

WETLAND ASSESSMENT
of the
RINDGE STONE & GRAVEL PROPERTY (Map 11, Lot 001, 001A)
Rindge, NH

REVISED FINAL REPORT



[Turtle crossing sign along roadside edge, Old New Ipswich Rd]

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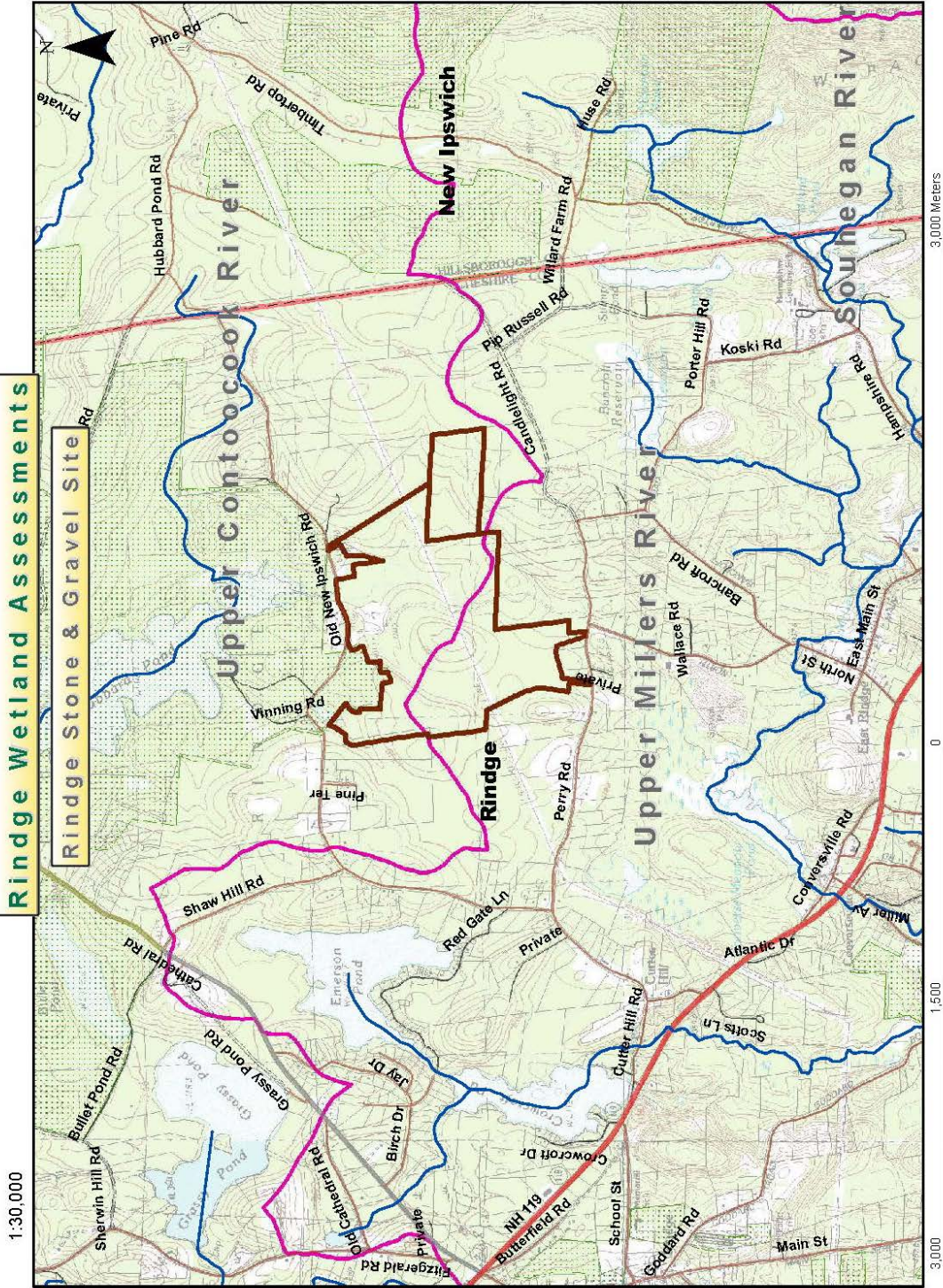
Submitted to:

Rindge Conservation Commission

December 22, 2017

Rindge Wetland Assessments

Rindge Stone & Gravel Site



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SUMMARY

Between March 2016 and May 2017 a field assessment of the 346-acre Rindge Stone & Gravel (RS&G) property in Rindge, NH was completed for the Rindge Conservation Commission (RCC). The initial purpose of the study was to determine if the property would be a suitable site for on-site wetland mitigation as a part of the proposed Kinder Morgan (KM) pipeline project nearby. Subsequent to the demise of the pipeline project, the assessment continued for the purpose of providing background information suitable for various grant applications that were intended to leverage the purchase of this property for conservation. The nearby Annett State Forest and high quality wetlands of the site suggested that it was suitable for such purposes.

Three site visits were completed at the RS&G Property for the purpose of mapping, classifying, and assessing the wetland resources. The first took place on March 1, 2016 and was held in the accompaniment of the landowner and two members of the RCC. The survey route was north of and along the powerline right-of-way that crosses the property from southwest to northeast. In the afternoon, a riparian wetland along Perry Road was circumnavigated. On April 22, another member of the RCC joined in the assessment of other wetlands and vernal pools. This route included the 47-acre lot in the southeast part of the property. The final visit on May 15, 2017 was held in part with an RCC member, and included all of the remaining wetlands and most of the boundaries of the property.

Eleven wetland evaluation units (WEU's) were identified, classified, and assessed. A total of 58.78 acres of wetland was evaluated, 51.91 acres of which was found to be directly on the RS&G property. A total of 129 separate NWI cover and/or soil types were found within the WEU's, with emergent types representing 12.2 % (7.22 acres), scrub-shrub types representing 22.7% (13.37 acres), forested types representing 54.5% (31.98 acres), ponded types representing 4.2% (2.47 acres), and riverine types (intermittent and perennial streams) representing 6.0% (3.52 acres). The remainder was comprised of upland islands (N = 2), ditches, and roadways. WEU's ranged between .9 acres (Wetland J) and 21.4 acres (Wetland A), with a mean of 5.33 acres. Other isolated wetland units on the property totaled 3.65 acres, most of which were created wetlands within the gravel pit area.

Wetlands outside of the gravel pit area and powerline right-of-way were of moderate to high quality. Six wetlands exceeded the mean value of 7.2 for Ecological Integrity, with two wetlands, Wetland B and I exceeding a score of 8.0. Wetland wildlife function was also well expressed in these wetlands, as well as the two nearby wetlands C and D. The absence of large streams or open expanses of water limited the Fish & Aquatic Habitat scores, with Wetland B providing the highest score of 6.5. Among the three water quality functions, Wetland A scored the highest for Sediment Trapping (8.0) and Shoreline Anchoring (10.0), and Wetland G scored the highest for Nutrient Transformation (8.2). Besides the two wetlands that were somewhat close to Tier 2 habitat, Noteworthiness attributes were present in three wetlands on the basis of rare natural communities (black gum swamp) and rare wildlife (Blanding's turtle and blue-spotted salamander).

When compared to other wetlands as well as other high value wetlands in the region, the Rindge Stone & Gravel wetlands ranked well above average for wildlife habitat, scenic quality, and groundwater recharge. The porosity of the soils and the underlying aquifer was responsible for the generally high scores for groundwater recharge on this site.

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REVISED

Wetland Assessment Summary
Of the
Rindge Stone & Gravel Parcel
Rindge, NH

By R. Van de Poll, CWS #110

I. Overview

In October 2014, Tennessee Gas Pipeline, LLC (TGP), a subsidiary of Kinder Morgan (KM), began proceedings to seek a license from the Federal Energy Regulatory Commission or FERC to cross three states in the Northeast with its Northeast Direct (NED) natural gas pipeline. General knowledge of the proposed pipeline route was enhanced during several informational sessions that KM held in the region during the fall of 2014 and spring/summer of 2015. The Town of Rindge, acting through its Conservation Commission, requested that Ecosystem Management Consultants (EMC) conduct an independent, in-depth assessment of the potential impacts of this pipeline along the 9.1-mile route through the town. Beginning in March 2015, a comprehensive mapping and assessment of wetlands along the proposed pipeline route took place, with a final report that was submitted and presented to the town in January 2016. In May 2016, KM suspended its activities with FERC and formally withdrew its application in June 2016.

Prior to TGP's withdrawal, the Rindge Conservation Commission (RCC) had been considering locations for possible on-site mitigation for the wetland impacts that would attend the construction of a 3-foot wide, 6 – 10 foot deep stainless steel pipeline. One of the landowners along the proposed pipeline route, Mark Harasimowicz, owner of Rindge Stone and Gravel (RS&G), invited the RCC to have them consider his property as a possible mitigation site. On March 1, 2016, members of the RCC, Harasimowicz, and Dr. Rick Van de Poll of EMC completed a site walk on about half of the subject property off of the Old New Ipswich Road. This constituted the first of the three field site visits.

Subsequent to the withdrawal of the pipeline proposal, the RCC continued negotiations with Mr. Harasimowicz to seek permanent protection of his property. Additional information was requested of EMC for the purpose of submitting grant applications to assist with the purchase of the property. Additional field site work continued into 2017 with an emphasis on completing wetland assessments of all wetland complexes on the property. The information contained in the following report updates the findings of the wetland mapping and assessment study and satisfies the baseline requirements for application to the Aquatic Resource Mitigation (ARM) Fund. This document includes data on three additional wetland complexes, all of which lay on parts of the property that was not visited during the first site visit. This report contains the tabular data for each wetland evaluation unit (WEU) assessment,

the requisite cover type and soil type maps, and a descriptive narrative of each wetland. Other attributes of the property are also discussed.

II. General Condition of Property

At +/- 346 acres in size, the Rindge Stone & Gravel property is the sixth largest lot in Rindge. Except for a gravel pit near the frontage on Old New Ipswich Road, it is presently undeveloped. It abuts the 3780-acre Annett State Park that lies to the north, and shares about 3500 feet of common boundary. About 20 acres of the lot has been actively mined for gravel and stone, and several active piles, crushers, trailers, and sorting screens still lie in the active pit area.

Otherwise the parcel is mostly wooded with a mix of hardwoods and softwoods. Across the south-central part of the property is a 180-foot wide swath of open powerline owned and maintained by Eversource (PSNH). This .8-mile long clearing encompasses about 23 acres of uplands and wetlands on the property. The only other non-forested areas include the 24 acres of marsh and scrub-shrub habitat that represents about 45% of the property's jurisdictional wetlands.



Above: NE corner of property along Old New Ipswich Rd



Clear trout stream entering Wetland A near access road bridge at powerline

The property spans two HUC 10 watersheds, the Upper Contoocook River and the Upper Millers River.¹ Roughly 230 acres (70%) lie in the Upper Contoocook and 94 acres lie in the Upper Millers River. The upper watershed position of the property and relative low relief favored the deposition of coarse sand and gravel during the post-glacial era, wherein roughly one quarter of the property contains soils that formed in glaciofluvial materials. Stratified drift aquifers underlie the northeastern part of the property (+/- 120 acres) and a small sliver of the south corner of the property. This headwaters parcel has very few perennial streams, with the primary stream draining a 385-acre catchment in the east part of the property and crossing Old New Ipswich Road at the large marsh depicted above. A second perennial stream forms the lower part of an 88-acre catchment above Perry Road at the south edge. A total of 10 intermittent stream lengths were identified, most of which transited the wetland systems noted below. Perennial stream lengths were estimated at 5,000 feet, whereas intermittent streams were estimated at 8645 feet in total length.

¹ It should be noted that the HUC (aka Hydrologic Unit Code) 10 watershed line is in error on the property and includes 15 acres more in the Upper Millers River watershed than is present based on field analysis. In terms of the ARM Fund watershed areas, the property is therefore split between the Contoocook River watershed and the Lower Connecticut River watershed.

Roughly 300 acres of upland and wetland forest comprise all but the very northeast and northwest part of the property. While all of the upland forest types were identified as Hemlock-Beech-Oak-Pine Forest,² the wetland forests were more varied. Red Maple-Sphagnum Basin Swamps were the most common, although Hemlock-Cinnamon Fern Forest/Swamp was also frequent on the property. Perhaps the most unusual type was the Black Gum-Red Maple Basin Swamp that was a part of Wetland G as described below. Unlike the narrower, spring-seep wetlands elsewhere on the property, this swamp was a relatively flat basin with classic pit-and-mound topography. Tree ages were estimated at 250 years (black gum) and 300 years (hemlock).



Old black gum trees in Wetland G

Vernal pools were frequent on this flat, upper watershed property as well. Twelve confirmed pools were identified by virtue of their site characteristics and obligate breeding amphibians. Wood frog and spotted salamander were the two most frequent obligate breeders



Vernal pool in Wetland I with spotted salamander eggs (inset)

identified, although at least one pool had blue-spotted salamander eggs masses as well. Two other seasonal pool areas, one of which was in the black gum swamp, were also identified as possibly having vernal pool activity on an occasional basis. A number of other sites also contained spotted salamander eggs although lacked any basin characteristics more typical of a vernal pool. Some of these stream-inundated areas also contained fish (e.g. eastern brook trout). Others included ATV or skidder-created depressions that held a few egg masses that were destined for

overheating, hypoxia, and/or rapid desiccation.

Wildlife species were observed during each of the field outings, with white-tailed deer, eastern coyote, black bear, red fox, gray fox, snowshoe hare, porcupine, gray squirrel, red squirrel, chipmunk, and beaver being the most frequent. Other species noted infrequently included star-nosed mole, hairy-tailed mole, short-tailed shrew, raccoon, bobcat, flying squirrel, deer mouse, and red-backed vole.



Bill Preston holding blue-spotted salamander eggs from below Wetland J

² According to *The Nature of New Hampshire, Natural Communities of the Granite State* (Sperduto and Kimball 2011), this forest type is the most common mixed forest in the state.

Most of these species was identified by evidence of their passing, such as track, scat, rub marks, browse, dens, and sightings. The timing of the field site visits was not conducive for recording a full spectrum of birds, although at least 56 species were documented by aural or visual clues. Canada goose, wood duck, swamp sparrow and song sparrow were some of the species found in the main marsh system, while broad-winged hawk, barred owl, pileated woodpecker, black-throated green warbler, northern waterthrush, and common grackle were found in some of the forested wetland systems. Several open ground (early successional) birds were noted for the gravel pit and powerline areas, including eastern towhee, prairie warbler, and field sparrow.



III. Results & Discussion of Findings

A) Wetland Resources - General

A total of 20 different wetland evaluation units (WEU's) were identified on the Rindge Stone & Gravel property. Eleven of these WEU's were large enough to warrant separate evaluations. The nine remaining WEU's were comprised of small, isolated basins with uniform NWI cover and soil types. The eleven WEU's are identified on a map in Appendix A, which illustrates where all of the evaluated wetland complexes were located. Segregation of the 127 different wetland cover/soil type units identified on the property into WEU's followed the latest version of the *NH Method*,³ wherein individual wetland units were aggregated according to their occurrence in naturally occurring basins, in riparian areas, or as a part of larger wetland complexes that are currently separated by roads.

The following table summarizes the results of the NH Method assessment of each of the 11 WEU's:

Wetland Functions & Scores	A	B	C	D	E	F	G	H	I	J	K
1. ECOLOGICAL INTEGRITY	4.8	8.8	7.5	7.6	6.7	5.8	6.7	7.4	9.3	7.0	7.7
2. WETLAND WILDLIFE HABITAT	5.7	7.2	6.1	6.1	5.4	5.3	5.1	5.9	6.5	4.6	5.3
3. FISH & AQUATIC HABITAT	5.2	6.5	2.5	5.7	4.5	5.0	2.7	3.6	3.6	4.5	4.5
4. SCENIC QUALITY	5.2	5.3	4.5	3.2	3.2	7.5	5.3	4.7	3.2	3.2	2.3
5. EDUCATIONAL POTENTIAL	5.8	6.0	5.2	5.4	5.6	6.1	4.6	4.8	5.7	3.7	4.1
6. WETLAND-BASED RECREATION	6.8	4.9	3.6	4.4	3.4	6.5	3.6	4.4	3.0	2.5	3.4
7. FLOODWATER STORAGE	3.3	2.2	1.8	1.4	1.8	2.2	3.2	1.2	3.3	3.3	3.3
8. GROUNDWATER	8.2	4.4	3.6	5.4	7.2	4.6	2.8	3.6	4.7	2.4	5.2
9. SEDIMENT TRAPPING	8.0	7.5	7.4	4.1	7.4	6.7	7.6	6.6	8.0	5.0	6.9
10. NUTRIENT TRANSFORMATION	6.5	6.9	6.8	5.1	6.3	7.3	8.2	7.5	7.3	4.7	7.1
11. SHORELINE ANCHORING	10.0	3.3	7.5	5.6	6.3	8.1	0.0	7.5	7.8	5.3	6.5
12. NOTEWORTHINESS	30.0	10.0	10.0	0.0	0.0	10.0	30.0	0.0	10.0	20.0	10.0

Table 1. Results of the NH Wetland Method assessment of 11 wetlands on the Rindge Stone & Gravel property. Note that the highest scores for each function are highlighted in pink and the second highest scores are highlighted in green

Scores ranged from a possible 0.0 (i.e. for a function that was not present in a given wetland), to 10.0 as a maximum score for all but the Noteworthiness function. Noteworthiness varied from 0.0 to 30.0 based on the number of 10-point attributes present in each wetland. The table above reflects the variability among the eleven wetlands, which indicates that the two highest scoring functions among nearly all of the wetlands was Sediment Trapping and Nutrient Transformation. With exception of Sediment

³ *Method for Inventorying and Evaluating Freshwater Wetlands in New Hampshire* (Stone, Mitchell, Van de Poll, and Rendall 2015). See www.nmethod.org

Trapping in the stream-based Wetland D and J, all other scores exceeded the regional average.⁴ Ecological Integrity was also fairly high in all but Wetland A and F. The presence of fill and other human disturbance in or adjacent to these roadside wetlands lowered their scores. The absence of large streams or open water bodies on the property limited the scores for Wetland Wildlife Habitat and Fish & Aquatic Habitat, although Wetland B exceeded the regional average score for both of these functions. The diversity of habitat and roadside viewing of Wetland F allowed this wetland to score high for Scenic Quality and Educational Potential. Scores for the Floodwater Storage function was low throughout owing to the upper watershed position of the property and the absence of large streams or basins. The general lack of public access limited the Scenic Quality, Education Potential, and Wetland-based Recreation functions among all other wetlands. The presence of the afore-mentioned aquifers and generally coarse soils of the property yielded high scores for Groundwater Recharge. The scores for Wetland A (8.2) and Wetland E (7.2) were among the highest Groundwater scores ever recorded by the author. Relative to the Noteworthiness function, Wetland A, G and J were close enough to a regionally significant Wildlife Action Plan area (Tier 2) to score points. The proximity of the Blanding's turtle to Wetland A and the presence of blue-spotted salamanders near Wetland J also carried some value for notable biological attributes. In terms of other uncommon to rare elements that resulted in 10-point values in the Noteworthiness function, the fairly pristine fen component of Wetland C and the black gum swamp in Wetland G were also noteworthy.

The following narrative describes and depicts each of the eleven WEU's in more detail. This is followed by a generalized evaluation of the property as a whole relative to its potential for land acquisition and/or protection through the Aquatic Resources Mitigation (ARM) Fund.

B) Wetland Evaluation Units

Wetland A

The largest wetland unit 'A' (21.3 acres) lies in the north central part of the lot along Old New Ipswich Road. It is comprised of an extensive scrub-shrub habitat that is bisected by a meandering perennial stream. This stream drains a 385-acre sub-watershed at the edge of the much larger HUC 12 Upper Contoocook River watershed. The wetland 'A' drainage flows generally north and exits under Old New



Ipswich Road in the northeast corner of the property (see photo at left). The wetland is comprised of forested, scrub-shrub, emergent, and riparian cover types. Soils are fairly coarse since the wetland lies next to the formerly active gravel pit where the sand and gravel Colton series soils are mapped. A stratified drift aquifer underlies the entire wetland, and Favorable Gravel Well areas lie immediately adjacent to the wetland. The entire wetland is within a source water protection district.

Wetland A from Old New Ipswich Road

⁴ Regional average scores were derived from a tally of 164 wetlands that have been evaluated to date by the author and other wetlands scientists from around the state (see NHANRS Report on Wetland Buffers, 2017).

Wetland A is the only wetland on the RS&G property within close proximity to a known state-listed species, the Blanding's turtle. The photo on page 2 depicts a turtle crossing sign that was placed to help drivers on Old New Ipswich Road be more aware of crossing turtles that are moving into or out of the Wetland A marsh. Since this wetland is the largest and most significant wetland on the property, the presence of out-migrating turtles increases the value of the remaining wetlands on the parcel, notably those that contain vernal pool basins. The only threats to this wetland has been the gravel operations themselves since they has destabilized wetland buffer soils all around Wetland A. Activities on the powerline may also affect this wetland since the upper part lies within the ROW. In terms of restoration, the protection and enhancement of the buffer areas that are currently within the gravel operation is suggested. Further destabilization of the porous soils on the east side of this wetland is discouraged as this will likely directly affect the water quality of Wetland A.

Wetland B

The third largest wetland (6.9 acres) lies south of Wetland A and feeds into it at the very edge of the Upper Contoocook watershed. It is largely comprised of forested and scrub-shrub habitat with one small area (1.5 ac.) of beaver marsh. Beavers appear to still be active in the wetland, although it did not appear that they were residential during 2016 or 2017. The outflow of Wetland B forms an intermittent/perennial drainage that follows the south edge of the Eversource ROW and then joins the upper part of Wetland A. The sub-watershed of Wetland B is fairly small (89 ac.) and is entirely within an unfragmented, forested area. For this reason it



Wetland B as seen from ROW, beaver pond visible



scored the high for Ecological Integrity (8.8). Soils are fairly fine, although the edge of a stratified drift aquifer is mapped for the main part of the marsh. The inflow areas to the south and east were examined in the field in 2017 and were found to be mostly comprised of poorly drained drainageways with scattered seepage pools. The principal inflow stream was significantly compromised by an ATV trail that has crossed the stream for many years and is now nothing but exposed rock and stone.

Left: Years of damage to the stream crossing of an ATV trail

Wetland C

This wetland was the fifth largest (5.0 acres) yet contained some of the most diverse and interesting wetland habitats. Aside from the half-acre open water portion that lay astride the edge of the Eversource ROW, it also contained a significant sphagnum peat area otherwise deemed to be an acidic fen, complete with cotton-grass, cranberry, rose pogonia, leatherleaf, and sheep laurel. Given its size and relatively undisturbed nature, it is probable that this fen contains rare plants, if not some rare invertebrate species. It was also found to contain breeding spotted salamanders in the ponded area. The 145-acre sub-watershed of Wetland C was also near the edge of the HUC12 boundary, hence it also

contained mostly unfragmented habitat and scored very high for Ecological Integrity. In spite of the presence of the Eversource ROW in the sub-watershed, most of the effects were noticeable only along the immediate northwest boundary of the wetland. There were some rogue ATV tracks across the peat mat, however, especially in the east part. Although restoration of this long-term impact is not possible, signage or some other preventative measures to keep motorized vehicles out of this otherwise pristine fen is encouraged.



Left: the open water portion of Wetland C where spotted salamanders were breeding; Right: ATV tracks in the eastern part

Wetland D

This wetland was the second smallest WEU on the property (1.5 acres), and lay immediately below Wetland C. The waterway that comprised much of Wetland D was determined to be perennial as a result of the inflow from Wetland C. As a result, Wetland D was largely riparian, with smaller forested seep edges along its entire course. The gradient was fairly steep and the water flow mostly confined to the stream channel, hence the Sediment Trapping value was fairly low. The north edge of the wetland was impacted by the adjacent gravel pit operation, and stumps and debris formed part of the sub-



Wetland D was largely comprised of a perennial trout stream with small pocket seep wetlands along its edges

watershed edge of this wetland. The southern part of the inflow drainage of this wetland lay within the Eversource ROW, and so any use of chemical herbicides would be directed through Wetland D downstream into Wetland A. The outflow of this wetland was determined to be the 'pinch point' at the northwest edge where the gravel pit access road crossed the wetland on a bridge. This point was only a few meters above the edge of the open swamp of Wetland A.

Wetland E

This wetland was also small (2.7 acres) and mainly riparian, and was located to the west of the main access road in the Upper Contoocook watershed. The general topography of the wetland followed a post-glacial drainageway leading northeasterly towards Old New Ipswich Road. The drainageway was fairly narrow – about 30 meters at its widest point, and it contained at least two small basins that serve



Pocket vernal pool in upper Wetland E

as vernal pools. One was comprised of several pockets with spotted salamander eggs underneath upturned root mounds, and the other was a small excavated test pit with wood frog eggs. The central portion of the wetland had a sufficient slope to support a flowing intermittent stream. The lowest portion of the wetland was more level, and composed of a Red Maple-Sensitive Fern Seepage Swamp. The very outlet of the swamp at Old New Ipswich Road has been dammed and culverted prior to its outflow into the main wetland system feeding Hubbard Pond in Annett State Forest. The

ponded portion adjacent to the road and boundary wall contained spotted salamander eggs and several secondary vernal pool indicators. Wetland E appeared to have fairly coarse soils and was underlain by the Upper Contoocook aquifer, hence it scored very high for Groundwater Recharge. It also scored fairly high for Sediment Trapping since it was thickly vegetated and had variably circuitous stream flow.

Wetland F

The 5.2-acre Wetland F lay partly off the Rindge Stone & Gravel property in its very northwest corner just south of Old New Ipswich Road. About one-third of the wetland (and most of the beaver pond) was found to be on the Annett State Forest property. The 99-acre sub-watershed of

Wetland F included a few of the scattered residences along Old New Ipswich Road, and the outflow was confined to a culvert passing under the roadway as the intermittent drainage led northeasterly towards Hubbard Pond. The wetland itself was comprised of a forested seepage swamp in its upper part, which graded to a Red Maple-Sphagnum Basin Swamp in its central part. A narrow stream channel connected the latter to the beaver-impounded area, which had a scrub-shrub, emergent, and aquatic bed border. The pond itself was over 1.5 acres in size, and contained the best available PUB habitat for Blanding's turtles on the property. An interesting feature of this wetland was the sizable outcrop of Rangeley mica schist that formed much of the northwestern upland buffer.



Lower marsh, beaver pond of Wetland F at edge Annett SF

Wetland G

Wetland G was one of four WEU's that fell outside of the Contoocook River watershed. The entire 7.9-acre wetland complex and its 65-acre sub-watershed was located within the Upper Millers River HUC 12. The fairly level upper part was found in the same drainage pathway as Wetland E, but just southwest of the divide. Seepage swamps formed most of the forested section north of the powerline, which then sharply transitioned into a PSS1E swamp in the Eversource ROW. South of the ROW the wetland graded back into a forested swamp of very high quality. This relatively pristine Black Gum-Red Maple Basin Swamp was continuous to the north prior to the clearing for the powerline. The continued disturbance of the ROW has significantly affected what was once an exemplary natural community. Trees in excess of 250 years in age were found in the unaffected portion of the swamp. The outlet of this swamp led into an intermittent drainageway that formed the upper part of Wetland K to the southeast. Both Wetland G and K was within 500 feet to the east of a WAP-designated area of regional habitat importance that surrounded a dry, open drumlin with grassland bird habitat. Wetland G also received Noteworthiness points for its black gum swamp and the fact that it had the highest score for Nutrient Transformation among all 11 RS&G wetlands.



The powerline access road is severely eroded above Wetland G; fortunately, this wetland is exceptional at Nutrient Transformation

Wetland H

Wetland H was the fourth smallest WEU (2.6 acres), and was found along Perry Road at the very southern edge of the property. It included a small, intermittent stream that flowed southerly from a series of seeps and seasonally flooded basins south of the Eversource ROW. Along the east side of the wetland, several incursions by abutters was observed, who have filled small portions of the wetland with road debris and stumps. In spite of this, the upper part of the wetland was found to be fairly pristine, with a 125 to 135-year old conifer (Hemlock-Cinnamon Fern) swamp forming the



Right: a portion of the lowland spruce-fir swamp at the upper edge of Wetland H; note the shallow root systems from a perennially high water table that favors conifers

uppermost basin. The gentle grade of the terrain in this part of the wetland has supported the development of a Lowland Spruce-fir Forest, which at this latitude of southern New Hampshire was comprised of a mix of red spruce and eastern hemlock. An intermittent drainage with several seasonal



One of the seasonal pools along the stream above Wetland H

pools (without obligate breeding amphibians) enters the system from the northwest, although it provided little surface water flow to this generally groundwater fed system. The outflow of Wetland H is constricted by a culvert at Perry Road, where it exits the property to the south on its way to Converse Meadow Pond. This slightly under-sized culvert was perched on the downhill side of the road. Replacing this culvert and removing the fill and debris would improve the ecological functioning of this wetland.

Wetland I

This 1.75-acre wetland was located at the very southern edge of the Upper Contocook watershed just south of Wetland A and B. It had the smallest catchment size of any of the wetlands on the property (11 acres) and as a consequence had a relatively high Floodwater Storage function score (3.3) and the highest Sediment Trapping score (8.0). The wetland was directly connected to Wetland B by a narrow, 45-foot wide skid-trail created pool at the catchment divide. From here an intermittent stream and seepage based system descended to the southeast where it graded into a high quality Hemlock Cinnamon Fern Swamp with very old trees. The lowest portion curved back easterly again and was comprised of a hardwood dominated vernal pool swamp that finally drained northeasterly towards Wetland B. The small size and relatively intact condition resulted in the highest Ecological Integrity score (9.3) for all 11 wetlands.



Left: the PFO1/SS1E vernal pool portion of Wetland I; Right: the outflow narrows to 9 feet at an intermittent stream leading to Wetland B; the upland buffer to the east of this wetland had signs of having been burned during the post hurricane fires

Wetland J

At .9 acres, this wetland was the smallest WEU on the RS&G property. It was recorded in the central part of the 47-acre 'southeast lot' of the property along an intermittent drainageway that led into Wetland B. Most of this system involved flashy run-off channels with periodic red maple and yellow birch swamp basins. Below the old stage road crossing the stream actually split in two and descended a fairly steep section over rocks and till. The terminus of the wetland was determined to be the point where the final basin narrowed to a seven-foot wide drop into a well-defined stream channel. The entire wetland was no more than 60 feet at its widest point and was consistently stream-dominated. The absence of a functioning culvert at the old stage road crossing was creating localized erosion and shifting of the stream channel.



Left: The stream splits in two in the central part of Wetland J; Right: the property edge clearcut above the inflow stream to Wetland J can be seen in the distance

Wetland K

Not unlike Wetland J, the 2.8-acre Wetland K was a narrow, stream-dominated system. No more than 100 feet wide at its widest point, it was located in the very southwestern part of the property along Perry Road. Its 87.6-acre sub-watershed derives most of its inflow from Wetland G, although a number of bench-forming groundwater seeps to the east of this inflow were also responsible for the intermittent stream that left the property through a narrow culvert on Perry Road. Curiously, the basin wetland in the southeast part of Wetland K below the abutting property's house did not appear to have an outlet under the road. This was in part responsible for the relatively high Flood Storage score. The high yield aquifer in the Upper Millers River watershed that lay mostly south of Perry Road was within 500 feet. As a result, the Groundwater Recharge value of this wetland was fairly high (5.2).



Right: the inflow to Wetland K drained the black gum-red maple swamp of Wetland G and was comprised of exceptionally clear, cool water

A total of 6.65 acres of smaller, isolated wetland units were identified on the Rindge Stone & Gravel property during the field surveys. Some of these extended off of the property but contained notable basins on the RS&G land, such as the vernal pool basin in the very southeast part. At least three of these basins did contain obligate breeding amphibians, including the blue-spotted salamander eggs that were found very close to but isolated from the open water of Wetland J. These isolated units did not include the seasonally inundated ATV pools along the powerline right-of-way, nor did they include all of the scraped 'holes' in the gravel pit area, which may, if left over time, result in jurisdictional wetlands. The latter condition formed the largest single cluster of wetlands in the northeast part of the property (1.9 acres), where fairly recent excavations have gone well below the water table. During one of the site walks there was some discussion about possibly turning these sites into cranberry farms, which appeared to be very possible given the site conditions and well-established presence of wild cranberry.



A now stabilized part of the gravel pit currently supports a sizable patch of wild cranberry and could be developed for this purpose

IV. ARM Fund-Compatible Attributes of the Property

In terms of other attributes of this property that could make it competitive during an ARM Fund round for both the Contoocook River and Lower Connecticut River HUC 8 watersheds, the following evaluation table provides a summary: ⁵

Attribute	Present?	Possible Pts	Notes
Restoration Potential	yes	12 - 18	Remove gravel equipment; recontour land; develop cranberry beds; improve passage for turtles under road; install culverts, rock fords
Source water	yes	3	
Wellhead protection	no	0	
High yield aquifer	yes	3	> 2000 s.f./day (Contoocook); > 9999 s.f./day (Upper Millers River)
T&E spp., exemplary natural community	yes	6	Blanding's turtle habitat (confirmed nearby); black gum swamp; blue-spotted salamander
WAP habitat	yes	6	Wetland G,J,K near Tier 2
Cons. Lands nearby	yes	4	abuts Annett State Forest
Provides connection	no	0	
Overland connection	yes	4	several connections between WEU's
Unfragmented Land	no	0	unfrag block < 1600 acres
Same watershed as impact area	?		uncertain at this time
Aquatic resource protection	yes	6	legal protection of at least 11 vernal pools (need to further document)
Regionally recognized	no	0	not next to prime wetland
Buffer protection	yes	4	Will protect at least 200 ft buffer around each aquatic resource
Watershed protection	yes	2	Will protect watersheds of most of 7 of the 11 WEU's
Partnership	yes?	3	\$ Match of at least 30% by town?
Priority Plan	no	0	Not in state or federal plan
Town support	yes	2	local support documented
TOTAL	11 Y, 5 n, 2 U	55 - 61	

Table 2. Potential responses to ARM Fund evaluation criteria

Perhaps the most variable response to ARM Fund queries summarized in the above table is in regards to restoration. Question 1A and 1B on the ARM Fund evaluation sheet addresses the point values for restoration, enhancement, and creation efforts for any given project. Recent revisions to this evaluation question has resulted in a focus on three criteria for wetlands (1A) and four areas for streams (1B). In order to properly prepare for a detailed response to this application question, the following table has been prepared for the Rindge Stone & Gravel property:

⁵ This table mimics the ARM Fund rating sheet that is completed for any project that applies for grant funding. The full description for these attributes are a part of the Chapter 800 Env-Wt rules, which can be reviewed at http://www.gencourt.state.nh.us/rules/state_agencies/env-wt.html

Wetland	Size	Potential Restoration Activity*	Current Score	Resulting Score
Wetland A	21.4	Restore buffer on west side; remove equipment, fill; replant with native shrubs & trees; remove invasive plants; replace outflow culvert; install culvert at inflow under powerline	EI: 4.8 WQ: 8.1 Wld: 5.5	7.6 8.1 5.8
Wetland B	6.9	Provide adequate crossing for stream area (rock ford?)	EI: 8.8	9.1
Wetland C	5.0	Install signage to attempt to limit ATV abuse of pristine wetland off of the powerline; install drainage culvert to encourage stream flow and discourage artificial impoundments that trap breeding amphibians	EI: 7.5	7.5
Wetland E	2.7	Block ATV use across wetland at skid trail; restore buffer with plantings	EI: 6.7	7.0
Wetland G	7.9	Work with Eversource to control erosion and damage from access road that leads into and crosses wetland; allow to revegetate; create vernal pool basin at southeast edge powerline to restore hydrology, enhance wildlife habitat and minimize water quality degradation from continued use of access road	EI: 6.7	7.5
Wetland H	2.6	Remove fill along east side from abutter; replace culvert under Perry Road with larger size, natural bottom	EI: 7.5 Wld: 4.8	7.9 5.2
Wetland J	.9	Remove fill along old stage road; install culvert to direct intermittent stream flow and reduce damage from ATV's	EI: 7.0	7.9
SUM	47.4	SUM of scores & change	EI: 49.0 WQ: 8.1 Wld: 10.3	54.5 8.1 11.0
		% Change	EI WQ Wld	11.2% 0% 6.8%
		* Note this does not include any specific increases in functionality of the stream systems, which should receive points under Q1B		

Table 3. Potential change in functional value scores for various restoration activities on the RS&G property

Table 3 does not include stream restoration values, nor does it include potential points for providing benefits to groundwater recharge, flood storage, and natural community enhancement as a result of the above proposed activities. Whereas the apparent sum of effects of such restoration may appear to be at the lower end of the evaluation scale, the overall impacts to each wetland may warrant higher ratings in the eyes of the ARM Fund's Site Selection Committee. Although there have not yet been any test cases for the new evaluation criteria (since they are new for 2018), it is suspected that the overall "bump" in values for the above-described restoration and enhancement treatments would be in the moderate range, that is, an improvement of between 33% and 67% of the wetland functions so described. This would result in a net point total of between 12 and 18 points for Question 1A, with some possible additional points for the increase in aquatic organisms passage (AOP) under Question 1B provided by the five proposed culvert replacements/installations.

V. Summary and Recommendations

The 11 wetland complexes and their upland buffers on the Rindge Stone & Gravel property provide an exceptional mix of wildlife habitat to the watershed divide area along the Upper Millers River and Upper Contoocook watersheds. The position of the large sand and gravel deposit within and adjacent to the wetlands also contains high groundwater recharge value that contributes a significant amount of drinking water supplies to the general area. The northern part of the wetland system forms the upper watershed of Hubbard Pond, and therefore has a direct influence on the water quantity and quality of an otherwise undeveloped pond within the adjacent Annett State Forest. Because of this, it has been rated as being of high value for wildlife in the biological region according to the 2015 Wildlife Action Plan. The impacts of both the gravel operations and the Eversource powerline have not been insignificant, especially in regards to supporting active ATV use across many of the wetlands and their upland buffers. Partly as a result, several potential restoration areas exist within and adjacent to the wetland complexes that could result in a significant increase in ecological function. While these have not been specifically designed or budgeted as yet, many of them involve fairly easy and moderate cost activities such as the removal of fill, the installation of culverts or rock fords, and the creation of alternative wildlife habitats, such as the cranberry bog near Wetland A. More specific detail on some of the possible restoration actions noted in Table 3 are as follows:

Restoration Potential

- 1) Removal of Fill** – there are several areas within the former gravel pit operation area where the current water table exceeds the level of the ground surface. At some of these sites there are fill piles that could be removed or re-contoured to provide greater hydrologic integrity to the basin systems as well as better wildlife habitat. Other fill piles could be removed to disperse micro-topographic flows thereby reducing concentrated run-off, minimizing erosion, and encouraging greater groundwater recharge. This is particularly true for the western and eastern edges of Wetland A. The fill placed in wetland H could be removed in order to restore riparian function to the eastern side of this wetland system.
- 2) Installation of Culverts** – the Old New Ipswich Road crossing of the outflow of Wetland A includes at least one undersized culvert that is likely preventing passage of Blanding’s turtles (among other species). At least two areas along the Eversource ROW involve perennial or intermittent stream crossings that should be culverted to allow for aquatic life passage and prevent downstream erosion and siltation. One of these is at the upper part of Wetland A, where run-off has actually created a streambed out of the well-used access road/trail. The other is at the outlet of Wetland C, where an existing roadway berm is creating artificial impoundments and inundated silt basins. The spotted salamander larvae that hatch out in this area likely do not survive the excessive heat of full exposure under the powerline. Wetland H could also use an outflow culvert under Perry Road. The current one is undersized and significantly perched on the downslope side. This would improve AOP along this intermittent stream system. A fifth culvert should be placed



The artificially impounded outlet to Wetland C currently attracts unsuccessful amphibians

along the intermittent inflow to Wetland J. The old stage road in this location is deeply rutted and currently transports sediment into this riparian system.

3) Wetland Habitat Enhancement –

a. The edge of Wetland G at the ROW lacks a suitable hydrologic connection to the black gum basin swamp to the south. A deeper water basin in this area could be contoured to create a vernal pool with a clear flow path at high water to the remainder of Wetland G. This would also help dewater the currently inundated area along the access road that is currently experiencing severe sediment and nutrient transport from the access road up gradient. The latter will need to be ditched, and water barred to prevent further inputs to the system. Working with Eversource will be required for this activity since the most highly eroded portion of this access road is on an abutting property.

b. **Cranberry Bog** – a now impervious zone of the old gravel pit currently supports a number of perennial and annual acidophilic plants that are common associates of wild cranberry. Wild large cranberry was found in the vicinity, and indicates that suitable conditions exist that could be managed for small-scale production and wildlife habitat. The site lies just before the bridge over Wetland D near some old concrete culverts. The entire area could be improved by re-contouring the old fill piles, and the basin that has been created could be deepened slightly to promote shallow peat beds suitable for cranberry cultivation. This activity has been successful elsewhere with minimal maintenance and controls.⁶



Potential cranberry bog in the old gravel pit area

c. **Trail Crossing of Wetland B** – The easterly inflow to Wetland B involves a perennial stream that is crossed by the old stage road & recreational trail that runs from the powerline southeasterly to the southeast corner of the property. The stream crossing is currently severely eroded and transporting sediment during all high water run-off events. Whereas a culvert could be installed here, this would entail the placement of additional rip-rap and fill to concentrate the flow. Since the bed of this stream is already filled with stones (the fines having already been washed away), it is suggested that this become a rock ford unless the trail gets shut down, in which case it will likely revert back to the perched forested swamp on either side.



Heavily eroded streambed of upper Wetland B

⁶ See work at Ambrose Pit by The Community School, Tamworth, NH.

Certain aspects of the property's condition will need to be addressed in order to apply for ARM Funds and be successful with a grant application. First, a survey needs to be on file and registered with the County Registry, which may have already taken place. An appraisal also needs to be completed within six months of the final transaction in order to establish appropriate financial amounts for the application's budgetary requests. Depending on the results of these two efforts, the disposition of the property needs to be established – i.e. will the town take title to the property? Will the current landowner retain the fee and merely sell the development rights? Who will be the conservation buyer (besides the state, who by law must retain an executory interest in the easement)? Will the rights to mine gravel be a part of the final transaction (which may necessitate a second appraisal of the amount of residual gravel)?

Transaction costs will also need to include funds for a title examination, resolution of any outstanding liens on the property, plus closing costs. A stewardship endowment will need to be assigned to any organization that holds an interest in the property, whether it be the town or a third party non-profit (i.e. land trust). If a third party holds the easement, then the stewardship amount must be calculated by the organization. For all easements so assigned, a baseline documentation report (BDR) must be completed to testify to the baseline condition of the property at the time of sale. While this report can serve as partial completion of that requirement, a full documentation of the boundary conditions will have to be performed as well.

For most properties that become conservation lands, a management plan (MP) must also be prepared. Pending the outcome of any restoration activity that is planned and funded through the grant application, the MP must also address the long-term sustainability of any restoration activity that takes place, for example, sediment and erosion control, invasives control, and recreational use. The latter has to be coordinated with Eversource since they own the right to maintain the powerline and access road. Although snowmobile access to the property has been granted by the landowner, this needs to be reviewed in light of a potential shift in land use. For example, are all of the snowmobile trails suitably designed to prevent erosion and allow for aquatic life passage? The ARM Fund agreement, if funded, will contain language that requires the landowner and/or easement holder to ensure that such values are upheld. Further, any timber management that occurs on the property will require suitable wetland and stream buffers to protect the aquatic resource (which is actually what the ARM Funds pays to protect). All of this needs to be worked out with all partners that have an interest in the final disposition of the land.

Although it may appear onerous to the town or landowner to enlist a property with such restrictions or conditions, it is the belief of this author that such an endeavor is in the best interests of the town. The conservation of this property will add to the protection zone around Annett State Park, contribute to a permanent overland wildlife corridor between Annett and Converse Meadow, help conserve a state-endangered turtle by protecting aquatic habitat, and provide for the continuance of well-used recreational trails that serve the interests of many citizens, some of who come from well beyond the town. Rindge has very few properties of this size left to protect. The Rindge Stone & Gravel property is the 6th largest unprotected tract in town. An effort to conserve this parcel will not only secure permanent open space for a critical upland and wetland corridor in town, it will also benefit thousands of human and non-human residents within this critical upper watershed complex of wetlands and uplands.

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Appendices

A) Maps

1. Site Visit Map A-1
2. WEU Location Map (with watersheds) A-2
3. WAP Highest Ranked Habitats Map A-3
4. WEU Maps
Wetland A to Wetland K A-4a,b to A-14a,b

B) Wetland Evaluation Data Forms B-1 to B-44

Appendices

A) Maps

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| 1. Site Visit Map | A-1 |
| 2. WEU Location Map (with watersheds) | A-2 |
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| 4. WEU Maps | |
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B) Wetland Evaluation Data Forms B-1 to B-44

Legend for NWI Classes							
WEU's All by NWI Class		PFO1/4/R4SB3E/7E		PFO4E		PUB3/4Hh	
NWI_code		PFO1/4/SS1/4E		PFO5/EM1E		R2UB2/3Hh	
	DITCH		PFO1/4/SS1E		PSS1/4/FO1/4E		R3UB1/2/PFO1/4E
	PEM1/ML1B		PFO1/4E		PSS1/EM1/R4SB3/7E		R3UB1/2/PFO4/1G
	PEM1/SS1/3E		PFO1/5/SS1E		PSS1/EM1E		R3UB1/2G
	PEM1/SS1E		PFO1/R4SB3E		PSS1/FO1/4B		R3UB1/2H
	PEM1/UB2/3F		PFO1/SS1E		PSS1/FO1/4E		R4SB3/PFO1E
	PEM1B		PFO1E		PSS1/FO1E		R4SB3/PFO4/1E
	PEM1E		PFO4/1/R3UB1/3E		PSS1/FO4E		R4SB3E
	PEM2/AB3/4G		PFO4/1/R4SB3E		PSS1/R4SB3E		R4SB3E/PFO1/4E
	PFO1/4/5/EM1E		PFO4/1/SS1E		PSS1E		ROAD
	PFO1/4/5E		PFO4/1/SS4E		PSS3/1B		U
	PFO1/4/R3UB1/2E		PFO4/1E		PUB2F		
	PFO1/4/R3UB1/2G		PFO4/R4SB3/7F		PUB3/4/AB3/4Hb		
	PFO1/4/R4SB3E		PFO4/SS1E		PUB3/4/EM1Fb		

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