an examination of available literature, aerial photos, and maps.

2.0 TOPOGRAPHY

The topography along the proposed Phase 3 alignment in Scioto County, Ohio is characterized by the steep dissected topography of the uplands and the low relief, relatively level areas in the lowlands. This erosional topography is located in the Shawnee-Mississippian Plateau of the unglaciated portion of the Appalachian Plateau.

The area along the proposed Phase 3 alignment is not highly developed and contains limited secondary roadways. The majority of roads are two-lane county roads. The major existing roads near or crossing the proposed SCI-823 alignment are SR 728, SR 139, and SR 335. Most of the roads are located within the stream valleys with occasional roads running along ridgelines.

3.0 GEOLOGY

3.1 Regional Geology

The lithology of central Scioto County is primarily composed of Mississippian aged rocks including shale, siltstone, and sandstone. The middle to upper Devonian aged rocks of the Ohio Shale and Olentangy Shale are found within deeper portions of the Scioto River valley. The upper Devonian aged rocks are undivided from the lower Mississippian aged rocks in previous mapping efforts within the county. The undivided Devonian and Mississippian aged rocks are located within portions of the Ohio River valley, Scioto River valley, and some of the deeper tributary valleys of the major drainages. Overlying the Devonian aged rocks; the full Mississippian aged stratigraphic column is present throughout much of Scioto County. Some of the best exposures of the Mississippian aged Logan Formation are found in Scioto County. Along the higher ridgelines in the eastern and east central portions of Scioto County, Pennsylvanian aged rocks cap the higher hilltops with residual soils overlying the rock.

The geology is affected by both regional and local bedrock structural features. The controlling regional feature is the Cincinnati Arch, which is located to the west of the proposed alignment. Generally, the rock strata of the region vary in thickness towards the Arch and the beds appear at increasingly higher elevations. There are two local structural features evident that affect the bedrock seen near the proposed alignment; a low dome and a monoclinal arch. The low dome is located west of Sciotoville on the north bank of the Ohio River, resulting in a reversal of the local dip seen in the bedrock adjacent to the dome. The low monoclinal arch is located in the western portion of the county trending north-northeast and crossing Scioto Brush Creek near Otway. This structural feature may increase the dip of the bedrock in and adjacent to the northern portion of the proposed alignment. The regional dip of the bedding within Scioto County ranges between 13 and 43 feet per mile to the east-southeast (approximately E15°S to E20°S)[1].

3.2 Geology Along the Proposed SCI-823 Alignment

The following sections describe the general characteristics of the lithology found within the proposed limits of construction. The descriptions are organized by age of formation: Pennsylvanian, Upper Mississippian, Lower Mississippian, and Upper Devonian – Undivided.

Pennsylvanian Rock

Pennsylvanian aged rocks from the Pottsville Group are found capping the higher ridgelines seen throughout the proposed alignment, except to the north in Valley Township. This unit is mapped as the Pennsylvanian Breathitt Formation on the open-file bedrock geology maps compiled by the Ohio Department of Natural Resources – Division of Geological Survey (ODNR – DGS). This name originated from mapping efforts of the Pennsylvanian Pottsville and Allegheny Groups in Kentucky.[2] The Pottsville Group members found within the proposed limits of construction will be referred to as the Breathitt Formation in this report to be consistent with bedrock geology maps prepared by ODNR – DGS.

The Breathitt Formation is found as thin bands generally following the topographic contours of the higher ridgelines. Due to the regional dip, the Pennsylvanian Breathitt Formation is generally absent or found above an elevation of 1000 feet within the northern and northwestern portion of the proposed alignment, above an elevation of 850 feet in the central portion of the alignment, and above an elevation of 760 feet in the

[1] Hyde, J.E. (1953), *Mississippian Formation of Central and Southern Ohio*, Bulletin No. 51, Ohio Division of Natural Resources Division of Geologic Survey, Columbus, Ohio.

[2] Verbal communication with Ohio Department of Natural Resources Division of Geological Survey.

southern portion of the proposed alignment. The top of the underlying Mississippian aged Maxville Limestone is associated with an erosional unconformity and the contact is probably undulating and non-uniform. The Breathitt Formation consists of conglomerate, coal, shale, thin limestone, sandstone, and iron ores. Generally, shale and sandstone are the dominant lithologies with occasional thin, bony coal beds or blossoms.

The predominate marker beds found within the Breathitt Formation are the Harrison Ore, located immediately overlying the Mississippian aged Maxville Limestone, the Sciotoville Clay, the Sharon Ore, and the Anthony Coal. Of these members, the Harrison Ore is the only marker bed that is relatively continuous within proposed limits of construction. The Harrison Ore is described as being closely associated with the underlying Mississippian aged Maxville Limestone, sometimes described as being an alteration of the underlying limestone.[3] Even when the Maxville Limestone is absent, the Harrison Ore is generally found. The ore is often brecciated or conglomeratic and is described as being sedimentary in origin as opposed to an alteration product. Consequently, the material comprising the Harrison Ore varies greatly from place to place, but it is commonly interpreted as the basal unit of the Pennsylvanian rocks. The Sciotoville Clay is relatively continuous throughout the alignment, whereas the Sharon Ore and the Anthony Coal are reported within the proposed limits of construction but neither are continuous or well developed.

Upper Mississippian Rock

Upper Mississippian aged rocks from the Waverly Series, Cuyahoga and Logan Formations comprise the majority of the rocks within the proposed limits of construction. These two formations are not divided on the bedrock geology maps compiled by ODNR – DGS. However, formal subdivisions do exist and are used in the following descriptions. These rocks represent the middle and upper portion of the Mississippian System within the region.

The Maxville Limestone, overlying the Logan Formation, marks the contact with the overlying Pennsylvanian aged Breathitt Formation. The Maxville Limestone consists of isolated, discontinuous pockets of limestone that can range from very pure to cherty and is discontinuous due to an erosional unconformity at its upper surface. Where the Maxville Limestone is absent, the Logan Formation marks the upper contact with the overlying Pennsylvanian aged Breathitt Formation.

The underlying Logan Formation varies in thickness in part due to the erosional unconformity at its upper boundary and consists primarily of gray to brown fine-grained sandstone, siltstone, and sandy shale, but is characterized by the dominance of sandstone. Three members of the Logan are identified within Scioto County. Working up the stratigraphic column, they are the Byer Sandstone, the Allensville Conglomerate, and the Vinton Sandstone. Occasional iron ores are present within the Logan Formation, but are usually thin, isolated, and nodular. Generally, the Vinton member is a fine-grained sandstone which can be finely interbedded with sandy shale and often contains zones of

[3] Stout, W., (1916), *Geology of Southern Ohio*, Bulletin No. 20, Ohio Department of Natural Resources Division of Geologic Survey, Columbus, Ohio

fossils and ironstone concretions. The Allensville member is a fine-grained sandstone that can be finely interbedded with sandy shale with small pebble beds (1 to 2 inches) throughout. This member is not easily distinguishable from the Byer member and is often missing within the sequence. The Byer member is generally a fine-grained sandstone which can be finely interbedded sandstone and sandy shale or massive sandstone.

The Logan Formation is the dominant rock strata found within the proposed limits of construction. The hillsides in the southern and central portion of the proposed SCI-823 alignment are composed of sandstones of the Logan Formation with the exception of the Pennsylvanian Breathitt Formation capping the higher ridgelines as discussed in Section 2.2.1 of this report. Within the northern portion of the proposed alignment, the upper half to one third of the hillsides are composed of the Logan Formation. The Logan Formation gradually descends eastward until it passes under cover at the approximate eastern boundaries of Porter, Harrison, and Madison Townships to the east of the proposed alignment. Examples of the rock strata can be seen within several rock cuts throughout the area along the Ohio River and the lower Little Scioto River in which the cuts are composed entirely of the Logan Formation. Field observations of road cuts within the Logan Formation indicate that two regional joint set orientations are found within the proposed limits of construction. The main joint set is near vertical and trends east-west. A secondary joint set is near vertical and trends north-south.

The Cuyahoga Formation, underlying the Logan Formation, contains gray to brown shale interbedded with minor amounts of sandstone and siltstone with occasional massive sandstone beds. Two sandstone members of the Cuyahoga Formation are reported on the current stratigraphic column[4] as the Black Hand Sandstone and Buena Vista Sandstone. The Cuyahoga Formation, however, is characterized by the dominance of shale. Stout[3] reported three members within Scioto County. Working up the stratigraphic column, the members are the Henly siliceous shale, Buena Vista Sandstone member, and the Portsmouth Shale. The Buena Vista sandstone member dips below cover just east of the Scioto River and almost the entire visible portion of the Cuyahoga near the proposed SCI-823 alignment is composed of Portsmouth Shale. The Portsmouth Shale member of the Cuyahoga Formation is generally composed of blue to gray sandy shale with occasional thin sandstones or layers of concretionary ironstone, seldom over an inch or two in thickness. The shale readily weathers to buff colored flaky fragments and subsequently to clay. Areas within the northwestern portion of the proposed SCI-823 alignment underlain by the Portsmouth Shale of the Cuyahoga Formation exhibit undulating, hummocky terrain indicative of landslides and earth flow due to the high clay content of the weathered shale. The contact between the Logan and Cuyahoga Formations is generally transitional and may be up to 25 feet in thickness.[1] The Cuyahoga Formation gradually descends eastward from the Scioto River, and is estimated to pass under cover approximately 1 mile west of Clarktown in the central part of the county and at Sciotoville in the south.

[4] Hull, D., (1990), Larsen, G., (2000), Slucher, E., (2004). *Generalized Column of Bedrock Units in Ohio*, Ohio Department of Natural Resources Division of Geological Survey, Columbus, Ohio.

Lower Mississippian and Upper Devonian Rocks - Undivided
Along portions of the Ohio River and Scioto River valleys, the Lower Mississippian and Upper Devonian rocks have not been divided in previous mapping efforts. Previous mapping efforts combine the Mississippian aged Sunbury Shale, Berea Sandstone, and Bedford Shale with the upper Devonian aged rocks. However, formal subdivisions do exist and are used in the following descriptions. These rocks are poorly exposed at the ground surface due primarily to burial by glacial outwash, lacustrine soils, and alluvial deposits. The Sunbury Shale may be exposed in the lower slopes of the hills immediately east of the Scioto River, but is under cover throughout the rest of the alignment.

Generally, outcrops of these rocks are not seen within the limits of construction and are primarily found beneath the overburden of the larger stream channels. The Mississippian aged Sunbury Shale is located at the contact with the overlying Mississippian Cuyahoga Formation. Generally, the Sunbury is a brown to black carbonaceous shale that is thin, fissile, and planar, often containing small pyritic concretions. The Sunbury ranges in thickness from 10 to 50 feet. Underlying the Sunbury Shale, the Mississippian Berea Sandstone consists of gray sandstone and minor shale and ranges in thickness from 10 to 50 feet with thin to thick bedding. The bottom of the group is composed of the Mississippian and Devonian aged Bedford Shale. The Bedford contains gray to brown shale with interbedded sandstone beds up to two to three feet in thickness. The sandstone beds consist of thin platy sandstones seldom over a fraction of an inch thick and separated by thinner shale partings. The Bedford shale overlies the Devonian aged Ohio Shale.

Quaternary Geology
Soils found within the limits of construction can be divided into three groups. First, residual and colluvial soils derived from weathering of underlying rock and downslope transport; second, there are lacustrine and outwash deposits of glacial origin; and finally, soils consisting of recent alluvial deposits. The residual and colluvial soils are found along the ridge tops and hillsides, glacial soils are typically found within the major stream valley and their tributaries, and recent alluvial deposits are found along and within stream channels and valleys.

Residual and Colluvial Soil
Residual and colluvial soils are found on the ridge tops and the hillsides within the proposed limits of construction. Along the proposed alignment, residual and colluvial soils are generally thin to moderately deep, covering moderate to very steep slopes. Residual and colluvial soils on the hillsides are prone to landslides. Landslide susceptibility within the proposed limits of construction is addressed in Section 7.0 of this report.

Four soil complexes are reported along the hillsides consisting of: Shelocta-Brownsville, Shelocta-Wharton-Latham, Latham-Wharton-Shelocta, and Shelocta-Steinburg-Latham. These complexes combined make up approximately 80 percent of the soils found within the county having slopes ranging from 8 to 70 percent and are composed of residuum and colluvium derived from shale, siltstone, and sandstone.

Lacustrine Soils and Glacial Outwash

The two types of glacial soils encountered within the proposed limits of construction are lacustrine deposits and glacial outwash deposits.

The lacustrine soils are commonly known as the 'Minford Silts' or the Minford Complex. The soils within this group will be referred to as the Minford Complex in this report. These deposits are primarily found within the Little Scioto River Valley and its tributaries in the central and southern portions of the proposed alignment. The Minford Complex soils are generally found between elevations of 650 to 780 feet. These deposits were formed during the early to middle Pleistocene Age when the northward flowing Teays River system was blocked by the southward advance of the Kansan aged ice sheets. As the glaciers advanced, the course of the Teays River was blocked south of Chillicothe and a large lake was formed from the impoundment of the waterways. As a result of the impoundment, vast quantities of sediments were deposited ranging from 10 to 80 feet in thickness, thinning towards the margins.

The deposits range from a basal lag deposit, consisting of sands with pebbles and cobbles, to very plastic clays that usually have a high water content. The Minford Complex soils vary considerably throughout the area of the proposed alignment, partially due to original deposition and change since the time of formation. When present, these materials lie on or near bedrock. The Minford Complex soils have no regular succession, but typically sands and sandy silts are found near the bedrock and fine laminated silts and clays are found at the higher levels of the sequence. Occasionally, the Minford Complex contains sandstone cobbles and boulders and quartz pebbles in the lower parts of the sequence. These cobbles, boulders, and pebbles within the sequence are believed to be of local origin. However, the silt and clay deposits are peculiar for Ohio in that they typically contain up to 50 percent sericitic mica, indicating that they are probably derived from a metamorphic schist terrain such as the Piedmont province within the Appalachian Mountains[5]. Most lacustrine deposits within Ohio are glacial, consisting of "rock flour" derived from the movement of glaciers or are composed of materials derived from weathered sandstones, shales, and calcareous rocks which dominate the lithology of the rocks within Ohio. Thin alluvial and/or glacial outwash deposits are frequently found overlying the Minford Complex soils. The typical section for the Minford Complex soils is located in a rail cut on the outskirts of the Village of Minford, Ohio.

Glacial outwash deposits are found along the Scioto River valley occupying the valley of the preglacial Teays-aged Portsmouth River and within the Ohio River valley. The glacial deposits are late Wisconsinan in age and consist of sand and gravel deposits with small isolated peat deposits. Generally, these deposits are saturated at shallow depths with high recharge rates. Several sand and gravel pits can be seen along existing US 23, where these sand and gravel deposits have been or are currently being extracted.

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[5] Stout, W. and Schaaf D., (1931), *Minford Silts of Southern Ohio*, Bulletin of the Geological Society of America, Vol. 42, pp. 663-672.

Four soil complexes are reported along the preglacial valleys and on flood plains, terraces, and fans consisting of Omulga-Monongahela-Haymond, Weinbach-Wheeling-Elkinsville, Nolin-Shelocta-Omulga, and Tioga-Sardinia-Fitchville. These complexes combine to make up approximately 15 percent of the soils found within the county having slopes ranging from 0 to 40 percent (majority are between 0 and 15 percent) and are formed in colluvium, lacustrine sediments, flood plains, fans, and in preglacial valleys.

Alluvial Soils

Generally, the largest deposits of alluvial soils are found along the Little Scioto River and the Ohio River. These deposits are usually granular with high fines (clay and silt) content. Alluvial soils, to some extent, are found along all of the creeks and rivers within the proposed limits of construction. Generally, alluvial deposits range from silty clay to coarse sand. Where bedrock is shallow, alluvial deposits may contain coarse sand, gravel, and cobbles.

Two soil complexes are reported along the flood plains consisting of Nolin-Genessee and Stendal-Cuba-Tioga. These complexes combine to make up approximately 5 percent of the soils found within the county having slopes ranging from 0 to 3 percent and are formed in alluvium within the flood plains.

4.0 LAND USE

Land use along the project varies from managed forests and wooded areas, to agricultural and residential usage. Generally, road access and topography determine the use, with the steeper, more remote terrain forested or used as pasture. Along the roads, the valley and low relief lowlands are maintained as residential areas or utilized as cultivated fields. The following is a detailed discussion of the land use along the proposed Phase 3 alignment of the project.

4.1 Phase 3 Mainline

Station 00+00 to Station 44+00 and US 521

This is an area of low relief that includes the right of way for both US 52 and County Road 503 (Ohio River Road). At approximately station 44+00, there is a 1H:1V rock cut slope with a 15 to 20 foot wide flat catchment area.

Station 44+00 to Station 62+00

From station 44+00 to station 50+00, the terrain is relatively level and is overgrown with brush, coniferous trees and immature deciduous trees. This area has been timbered and several old logging roads cross the proposed alignment. From station 50+00 to station 62+00, the terrain is considerably steeper with more mature deciduous trees. This area is mostly wooded with a vertical relief of over 200 feet.

Station 62+00 to Station 75+00 and SR 140 Interchange

This is a small hollow with a level area along SR 140 that originally was developed as an elementary school and residential area. The elementary school now sits vacant and unused, while an area approximately 150 feet to the left of the proposed Phase 3 alignment has since been developed for commercial use as a fuel station and convenience store. Three residential structures are near or within the limits of construction. A 0.43-acre pond is located just left of the proposed centerline at station 73+50. A perennial stream crosses the proposed Phase 3 alignment near station 69+00 and the proposed SR 140 ramp A at station 69+50. The proposed centerline of ramps A and B traverse the steep wooded sides of the hollow. An intermittent stream crosses the proposed centerline of SR 140 ramp A at station 68+00. Several areas of junk and debris are present.

Station 75+00 to Station 107+00
The proposed Phase 3 alignment follows a ridge as it continues north. This area has a vertical relief of approximately 200 feet. It is wooded and has been extensively timbered over the years. As a result, several logging roads cross or are near the proposed alignment. In addition, there are several areas where clay was open pit mined along the ridge. At Station 107+00 the slopes are very steep, in some places close to vertical.

Station 107+00 to Station 112+00
This relatively flat area has been cleared of brush and is used as a pasture and commercial sawmill. A long shallow pond crosses the alignment near station 107+50.

Station 112+00 to Station 113+25
This is the right-of-way of an abandoned railroad. This area is wooded and overgrown with some debris along the abandoned railroad.

Station 113+25 to Station 114+25
This area is used as a junkyard. A large amount of debris and deteriorating cars can be found to the right and left of the proposed alignment.

Station 114+25 to Station 115+75
This is the right of way and steep-sided embankment of an active railroad.

Station 115+75 to Station 133+00
This a low relief residential area known locally as Highland Bend. There are several residential structures within the construction limits of the proposed alignment. From station 127+00 to station 130+00, there is a 20 to 30-foot deep ravine that contains an intermittent stream. The ravine has also been used as a dump and it contains a wide variety of debris.

Station 133+00 to Station 137+75
This is the channel of the Little Scioto River. The channel has slopes of 1H:1V or steeper and is approximately 55 feet deep. Along the northern side of the Little Scioto River, SR 335 follows the edge of the river channel.

Station 137+75 to Station 147+00
This area is a deep hollow with slopes as steep or steeper than 1H:1V. The hollow drains into the Little Scioto River. Some portions of this area have been extensively logged. There are a considerable number of sandstone boulders that litter the steep slopes of this hollow.

Station 147+00 to Station 162+25
The proposed Phase 3 alignment follows a ridge for most of this section. This area also has steep slopes and is wooded. It has been timbered in the past and there are a number of logging roads in this area.

Station 162+25 to Station 171+00
The proposed Phase 3 alignment crosses a small hollow that opens into a larger hollow known as Stout Hollow. The slopes of the small hollow are wooded and steep, generally 1H:1V or steeper. County Road 246 or Stout Hollow Road is located on the south side of the hollow and crosses the proposed Phase 3 alignment at Station 166+30. Along the northern side of Stout Hollow Road, there is a large amount of debris that has been dumped from Stout Hollow Road. A 138Kv transmission line crosses the alignment near Station 167+50.

Station 171+00 to Station 203+00
The proposed Phase 3 alignment crosses a high ridge at Station 171+00 and follows a long, steep sided hollow that terminates at another ridge near Station 203+00. This is the main area of Stout Hollow described in the previous section. This part of Stout Hollow is a steep sided drainage basin, with vertical relief of over 230 feet and slopes of 2H:1V or steeper. The relatively flat bottom of Stout Hollow ranges in width from 100 to 200 feet. This area is rugged and has been timbered in the past. As a result, there are several logging roads that cross or are near the proposed Phase 3 alignment in this area. There is a perennial stream that flows through this hollow. This area is very rugged and during the investigation, was overgrown with small trees and dense vegetation.

Station 203+00 to Station 230+00
The proposed Phase 3 alignment follows a ridge to Station 205+00 where it crosses a hollow known as Mansfield Hollow. Mansfield Hollow ranges in width from 75 feet to just over 100 feet and has slopes of 2H:1V or steeper with a vertical relief of 130 to 150 feet. A 138KV electric transmission line crosses the alignment at Station 208+00. The proposed Phase 3 alignment follows a ridge north of Mansfield Hollow to Station 230+00. This portion of the proposed Phase 3 alignment has also been timbered and several logging roads can be found in this area.

Station 230+00 to Station 253+00
Shoumberg Hollow is also a steep sided drainage basin, with vertical relief of over 200 feet and slopes of 2H:1V or steeper. The relatively flat bottom of Shoumberg Hollow ranges in width from 225 feet to 300 feet. This area is rugged and has been timbered in the past. As a result, there are several logging roads that cross or are near the proposed

Phase 3 alignment in this area. There is a perennial stream that flows through this hollow.

Station 253+00 to Station 267+00
North from Shoumberg Hollow, the alignment follows a small drainage basin to a wooded ridge before crossing a pond and a pasture from Station 264+00 to Station 266+60. There is a small pond 100' right of Station 259+10 and there are many access roads that cross the proposed Phase 3 alignment or are within the limits of construction.

Station 267+00 to Station 284+00
This area is wooded, but has been timbered frequently. As a result, there is an abundance of small immature trees and dense vegetation. There are several logging roads that are within the limits of construction or cross the alignment.

Station 284+00 to Station 315+00
This area is known locally as Dan White hollow. Dan White Hollow is yet another steep sided drainage basin, with vertical relief of over 300 feet and slopes of 2H:1V or greater. The relatively flat bottom of Dan White Hollow ranges in width from 200 feet to 400 feet. The bottom of the hollow is an uncultivated open field with occasional tree debris and abandoned vehicles from past logging operations. A perennial stream flows through the hollow. The slopes have been extensively logged and there are few mature trees. The slopes are generally covered in dense vegetation and immature trees. There are also several areas of extensive erosion as a result of past logging operations. There are several access roads within the limits of construction.

Station 315+00 to Station 341+50
This area has also been extensively timbered. Smaller immature trees and dense vegetation are prevalent. There are areas of extensive erosion as a result of logging operations. The slopes in this area are steep and the proposed Phase 3 alignment crosses several small drainage basins with intermittent streams.

Station 340+00 to Station 353+00
This narrow valley is known as Blake Hollow. Blake Hollow ranges in width from 75 feet to just under 100 feet and is contained by approximately 2H:1V or steeper slopes with a vertical relief of nearly 300 feet. The area is generally wooded with occasional debris piles.

5.0 BEDROCK EXPOSURES

Natural and man-made bedrock exposures exist at several locations along the alignment. Bedrock exposure locations are illustrated on the land use and reconnaissance notes in Appendix A. Logs for these exposures can be found in Appendix B.

Station 44+00
This is a steep, approximately 1H:1V 75-foot rock cut slope created in the 1950's during construction of US 52, when Ohio River Road was relocated to its current location. The

rock cut slope extends from the intersection of Hastings Hill Road and Ohio River Road to the intersection of SR 140 and Ohio River Road. The rock cut ranges in height from 50 feet to 85 feet. Bedrock along this cut is generally thin to medium bedded weathered gray and brown very fine-grained sandstone. The cut appears to be stable and is producing a minimal amount of small rockfall.

Station 106+00 to Station 108+00

There are two areas of exposed bedrock along the near vertical slope in this area. One area of exposed bedrock extends from 65 feet left of the proposed centerline at station 106+50 to 625 feet left of the centerline at station 106+75. This exposure ranges from 10 to 20 feet in height. The bedrock here consisted of weathered, thin to medium bedded medium hard gray and brown sandstone.

A second, smaller area of exposed bedrock was located approximately 82 feet to the right of the proposed Phase 3 alignment. The bedrock here also consisted of weathered, thin to medium bedded medium hard gray and brown sandstone.

Both of these exposures were likely created in the early 1900's during the construction of the nearby railroad. Most of the overburden was removed and used as fill, exposing the underlying bedrock. There is a considerable amount of talus and large rock fragments at the base of both areas of exposed bedrock.

Station 139+10

Approximately 164 feet right of the proposed alignment, an intermittent stream has eroded the overburden to reveal a 2-foot bedrock exposure. Medium bedded, medium hard to hard, moderately weathered brown fine-grained sandstone was observed along the northern side of the streambed.

Station 302+00

Approximately 523 feet right of the proposed centerline, bedrock is exposed in a stream channel. Massively bedded, medium hard, moderately weathered gray very fine-grained sandstone was observed in the bottom of the stream channel.

Station 305+90

Approximately 627.6 feet right of the proposed centerline, a perennial stream has incised the valley wall and created a small, 3 to 4-foot tall, 40-foot long bedrock exposure. Gray medium hard, medium to massive bedded, very fine-grained sandstone was observed exposed along the northern valley wall. A photo of this exposure can be found in Appendix B.

Station 345+25

Approximately 340 feet right of the proposed centerline, bedrock is exposed in a stream channel. Massively bedded, medium hard, moderately weathered gray very fine-grained sandstone was observed in the bottom of the stream channel.

6.0 DRAINAGE AND WATER CROSSINGS

6.1 Ponds

There are six man-made ponds that are within or near the limits of construction. Three of the ponds are simple embankment ponds built across a valley to contain water from an existing stream. Three of the ponds were built by excavation and embankment construction, developing existing springs as the primary sources of water. The pond sources, depths, types of construction, and other details were determined from landowner conversations and field observations. Photos of two representative ponds are shown in Appendix B.

Station 73+50

Just left of the proposed Phase 3 alignment is a 0.43-acre embankment pond. The pond is fed by surface runoff. The pond is approximately 8 feet deep with .5 to 2 feet of fine sediment in the bottom.

Station 107+50

A long, narrow excavated embankment pond crosses the proposed Phase 3 alignment at this location. According to the property owner, this pond was a borrow pit during the construction of the nearby railroad. The pond is fed by surface runoff. It is generally shallow with depths of 4 to 5 feet and 1 to 2 feet of fine sediment and organic material.

Station 171+50

Approximately 620 feet left of the proposed Phase 3 alignment is a small, 0.02-acre excavated embankment pond. Both surface runoff and a spring feed the pond. There is approximately 1.5 feet of fine sediment in the bottom of the pond, which is 3 feet deep.

Station 259+10

Approximately 30 feet right of the proposed centerline is a spring-fed excavated pond with a surface area of 632 square feet. The depth of the pond is approximately four feet and there is about 1.5 feet of soft sediment and organic material in the bottom of the pond.

Station 265+00

At this location, there is a .21-acre embankment pond that was constructed within the last five years. The pond is approximately seven feet deep and there is approximately 1.5 feet of soft sediment and organic material in the bottom of the pond.

Station 269+90

Approximately 30 feet right of the proposed Phase 3 centerline is a spring-fed excavated pond with a surface area of 485 square feet. The depth of the pond is approximately 2 feet and there is approximately 1.5 feet of soft sediment and organic material in the bottom of the pond.

6.2 Wetlands

According to the National Wetlands Inventory, there are no areas that meet the definition of a true wetland within the proposed Phase 3 limits of construction. There is one low area that is very soft and wet at approximately station 320+00. This area is indicated on the land use and reconnaissance notes in Appendix A.

6.3 Streams and Rivers

There are a large number of streams near or within the limits of construction in various locations. Three of the streams are perennial, normally flowing throughout the year. A number of streams are intermittent, flowing only during the wet season. All other streams are ephemeral, without a clearly defined channel and flowing only during heavy rainfall events. The streams are labeled as perennial, intermittent, or ephemeral on the land use and reconnaissance notes in Appendix A.

The proposed Phase 3 alignment crosses the Little Scioto River at station 136+00. At this location the river is influenced by flood and flood control on the Ohio River. This often leads to the flooding and saturation of the riverbanks, followed by rapid drawdown.

6.4 Springs and Seepage

Springs were relatively rare along this section of the proposed Phase 3 alignment. The three springs that are present were all developed into small ponds to provide a source of water for livestock. Seepage was noted during the winter in several locations. Seepage locations are noted on the land use and reconnaissance notes in Appendix A.

7.0 LANDSLIDES

The hillsides and natural slopes along the Phase 3 alignment range are generally very steep with thin residual soils. The low shear strength of the residual and colluvial soils combined with the steep topography makes some of the hillsides within the proposed Phase 3 limits of construction prone to shallow surficial landslides. It is anticipated these shallow landslides will be removed during the course of earthwork operations.

Generally, the dominant rock type along the proposed Phase 3 alignment is sandstone of the Mississippian aged Logan Formation. However, in several locations Pennsylvanian shale and siltstone is found along the ridges in Phase 3. The shales weather to clay with low shear strength. Under the proper conditions, the weathered, weak shales can become unstable.

Three areas showed signs of significant instability near or within the limits of construction. Generally, the slope instability appeared to be relatively shallow landslides contained within the overburden, though one of these areas showed signs of a possible past massive landslide. During construction, these areas should be carefully monitored. Areas of slope instability were first identified using aerial photography and then verified during the fieldwork. All areas of possible slope instability are shown on the land use and reconnaissance notes in Appendix A.

Station 136+25 to Station 137+50
This area includes the northern shore of the Little Scioto River to the edge of SR 335. Cracking along the shoulder of SR 335 and displaced trees provided evidence of recent movement during the investigation. Slope movement in this area is likely due to saturation and rapid drawdown during flood events. Photos of this landslide can be seen in Appendix I.

Station 138+50 to Station 146+50
Mapping and field work revealed signs of a past, possibly massive landslide in this area. The slopes in this hollow are generally 1H:1V or steeper. The terrain is hummocky and a perennial stream has eroded the lower portions of the slopes in the hollow. Bedrock is exposed in the lower portions of the hollow towards the Little Scioto River.

Station 319+75 to Station 323+75
This is likely a shallow landslide that may have occurred as a result of logging activities. There is a wet area at the toe of the slope and several logging roads have been cut into the slope at varying elevations.

8.0 MINING AND PREVIOUSLY UNKNOWN WELLS

An examination of the Ohio Department of Natural Resources' Abandoned Underground Mine Database showed no known abandoned underground mines within 1000 feet of the proposed Phase 3 alignment. Conversations with property owners confirmed this. There was in the past, however, surface and small "pit" mining of clay. The mines were found from the proposed Phase 3 centerline at station 91+80 to about 200 feet left of the proposed Phase 3 centerline near station 102+40. The disturbed areas were small and the resulting mining pits were shallow. The locations of the surface pit mines are shown on the land use and reconnaissance notes in Appendix A.

9.0 DUMPS AND DEBRIS

Many small dumps, miscellaneous junk, and other debris can be found along the alignment within the limits of construction. The dumps are generally small and are indicated on the land use and reconnaissance notes in Appendix A. A representative photo of a dump can be found in Appendix B. There was one area of debris that was unusually large along Stout Hollow Road, to the left of where it is crossed by the alignment. This area of debris is outlined on the land use and reconnaissance notes in Appendix A.

10.0 EXISTING ACCESS ROADS AND TRAILS

There are a large number of access roads created by private property owners crossing the proposed Phase 3 alignment, or within the limits of construction. These roads could prove useful during construction. The access roads are labeled on the land use and reconnaissance notes in Appendix A.

11.0 EXISTING EMBANKMENTS

There are few existing embankments in the area and they are usually less than ten feet high. The small embankment of SR 140 near the alignment was constructed less than five feet high and with slopes of 2H:1V to 1H:1V, the embankment appears to be stable. The sidehill fill embankment of SR 335 along the Little Scioto River is showing signs of instability as detailed in the landslides section of this report.

12.0 EXISTING PAVEMENTS

The existing pavement for SR 140 is in relatively good condition. Pershing and Slocum Roads are very badly deteriorated. There is also cracking in the asphalt of SR 335 along the Little Scioto River. The chip seal pavement utilized on Stout Hollow Road and Blake Hollow Road is in good condition. Photos illustrating the pavement conditions of all of these roads can be found in Appendix B.

13.0 GEOTECHNICAL DESIGN CHECKLIST

The geotechnical design checklist applicable to this report is included in Appendix C.

14.0 CLOSING REMARKS

We appreciate the opportunity to be of service to you on this project. Please do not hesitate to contact us with any questions or concerns regarding this report.

Sincerely,

DLZ OHIO, INC.

Andrew M. Jalbrzikowski
Engineering Geologist

Pete Nix, P.E.
Geotechnical Division Manager

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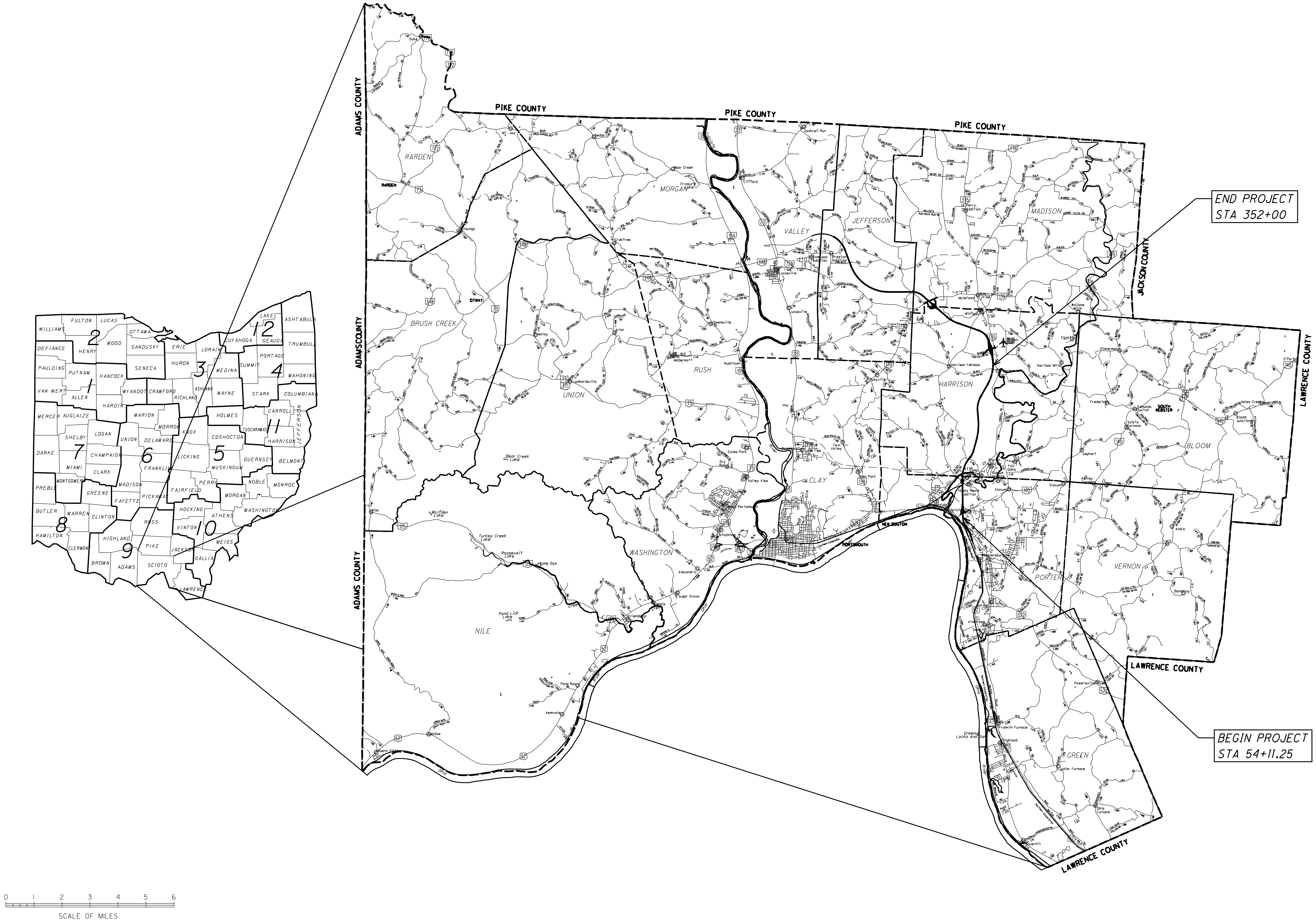
APPENDIX A

General Location Map
Land Use and Reconnaissance Notes



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LOCATION MAP
PORTSMOUTH BYPASS PHASE 3

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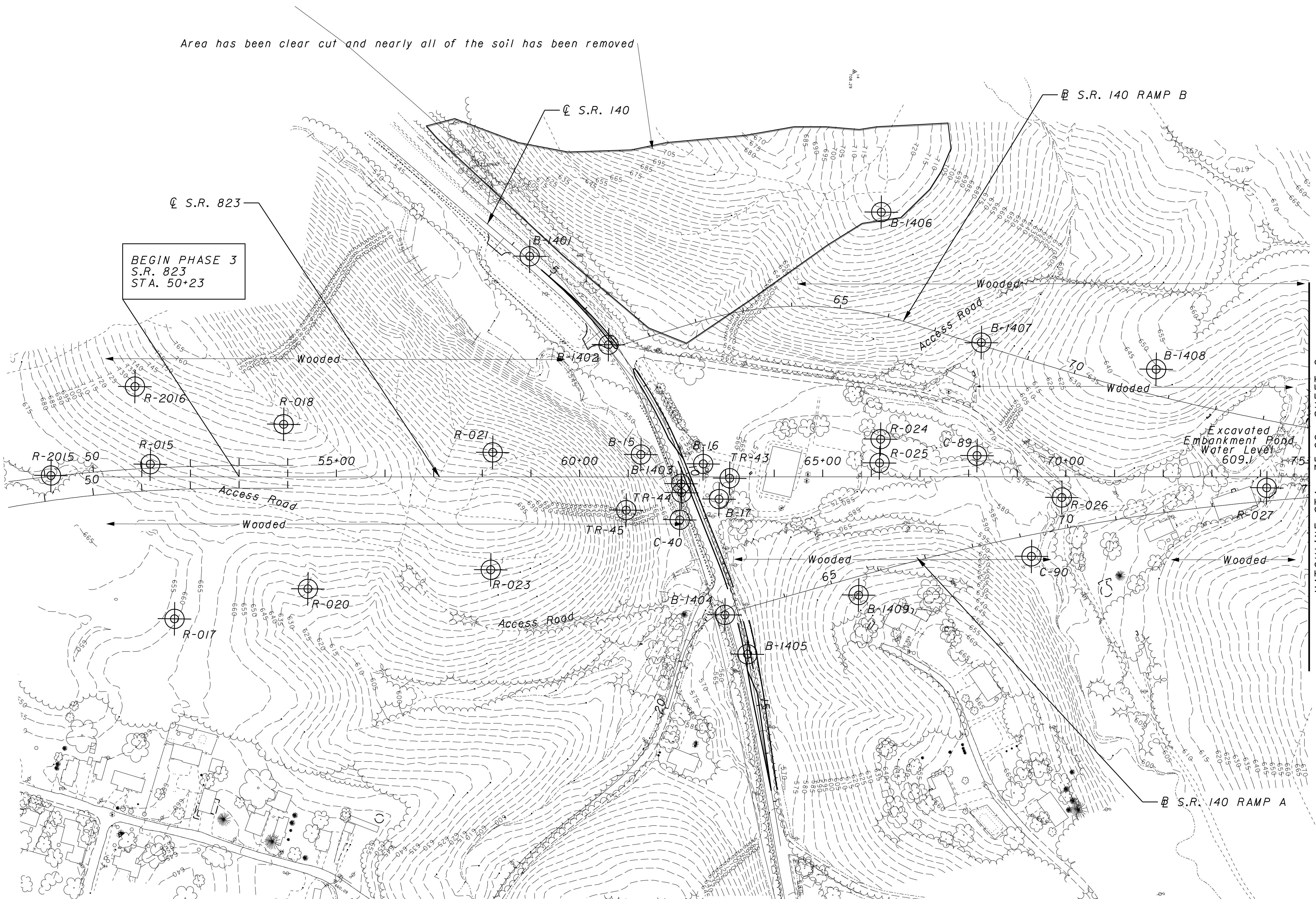
1/1



HORIZONTAL SCALE IN FEET

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LAND USE AND RECONNAISSANCE NOTES

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1/13

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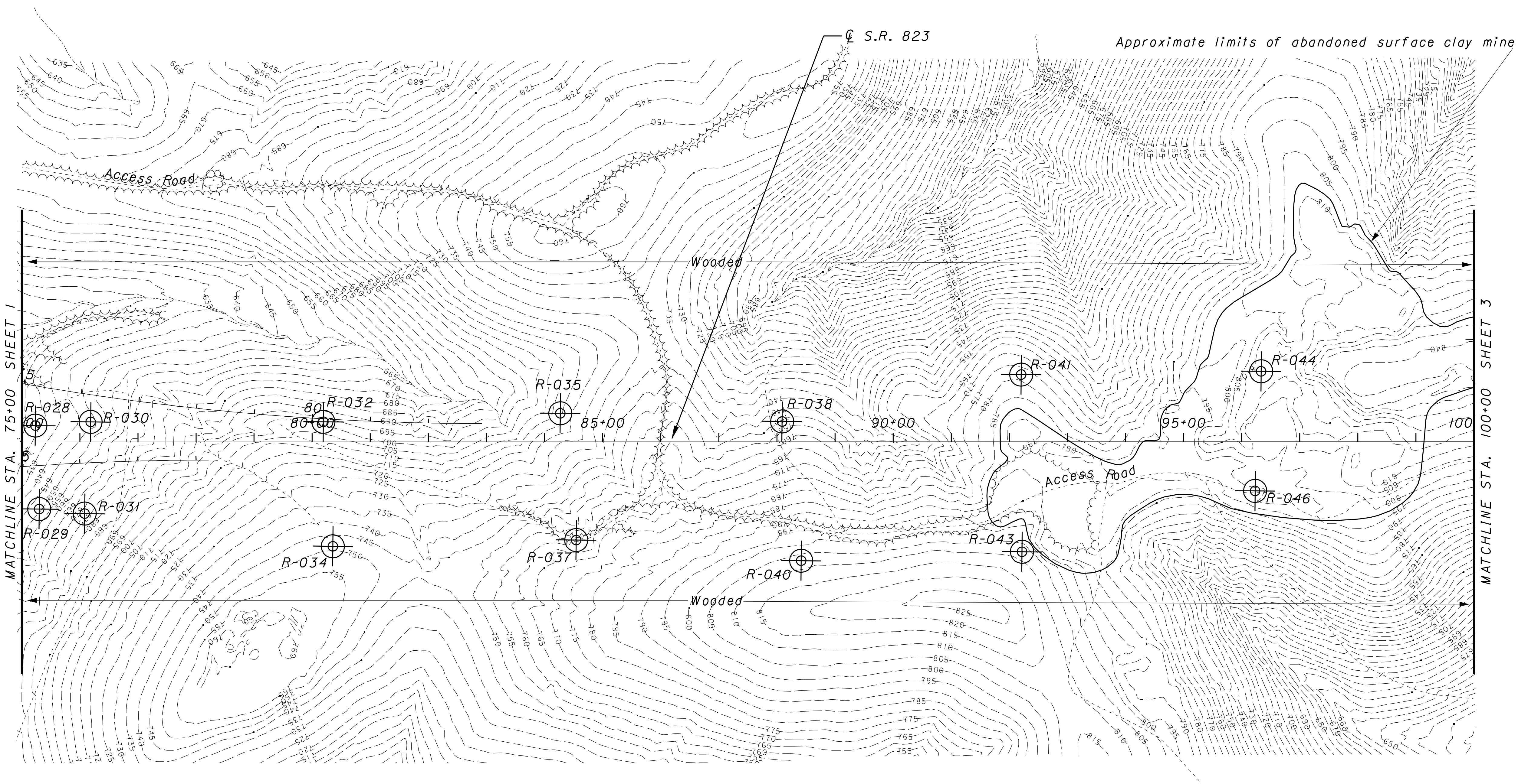

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CHECKED AEN

LAND USE AND RECONNAISSANCE NOTES

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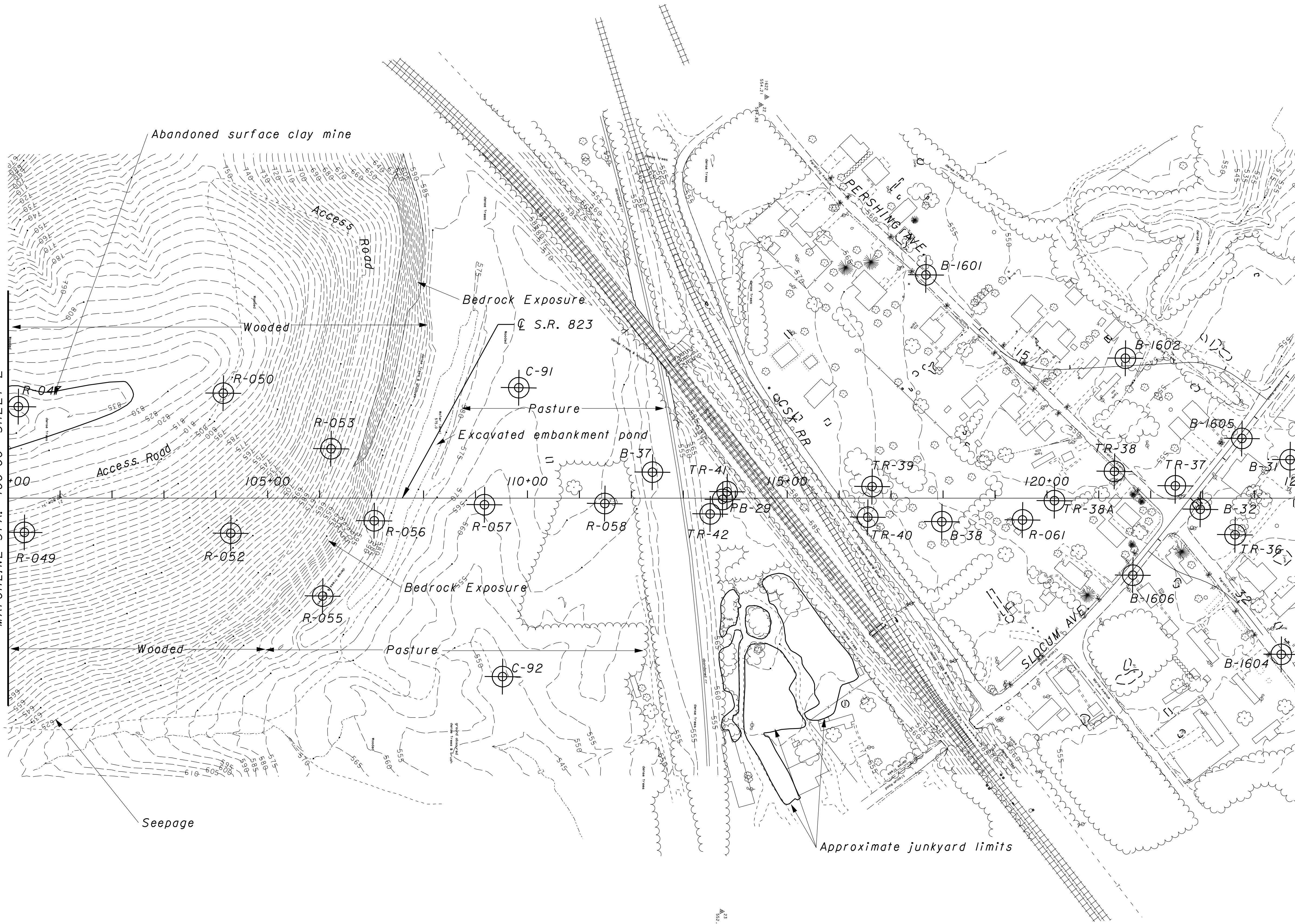

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DRAWN AMJ
CHECKED AEN

LAND USE AND RECONNAISSANCE NOTES
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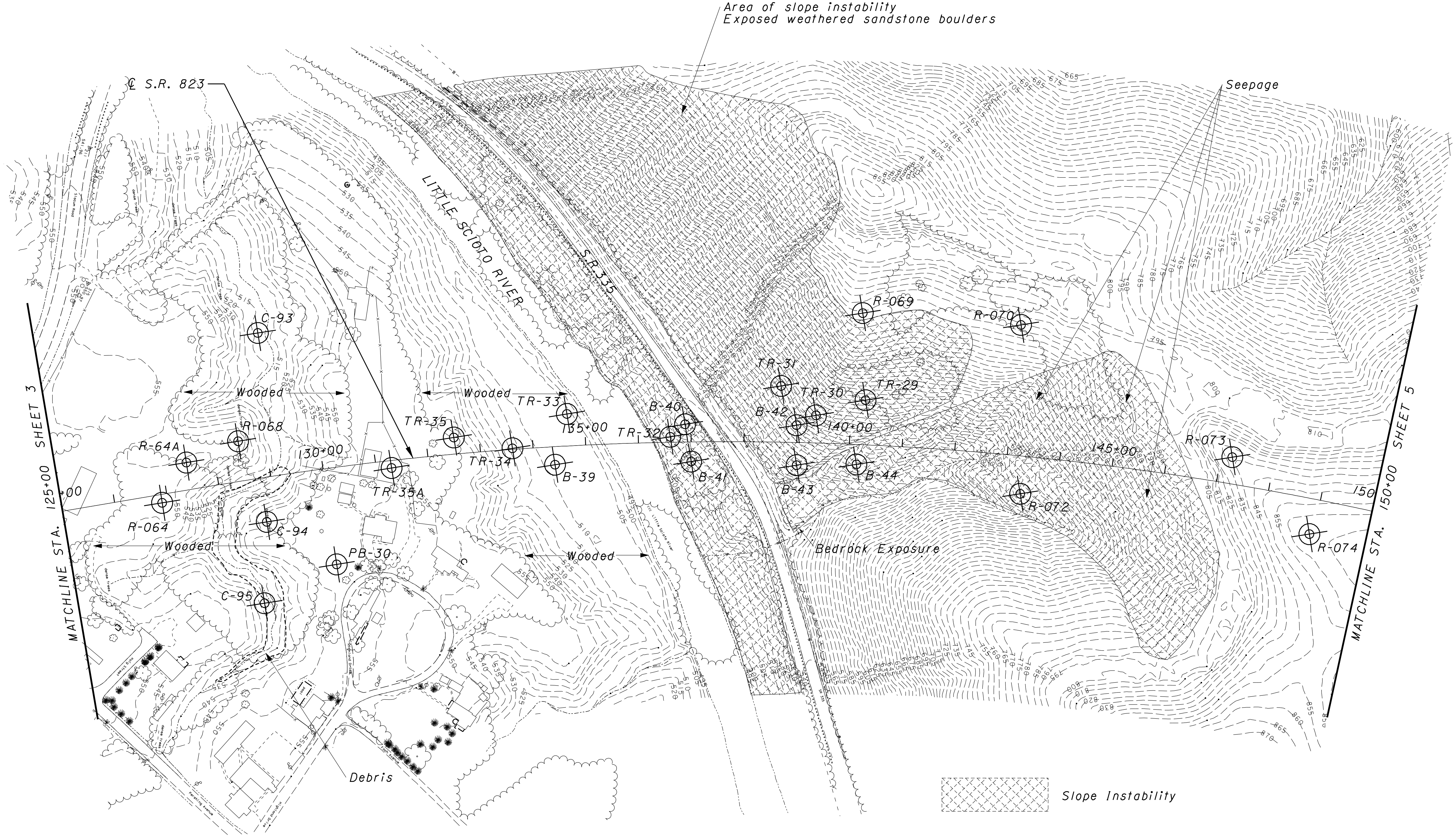

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DRAWN AMJ
CHECKED AEN

LAND USE AND RECONNAISSANCE NOTES
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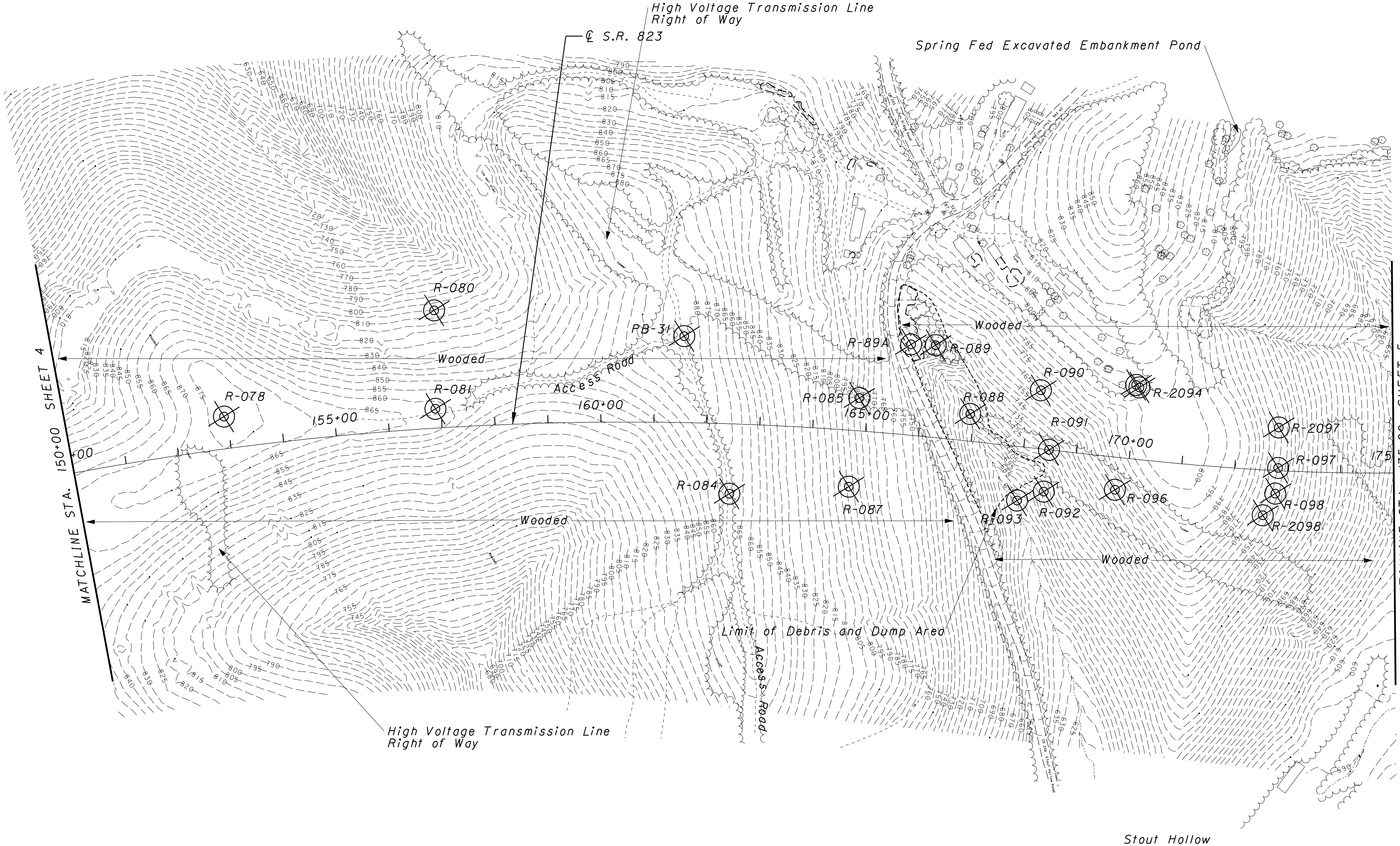

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DRAWN AMJ

CHECKED AEN

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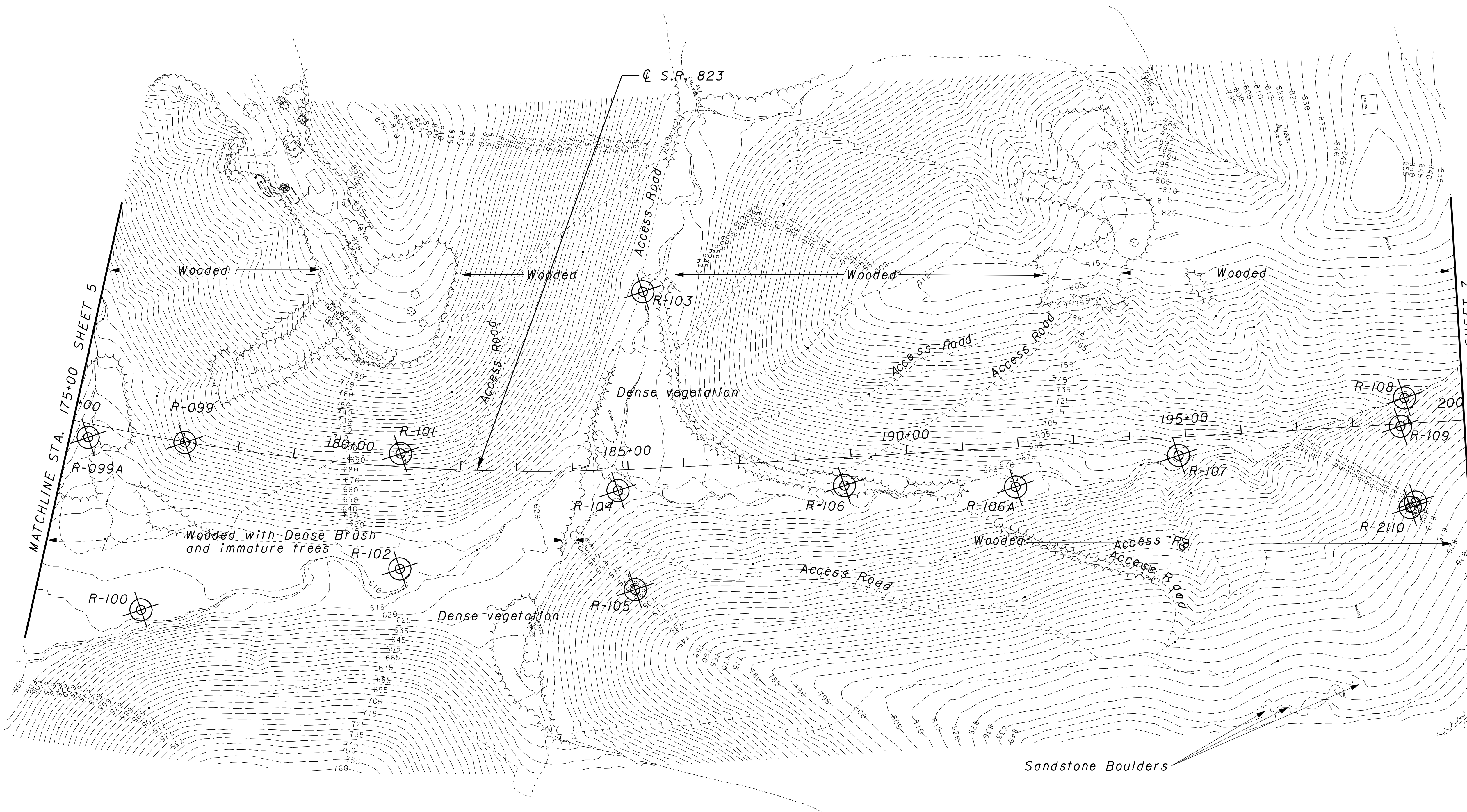

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DRAWN AMJ
CHECKED AEN

LAND USE AND RECONNAISSANCE NOTES
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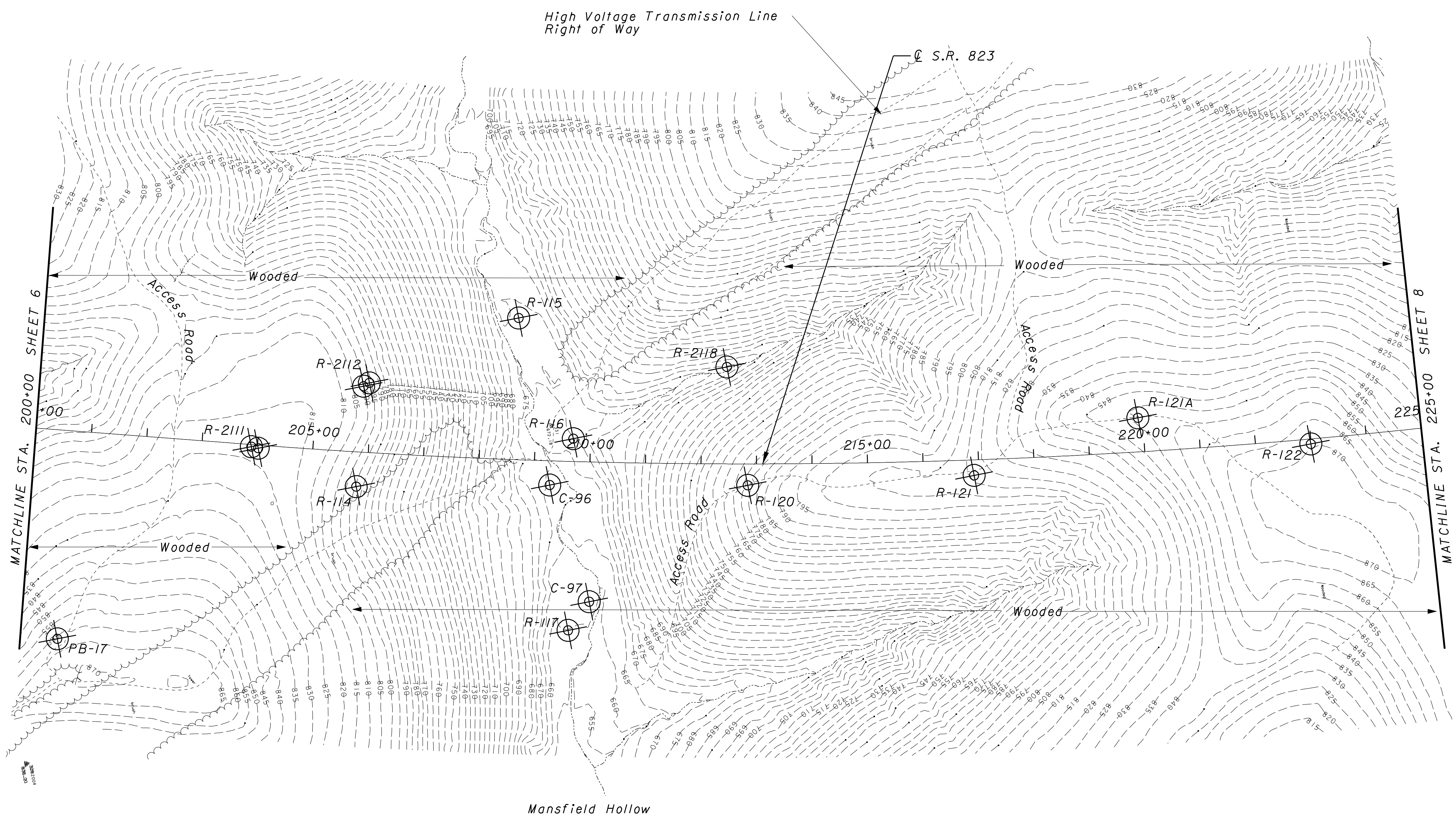

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DRAWN AMJ

CHECKED AEN

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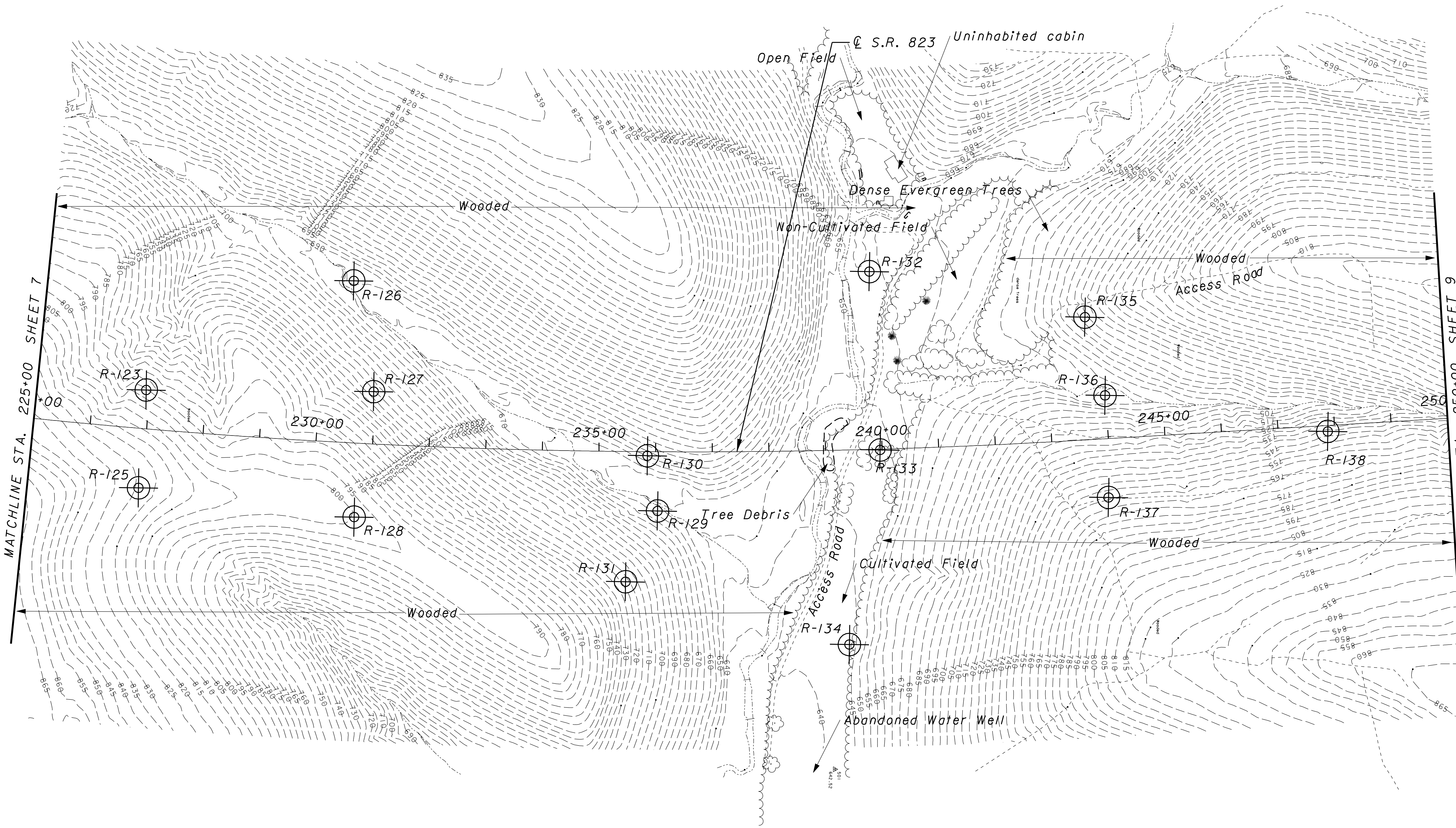

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DRAWN AMJ
CHECKED AEN

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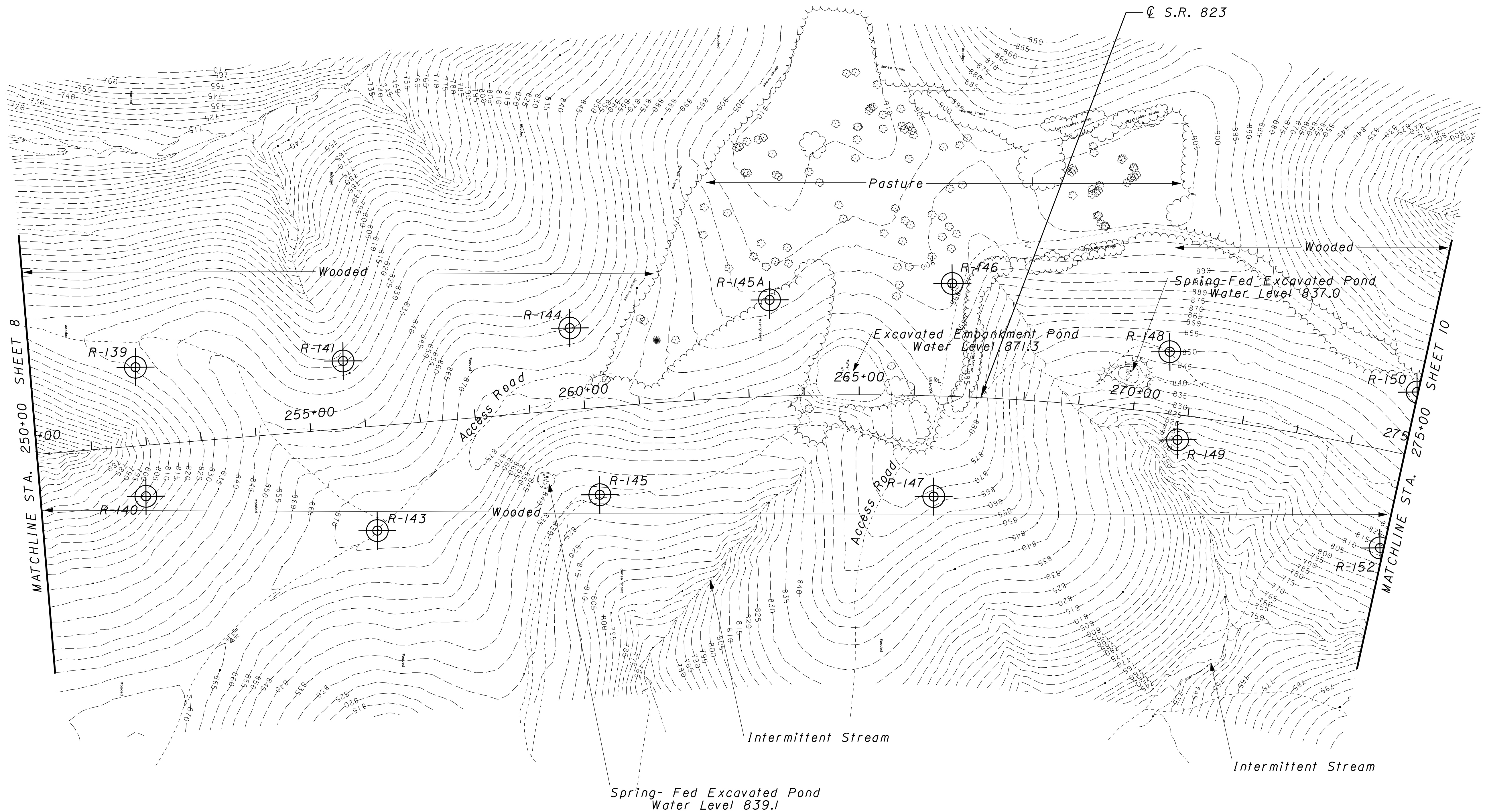

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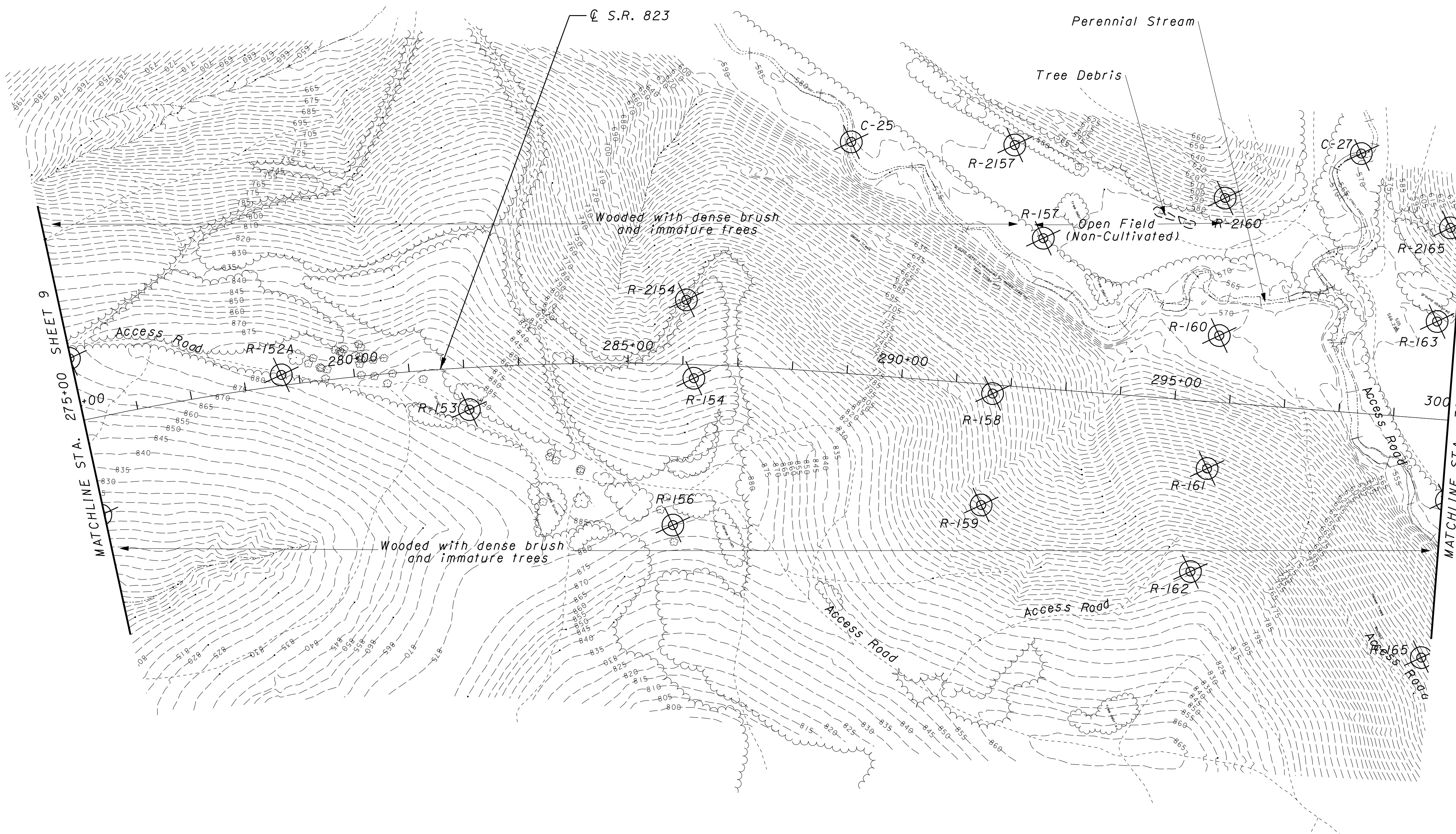

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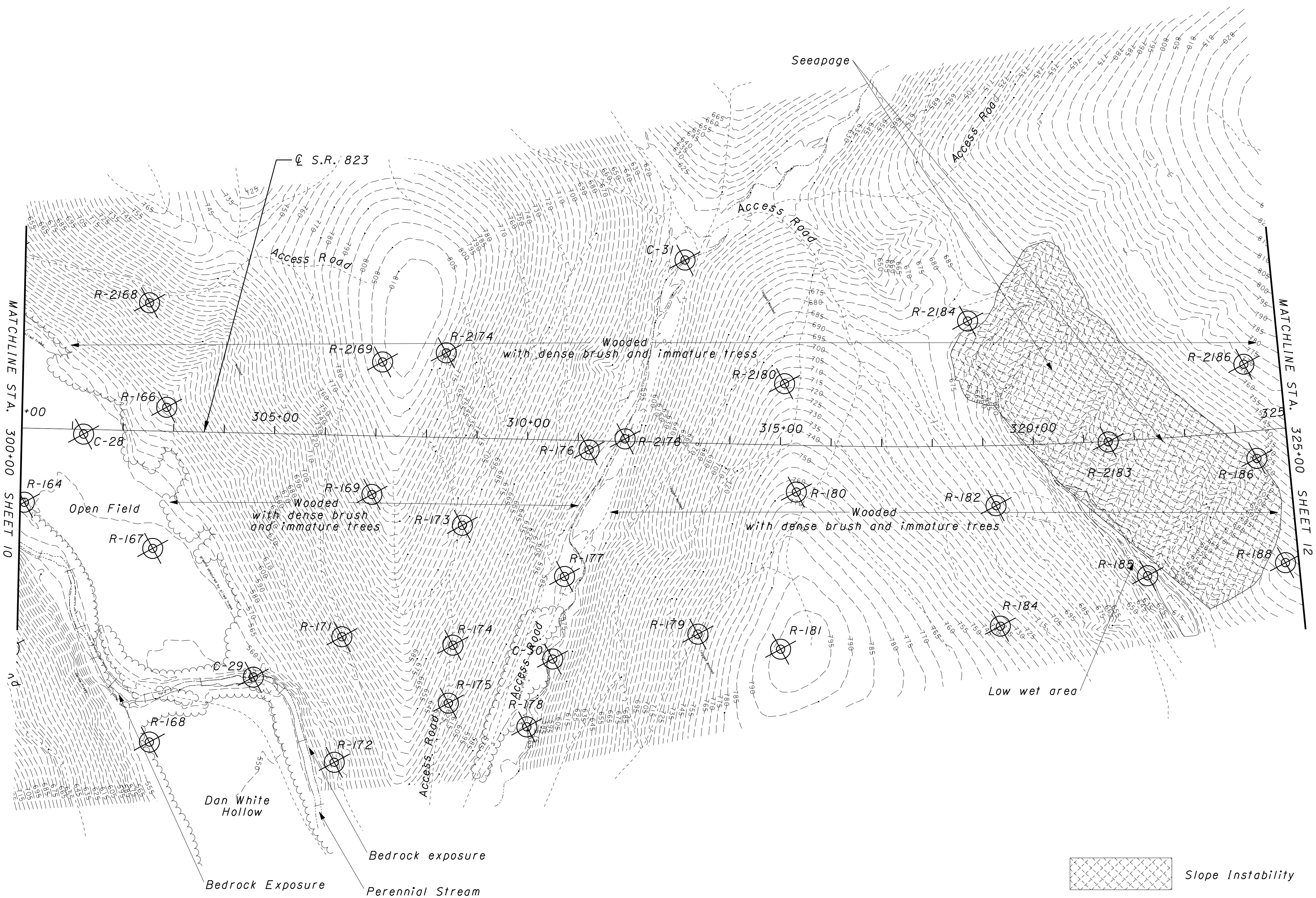

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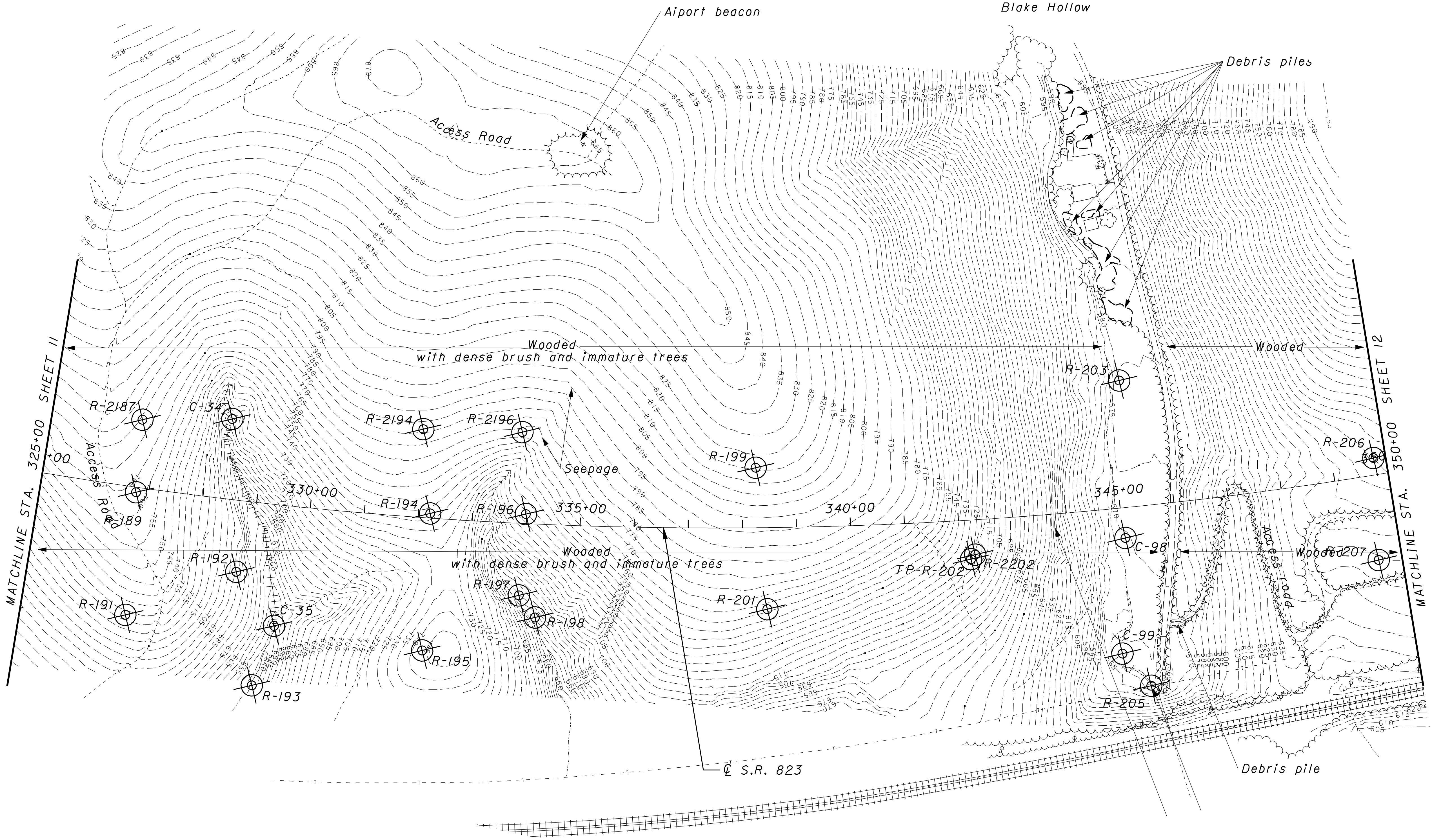

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DRAWN AMJ
CHECKED AEN

LAND USE AND RECONNAISSANCE NOTES
S.R. 823 STA. 325+00 TO STA. 350+00

SCI-823-0.00

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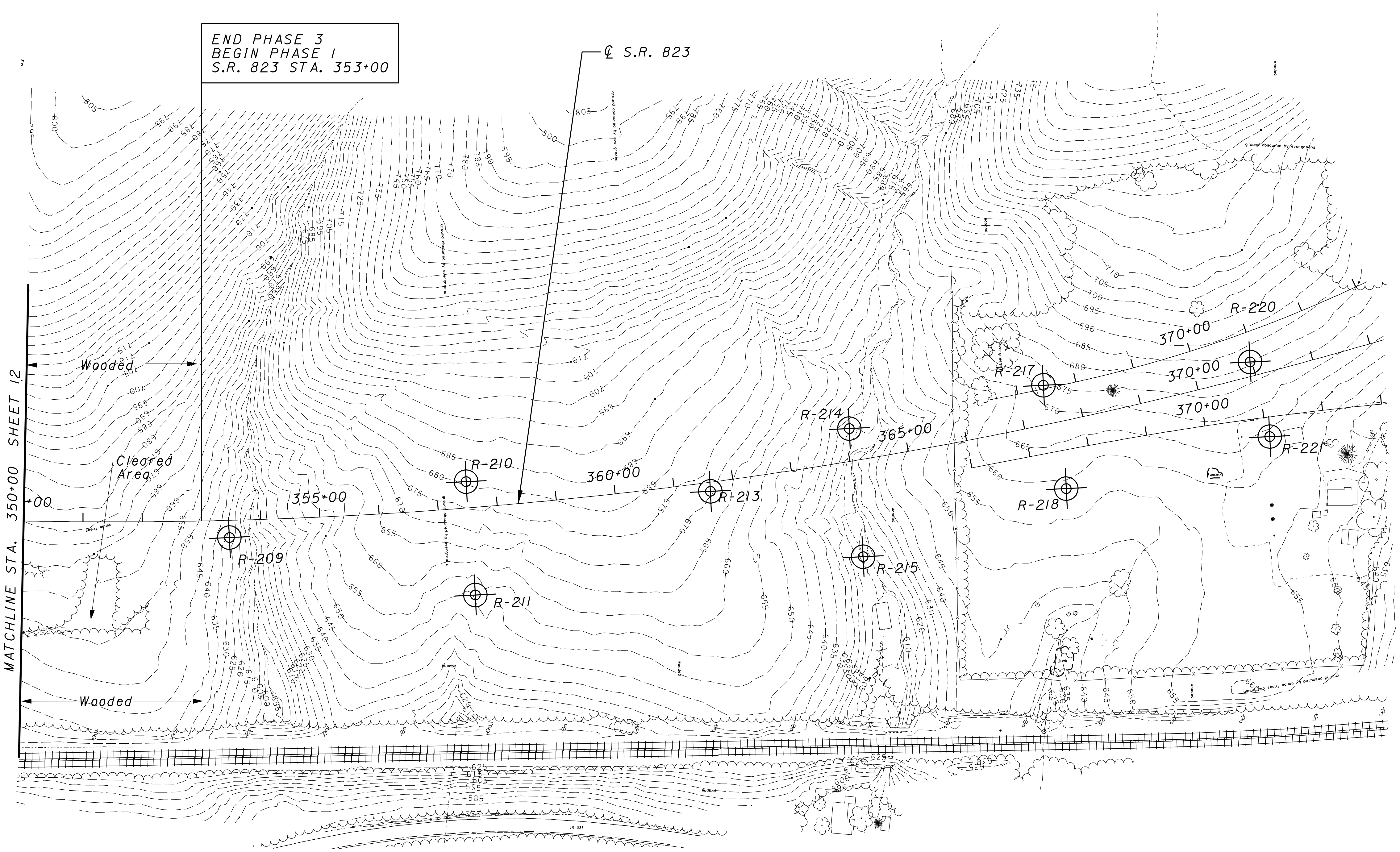

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0 50 100 200
HORIZONTAL SCALE IN FEET

DRAWN AMJ
CHECKED AEN

LAND USE AND RECONNAISSANCE NOTES
S.R. 823 STA. 350+00 TO STA. 353+00

SCI-823-0.00

APPENDIX B

Bedrock Exposure Logs
Existing Pavement Photos
Bedrock Exposure Photos
SR 335 Landslide Photo
Pond Photos
Dump and Debris Photos

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring RE-1 | Location: Rock Exposure north of Ohio River Road - STA 44+00 | Date Drilled: 4-2-2007

WATER OBSERVATIONS: Water seepage at:
Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
0	630.0						Soft to medium hard brownish gray SANDSTONE interbedded with SILTSTONE; very fine to fine grained, moderately to highly weathered, laminated to medium bedded, highly fractured.							

STANDARD PENETRATION (N): Natural Moisture Content, % - ●; PL ├──┤ LL; Blows per foot - ○; scale 10 20 30 40

Depth scale: 0, 5, 10, 15, 20, 25, 30

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring RE-1 | Location: Rock Exposure north of Ohio River Road - STA 44+00 | Date Drilled: 4-2-2007

WATER OBSERVATIONS: Water seepage at: Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ├──┤ LL Blows per foot - ○ 10 20 30 40
30	600.0													
35														
40														
45														
50														
55														
60														

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring RE-1 | Location: Rock Exposure north of Ohio River Road - STA 44+00 | Date Drilled: 4-2-2007

WATER OBSERVATIONS: Water seepage at: Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ├─┤ LL Blows per foot - ○ 10 20 30 40
60	570.0													
65														
70.0	560.0						Bottom of Boring - 70.0'							
75														
80														
85														
90														

Client: TranSystems, Inc.	*Project:* SCI-823-0.00	*Job No.* 0121-3070.03
LOG OF: Boring RE-2	*Location:* STA 106+25 82' Right	*Date Drilled:* 4-2-2007

WATER OBSERVATIONS: Water seepage at:
Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetro-meter (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
0	627.0						Soft to medium hard brownish gray SANDSTONE interbedded with SILTSTONE; very fine to fine grained, moderately to highly weathered, laminated to medium bedded, highly fractured.							
10.0	617.0						Bottom of Boring - 10.0'							

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢—⊣ LL
Blows per foot - ○
10 20 30 40

Depth scale: 0, 5, 10, 15, 20, 25, 30

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring RE-3 | Location: STA 107+50 460' L | Date Drilled: 4-2-2007

WATER OBSERVATIONS: Water seepage at: Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢⊣ LL Blows per foot - ○ 10 20 30 40
0	657.0						Soft to medium hard brownish gray SANDSTONE interbedded with SILTSTONE; very fine to fine grained, moderately to highly weathered, laminated to medium bedded, highly fractured.							
5														
10														
15														
20														
25														
30														

Client: TranSystems, Inc.	Project: SCI-823-0.00	Job No. 0121-3070.03
LOG OF: Boring RE-3	Location: STA 107+50 460' L	Date Drilled: 4-2-2007

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	WATER OBSERVATIONS: Water seepage at: Water level at completion: DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ├──┤ LL Blows per foot - ○ 10 20 30 40
30	627.0													
35														
40														
45														
50														
55														
60														

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring RE-3 | Location: STA 107+50 460' L | Date Drilled: 4-2-2007

WATER OBSERVATIONS: Water seepage at: Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢⊣ LL Blows per foot - ○ 10 20 30 40
60	597.0													
65														
70														
75														
80														
85														
86.0	571.0						Bottom of Boring - 86.0'							
90														

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring RE-4 | Location: STA 139+10 164' R | Date Drilled: 4-2-2007

WATER OBSERVATIONS: Water seepage at: | Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
0	538.0						Medium hard brownish gray SANDSTONE very fine to fine grained, moderately weathered, medium bedded, slightly fractured.							
2.0	536.0						Bottom of Boring - 2.0'							

STANDARD PENETRATION (N): Natural Moisture Content, % - ● ; PL ⊢—⊣ LL ; Blows per foot - ○ ; scale 10, 20, 30, 40

Depth scale: 0, 5, 10, 15, 20, 25, 30

Client: TranSystems, Inc. | *Project:* SCI-823-0.00 | *Job No.* 0121-3070.03

LOG OF: Boring RE-5 | *Location:* STA 302+00 523' R | *Date Drilled:* 4-2-2007

WATER OBSERVATIONS: Water seepage at: | Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
0	552.0						Hard gray SANDSTONE interbedded with SILTSTONE; medium hard brownish gray SANDSTONE, very fine to fine grained, slightly weathered, laminated to medium bedded.							
2.0	550.0						Bottom of Boring - 2.0'							

STANDARD PENETRATION (N): Natural Moisture Content, % - ● ; PL |—| LL ; Blows per foot - ○ ; scale 10, 20, 30, 40

Depth scale: 0, 5, 10, 15, 20, 25, 30

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring RE-6 | Location: STA 305+60 627.6' R | Date Drilled: 4-2-2007

WATER OBSERVATIONS: Water seepage at: | Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
0	553.0						Medium hard gray SANDSTONE, very fine to fine grained, slightly weathered, laminated to medium bedded, slightly fractured.							
4.0	549.0						Bottom of Boring - 4.0'							

STANDARD PENETRATION (N): Natural Moisture Content, % - ●; PL ⊢—⊣ LL; Blows per foot - ○; 10 20 30 40

Depth scale: 0, 5, 10, 15, 20, 25, 30

Client: TranSystems, Inc.	Project: SCI-823-0.00	Job No. 0121-3070.03
LOG OF: Boring RE-7	Location: STA 345+25 340' R	Date Drilled: 4-2-2007

WATER OBSERVATIONS: Water seepage at:
Water level at completion:

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
0	559.0						Medium hard gray SANDSTONE, very fine to fine grained, slightly weathered, laminated to medium bedded.							
3.0	556.0						Bottom of Boring - 3.0'							

STANDARD PENETRATION (N): Natural Moisture Content, % - ●; PL ⊢—⊣ LL; Blows per foot - ○; scale 10, 20, 30, 40

Depth scale: 0, 5, 10, 15, 20, 25, 30

Photo 1. SR 140 pavement.

Photo 2. Pershing Avenue. and Slocum Avenue asphalt pavement

Photo 3. Slocum Avenue asphalt pavement.

Photo 4. Stout Hollow Road chip seal pavement.

Photo 5. Blake Hollow Road chip seal pavement.

Photo 6. Landslide along SR 335.

Photo 7. Excavated embankment pond at Station 73+50.

Photo 8. Excavated embankment pond at Station 107+50.

Photo 9. Excavated embankment pond at Station 265+00.

Photo 10. Spring-fed pond at Station 269+90.

Photo 11. Rock cut at station 44+00.

Photo 12. Bedrock exposure left of station 106+50.

Photo 13. Bedrock exposure right of station 143+00.

Photo 14. Bedrock exposure right of station 302+00.

Photo 15. Debris pile north of Stout Hollow Road left of station 166+00.

Photo 16. Debris pile north of Stout Hollow Road, left of station 166+00.

Photo 16. Junkyard to the right of station 118+00.

APPENDIX C

Reconnaissance and Planning Checklist

II. Reconnaissance and Planning Checklist

C-R-S:SCI-823-10.13	PID:77366	Reviewer:AMJ	Date:11-16-2007

All projects must establish the geologic setting and identify possible geologic hazards that may exist in the project area prior to preliminary design. This Reconnaissance and Planning Checklist should be followed as a guide to establishing the above conditions.

Y N 1 Has the "Planning and Reconnaissance" section of the ODOT Specifications for Subsurface Investigations been followed?

2 Have the following ODOT sources of geotechnical information been reviewed:

Y N X a past construction plans, including soil profile sheets from District

Y N **X** b past project construction diaries

Y N X c interviews with people knowledgeable of the project site

Y N X d archived boring logs on file with the OGE

Y N X e past District and County Garage maintenance records

Y N 3 Has ODNR geotechnical information been reviewed?

Indicate which references were reviewed:

9 "Bedrock Geologic Map(s)"

9 "Bedrock Structure Map(s)"

9 "Bedrock Topography Map(s)"

9 "Geologic Map of Ohio"

9 "Known and Probable Karst in Ohio"

9 "Quaternary Geology of Ohio"

9 "Soil Survey(s)"

9 National Wetland Inventory Map

9 Ohio Wetland Inventory Map

9 Report of Investigations

9 "Landslides and Related Features"

9 aerial photographs

9 measured geologic section(s)

9 boring logs 9 water well logs

9 Bulletins 9 Information Circulars

9 Other List Other items:

Y N 4 Has information regarding the possible existence of geologic hazards in, or adjacent to, the project area been requested and obtained from individuals in the project area?

Indicate which individuals were consulted:

9 ODOT construction and maintenance employees

9 ODOT employees (active or retired) who were involved with the original construction?

9 current, former, adjacent landowner(s)

9 County Engineer / County employees

9 Township Trustees and employees

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		9 local planning and zoning officials	
		9 City or Village officials	
		9 Other — List Other items:	
Y N X	5	Has information pertaining to the existence of underground mines within, or adjacent to, the project area (requested from the District AUMIRA Coordinator, DMRM, and DGS) been reviewed?	
Y N X	6	Has the information from DMRM and DGS been reviewed regarding the existence of active, reclaimed, or abandoned surface mines within, or adjacent to, the project areas?	
Y **N** X	7	Has any of the geotechnical information gathered in Question 3, indicated the potential presence of lake bed sediments, organic soil, or peat deposits?	
	8	Identify the geologic features that may influence the design on this project:	

9 Landslide	9 Wetland or Peat	9 Fractures / Faults in exposed rock faces	9 Other
9 Rockfall	9 Karst	9 Underground Mine	9 Surface Mine

Notes

Stage 1: