

***CONDITION ASSESSMENT  
AND REPAIR EVALUATIONS***

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***CEDAR LAKE DAM / DEP #16603***

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NORTH STREET  
WOLCOTT, CONNECTICUT



***PREPARED FOR:***

***CEDAR LAKE OWNERS ASSOCIATION***

JANUARY 2012

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Prepared by:

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January 10, 2012

Matthew Smith  
Cedar Lake Owners Association  
63 Avery Avenue  
Wolcott, Connecticut 06716

Re: 2012 Inspection Report  
Cedar Lake Dam  
Wolcott, Connecticut

Dear Matt:

Our recent inspection of the dam found it to be in an overall fair to good condition. The dam was inspected on two occasions, once during normal overflow and once with low water level during the winter drawdown period. The basic reason for the lower rating from the prior inspection is due to the poor condition of the roof of the outlet tunnel or culvert emanating from the spillway. This condition will require consideration in the near future and may be combined with potential modifications being considered by the Town to the roadway along the top of the embankment. This and other issues are specifically addressed in the attached inspection report, in a form that follows the format used by the Dam Safety Section of the State of Connecticut DEEP Inland Water Resources Division.

**CONDITION OF THE DAM:**

The overall condition of the dam was assessed as fair to good. Other than the discharge tunnel from the spillway, maintenance items pointed out and discussed in the report and shown in the accompanying photos are not severe and do not appear to have any detrimental impact upon the current structural integrity of the dam. They should, however, be addressed in a timely fashion to avoid more severe problems in the future. Some of the more outstanding issues addressed include removal of vegetation from the upstream side of the dam, monitoring of seepage and other embankment conditions, joint repairs to the upstream concrete embankment wall, stone masonry and concrete issues at the spillway, and corrosion of metal features at the spillway and intake areas.

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Matthew Smith  
January 10, 2012

**RECOMMENDATIONS:**

To maintain the dam's integrity, recommendations for repairs and continued monitoring should be carried out as soon as practicable and, where indicated, under engineering supervision during construction. Because of the potential safety concern posed by the condition of the spillway's outlet tunnel beneath the road, this matter must be addressed as soon as possible. This must be done in conjunction with the Town of Wolcott since it is the owner of the road; responsibilities for replacement must be clearly delineated with respect to ownership of the embankment section.

Should you have any questions regarding this report or require additional information, please contact me at your convenience.

Respectfully yours,

Karl F. Acimovic, P.E. & L.S.

Encl.  
Inspection Report

# **INSPECTION REPORT**

# DEP / INLAND WATER RESOURCES DIVISION

## INSPECTION CHECK LIST

DAM NAME & NUMBER: **CEDAR LAKE DAM / DEP # 16603**

INSPECTION DATE: **SEPTEMBER 29, 2011**  
**DECEMBER 12, 2011**

IMPOUNDMENT AREA: **CEDAR LAKE**

POOL LEVEL: **3-½" ABOVE SPILLWAY CREST <sup>1</sup> (09-29-11)**  
**3' +/- BELOW SPILLWAY CREST (12-12-11)<sup>2</sup>**

WEATHER CONDITIONS: **CLOUDY, LIGHT RAIN, 65° - 70° F (09-29-11)**  
**SUNNY, CLEAR, LOW 40° F RANGE (12-12-11)**

INSPECTOR(S): **KARL ACIMOVIC, P.E.**

ACTION TAKEN: **INSPECTION ONLY**

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### DAM / EMBANKMENTS

GENERAL CONDITION: Overall good, both upstream and downstream.

VEGETATIVE COVER: Upstream Embankment – Brush (small woody vegetation) and weeds are present and need to be removed from both the left and right<sup>3</sup> sides of the dam (see photos). Most of this vegetation is directly adjacent to the upstream wall.

Downstream Embankment – Brush has been cut; there were no signs of any significant woody vegetation. Also, grass has been cut and the vegetative cover is in good condition.

EROSION / BURROWS: None Apparent.

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<sup>1</sup> Spillway crest taken as top of weir boards and top of concrete surface.

<sup>2</sup> At the time of the first inspection, the weir gate was in. During the second inspection, the weir gate had been removed and the low level outlet gate was partially open. Flow at the base outlet was running clean.

<sup>3</sup> References made to left and right in this document are in the direction of flow; i.e., in the downstream direction.

#### SETTLEMENT / ALIGNMENT / MOVEMENT:

There are signs of mild surficial sloughing of surface stone on the downstream embankment at the very right and just left of the low level outlet. Some of this appears to be caused by the consistent use of a footpath on top of the embankment and just behind the guard rails of the downstream crest.

#### SEEPAGE / FOUNDATION DRAINAGE:

Although there are no new apparent seepage areas, notes in previous inspections have addressed the issue of high groundwater and potential seepage at the base of the right downstream embankment. Although not a structural problem for the embankment, it would be prudent (for a higher factor of safety) to install footing drains as outlined in the 1996 recommendations or to incorporate them into any embankment / road modifications which may be instituted by the Town to facilitate safer pedestrian movement. Note that this area has standing water at both normal high water level and during the winter drawdown; soil surfaces are soft and spongy.

#### RIPRAP:

Upstream Side - Riprap on the upstream embankment is in generally good condition, with exception of the small amount of vegetative growth previously noted.

Downstream Side - Riprap on the downstream embankments is also in generally good condition, with the exception of the minor sloughing previously noted. Riprap along outlet channels has generally been kept clear of vegetative growth and continued maintenance is recommended to keep it in that condition.

#### STONE MASONRY:

There is no stone masonry along the embankment sections. Stone masonry is present along the low level outlet and spillway areas and will be addressed in those sections.

#### CONCRETE CONDITION:

Overall, the upstream concrete embankment wall is in good condition. There are, however, several maintenance issues which need to be addressed, namely small cracks and weathered joints. Small cracks are visible on both the left and right sides of the gatehouse. Many of these are minor and need only be monitored at this time; those that need repair are located generally at or near the spillway and upstream intake for the low level outlet near the gatehouse. Vertical expansion joints will need to be cleaned and

refilled. While most of the vertical joint openings have remaining sealant in them, the base of the joints are either not filled or have lost their sealant. The base of many of these joints is the most critical area, since water can intrude easily into and through the embankment via these openings. One of the voids below the expansion joints was as deep as 6” and many of the base areas were visibly open for several feet on either side of the joint. (See recommendations.)

**CRACKS:** Cracks in concrete noted above; there are no apparent cracks in the earth embankment section.

**OTHER:** Gabions along the base of the downstream embankment remain in good condition, with no signs of any significant corrosion detected along the wire cages.

Road Condition and Drainage – The road surface in many areas appears rutted and cracked; there are numerous longitudinal and transverse cracks, particularly near the right side of the dam. This allows for ponding of water and intrusion of seepage into the top of the embankment. There are some leak-offs along the upstream wall area, but here there is also a prevalence of shallow ponding areas leading to rutting of the pavement and poor runoff conditions. Since there are no catch basins at or near the left upstream side of the dam, sediment runs directly into the lake, either directly from the gutter or the leak-offs along the wall.

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## **SPILLWAY / TRAINING WALLS / APRON**

**GENERAL CONDITION:** Generally good, but there are some issues with the concrete and stone masonry.

**SETTLEMENT / ALIGNMENT / MOVEMENT:**

None apparent.

**STONE MASONRY:** While stone masonry is currently stable along the downstream face of the spillway (and at the upstream end of the spillway outlet passageway), there are some voids which need to be chinked and mortared to prevent deterioration.

**CONCRETE CONDITION:** There are several cracks and loose chunks of concrete on the upstream surface that require maintenance repairs. These areas have been identified in the attached photos. There is also some undermining at the junction of the slab to the walls (on both sides

of the spillway); void areas at those junctures were measured at approximately 9” deep.

CRACKS: As noted above.

SCOURING / UNDERMINING:

Except for some of the small void areas noted at the base of the spillway wall, there are no significant scouring or undermining issues.

OTHER: *“Protective safety fencing shows signs of corrosion, but is structurally sound except for one displaced horizontal joint at a vertical support post. While this fencing is good for access control and safety, it should be closely monitored during storm situations due to its inherent capacity to collect debris and thereby raise water level by blocking flow.”<sup>4</sup>*

The weir gate slots (metal channels) were in good condition, but need to be cleaned of debris.

Outlet Tunnel / Culvert – This discharge channel beneath the road is currently in poor condition. This assessment is based upon two major factors. While the base area is in good condition, the concrete portion of the roof near the downstream side (approximately 8 feet in from the end) is beginning to deteriorate and crumble. As shown in the photos, there is a bulged and broken section which, if it falls, can impact both the road and the outflow from the dam’s spillway during both normal and severe flow conditions. It could cause a portion of the road to either sink or to develop a sinkhole, with a subsequent impact to vehicular traffic at road level. In addition, if the entire passageway is blocked to flow, the low level outlet sluice gate could be fully opened, but would probably be limited to passing normal flows. Storm events could then cause a higher than normal lake level, with a potential rise to the top of the dam. In addition to the poor overhead concrete condition, large stones spanning the roof area near the center and upstream end of the tunnel show signs of voids and lost fill material between the stones. Note that these stones are not cut and fitted; there are fairly large openings, and the loss of fill material at this point has been confined to the finer soil particles, larger ones having been caught in the open cracks. The continued loss of finer soils from above the tunnel and beneath the roadway could lead to issues similarly described for the concrete roof section.

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<sup>4</sup>Taken from the 2006 Inspection Report – still relevant to the current situation.



## **DOWNSTREAM CHANNEL**

- SCOURING: Again, no significant scouring was noted, even at the downstream headwall outlet.
- DEBRIS: A small amount of debris was noted; this occasional debris buildup needs only routine maintenance.
- RIPRAP: Some of the larger riprap currently within the outlet channel of the spillway flow needs to be moved and reset for better flow efficiency directly at the discharge point.
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## **EMERGENCY SPILLWAY**

[Not applicable; there is no emergency spillway at this site.]

CONCRETE CONDITION:

STONE MASONRY:

VEGETATIVE COVER:

RIPRAP:

OTHER:

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## **INTAKE STRUCTURE(S)**

GENERAL CONDITION: The intake structure at Cedar Lake Dam consists of a brick gate house, an upstream intake channel constructed of stone masonry and concrete, and a control valve / gate with an operating wheel hoisting mechanism situated within the gatehouse.

CONCRETE CONDITION: The interior floor and roof of the gatehouse are composed of concrete; both appear to be in good condition. The upstream wall surfaces of the gate intake are also concrete<sup>5</sup>; these surfaces are in good condition, but the underlying trash rack support structure shows signs of cracking and loss of concrete along the right side at the water surface level (i.e., during the December inspection, meaning that this problem is below normal summer water level).

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<sup>5</sup> Note that these approach walls were excavated out, repaired and modified in 1993. See report dated February 1994.

**SETTLEMENT / ALIGNMENT / MOVEMENT:**

None apparent.

**STONE MASONRY:**

Surficially, stone masonry appears in good condition from the upstream side and above water level. It is recommended that an underwater (diving) inspection be done to verify the condition of submerged facilities at the upstream intake.

**CRACKS:**

No cracks, other than those mentioned above, were noted during the inspection.

**OTHER:**

The gatehouse door and frame show some mild signs of corrosion. They should be cleaned and, where corrosion is present, coated with paint.

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**OUTLET STRUCTURE**

The low level outlet consists of a PVC pipe discharging its flow through a stone masonry wall set back inside the earth embankment of the dam. Flow discharge through this pipe is controlled by the gate mechanism situated at the intake structure noted above.

**GENERAL CONDITION:**

Its general condition is good, with only minor leakage apparent around the perimeter of the pipe directly at the wall junction. This character and amount of this leakage or seepage appears not to have changed since the last inspection (estimated at approximately 0.5 to 1.0 gpm); thus, continued monitoring only is recommended at this time. The visible portion of the PVC pipe is in very good condition.

**CONCRETE CONDITION:**

The only concrete in this structure is the roof slab, which appears to be in good condition.

**SETTLEMENT / ALIGNMENT / MOVEMENT:**

None apparent.

**SCOURING / UNDERMINING:**

None apparent.

STONE MASONRY: The stone masonry walls surrounding the pipe outlet are in good condition, as is the grout filling the voids between the stones.

OTHER: Seepage noted in the previous report continues to be noted at the right downstream end of the outlet wall, adjacent to the gabions and riprap. The amount is similar to that inside the structure; it is running clean and should only continue to be monitored at this time.

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## **MISCELLANEOUS FEATURES**

### ACCESS - ROADS, BRIDGES, ETC.:

As with past inspections, there continue to be signs of cracking and rutting in the asphalt surface at the top of the dam. Since North Street is a major accessway to the west side of the lake, it's use is presumably high. Therefore, its top surface condition, as well as the culvert beneath it that carries spillway outflow, are important aspects for public safety. It is also a narrow road with a moderate amount of pedestrian use, which has led to the current study undertaken by the Town of Wolcott to accommodate a walkway along one of the top edges of the embankment. Some settlement (noted previously as rutting) and cracking leading to infiltration was evident in wheel track areas of the roadway.

### SAFETY - FENCING, RAILING, ETC.:

Protective spillway fencing and railing (as previously noted) shows signs of corrosion, although there are no apparent structural problems at this time.

### DOWNSTREAM HAZARD REASSESSMENT:

As with the last inspection and assessment, there do not appear to be any changes directly downstream of the dam that would warrant a change in its current hazard rating, which is a "B". The B designation denotes a significant hazard potential dam which, if it were to fail, would result in any of the following: (i) Possible loss of life; (ii) Minor damage to habitable structure, residences, hospitals, convalescent homes, schools, etc.; (iii) Damage to or interruption of the use of service utilities; (iv) Damage to primary roadways (less than 1500 ADT<sup>6</sup>) and railroads; and / or (v) Significant economic loss.<sup>7</sup>

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<sup>6</sup> "Average Daily Traffic" count.

<sup>7</sup> The information for hazard classes is taken from Section 22a-409-1 of the Regulations of Connecticut State Agencies.

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## **RECOMMENDATIONS**

1. **Upstream Embankment** – Remove brush and high vegetative growth from both the left and right ends of the dam, at or just within the normal high water level of the lake.
2. **Downstream Embankment** – For the short term, monitor any additional sloughing of stone and work with the Town in resolving the issue of pedestrian traffic along the edge of the road on top of the dam. For the long term, a uniform stone face should be reestablished along the upper crest area.
3. **Right Downstream Toe Area** - The base area of the right downstream embankment *“is currently kept in relatively good condition, but is fairly saturated along the right side. This is probably due to low level seepage beneath the embankment of the dam, from high groundwater levels along surrounding embankments and from occasional drainage coming off the roadway. A plan was drawn up in 1995 to install toe drains along this saturated area, but no action has been taken to date. While the need is not critical, consideration should be given to placement of these drains to facilitate better maintenance. In addition, the Town’s drainage pipe, partially filled with sediment, should be cleared out to restore its full capacity and to avoid the possibility of excess overflow running along the right downstream embankment. Note that there are signs that such flow may already occur.”*<sup>8</sup>
4. **Upstream Concrete Embankment Wall** – Cracking in the wall itself remains minor, but must be monitored on a regular basis. Vertical expansion joints in general need to be cleaned out and resealed, particularly along the base of the joints and some top areas which have minor vegetative growth pushing them out. I highly recommend that the base soil area at each of the joints be hand excavated and that the wall joints be sealed as low as possible below ground level, preferable about 18” below current grade. The excavated areas should then be refilled with an impervious cover to minimize and / or eliminate seepage through the embankment along the base of the upstream wall. Since footing conditions for this wall are unknown, an engineer should be present during these particular repairs for any modifications which may be necessary. Void areas without footings may need special treatment, such as additional impervious or concrete fill.
5. **Spillway Stone Masonry** – Voids noted along the downstream face of the spillway (situated also at the upstream end of the spillway outlet tunnel beneath the road) need to be chinked and mortared. This should be reviewed with an engineer prior to performing this work; some modifications for small drains may be necessary.
6. **Spillway Concrete Areas** – Loose and cracked concrete must be repaired. Where feasible, open joints should be cleaned and filled with sealants, while concrete should be

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<sup>8</sup>The section in italic is taken from the 2006 Inspection Report and is still valid for the current assessment.

chipped out and, in general, refurbished or patched with epoxy or similar repair products. In addition, voids at the slab / wall interface area must be cleaned out and filled in with concrete.

7. **Metal Corrosion** – Features such as fencing at the spillway, the interior valve controls at the gatehouse, and the gatehouse door frame should be cleaned of surface corrosion and recoated with appropriate steel paint products (minimum 2 coats), to stem further deterioration while they are still in structurally good condition.
8. **Upstream Intake Area** – Concrete repairs are recommended for the trash rack support structure, noted at the lower lake level encountered during the December inspection. It is also recommended that for the next scheduled formal inspection, the services of a diver be engaged to examine the submerged features of the lower intake area.
9. **Outlet Tunnel / Culvert** – This structure, noted as being in poor condition, will need to be replaced. It is recommended that its replacement be coordinated with any potential work on the pedestrian access or other roadwork on the top surface of the dam, to maximize efficiency of construction and to ease the impact on traffic along the roadway. For ease of construction, it is recommended that the tunnel be replaced with a precast concrete box culvert, since it can be set in place within a relatively short period of time and a minimum disruption to traffic. Note, however, that this construction will entail a road closure.

# **PHOTOS**

*[TAKEN SEPTEMBER 29, 2011 & DECEMBER 12, 2011]*



Photo 1 - An overview of the downstream side of the dam embankment taken from the left side. Small trees and other vegetative growth were removed from the slopes since the last inspection. Grass growth along the base is in good condition. The wet area noted in the inspection report is situated at the upper center of the photo, past the low level outlet channel.



Photo 2 – The top downstream crest showing the area used frequently by pedestrians crossing the dam area.



Photo 3 – The roadway forming the top of the dam embankment, looking westerly from the left side.



Photo 4 – The left upstream end of the embankment showing vegetation along the wall area to the left of the spillway.





Photo 5 – The spillway weir area during normal lake water level condition in September of 2011.



Photo 6 – Flow over spillway dropping into the entrance area of the tunnel / culvert beneath the road.



Photo 7 – Looking westerly along the top of the dam and roadway toward the spillway overflow at the center of the photo. Note the sediment deposits along the edge of the road and top of wall where there is periodic ponding.



Photo 8 – A view toward the right upstream end of the dam showing thick vegetation along the upstream wall section.



Photo 9 – A rutted and cracked asphalt area near the right end of the dam, indicative of many of the other asphalt issues along the top of the embankment.



Photo 10 – One of the many minor vertical cracks along the upstream concrete embankment wall that needs to continue to be monitored.



Photo 11 – A view towards the spillway. Note the woody vegetation growing at the base of the vertical joint at the left of the photo and the crack along the concrete surface in the center.



Photo 12 – Cracked section of concrete surface on the left side of the spillway.



Photo 13 – A closeup of the void area beneath the embankment wall just left of the spillway opening.



Photo 14 – The right side of the spillway slab, again showing cracked sections of concrete and a void area at the base of the wall. Note also the corrosion of the metal protective barrier, indicative of other sections (see previous photos).



Photo 15 – A closeup of the view of the void area beneath the wall in Photo 14; this void went at least 9” deep beneath the wall and is very likely the source of some of the seepage emanating from the base of the masonry wall beyond.



Photo 16 – One of the many vertical joints with deteriorating sealant. This one has vegetation growing out the top, with sealant being pushed out by the roots.



Photo 17 – A closeup of the trash rack support at the gatehouse intake, with a 30” long crack and a broken section adjacent to the wall.



Photo 18 – Interior of the gatehouse. Note the mild corrosion on the gate wheel control mechanism and some spalling of interior brick (see chips at left base).



Photo 19 – Typical of the vertical expansion joints is the missing sealant at the base and open voids leading beneath the wall. Footing conditions are unknown at these locations.



Photo 20 – Another of the vertical joints. Note that at this location, the void at the base of the wall extends on both sides for a total length of about 5' to 6'.





Photo 21 – View of the right downstream wet area, noted by the reflective water surfaces. Note that this area is typically and normally wet and saturated with lake water levels at their high or low elevations.



Photo 22 – The spillway discharge tunnel beneath the road, with severe concrete roof deterioration, evidenced by a downward bulge and exposed interior disintegrating concrete.



Photo 23 – Comparison photo from the 2006 inspection showing the interior condition of the discharge tunnel area. Note the difference in roof condition.



Photo 24 – The roof of the spillway discharge tunnel just beyond the concrete section, at the approximate center of the road above. Note open areas between large stones spanning the structure.



Photo 25 – Interior of the spillway drop structure, showing some of the smaller typical voids in the stone wall and the staining from seepage and leakage at the base. A note for Photo 15 shows that some of this seepage may be from a void at the spillway slab and wall juncture area at the top of this wall.



Photo 26 – The existing discharge area for the spillway tunnel beneath the road. Large stones are a partial block to flow efficiency at this channel location.



Photo 27 – A portion of the downstream slope showing an area of surficial sloughing caused by the steep slope and the movement of pedestrians along the top crest behind the guard rail.



Photo 28 – The low level discharge pipe emanating from the center base of the downstream embankment. This area has changed little since the last inspection and seepage at the wall adjacent to the pipe remains constant.