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WETLAND MITIGATION PLAN: DEER CREEK DEVELOPMENT, SCHERERVILLE, INDIANA

USACOE 88-145-009-0E

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AUDITOR LAKE COUNTY

Revised: September 24, 1996

Prepared for:
Mr Richard M. Teibel
1332 Wilderness Dr.
Schererville, IN 46375

Prepared by:
J.F. New & Associates, Inc.
708 Roosevelt Road
Walkerton, IN 46574
219-586-3400

Mail to:
John Teibel
P.O. Box 1313
Lafayette, IN 47902

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I. PROJECT SUMMARY

Mr. Teibel proposes to fill 21.1 acres of wetlands and excavate 5.63 acres of wetlands for a pond for a total of 26.73 acres of wetland impacts at his Deer Creek Development (Sheet 1). A portion of this work was completed without authorization from the Corps of Engineers. Mr. Teibel proposes to mitigate for these impacts through the construction of 47.83 acres of wetlands onsite, preservation of 18.98 acres of existing wetlands, and elimination of the outlet of a pond excavated in wetlands and the construction of shallow side slopes in this pond.

[Note: A related, but separate, after-the-fact permit application is being submitted by Villa Cesare (USACOE File Number 89-145-077-1G). Mr. Teibel has tentatively agreed to work with Villa Cesare help them meet their compensatory mitigation requirements in conjunction with his project. This amounts to an additional 7.3 acres of wetlands to be created. The design presented in this document includes this additional acreage for a total of 55.13 acres. This is done so that the mitigation wetland can be assessed as a whole. A formal presentation of the Villa Cesare proposal will be presented in a separate document.]

II. GOAL OF MITIGATION

The overall goal of the mitigation project is to replace many of the functions and values of the wetlands lost and to provide permanent protection for the remaining wetlands on the site. Permanent protection will be provided by a deed restriction or conservation easement which would protect the site in perpetuity. All of the wetlands on the site have been impacted to varying degrees. Drainage, both local and regional, has severely reduced their hydroperiod. Additionally, review of aerial photographs has revealed that essentially the entire site has been farmed at one time or another. This accounts for the fact that early successional species dominate the wetlands. Despite these disturbances, the wetland continue to provide certain wetland functions and values. Some of the primary wetland functions and values applicable to this project are:

Water Quality

The existing wetlands on the site primarily derive their hydrology from a high water table supplemented by local runoff. Because the bulk of the water "processed" by the wetlands to be impacted is groundwater, the ability of these wetlands to have a substantial impact on water quality is somewhat limited. While the mitigation wetland will also derive its baseline hydrology from the high water table, it will be located adjacent to the Schererville Ditch.

Floodwaters from the ditch will be processed by the wetland providing an increased water quality function to the watershed.

Wildlife Habitat

The bulk of the wetlands to be filled (19.66 acres) are adjacent to US 41 which is a major highway in this part of Lake County. The wetland is primarily wooded with a shrub understory with small openings. The trees are typically early successional including cottonwood (*Populus deltoides*), boxelder (*Acer negundo*), and trembling aspen (*Populus tremuloides*). It is bisected by a maintained pipeline crossing. While the highway limits wildlife use to some extent, this woodlot does provide habitat for birds tolerant of edge habitats. The remaining wetlands to be filled are very small farmed wetlands which provide very limited wildlife habitat. The 47.83 acre (55.13 acres including Cesare Batisti) mitigation wetland will be constructed contiguous with the 18.98 acre preservation area and 5.63 acre pond providing a 72.44 acre (79.74 acres) block of wildlife habitat well away from US 41. This alone increases the long term potential to provide good wildlife habitat. The mitigation area will also provide a variety of habitats encouraging additional species to use the site. Being adjacent to two major ditches increases the value of the mitigation area since linear landscape features such as ditches frequently function as wildlife travel and dispersal corridors connecting habitat patches.

Recreational and Educational Use

The wetlands to be filled are currently on private property with no authorized public use. Whether or not the wetland remains in Mr. Teibel's ownership or is transferred to others, Mr. Teibel's hope is that it will be available to local residents for passive, nonconsumptive use. Bird watching and similar activities have minimal impacts on the wetland resource. The presence of a large protected wetland resource in close proximity to a residential development also has the great potential to increase public awareness regarding the value of wetlands.

Floodwater Storage

The existing wetlands on the site provide some stormwater storage by collecting rainwater from portions of the site. However, because of the flat nature of the site, this storage capacity is limited. Portions of the site currently become inundated during flood events. The depth of flooding, however is minimal so that total storage is also minimal. The mitigation wetland, however, is being excavated to provide more than 150 acre-feet of additional floodwater storage capacity to alleviate significant local flooding problems. The excavation also allows the mitigation wetland to overcome the zone of influence of the Schererville Ditch.

III. MITIGATION PLAN

The mitigation plan can be broken into three discrete tasks: 1) create 47.83 acres (55.13 acres including Cesare Batisti) of wetlands to provide compensatory mitigation for wetland impacts, 2) fill in the side slopes of the 5.63 acre pond to 10:1 and eliminate the outlet to minimize the impacts of its excavation and, 3) preserve in perpetuity 18.98 acres of existing wetlands along with the mitigation wetland and the pond. Together, each of these items will create a block of 72.44 acres (79.74 acres) acres of contiguous wetland habitat. This is far in excess of that currently present on the site and will result in a significant wetland resource for the watershed.

Compensatory mitigation

Teibel proposes to create 47.83 acres of wetlands (55.13 acres including Cesare Batisti) on the west side of the Deer Creek development site (Sheet 2). This will ensure that wetland values and functions are not lost to the immediate watershed. The mitigation wetland will be constructed by excavating upland farm fields, and oldfield scrub adjacent to the Dyer and Schererville Ditches. The excavation will be carried out to create a varied bottom conducive to the establishment of a variety of forested (PFO1A, PFO1C), emergent (PEMC, PEMA, and PEMB), and scrub/shrub (PSSC) wetland types (Sheets 3 and 4). Fill material removed during excavation will be used onsite to achieve acceptable building grades and to regrade the slope of the pond edge. Stockpiled topsoil will then be spread over the mitigation area to a depth of at least 6 inches to ensure an adequate substrate for plant growth. The wetland will then be planted with appropriate wetland vegetation as detailed in Section IV. All exposed soil will be seeded with a temporary nurse crop to control erosion. All nonwetland side slopes will be planted with native grass to control erosion and provide wildlife habitat.

Because the Schererville Ditch's zone of influence extends approximately 840 feet from the ditch, it will be necessary to excavate the majority of the wetland to the water table. The exception is in the northeast corner of the mitigation area which is currently drained by the northern end of Lateral Ditch #3 (Sheet 5). Hydrology will be restored to that area without altering the topography by filling the lateral ditch and raising the elevation of the surrounding uplands in preparation for site development. (A figure showing the location of the lateral ditches and their zone of influence can be found on Sheet A2 in a January 14, 1994 report by Earth Source, Inc. submitted to Mr. Don Reinke, USACOE.) A 200 foot long (±) very shallow slope (>35:1, see Sheet 4) will protect the existing wetland from being drained by the excavation of the mitigation wetlands. Hydrology will be provided to the majority of the mitigation wetland by excavating into the water table and providing a connection to the Schererville Ditch. The Schererville Ditch will provide both a source of water and hydrophytic seeds to assist in the revegetation of the mitigation area. Note that the direct connection with the Schererville Ditch will prevent floodwaters from remaining in the wetland long after the ditch floodwaters have receded. This will keep the flood duration short and protect the shallow water and seasonal wetland areas from drowning.

Tree cavity nesting opportunities will be limited within the mitigation wetland for many years. To reduce this impact on wildlife, 5 wood duck nesting boxes with predator guards will be erected within the wetland. Wood ducks have been severely impacted by nesting habitat loss but readily use artificial nest cavities. Screech owls also frequently use the boxes for overwintering. To encourage use by other cavity nesting birds, 10 nest boxes suitable for bluebirds and tree swallows will also be erected. The grading plan is designed to vary the topographic features across the site so that the plant communities will be interspersed maximizing wildlife value.

Pond resloping and spoil removal

To minimize the impacts of the pond excavation, the side slopes will be filled in to a slope of 10:1 to a depth of at least 3 feet (Sheet 5). This will allow the development of a substantial littoral zone around the margins of the pond increasing its habitat value. Fill material will come from spoil piles which are present adjacent to the pond, with additional material coming from the excavation of the compensatory mitigation area. The side slopes will be dressed with 4-6 inches of topsoil to ensure a suitable substrate for plant growth. Removal of spoil from around the margins of the pond will also serve to restore these areas to wetland conditions. Spoil will also be removed from the small wetland area south of Cesare Batisti.

To further ensure the restoration of the wetlands adjacent the pond, Lateral #1 and the ditch which connects it to the pond will be filled. The ditch will be filled with soil excavated from the compensatory mitigation wetland. Both the mitigation area and Lateral #1 are located in areas of Maumee loamy fine sand so the filled lateral will have the same lateral flow as the adjacent uplands. Other laterals will be filled as part of the site preparation for housing development. This will result in the restoration of hydrology to the wetland preservation area, including the area surrounding the pond, to the greatest degree possible. The filled lateral ditch within the wetland boundary and any areas disturbed by regrading and spoil pile removal will be seeded with a temporary cover crop to control erosion. These areas will then be left to revegetate naturally. Because the pond itself is isolated from other sources of more aquatic seed sources it will be planted with several species (see Section IV) including duck potato *(Sagittaria latifolia)*, white water lily (*Nymphaea odorata*), burr reed (*Sparganium americanum*), pondweed (*Potamegeton* sp) and wild rice (*Zizania aquatica*). These species will provide good wildlife habitat but might otherwise not be able to colonize the pond.

Wetland preservation

In preparing plans for the development, Teibel has avoided impacts to 18.98 acres of wetlands on the site. These wetlands will be protected in perpetuity through a deed restriction or conservation easement. The pond and the compensatory mitigation area will be similarly

protected resulting in a total of 79.64 acres of wetlands being protected in perpetuity[1].

IV. PLANTING PLAN

A planting plan is proposed to help ensure that the wetlands develop into fully functional wetlands. The goal of the planting plan is to introduce a large variety of species to the site, particularly those which may be slow to naturally colonize, to maximize the potential for developing a diverse wetland plant community. However, conditions may or may not be suitable for a particular planted species. Thus, there can be no guarantee that each of the planted species will become established on the site.

While the design specifies 3 different planting zones, in reality these zones overlap. Over time we expect that the boundaries of these planted zones will blur as individual species spread and colonize new areas based on their competitive strengths and weaknesses. In addition to the 4 planting zones for the compensatory mitigation wetland, a planting list is also presented for the resloped pond margins and nonwetland mitigation area side slopes. Note that the acreages given for each of the planting zones includes the mitigation acreage for Cesare Batisti.

Wet meadow/prairie zone
Wet meadow zone (PEMA/C, see Sheet 2) will have a water depth of -12 to 0 inches during the spring monitoring period. This zone will be seeded with a wetland seed mix appropriate for Lake County including many prairie species. Several nurse crop species are specified to help ensure that soil erosion is controlled while the target species become established. Total acreage to be planted is 38.3 acres. Note that the same seed mix is used in conjunction with the Forested Zone planting.

Table 1. Wet Meadow Zone.

Botanical Name	Common Name	Indicator	Amount
Calamagrostis canadensis	Blue Joint Grass	OBL	0.5 oz/ac
Carex hystricina	Bottle Brush Sedge	OBL	3.0 oz/ac
Carex stricta	Tussock Sedge	OBL	1.0 oz/ac
Elymus canadensis	Prairie Wild Rye	FAC	1.0 lb/ac
Glyceria striata	Fowl Manna Grass	FACW	1.0 oz/ac
Panicum virgatum	Prairie Switch Grass	FACW	0.5 lb/ac
Scirpus atrovirens	Dark Green Rush	OBL	0.25 lb/ac
Spartina pectinata	Prairie Cord Grass	FACW	0.5 lb/ac

[1] The deed restricted area will actually total 81.2327 acres because of side slopes which are not counted as wetlands but are within the protected area.

(Table 1 continued)

Agrostis alba	Redtop Grass	FACW	1.0 lb/ac
Agrostis alba palustris	Creeping Bend Grass	OBL	3.0 oz/ac
Avena sativa	Seed Oats	UPL	32 lb/ac
Carex vulpinoidea	Fox Sedge	OBL	1.0 oz/ac
Carex spp.	Mixed Sedges	FACW-OBL	2.0 oz/ac
Echinichloa crusgalli	Barnyard Grass	FACW	0.25 lb/ac
Leersia oryzoides	Rice Cut Grass	FACW	2.0 oz/ac
Phleum pratense	Timothy	FACU	1.0 lb/ac
Silphium perfoliatum	Cup Plant	FACW	2.0 oz/ac
Helenium autumnale	Sneezeweed	FACW	2.0 oz/ac
Bidens spp.	Beggar's Tick	FACW	1.0 oz/ac
Sorgastrum nutans	Indiana Grass	FACU	0.5 lb/ac
Andropogon gerardii	Big Blue Stem	FAC	1.5 lb/ac
Aster novae-anglae	New England Aster	FACW	1.0 oz/ac

Shallow emergent zone

Shallow emergent wetland zone (PEMC, see Sheet 2) will have a water depth of 0 to 6 inches during the spring monitoring period. The species list includes a variety of species which will tolerate a range of water depths. Plants will be installed in a random pattern at a rate of approximately 800 per acre. Total size of this zone is 0.6 acres.

Table 2. Shallow Emergent Zone.

Common Name	Botanical Name	Number	Seed
Sweet flag	*Acorus calamus*	50	
Pickerel weed	*Pontederia cordata*	50	
Arrow arum	*Peltandra virginica*	50	
Hard stem bulrush	*Scirpus acutus*	50	
River bulrush	*Scirpus fluviatilis*	50	
Blue flag iris	*Iris versicolor*	50	
Water plantain	*Alisma subcordatum*	50	1 lbs
Three-square bulrush	*Scirpus americanus*	50	
Arrowhead	*Sagittaria latifolia*	--	2 lbs
Burr reed	*Sparganium eurycarpum*	50	
Common rush	*Juncus effusus*	50	
Wild rice	*Zizania aquatica*	--	2 bushels

Deep emergent zone

Deep emergent wetland zone (PEMF, see Sheet 2) will have a water depth of 6 to 12 inches during the spring monitoring period. Plantings specified in this zone will be planted in a random pattern at a rate of approximately 800 per acre over approximately 0.33 acres.

Table 3. Deep Emergent Zone.

Common Name	Botanical Name	Number	Seed
Fragrant water lily	*Nymphaea odorata*	50	
Yellow water lily	*Nuphar luteum*	50	
Pickerel weed	*Pontederia cordata*	50	
Hard stem bulrush	*Scirpus acutus*	50	
Soft stem bulrush	*Scirpus americanus*	50	
Wild rice	*Zizania aquatica*	--	1 bushel

Forested wetland

Forested zone (PFO1A/C, see Sheet 2) will have a water depth of -12 to 2 inches in the spring monitoring period. Trees and shrubs will be planted in a random pattern throughout the Forested Zone at a rate of 400 trees per acre on 15.9 acres. Because native species of wetland trees and shrubs are generally available in limited numbers it is difficult to specify absolute numbers of particular species, particularly the ones which are more difficult to propagate. To allow flexibility in purchasing nursery stock the following planting schedule will be adhered to: 1) at least 15 species of wetland trees and shrubs will be planted, 2) no more that 15% will be of any one species, 3) at least 50% will be tree species and at least 30% will be shrub species. A final list detailing the number and species planted will be provided to the Corps following planting. To control competition by weeds and to help control erosion, a long term nurse crop of wetland species will be planted in the Forested Zone. This will also create superior wildlife habitat.

Table 5. Forested Zone.

Common Name	Botanical Name	Number
Sycamore	*Platanus occidentalis*	
Red-osier dogwood	*Cornus stolonifera*	
River birch	*Betula nigra*	
Pin oak	*Quercus palustris*	
Gray dogwood	*Cornus racemosa*	
Winterberry	*Ilex verticillata*	
Elderberry	*Sambucus canadensis*	
Red maple	*Acer rubrum*	

(Table 5 continued)

Silver maple	*Acer saccharinum*	
Green ash	*Fraxinus pennsylvanica*	
Swamp white oak	*Quercus bicolor*	
Bur oak	*Quercus macrocarpa*	
Spice bush	*Lindera benzoin*	
Silky dogwood	*Cornus obliqua*	
Elderberry	*Sambucus canadensis*	
Nannyberry	*Viburnum lentago*	
Steeplebush	*Spiraea tomentosa*	
TOTAL		6400

Long term nurse crop:
The Forested Zone will be seeded with the Wet Meadow Zone seed mixture at the specified rate (see Table 1) for 15.9 acres.

Scrub/shrub wetland
The scrub/shrub wetland zone (PSSC/F, see Sheet 2) will have a water depth of 0 to 6 inches during the spring monitoring period. It will be planted "over" the Shallow Emergent Zone so that a suite of species will be interplanted surrounding the three islands to provide wildlife cover. Plantings will be carried out in a random pattern at a rate of approximately 400 per acre over approximately 0.6 acre.

Table 6. Scrub/Shrub Zone.

Common Name	Botanical Name	Number
buttonbush	*Cephalanthus occidentalis*	100
sandbar willow	*Salix exigua*	70
black willow	*Salix nigra*	70

Pond littoral zone
Resloping the pond margins will create the potential for a well developed littoral zone and wetland edge. While the shallow portions of the pond edge are expected to revegetate naturally due to the adjacent seed sources, many deeper water species may not be able to colonize the pond within a reasonable amount of time. To ensure that these deeper water areas become vegetated the following species will be planted.

Table 7. Pond Littoral Zone.

Common Name	Botanical Name	Number	Seed
Fragrant water lily	*Nymphaea odorata*	50	
Yellow water lily	*Nuphar luteum*	25	
Pickerel weed	*Pontederia cordata*	100	
Hard stem bulrush	*Scirpus acutus*	100	
Soft stem bulrush	*Scirpus americanus*	100	
Arrowhead	*Sagittaria latifolia*	----	1 lb
Burr reed	*Sparganium americanum*	50	
Pondweed	*Potamegeton* sp	50	
Wild rice	*Zizania aquatica*	----	0.5 bushels

Nonwetland side slopes
Nonwetland side slopes will be planted with a native grass seed mix to control soil erosion and provide wildlife habitat.

Table 8. Nonwetland Side Slopes

Common Name	Botanical Name	Seed
Big bluestem	*Andropogon gerardii*	1.75 lb/ac
Little bluestem	*Andropogon scoparius*	1.0 lb/ac
Side oats gramma	*Bouteloua curtipendula*	0.75 lb/ac
Switch grass	*Panicum virgatum*	0.25 lb/ac
Seed oat	*Avena sativa*	32 lb/ac
Prairie rye	*Elymus canadensis*	1.0 lb/ac
Squirrel tail barley	*Hordeum jubatum*	0.10 lb/ac
Annual rye	*Lolium multiflorum*	25.0 lb/ac
Timothy	*Phleum pratense*	2.0 lb/ac

V. SUCCESS CRITERIA

Success criteria are based on the functional goals discussed in Section II as well as meeting additional wetland establishment goals. These goals are based on a 5 year window of wetland development. Based on a construction date of 1996 with planting to occur in the spring of 1997, Teibel proposes to meet these goals by the year 2002. Note that some long term goals, such as the establishment of forested wetlands, cannot be achieved within a 5 year

monitoring period. Meeting goals such as this will be measured indirectly, in this case by measuring tree survival. Should the stated goals not be met, corrective actions will recommended.

Water quality

The ability of wetlands to improve water quality is well known, having been well documented in scientific literature. Engineered wetlands have been used to treat waste streams as varied as landfill leachate and municipal wastewater. Since the Schererville and Dyer Ditches will have a direct connection to the mitigation wetland, there is no reason to believe that there will not be an improvement in water quality both through the settling of sediment and the removal of nutrients. For this reason we are not recommending any direct measurements of water quality. We are simply making the well founded assumption that if ditch water is delivered to the wetland there will be an increase in water quality.

Wildlife habitat

The creation of wildlife habitat is a goal of the mitigation wetland. Woodduck and bluebird/tree swallow nesting success will be recorded yearly as a contributory measure of success. However, the primary measure of success will be an annual increase in species diversity and frequency of avian and terrestrial wildlife.

Vegetative cover

One of the long-term goals of the wetland mitigation plan is to achieve a diverse, appropriate plant cover within the wetland. This is important in its own right but also to achieve the goals of water quality improvement, increased wildlife habitat, recreational use, and others. We do not expect within the 5 year monitoring period to achieve the diversity and stability of a mature wetland ecosystem, particularly with regards to forested wetlands. We do expect, however, to achieve interim goals which will indicate that the system is progressing and developing towards this ultimate goal. Below are our specific interim goals for each planted community type. Note that percent cover goals differ for different plant communities due to both natural differences and differences in rate of development. For instance, deep marsh naturally has larger patches of open areas than shallow marsh.

1. Shallow emergent wetland zone (PEMC, see Sheet 2).
   - Year 1 10% aerial cover
   - Year 2 20% aerial cover
   - Year 3 40% aerial cover
   - Year 4 60% aerial cover
   - Year 5 80% aerial cover

2. Deep emergent wetland zone (PEMF, see Sheet 2).

Year 1	5% aerial cover
Year 2	15% aerial cover
Year 3	25% aerial cover
Year 4	35% aerial cover
Year 5	50% aerial cover

3. Forested zone (PFO1C, see Sheet 2). In measuring the success of seedling plantings it is more appropriate to use survival rather than aerial coverage.

Year 1	85% survival
Year 2	75%
Year 3	70%
Year 4	67.5%
Year 5	65%

For the cover crop/understory seeding the following is our goal.

Year 1	75% aerial cover
Year 2	75% aerial cover
Year 3	80% aerial cover
Year 4	85% aerial cover
Year 5	90% aerial cover

4. Scrub/shrub zone (PSSC/F, see Sheet 2).

Year 1	85%
Year 2	75%
Year 3	70%
Year 4	67.5%
Year 5	65%

5. Wet meadow zone (PEMA/C, see Sheet 2).

Year 1	75% aerial cover
Year 2	75% aerial cover
Year 3	80% aerial cover
Year 4	85% aerial cover
Year 5	90% aerial cover

Vegetation Diversity and Dominance

To ensure that the wetland will develop into a diverse plant community, a version of the Simpson Index[2] will be used as a measure of both diversity and dominance. The Simpson

[2] Simpson, E.H. 1949. Measurement of Diversity. Nature. 163:688.

Index has been modified to use percent cover rather than density to determine dominance. Both percent cover and density are valid indicators of dominance as discussed in the *Corps of Engineers Wetlands Delineation Manual* (1987). Percent cover will be used in this case because it will simplify the sampling procedure and is already being used in compliance with our aerial cover goals. The equation is as follows:

Dominance Index

$C=\Sigma(p_i^2)$

Where:
- C is the dominance value
- p is the proportion of the total percent cover in the sample quadrats that belongs to species i

Diversity Index

$D=1/C$

Where:
- D is the modified Simpson Index
- C is the dominance value

A diversity index was previously prepared for a 1" to 24" deep marsh community and is appropriate for use as a control site. This data set (Table 9) produced a diversity index of 2.5 for an undisturbed marsh community fringing a small lake. This is analogous to the Shallow Emergent, Deep Emergent, and Aquatic Bed Zones of this mitigation plan. However, because we do not expect to achieve a natural level of diversity within the 5 year monitoring period, a diversity index of 2.0 is proposed as the 5 year goal. This is approximately 80% of the diversity index of the control site.

We are unaware of an existing data set which would allow a goal to be reasonably set for the forested wetland/wet meadow planting zones. Teibel therefore proposes to establish a new control site. The new control site will be established following approval of this plan and photographs and map locations provided to the Corps within 30 days of completed field work. Documentation and data provided to the Corps will include photographs of the individual sampling quadrats to aid in comparison of the control site to the mitigation site. If a suitable area exists within the Teibel preserved wetland, the control site will be established there. Otherwise, the control site will be established on land protected from development as close to the Teibel site as possible. The control site will be subject to Corps of Engineers approval and will provide the benchmark against which to measure the success of the mitigation wetland. The control site will be identified by map location

Table 1. Simpson Diversity Index for an inundated wetland fringing Pine Lake, LaPorte, Indiana. The index is modified to used percent cover as a measure of dominance rather than density.

Species	Common	cover	pi	pi2
		class (mean)		
PLOT B1 - inundated to 2' water				
Nymphaea odorata	white water lily	0.1500	0.0630	0.0040
Ceratophyllum demersum	coontail	0.9750	0.5512	0.3038
Nuphar advena	spatterdock	0.0250	0.2913	0.0849
	open water	0.6250		
PLOT B2 - inundated 1-1.5' water				
Ceratophyllum demersum	coontail	0.6250		
Nuphar advena	spatterdock	0.1500		
Pontedaria cordata	pickerel weed	0.1500	0.0472	0.0022
Nymphaea odorata	white water lily	0.0250		
	open water	0.6250		
PLOT B3 - inundated to 5'				
Nuphar advena	spatterdock	0.3750		
	open water	0.3750		
PLOT B4 - inundated 1" - 2'				
Nuphar advena	spatterdock	0.3750		
Ceratophyllum demersum	coontail	0.1500		
Sagittaria rigida	stiff arrowhead	0.1500	0.0472	0.0022
Nymphaea odorata	white water lily	0.0250		
	open water	0.1500		
	Total (minus open water)	3.1750		0.3971
	C	0.3971		
	1/C (diversity index)	2.5182		
Daubenmire Cover Classes:	*Range*	*Mean*		
	0 - 5%	2.5%		
	5 - 25%	15.0%		
	25 - 50%	37.5%		
	50 - 75%	62.5%		
	75 - 95%	85.0%		
	95 - 100%	97.5%		

Hydrologic Regime
While there are many factors involved in determining what wetland plant communities will develop, hydrologic regime is perhaps the most important. If the hydrology is correct for a specific targeted plant community and a source of seeds or propagules is available, then the probability of success is high. However, if the hydrology is not correct for the target plant community, then the long-term probability of maintaining that plant community is virtually zero irrespective of the level of plantings or the proximity of natural seed sources. Therefore, obtaining the design hydrology is critical. In many cases it is also the most difficult aspect of a mitigation project to control. While hydrologic goals are given below it should be recognized that the hydrologic conditions that develop may vary somewhat. This is expected, and we further expect that the plant communities will respond and sort themselves out according to their hydrologic requirements.

The following goals are based on nonflood conditions during the spring monitoring:

1. Shallow emergent wetland (PEMC, see Sheet 2) zone will have a water depth of 0 to 6 inches.

2. Deep emergent wetland (PEMF, see Sheet 2) zone will have a water depth of 6 to 12 inches.

3. Forested (PFO1C, see Sheet 2) zone will have a water depth of -12 to 2 inches.

4. Scrub/shrub (PSSC/F, see Sheet 2) zone will have a water depth of 0 to 6 inches.

5. Wet meadow (PEMA/C, see Sheet 2) zone will have a water depth of -12 to 0 inches.

Wetland Delineation
The ultimate goal of the project is to produce 47.83 acres of wetlands (55.13 acres including Villa Cesare) to replace wetlands that will be lost to development.

VI. MITIGATION WETLAND MONITORING

To ensure that the restored and enhanced wetlands develop the wetland characteristics described, the following monitoring plan will be implemented:

Construction Monitoring
A qualified wetland scientist will be available to meet with the construction contractor prior to construction to ensure that the permitted mitigation design is properly implemented. Additionally, at least one consultation will be held during the construction phase to assure that plans are being followed, and one final inspection will be made at the end of

construction before the contractor is released. As-built contours of mitigation wetlands will be prepared and submitted to the Corps within 6 weeks of completed earth moving.

Post Construction Monitoring

At least one on-site consultation will be held between a wetland scientist and the landscape contractor prior to the implementation of the planting plan. Monitoring of the wetland will commence the first growing season following planting and will continue for five years. Site visits will be made primarily between July 15 and September 15 with an additional spring visit each of the five monitoring years to check the hydrology of the site. The monitoring plan will observe the following guidelines:

1. Stratified random sampling will be done with quadrats whose combined area is 1% of the overall area.[3] Quadrats will be located randomly in each of the four community planting zones in proportion to the amount of area each community covers within the site. Specific random locations of each quadrat will be identified in the first year of monitoring by constructing imaginary axes along the edges of each zone, dividing the axes into units, and picking pairs of units from a table of random numbers.

   Quadrat size will be 30' in diameter. This size quadrat will give an accurate measurement while allowing a reasonable number of quadrats to be sampled each year. In the forested and scrub/shrub quadrats, all woody saplings will be counted to assess plant survival. In addition, throughout all of the quadrats, percent cover will be measured for all herbaceous species to assess relative dominance within each community planting zone.

   The number of permanent 30' diameter random quadrats are as follows:

Forested and scrub/shrub	9
Wet meadow	2
Shallow emergent	11
Deep emergent and aquatic bed	8
TOTAL	30

   Percent cover will be visually estimated by cover class. Ecologists such as Daubenmire,[4] recognize that plant cover is very heterogeneous from point to point and from time to time even within a small stand. In addition, bias from one individual to

[3] Barbour, Michael G., Jack H. Burk, and Wanna D. Pitts. 1987. Terrestrial Plant Ecology. Menlo Park, CA: Benjamin/Cummings.

[4] Daubenmire, R.F. 1968. Plant Communities. New York: Harper and Row.

another warrant it unlikely that any two estimates will agree closely. Daubenmire suggests a range of seven cover classes which we will use to measure percent cover. The percent cover for each species will be averaged within each plant community zone based on the mean for the specific cover class.

Daubenmire Cover Classes:

Class	Range of cover (%)	Mean
6	95-100	97.5
5	75-95	85.0
4	50-75	62.5
3	25-50	37.5
2	5-25	15.0
1	0-5	2.5

2. Exact counts of woody species will be made to provide an estimate of plant survival. Water depth will also be noted for each quadrat. Photographs will be taken of each quadrat.

3. Five permanent photographic stations will be set up at key vantage points to provide a panoramic visual documentation of wetland development (Sheet 3). Each of the various planting zones will be depicted in one of the photographic stations.

4. Wildlife diversity and frequency will be recorded through pedestrian surveys. This data will be used allow a relative comparison of usage over the five year monitoring period. Nesting boxes will be checked and cleaned yearly. The number of boxes used and fledged young will be noted.

5. A general survey of the wetland will be made in order to note the presence of planted and volunteer species which were not present in the sample quadrats.

6. In the final year of monitoring, a wetland delineation will be carried out using the 1987 manual to determine the extent of the mitigation wetland.

Annual Report

An annual report based on the results of each year's inspection will be filed with the Corps of Engineers by November 30 of each monitoring year. The report will include the following:

1. Tables listing absolute and relative dominance within each community planting zone based on percent cover, diversity indices as compared to established wetland community control sites, and percent survival of woody species.

2. Photographs from each photographic station and sampling quadrat.

3. A description of the hydrology within each planting zone and a determination if that hydrology level meets the established performance standards.

4. An evaluation of the developing community structure and diversity of the restored wetland. The survival and spread of planted species will be discussed to determine if additional plantings need to be made.

5. An evaluation of recorded wildlife usage and an analysis of trends toward increased numbers and diversity of wildlife.

6. A description of remedial plantings (if any) and reasons for unacceptable mortality.

7. Comparison of previous year(s) data with current year to document trends toward a more mature and diverse wetland system.

VI. IMPLEMENTATION SCHEDULE

Excavation of the wetland was begun in August 1996. Due to the large size of the wetland and the extent of the excavation to take place, earth moving is expected to take 4 to 5 months. As-built contours will be submitted to the Corps within 6 weeks of completed earthmoving. Seeding with a temporary cover crop will be done to provide erosion control as soon as earth moving is completed. Planting is expected to occur in before August 15, 1997. Fall planting is not recommended due to poor survival. Formal monitoring will begin in the spring of 1998 and will continue through the end of the year 2002. Assuming that the project is deemed a success, monitoring will be terminated with the submittal of a final report in the fall of 2002.

VII. SUMMARY

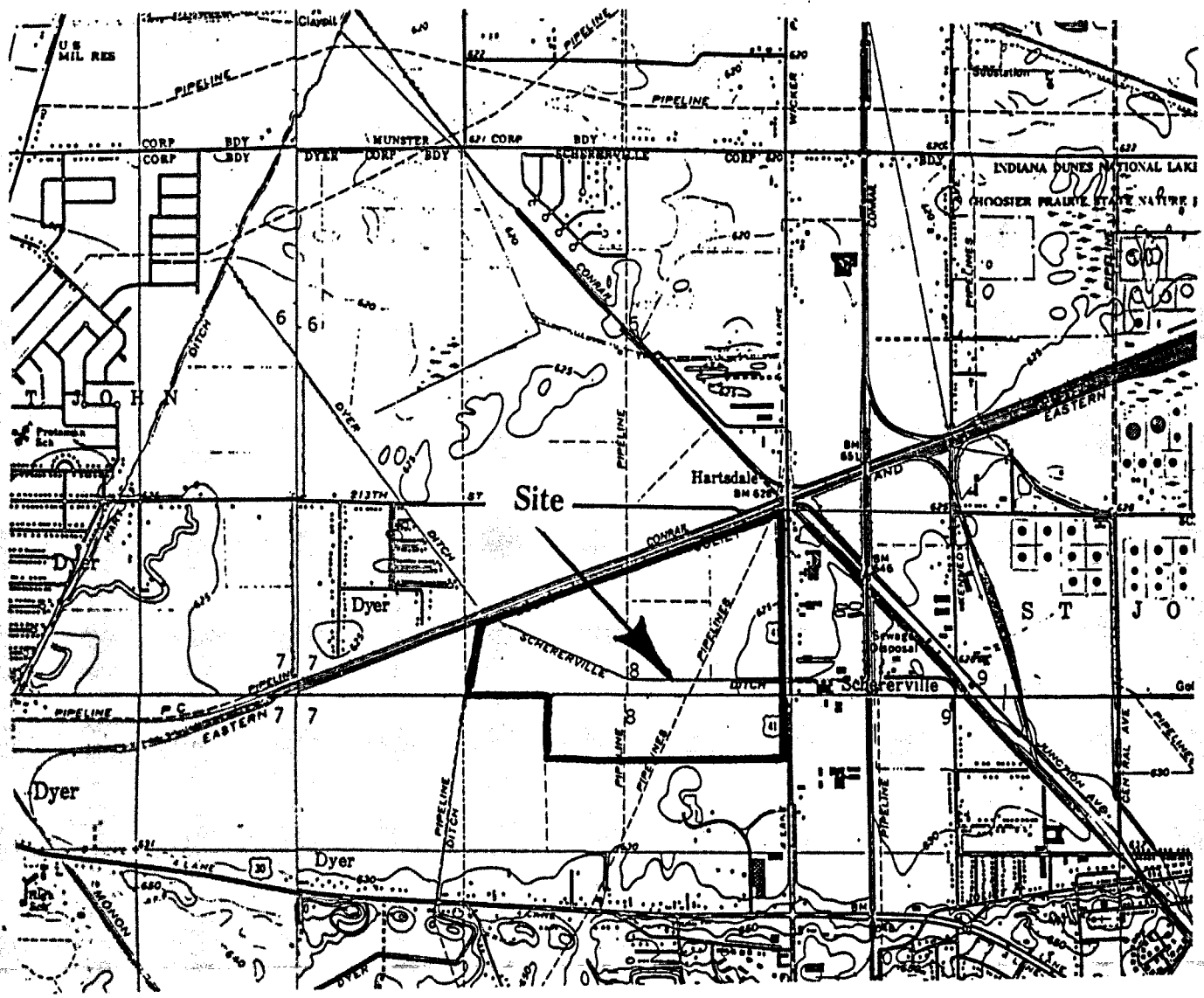
To reduce the environmental impacts of filling 21.1 acres and excavating 5.63 acres of wetland, Mr. Teibel proposes a three part mitigation plan which includes wetland replacement, wetland preservation, and reduction of impacts. Specifically Mr. Teibel proposes to:

1. Create 47.83 acres of wetlands adjacent to the Schererville and Dyer Ditches (55.13 acres including Cesare Batisti). This represents a 2:1 replacement for wetlands converted to upland and a 1:1 ratio for wetlands converted to open water.

2. Protect through perpetual deed restriction, 18.98 acres of unimpacted wetlands, 47.83 acres of created wetlands (55.13 acres including Cesare Batisti), and 5.63 acres of pond for a total of 72.44 acres (79.74 acres).

3. Reduce the impacts of a previous pond excavation within a wetland by resloping the margins of the pond to 10:1, vegetating this newly created littoral zone, filling the ditch which drains the pond, and removing spoil from the surrounding wetland.

This mitigation plan ensures that wetland function will not be lost to the immediate watershed and further protects in perpetuity a large wetland resource for the county.



PURPOSE: Site Development

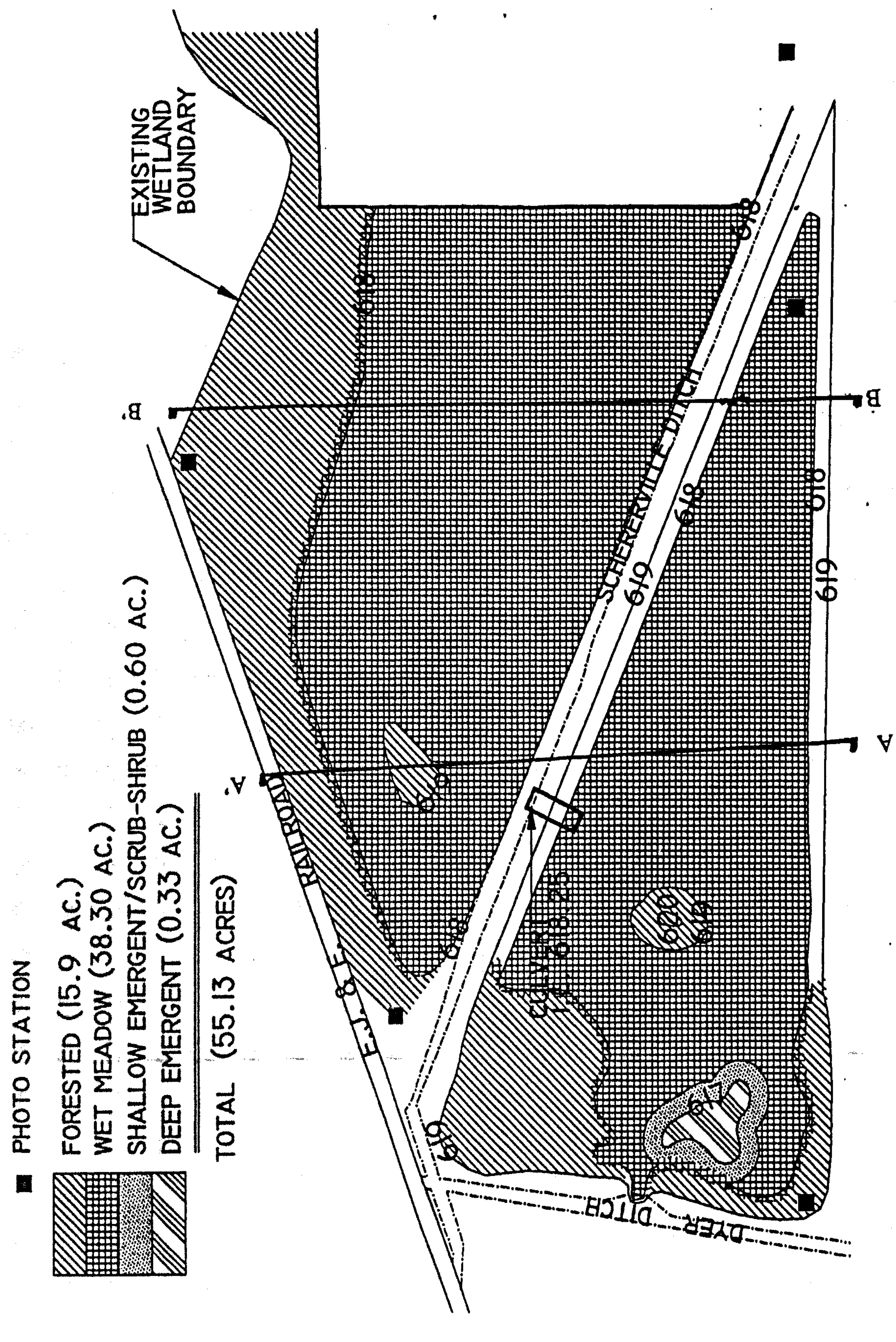
DATUM: MSL

88-145-009-2B
Location Map
Scale: 1"=2000'

Richard M. Teibel
1332 Wilderness Drive
Schererville, Indian 46375

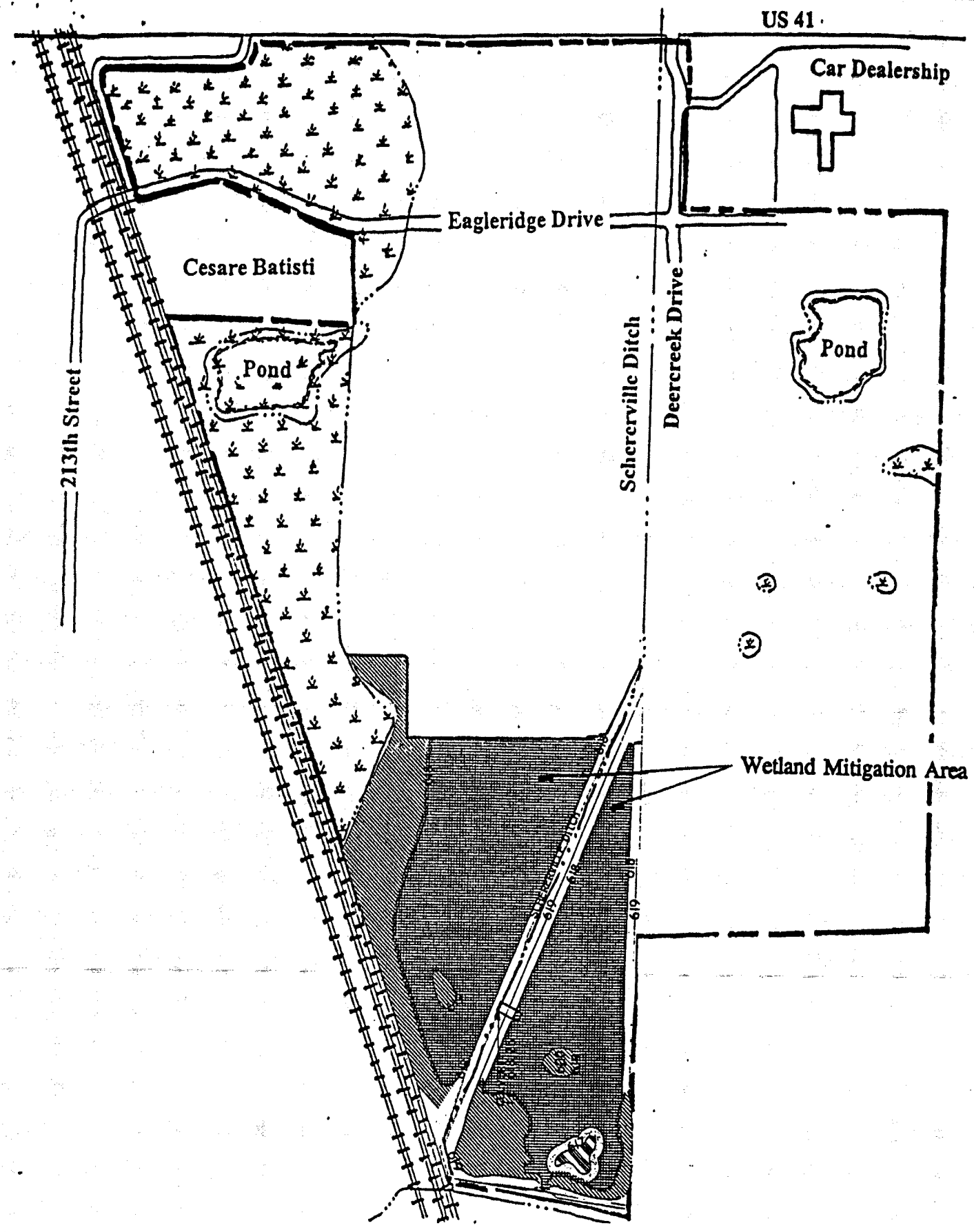
PROPOSED: Wetland fill

IN: Isolated Wetland
AT: Deer Creek Development
COUNTY: Lake
STATE: Indiana
APPLICATION BY: Richard. M. Teibel
AGENT: J.F. New & Associates, Inc.
SHEET 1 OF 9 Date: September 24 (revised)



Notes:
1). Total wetland mitigation acreage shown is 55.13 acres However, only 47.83 is proposed for Teibel. The remaining 7.3 is proposed seperately for Cesare Batisti (89-145-077-1G).

PURPOSE: Site Development DATUM: MSL North	88-145-009-2B MITIGATION AREA 1 Scale: 1"=300' Richard M. Teibel 1332 Wilderness Drive Schererville, Indian 46375	PROPOSED: Wetland fill IN: Isolated Wetland AT: Deer Creek Development COUNTY: Lake STATE: Indiana APPLICATION BY: Richard. M. Teibel AGENT: J.F. New & Associates, Inc. SHEET 2 OF 7 Date: September 24 (revised)



PURPOSE: Site Development

DATUM: MSL

North

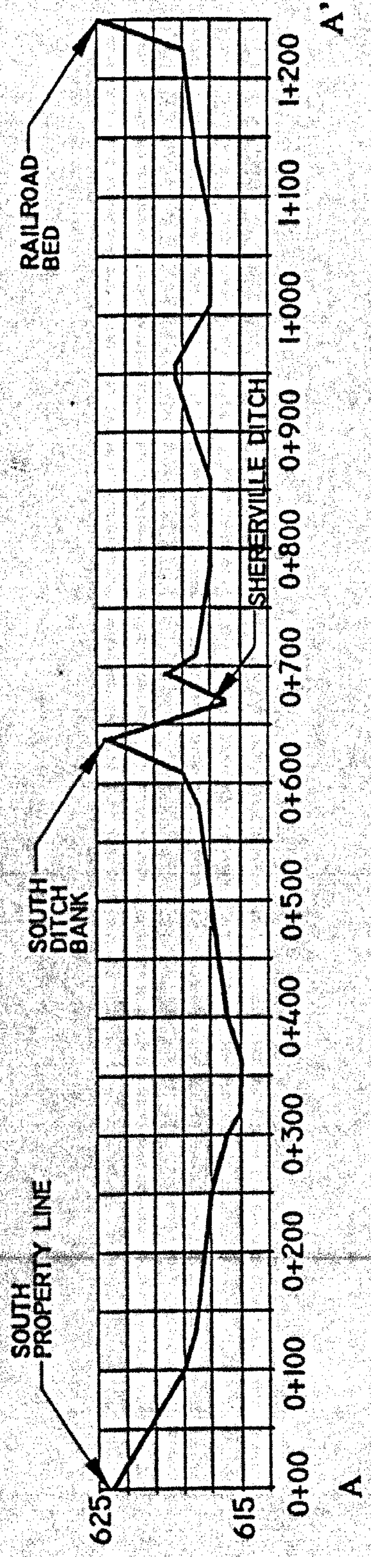
88-145-009-2B

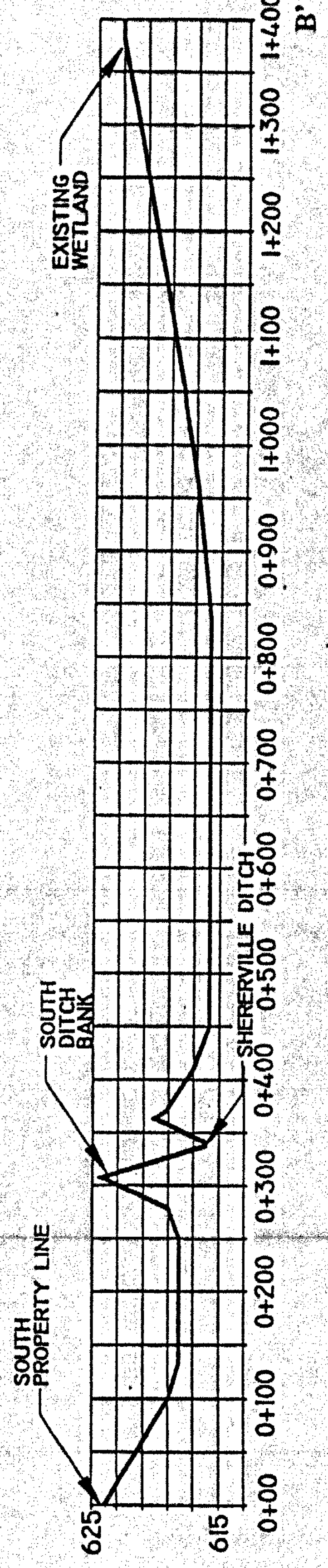
General Plan View of Site
Scale: 1"=600'

Richard M. Teibel
1332 Wilderness Drive
Schererville, Indian 46375

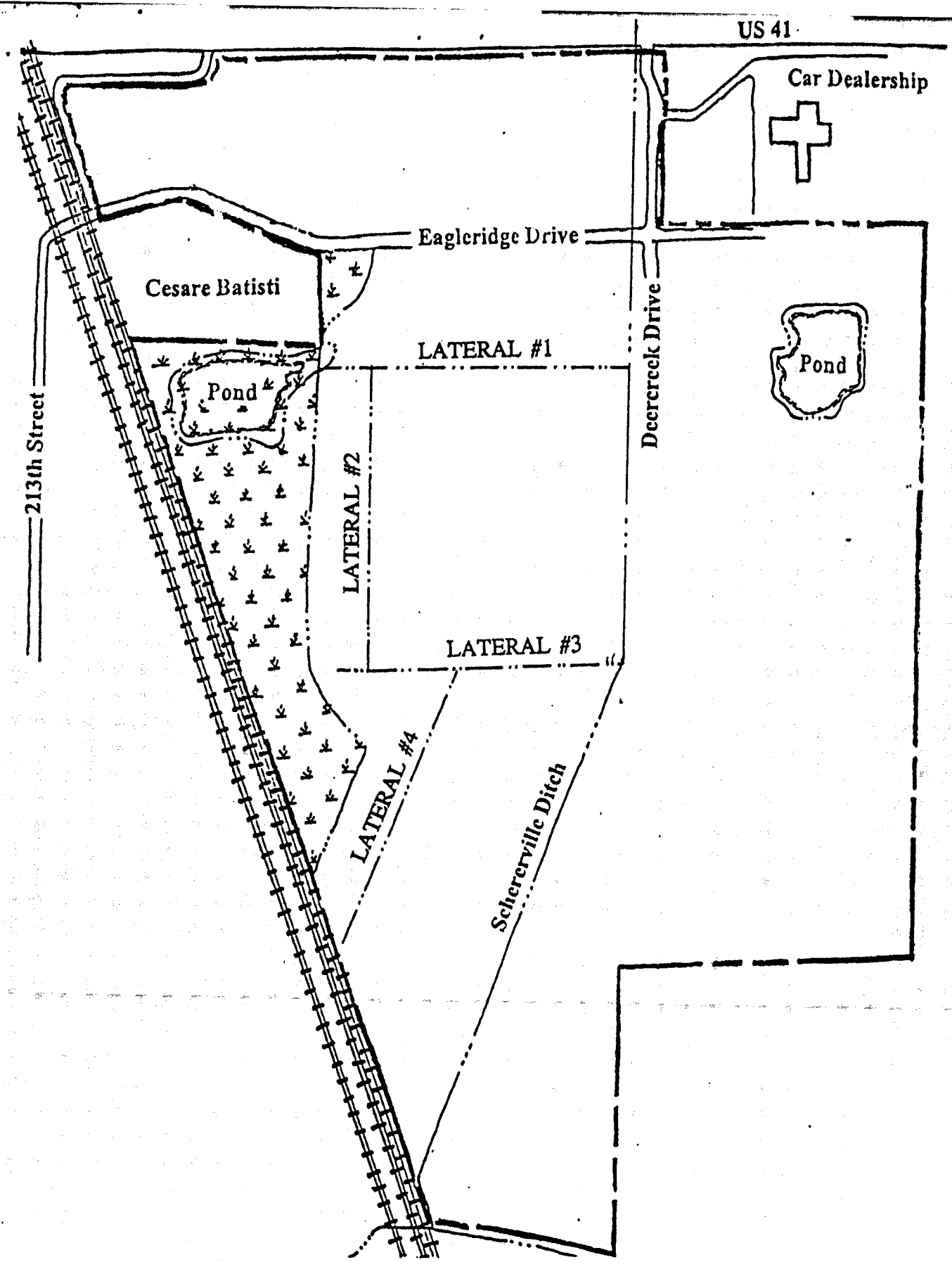
PROPOSED: Wetland fill

IN: Isolated Wetland
AT: Deer Creek Development
COUNTY: Lake
STATE: Indiana
APPLICATION BY: Richard. M. Teibel
AGENT: J.F. New & Associates, Inc.
SHEET 3 OF 9 Date: September 24 (revised)

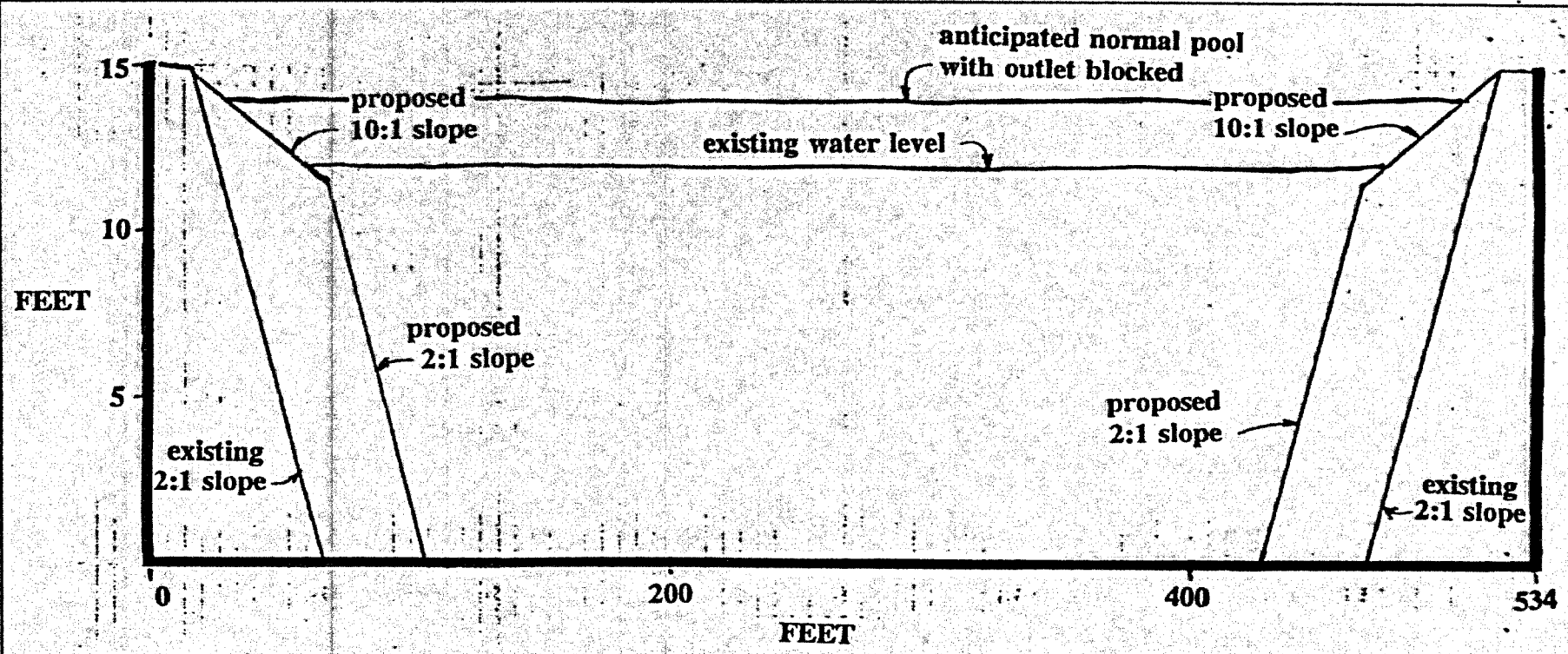


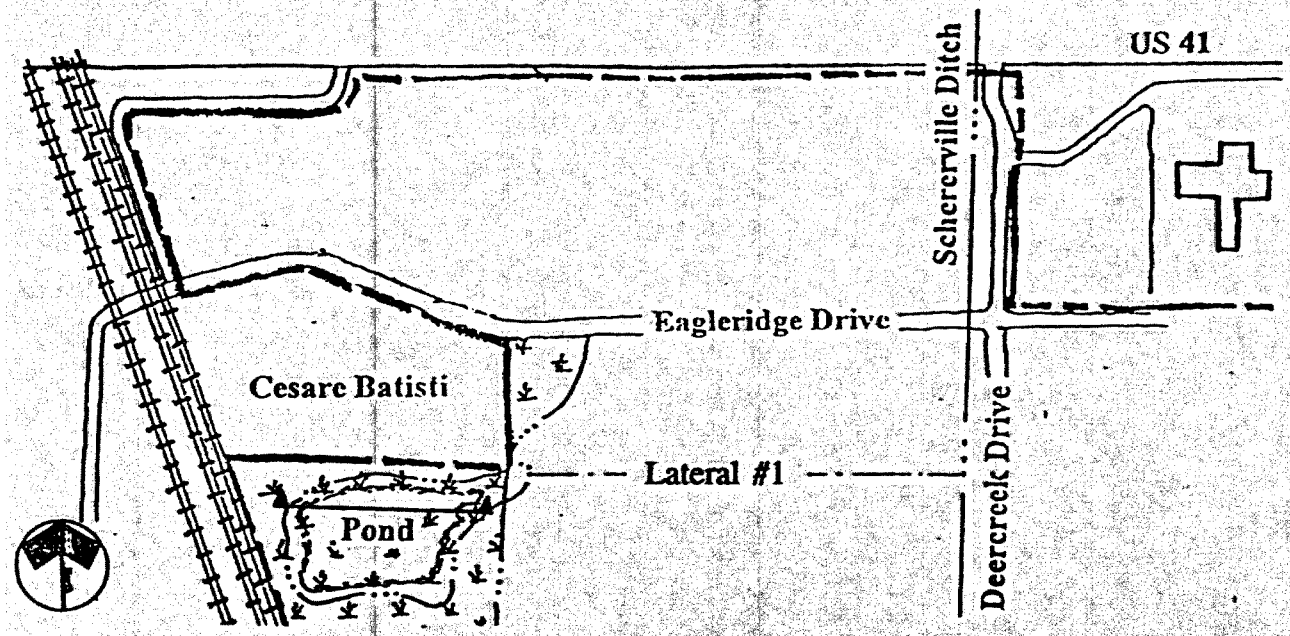


PURPOSE: Site Development DATUM: MSL	88-145-009-2B Cross Section of Mitigation Area Scale: As Shown Richard M. Teibel 1332 Wilderness Drive Schererville, Indian 46375	PROPOSED: Wetland fill IN: Isolated Wetland AT: Deer Creek Development COUNTY: Lake STATE: Indiana APPLICATION BY: Richard. M. Teibel AGENT: J.F. New & Associates, Inc. SHEET 4 OF 9 Date: September 24 (revised)



PURPOSE: Site Development DATUM: MSL	88-145-009-2B Plan View of Site Showing Lateral Ditches Scale: 1"=600' Richard M. Teibel 1332 Wilderness Drive Schererville, Indiana 46375	PROPOSED: Wetland fill IN: Isolated Wetland AT: Deer Creek Development COUNTY: Lake STATE: Indiana APPLICATION BY: Richard. M. Teibel AGENT: J.F. New & Associates, Inc. SHEET 5 OF 9 Date: September 24 (revised)





Note:
Lateral # 1 will be filled to pre-existing grade or higher to block the outlet of the pond. All spoil around pond to be removed to pre-existing grade. Pond margins to be resloped to 10:1 to a depth of 3 feet. All spoil material in the wetland south of Cesare Batisti to be removed to restore pre-existing grade.

PURPOSE: Site Development
DATUM: MSL

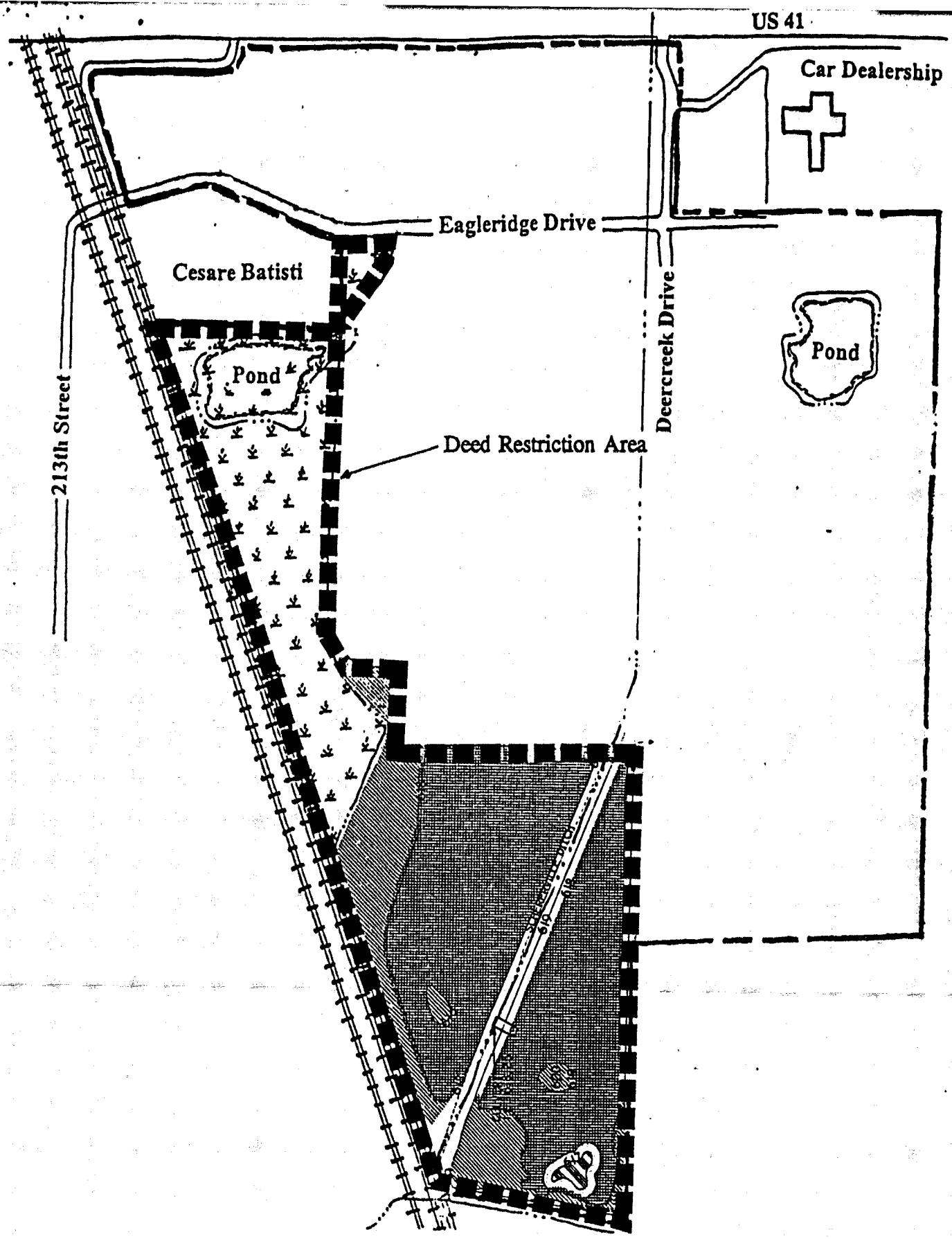
88-145-009-2B
Cross Section of Pond Restoration
Scale: As Shown

Richard M. Teibel
1332 Wilderness Drive
Schererville, Indian 46375

PROPOSED: Wetland fill

IN: Isolated Wetland
AT: Deer Creek Development
COUNTY: Lake
STATE: Indiana
APPLICATION BY: Richard. M. Teibel
AGENT: J.F. New & Associates, Inc.

Date: September 24 (revised)



PURPOSE: Site Development

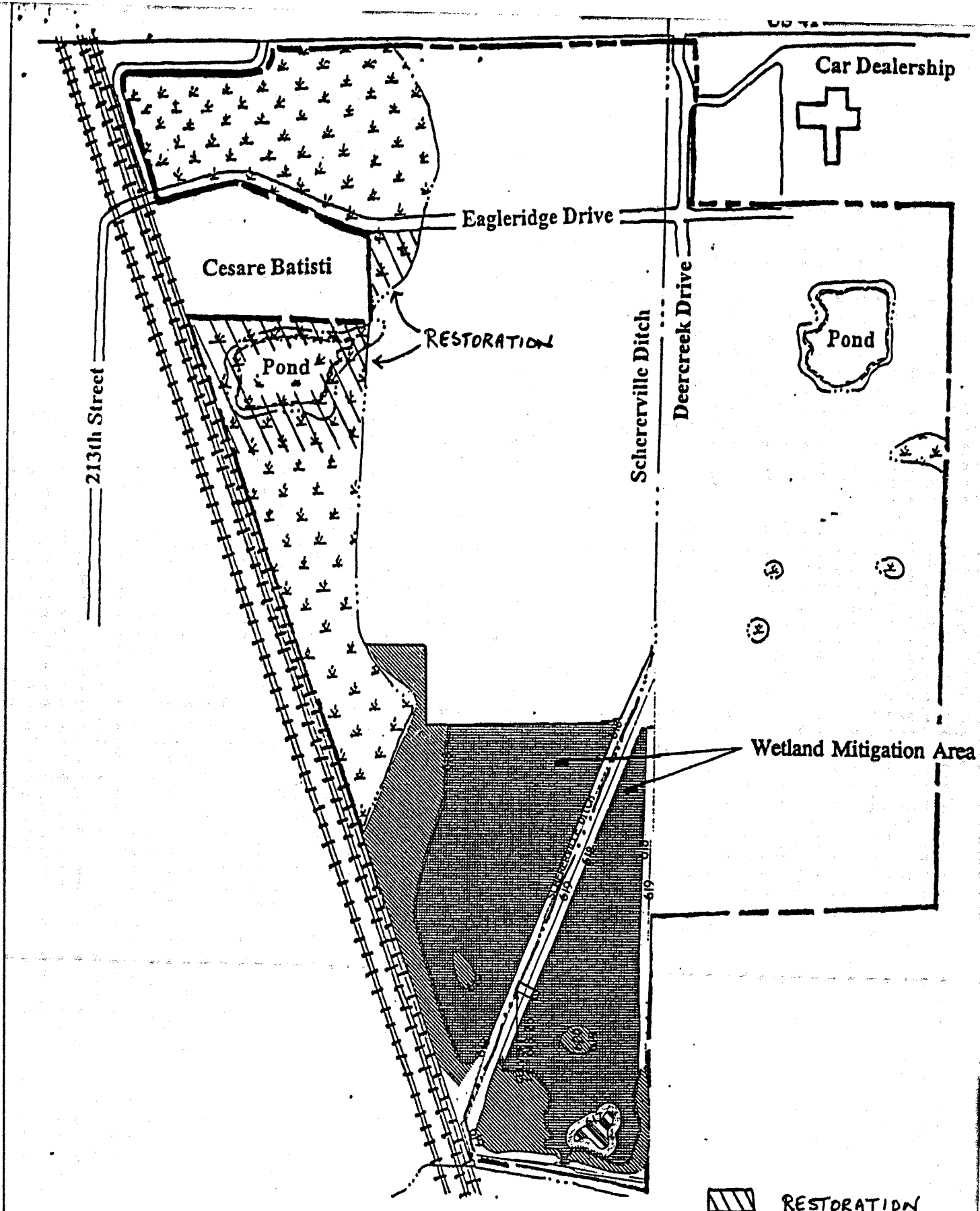
DATUM: MSL

88-145-009-2B
Deed Restriction Area
Scale: 1"=600'

Richard M. Teibel
1332 Wilderness Drive
Schererville, Indian 46375

PROPOSED: Wetland fill

IN: Isolated Wetland
AT: Deer Creek Development
COUNTY: Lake
STATE: Indiana
APPLICATION BY: Richard. M. Teibel
AGENT: J.F. New & Associates, Inc.
SHEET 7 OF 9 Date: September 24 (revised)



PURPOSE: Site Development

DATUM: MSL

North

88-145-009-2B

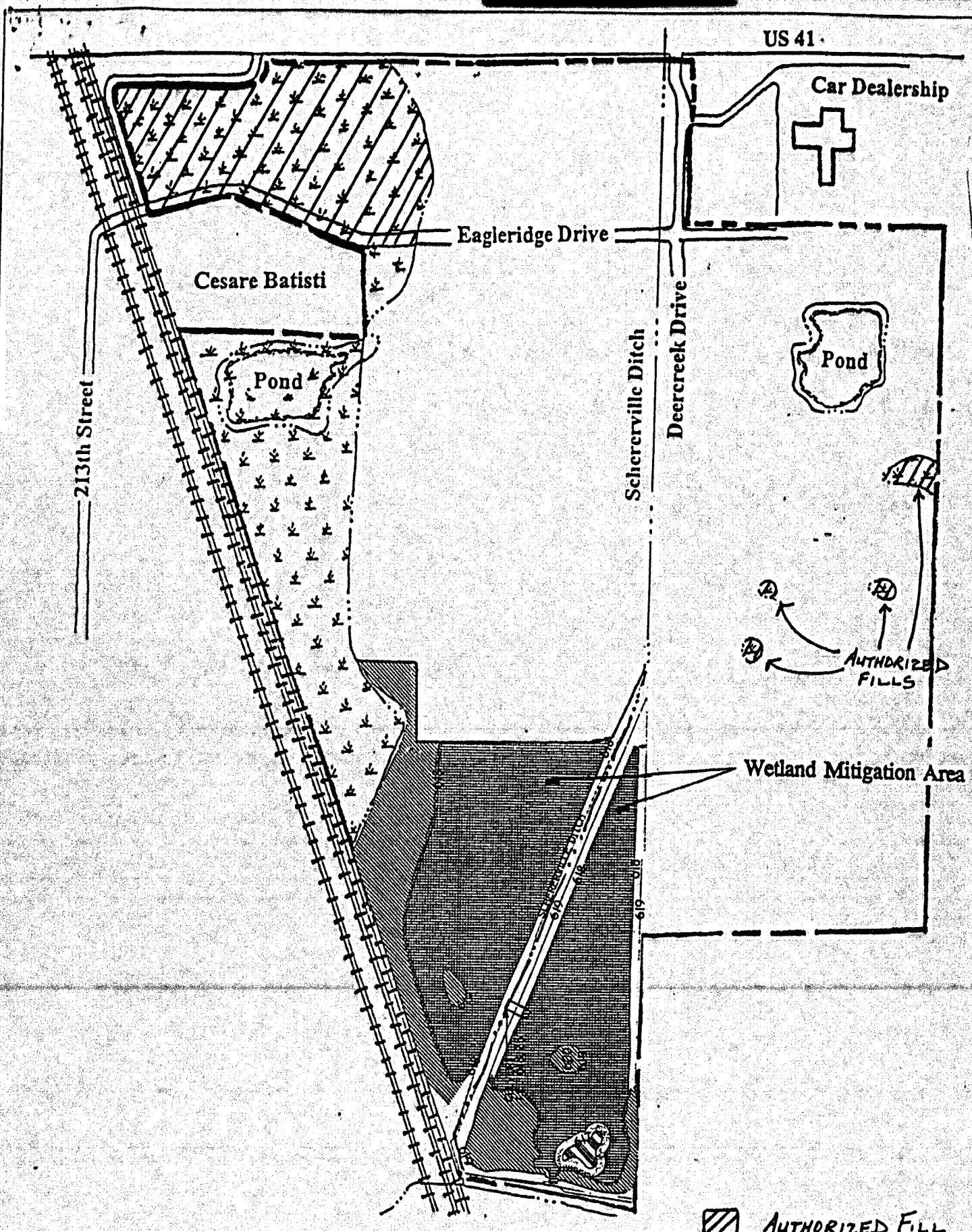
WETLAND RESTORATION

Scale: 1"=600'

Richard M. Teibel
1332 Wilderness Drive
Schererville, Indian 46375

PROPOSED: Wetland fill

IN: Isolated Wetland
AT: Deer Creek Development
COUNTY: Lake
STATE: Indiana
APPLICATION BY: Richard. M. Teibel
AGENT: J.F. New & Associates, Inc.
SHEET 8 OF 9 Date: September 24 (revised



PURPOSE: Site Development

DATUM: MSL

North

88-145-009-2B

AUTHORIZED FILL

Scale: 1"=600'

Richard M. Teibel
1332 Wilderness Drive
Schererville, Indian 46375

PROPOSED: Wetland fill

IN: Isolated Wetland
AT: Deer Creek Development
COUNTY: Lake
STATE: Indiana
APPLICATION BY: Richard. M. Teibel
AGENT: J.F. New & Associates, Inc.
SHEET 9 OF 9 Date: September 24 (revised)