In the Matter of Russell Biomass, LLC
OADR Docket No. 2008-116

DIRECT TESTIMONY OF
DR. PIOTR PARASIEWICZ

I. STATEMENT OF QUALIFICATIONS

1. Education. I have received a PhD, M.S. and G.E. in natural resources management and water engineering with focus on fisheries ecology from the University of Agricultural Sciences in Austria. My CurriculumVitae is provided as **Exhibit 1**.

2. Experience.

a. I was a Research Associate at the Department of Natural resources of Cornell University, Research Associate Professor at the Department of Natural Resources Conservation of University of Massachusetts and currently hold a position of a Research Associate Adjunct Professor and Director of Northeast Instream Habitat Program at Mt. Holyoke College in South Hadley, Massachusetts.

b. I am a founder and a director of a Rushing Rivers Institute, a non-profit promoting river science in river management.

c. I am also a founding member of the International Aquatic Modeling Group, a member of American Fisheries Society, and also of the River Management Society and Trout Unlimited.

d. I am a developer of the MesoHABSIM model, a computer simulation system for fish and mussel habitat restoration planning, currently used for development of Protected Instream Flow Standards in the State of New Hampshire.

e. My primary research area is the assessment and simulation of physical habitats

for fish communities as a basis for ecosystem restoration. My recent projects focus on river habitat simulation, instream flows and comprehensive river restoration planning.

f. I have 20 years of extensive experience in the planning and implementation of river restoration projects, the design of nature-like bypass channels to support fish passage and the restoration of highly migratory species, as well as the assessment of ecological integrity.

g. I have assisted in the drafting of laws and policies to protect instream flow in the states of NH and CT. These projects are set to determine methods to be applied in allocating water from a water source. Like Massachusetts laws, the goal was to balance human needs vs. the needs of the environment.

h. I am involved in the Index Streamflow Report for the Massachusetts Water Resources Commission, and I participate in working groups to develop stream flow laws and policy in Massachusetts.

i. I am familiar with the Massachusetts Water Management Act and regulations, and Massachusetts policies on streamflow.

II. REFERENCES

3. In preparing this Testimony, I completed the following tasks:

a. I reviewed the following files: Russell Biomass WMA permit application and T&B reports and correspondence, DEP emails, RB NPDES application, Environmental Assessment Indian River Power Supply LLC.

b. On December 16, 2008, I visited the Town of Russell, Massachusetts at the Westfield River around the site of the proposed Russell Biomass LLC facility that is the subject of the Water Management Act permit in this case. I visited the area and observed

the water withdrawal location, the dam, and other relevant features of the site.

c. I reviewed maps and regulatory and scientific delineations of the Westfield River watershed, also referred to as the "Westfield River basin." This includes the Westfield River basin map, as identified by DEP in 310 CMR 36.00 and 314 CMR 4.06, Table 4, Exhibit 2, "Westfield River Basin." The Westfield River Basin is also identified in 310 CMR 36.18 (Effective Dates for Permit Regulations by River Basins).

d. I have cited and referred to the following literature in this testimony:

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B. Ballesterro, T., D. Kretchmar, L. Carboneau, P. Parasiewicz, J. Legros, J. Rogers, T. Steger, J. Jacobs. 2006, Souhegan River Protected Instream Flow Report, NHDES- R-WD-06-50, Concord, NH. Report for New Hampshire Department of Environmental Services. http://www.des.state.nh.us/rivers/instream/souhegan/study.html

C. Bovee, K.D. 1982. A guide to stream habitat analysis using the instream flow incremental methodology. Instream Flow Information Paper No. 12. U.S. Fish and Wildlife Service, FWS/OBS-82/26, Washington, D.C.

D. Dynesius, M., and C. Nilsson. 1994. Fragmentation and flow regulation of river systems in the northern third of the world. Science 266: 753-762.

E. Faloon P.D. and R. A. Betts 2006. The impact of climate change on global river flow in HadGEMI simulations. Atmos. Sci. Let. 7:62–68(2006). www.interscience.wiley.com.

F. Gleick, P.H., A. Singh, and H. Shi. 2001. Emerging Threats to the World's Freshwater Resources. A Report of the Pacific Institute for Studies in Development, Environment, and Security, Oakland, California.

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H. Malmqvist, B., and S. Rundle. 2002. Threats to the running water ecosystems of the world. Environmental Conservation 29: 134-153.

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K. Parasiewicz, P., and M.J. Dunbar. 2001. Physical habitat modelling for fish - a developing approach. Archiv fur Hydrobiologie Supplement. 135/2-4: 239-268.

L. Parasiewicz, P., J. Rogers, J. Legros and M. Wirth. 2007. Assessment and restoration of instream habitat of the Eightmile River in Connecticut – Developing MesoHABSIM model. The National Park Service, Wild and Scenic River Study for the Eightmile River and the Eightmile River Wild and Scenic Study Committee. pp 62. http://www.neihp.org/projects/eightmile/index.htm

M. Poff, N.L., J.D. Allan, M.B. Bain, J.R. Karr, K.L. Prestergaard, B. Richter, R. Sparks, and J. Stromberg. 1997. The natural flow regime: a paradigm for river conservation and restoration. Bioscience 47: 769-784.

N. Pimm, S.L., G.J. Russell, J.L. Gittleman, and T.M. Brooks. 1995. The Future of Biodiversity. Science 269: 347-350.

O. Stiassny, M.L.J. 1999. The medium is the message: freshwater biodiversity in peril. Pages 53-71 in J. Cracraft and F.T. Grifo (eds.) The Living Planet in Crisis: Biodiversity Science and Policy. Columbia University Press, New York.

P. UNEP. 1999. Global Environment Outlook 2000.United Nations Environment Programme, Oxford University Press, New York.

III OPINIONS

4. My testimony is organized as follows. In the Background section I describe the circumstances of the project and my professional perspective on the overall impact and

proposed permitting conditions. In following sections, I address the technical issues and concerns associated with applied permitting process. The summary and conclusions sections provide a brief synopsis and the conclusions of my review.

Background

5. The dramatic impact of human-induced alterations on freshwater flora and fauna is widely reported (Gleick et al 2001, UNEP 1999). Running water ecosystems belong to the most severely human-impacted habitats on Earth (Nilsson et al 2005, Malmqvist and Rundle 2002). Of more than 3,500 species currently threatened worldwide, one-quarter are fish and amphibians.

6. In freshwaters, the projected decline in species diversity is about five times greater than that of terrestrial ecosystems (Pimm et al 1995). This rate is similar to the historical great extinctions (Malmqvist and Rundle 2002).

7. It has been suggested that some 30-35% of all freshwater fish species are already extinct or in serious decline worldwide (Stiassny 1999). Ninety-three percent of these occurred during the last 50 years, indicating extinction of freshwater fishes as a serious and accelerating global trend (Harrison and Stiassny 1999).

8. In Massachusetts, the streams and rivers bear the legacy of its industrial past. The rotting industrial infrastructure, with thousands of relic dams, turns what were once rivers into series of ponds.

9. High population density causes urban sprawl, which is accompanied by massive paving projects. It intensifies floods and droughts, causing damage to human property and stressing the fauna. Excessive water withdrawals dry up rivers with

terrifying regularity.

10. By the end of the summer of 2005, a significant number of state rivers were dry, and the Ipswich River was dry for the second time in four years. In 2007 numerous streams and rivers have been documented as dry in Massachusetts (http://www.mass.gov/dfwele/river/programs/rifls/lowflow_inventory.htm). This is not only caused by global phenomena but it is strongly exacerbated by water over allocation for residential and industrial use.

11. The change in global climate further contributes to this impact by causing higher summer air temperatures, a longer summer season, and lower minimum river flows together with more frequent and severe flooding (Faloon and Betts 2006).

12. The water in these reduced flows tends to warm up more quickly in rivers which have been widened by previous floods and historical logging operations. Shallow ponds, created by thousands of small dams, serve as natural solar collectors. Less cold water is entering the rivers from the ground because of the ground water withdrawals.

13. It is therefore not surprising that we frequently measure summer temperatures of over 80F in long stretches of the "coldwater" streams (Ballesterro et al 2007, Parasiewicz et al 2007). The rivers and streams of the Northeast are home to coldwater species such as Atlantic salmon (Salmo salar) and native brook trout for which the above temperatures are lethal.

14. Consequently, scientists anticipate a loss of coldwater fauna from rivers and streams of the Commonwealth, and that proactive management preventing extended droughts and low flow levels by avoiding excessive water withdrawals must be a

management priority.

15. In Massachusetts, the recently published Water Policy recognizes these deplorable river conditions and makes recommendations designed to protect and restore the physical integrity of the state's waters by protecting and restoring watershed connectivity, preventing habitat fragmentation and identifying the physical conditions, including flow and river habitat structure necessary to sustain fish, wildlife, aquatic and other water-dependent organisms.

16. On page 16 of the Environmental Assessment of Indian River Power Supply, LLC Indian River Project Project No. 12462-000 by FERC there is the following statement: "*Flow regulation as a result of the operation of hydroelectric generating facilities, has greatly influenced the flow regime, water quality, aquatic habitat, and movement of anadromous, catadromous, and riverine fish in the Connecticut River and its tributaries, including the Westfield River.*"

17. Although the Westfield River is listed as low stress basin by Massachusetts Water Resources Commission, 30% of the August low flows (54.82 mgd) are currently permitted to be withdrawn from the river. The majority of this water (about 81%) never makes back to the Westfield River as growing population density requires more water, and a number of industrial enterprises also attempt to use the water for production.

18. The affect on the aquatic fauna is not very well defined for the Westfield River, however a simple observation makes it obvious that the conditions are far from pristine. Although the river is listed as essential Atlantic salmon habitat, the passage for spawning fish needs to be provided by trucks and water temperatures regularly exceed lethal levels for adult and juvenile salmon.

19. This and all above facts lead to the conclusion that particular caution needs to be exercised when permitting any additional municipal, commercial or industrial water uses from the Westfield River basin. The priority must be given to the protection and improvement of ecological integrity of the river and proactive mitigation of the impact of climate change.

20. The consequences of inaccurate assessment may be very dire and lead to unrecoverable loss of natural heritage of the Commonwealth. Hence, it is obvious that resources should be dedicated to ensuring ecological integrity and that the most accurate and sophisticated available technology needs to be applied in the permitting process.

Current scientific methods/practice for allocating water

21. The science relating to protecting instream flows when water allocations are at issue has long tradition in the United States. Numerous approaches have been developed with varying levels of sophistication. Probably the most comprehensive description of available methods can be found in the book by Instream Flow Council: Instream Flows for Riverine Resource Stewardship (Anear et al. 2004 and Exhibit 3) Another, more recent, analysis of the development of this science has been authored by renowned scientists and has been also published by Instream Flow Council (See **Exhibit 4 and 5**).

22. To define how a withdrawal will change the "instream flow" and how it can ensure "protection of the aquatic habitat" current scientific practice is based on the application of three major principles:

a. The "natural flow paradigm" (Poff et al. 1997) has emerged as a widely accepted framework for describing the roles played by stream flow in shaping ecological

characteristics of streams and understanding the consequences of modifications to natural stream flow patterns by human activity.

b. The "Reference River Concept" requires establishing a natural benchmark for assessment of current ecological status and determination of human impact (see Exhibit 6).

c. Application of "Instream Flows Incremental Methodology" with associated habitat simulation models, aims to quantify biological response to human induced alterations. See **Exhibit 7**. It is widely recognized that the habitat models provide the highest level of accuracy of all available methods.

d. The operating principle of habitat models is to determine how flow changes are changing the living conditions of fish fauna. This information is derived from the observation of animals under various conditions and the development of mathematical formulas describing their habitat preferences. Simulated changes to these circumstances as caused by flow modification allow us to predict how fauna will respond to future water use. The particular strength of these models is the quantitative nature of the prediction telling how much more or less habitat will be available.

23. Since the elaboration of the original habitat modeling software "PHABSIM" (Bovee, 1982), there have been a number of important developments (see Parasiewicz and Dunbar, 2001). Now, PHIABSIM is considered to be a somewhat outdated technique, and has been replaced by models such as "River2D" and "MesoHABSIM."

24. MesoHABSIM model was developed in Massachusetts and first applied on the Quinebaug River in 2001. This approach has been applied in a number of studies

around the Northeastern region in tandem with the Target Fish Community approach. Ten studies have been conducted by the Rushing Rivers Institute and Northeast Instream Habitat Program to date for government and for non-profit organizations. The objectives of these evaluations were to develop watershed management plans, protect instream flows and the develop river restoration scenarios. The method has been published repeatedly in peer-reviewed journals and has been utilized by government organizations, Universities and consulting companies in Connecticut, Wyoming, Missouri, Texas and in Europe.

25. The best and most recent example of such application are studies on the Souhegan and Lamprey Rivers in New Hampshire which set the stage for the development of state wide instream flow standards for Massachusetts (http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/index.htm).

Site Location

26. The Russell Biomass Project is planned at the site of an abandoned paper mill and hydro-power operation about 4 miles downstream of the confluence of the West, East and Middle braches of th**e** Westfield River. A map of the site is attached hereto as **Exhibit 8.**

27. The watershed area of the area of the Russell Biomass site is 331 square miles and a number of tributaries deposited loads of stratified sediment in the adjacent valley. These sediments are highly permeable and conductive creating active exchange zone for between surface and groundwater. It is clearly visible in the topographical relief of the valley, **Exhibit 9** hereto, and a surficial geology map, **Exhibit 10** hereto.

28. The areas described in the previous paragraph are areas are commonly associated with cold water fish because there is a high possibility of infiltration of ground water to the river. The reports of local citizens and obtained fisheries data confirm that. The water recharging, or infiltrating to the river from the aquifer is colder than the surface water. However, on Table 4 of 314 CMR 4.06, Exhibit 2, the Westfield River is classified at the Russell Biomass site are as a Class B: warmwater fisheries. This seems to be more a sign of the human impact on water temperature than a reflection of natural conditions. As explained in the Testimony of Peter Schilling, Esq. in this matter, this general classification of this area of the River is overridden by specific findings of state and federal agencies that the area at the Russell Biomass site supports a cold water fishery.

29. On the flip side, in areas where gravel dominates the Westfield River substrate the water may as easily filtrate out of the river, that is discharge to the groundwater. It can be expected that at the time of drought, when ground water/aquifer levels are very low, that the Westfield River water is infiltrating into the aquifer. Hence, less water will be in the River at the Russell Biomass site location than measured at the three upstream gauges used by DEP to determine streamflow at the Russell Biomass site. When there is less water in a river, the water warms up faster. This could explain high water temperatures measured at the Russell Biomass site in August 2001 and cited in the Environmental Assessment of Indian River Hydro.

30. There are two flood protection reservoirs with dams in the upper Westfield River basin above the Russell Biomass site. The Westfield River has an East Branch, a West Branch, and the so-called mainstem, or Middle Branch. One reservoir is on the

East Branch (the Knightville Dam) and the other flood protection reservoir is on the Middle Branch (Goss Heights/Littleville Lake). These two dams have flood control devices that are used by the dam operators to release water down stream. The operation of the flood control dams modifies the natural flows in the Westfield River. The stream flow rates below the dams are impacted by how much water the dam operators release. The Russell Biomass site located approximately 5 miles downstream of the two flood control dams. Further manipulation of the Westfield River water level or streamflow occurs at the Texon/Cresent Mills dam one mile upstream of the Russell Biomass site. Although the Texon dam uses a "run-of-the river" operation, witnesses report that Westfield River flows frequently fluctuate in erratic fashion depending on the water use at the Texon dam. This is not unusual because the lack of downstream gauges makes enforcement of flow regulations virtually impossible.

31. The Russell Biomass site is shown on **Exhibit 8.** The site can be described as having three areas of interest to my testimony:

a. The impoundment, which is created by a dam resting on a natural granite outcropping. The dam height is 30 feet, and it is 425 ft long and runs from east to west, covering almost the entire bed of the river. The intake pipe is located in the impoundment. It is labeled "Water Withdrawal Point" on **Exhibit 8**.

b. The "bypass reach" which is also shown on **Exhibit 8**. This is the 170 ft long section of the river directly downstream of the dam. When the water in the impoundment is high enough, water goes over the dam. FERC has required that Indian River Hydro release an interim minimum flow of 50 cubic feet per second (cfs) over the dam to the "bypass reach."

c. The sluiceway. This is the area where the water is diverted from the impoundment to a narrow passageway on the east side of the dam, and behind the powerhouse of the hydro plant. This is where water is captured to run the hydro turbines. It is the area labeled on **Exhibit 8** as the "Indian River Hydro Gatehouse and Water Intake." After it is run through the turbines, this water empties into the Westfield River at the bottom of the bypass reach. FERC has approved restoration of this hydro operation.

d. The Russell Biomass effluent discharge point. This is a location 500 feet down stream of the dam. Its location is labeled on **Exhibit 8** as "Proposed Effluent Discharge (outall location 001)" This is one area where the RBM facility will discharge its effluent from power production operations. Storm water will be discharged through two other outfalls, identified on **Exhibit** 8 as "Stormwater Discharge (outfall location 004, est'd) and "Stormwater Discharge (outfall location 005 & 006, est'd)".

e. About 1 mile above Russell Biomass site, the Westfield River makes sharp turn to the east, apparently abandoning its historical course, which was west around the Turtle Bend Mountain. This old river course is also dominated by gravel deposits, which have also been added to by the Black and Stage Brooks (also known as Bradley Brook), which join the Westfield River only few feet above the dam. Bradley Brook is shown on **Exhibit 8**.

f. The proposed Russell Biomass facility is on the east side of the river on an alluvial terrace; only few feet above the high water mark shown on **Exhibit 11**. This area can be expected prone to flooding under expected future conditions.

DEP permit # 9P2-1-04-256.04

32. DEP was required to determine the Safe yield of the Westfield River Watershed basin before issuing the permit. DEP claims that it considered the factors listed in Section 36.31 of WMA and utilized these factors to determine the safe yield.

33. The safe yield of the Westfield River basin is defined under the WMA.

a. WMA regulations 310 CMR 36.00 defines "Safe yield as the maximum dependable withdrawals that can be made continuously from a water source, including ground or surface water, during a period of years in which the probable driest period or period of greatest water deficiency is likely to occur; provided however, that such dependability is relative and is a function of storage and drought probability."

b. Section 310 CMR 36.31 states that DEP may consider 6 factors in determining safe yield of a water source. The regulation says:

> (1) In determining the safe yield of a water source, the Department may consider at least the following:
>
> a) the natural variability of streamflow and aquatic habitat protection;
>
> b) the water balance of the water source;
>
> c) the hydrologic impacts of proposed, existing and permitted withdrawals;
>
> d) the safe yield of any isolated or severely impacted subbasin within the water source;
> =
> e) any information or guidelines developed by the Department of Conservation and Recreation or the Water Resources Commission; and
>
> f) any other or additional information deemed applicable or relevant by the Department.

34. The Affidavit of James Bumgardner submitted in this appeal asserts that DEP

did consider these factors in making its decision. However, DEP's consideration of these factors was based on erroneous data/science as shown below.

35. The **natural flow variability** in the river has not been considered. The flow analysis conducted by DEP staff is based on flows that are **altered by human actions.** The flows in the Middle and East Braches are artificially regulated by two flood control dams and, as presented in **Exhibit 12** do not have the same variability as natural flows. Furthermore the operation of Texon dam influences flow patterns in the river.

36. DEP has not considered the natural flow variability at the site. The river flow estimates for the Russell Biomass water withdrawal are based on flows 4 miles upstream and disregard the alluvial geology of the valley, and therefore the high likelihood of water flow between the surface and groundwater. This may mean that at times of drought the flows at the site may be much lower than the estimates based on the three upstream gauges.

37. There are numerous hydrological models available that could have been used to estimate natural flow variability at the site. None of these models has been applied.

38. A determination of the natural flow variability at the site is necessary, because otherwise it is impossible to say whether the natural flow variability will be affected by the Russell Biomass withdrawal. The DEP's qualitative statements in the permit, such as that the withdrawals are "proportionally very small" are inaccurate and have no scientific underpinning.

39. The **aquatic habitat protection** for fish and invertebrates has not been considered because:

a. The target fish and invertebrate community as recommended by

Massachusetts Water Policy, have not been identified.

b. The status of aquatic habitat for the life stages of target fish and invertebrates has not been determined by specifying

1) Habitat hydraulics at appropriate scale

2) Availability of cover and substrates

3) Existing thermal conditions

4) Existing water quality conditions

c. The habitat simulation has not been applied to define change in the aquatic habitat due to RBM water withdrawals and discharges.

40. DEP did not adequately/properly consider the **water balance of the water** source for all users. This includes fish and invertebrates.

41. To figure out the water balance DEP should have looked at all of the existing and permitted withdrawals for the Westfield River basin as well as determine "instream flow" necessary for "aquatic habitat protection."

42. The permit and the Jimmy Bumgardner Affidavit ¶ 7 state that DEP compiled a list of all registered and permitted withdrawals "and evaluated the potential for the proposed withdrawal to impact these withdrawal volumes." Listing these withdrawals without defining the needs of aquatic fauna is not a water balance. The goal of the balance is to maintain adequate flow in the river, not just calculate whether the proposed withdrawal will impact the existing withdrawals.

43. Under 310 CMR 36.00, Consumptive loss means that portion of a withdrawal which is estimated by the Department not to be discharged back to the basin from which

it was withdrawn. The Department's estimation of the portion of a withdrawal considered to be consumptively lost to the basin shall be based upon the use to which the withdrawal is put and any interbasin transfer. The RBM withdrawal is also a consumptive loss.

44. As presented above the **hydrologic impact** of proposed withdrawals has not been considered because the current hydrological status has not been established since:

a. The current flows at the site are unknown;

b. The reference or naturalized flows are unknown; and

c. The presented calculations of flows and derived criteria are very crude.

45. The **hydrologic impact** of existing and permitted withdrawals has not been considered to the fullest possible extent because:

a. Despite the fact that the Indian River Hydro shares the very same location with RBM the conditions of the FERC exemption, including the minimum downstream release by Indian River Hydro were obviously not considered.

b. The FERC requires that inflow to the Indian River Hydro project will equal outflow from the project on an instantaneous basis, and water levels above the dam are not drawn down.

c. The permit allows an instantaneous withdrawal of 1.37 cfs (or actually 1.6 cfs (see ¶ 54 below) is at odds with this requirement and makes compliance impossible.

d. FERC requires a minimum outflow through the bypass reach of 50 cfs while DEP allows for withdrawals down to 17.8 cfs.

e. FERC anticipates potential increase of water temperature through the bypass reach, what has not been considered in the thermal impact analysis for Russell Biomass.

f. An operational coordination plan between two industries (Russell Biomass and

Indian River Hydroo) has not been presented.

46. With the goal of complying with 310 CMR 36.31(a) and (b) DEP describes how it listed all the registered and permitted users in the Westfield River watershed and "evaluated the potential for the proposed withdrawal to impact their ability to withdraw their authorized withdrawal volumes" and "evaluated the cumulative impacts of the withdrawals upstream or near" the site, and "determined that the cumulative withdrawal of all upstream withdrawals is *proportionally very small* when compared with the Westfield River streamflow and will not cause substantial or identifiable impacts to designated or existing uses." (Bumgardner Affidvait ¶ 7). This claim is unreasonable because:

a. The record does not contain an analysis of the potential for the RBM withdrawal to impact existing registered and permitted withdrawals: to demonstrate this impact DEP should have properly used hydrologic models to show how much water will be left in the River and to evaluate in terms of meeting seasonal instream flow needs.

b. The statement that the upstream withdrawals are "proportionally very small" compared to the streamflow and contains no quantification of the instream flow needs.

c. Using a static number, such as 7.7% of the lowest recorded stream flow of 17.8, recorded on one date, August 19, 1970, does not show that DEP considered the natural flow regime.

d. I found no biological data in the records that I reviewed supporting DEP's statement that because the proposed withdrawal is only 7.7% of the lowest recorded streamflow, that the withdrawal "would likely not have a substantial detrimental impact to the Westfield River".

e. The information and guidelines developed by the Department of Conservation and Water Resources Commission has been ignored.

f. Recommendation 7 of the Massachusetts Water Policy to protect and restore critical land and water resources has been ignored.

47. The Massachusetts Water Resource Commission, in its April 2008 Index Streamflow Report (draft was available in October 2007) states that "[m]aintaining a natural flow regime is recognized as a key to sustaining native aquatic species" see p. 4, as well as "[w]here development occurs, efforts should be made to retain natural stream flow characteristics to the extent possible." P. 9. The Report recommends application of a "site specific analysis". P. 6. On page 35, the Report describes two key habitat modeling techniques that should be applied in order to determine the natural flow regime: PHABSIM and MesoHABSIM.

48. Upon the recommendation of Department of Conservation of Resources, Mr. Bumgardner participated at the UMass Course Nat-RESR 597on August 28-31, 2006, where the detailed information about available habitat modeling techniques was presented. Mr Bumgardner did not require Russell Biomass to apply any of these modeling techniques as part of its application for a Water Management Act permit.

49. The DEP did not include any **other or additional information deemed applicable or** relevant as part of its claim to have considered safe yield under 310 CMR 36.31.

50. The water quality and thermal impact relating to the Russell Waste Water Treatment Plant, which is located directly on the Westfield River, is not considered in the project documentation. The plant and effluent discharge locations are identified on

Exhibit 8 as "Russell Wastewater Treatment Plant" and "Treatment Plant Effluent Discharge (est'd)." The Treatment Plant discharge location is above the dam, in the impoundment.

51. The Russell Biomass analysis of **thermal impact** of the project is based on **inadequate data and imprecise information**.

a. The temperature data has not been monitored continuously at the site location.

b. The only description of thermal analysis found in provided documents was the presentation of the data from four USGS gauges (location unspecified) in DEIR. This data is not from the same location as RBM and therefore the conclusions are not valid for the site. The detail of the used data has not been provided (except a summary of monthly means), which is inadequate to determine the impact of thermal discharge in the times that may be critical for the fauna.

c. The temperature data **for the location** consists of four spot-check measurements taken in summer 2001 for the Westfield River Watershed 2001 Water Quality Report. The Environmental Assessment Report for Indian River Hydro also includes a summary of spot check data taken between May 2000 and March 2004. The temperatures measured during this time are within and above the maximum for Atlantic salmon. It is very likely that in drought conditions the temperatures will exceed the lethal levels for salmon and other coldwater fauna.

d. Thermal releases from Russell Biomass will certainly exacerbate this situation and no evidence to the contrary has been provided.

e. The Russell Biomass NPDES permit "mixing zone" analysis is based on a very

primitive hydraulic model and assumes that ambient temperature is equal to monthly means, which does not represent conditions that may be harmful to the aquatic life.

52. The analysis of the **water quality** impact of the project is based on **inadequate data and imprecise information**.

a. The water quality at the site has not been continuously monitored in preparation of the project.

b. Instead, the data from the Westfield River Watershed 2001 Water Quality Report has been used, which is based on 4 spot check surveys taken in between August 1st and October 3rd, 2001. The flows at the times of the surveys were above 130 cfs, much higher than 7Q10. Hence, this does not represent critical drought conditions when concentration of pollutants is the highest and when the Russell Biomass plant would still be permitted to operate.

c. The future changes in operation of Russell Waste Water Treatment Plant (by climate change and population increases) are also not included in the analysis. This is contrary to the WMA requirements.

53. No impact of **climate change** has been incorporated in the considerations with an accuracy allowing for any meaningful conclusions.

a . As stated by Jimmy Bumgardner in his Affidavit, ¶ 11, the analysis of potential flow changes in the Westfield River is based on analysis of flows impacted by the Knightville Dam. It is inappropriate to base conclusions about the impacts of future climate change by using a river flow that is hydrologically altered by dam operations. Mr. Bumgardner's conclusions say nothing about the potential impact of climate change,

it merely describes the way that the Army Corps releases water from the Knightville reservoir through the dam. One glance at the Westfield River hydrograph from December 2008 makes it very clear that the analyzed flows used by Mr. Bumgardner are far from natural. Therefore, the analysis is seriously flawed. See Hydrograph, **Exhibit 12**.

b. The conclusions of Mr. Bumgardner are based on analysis of averages and median flow values. This is biologically irrelevant, because averages "do not kill". To put it in perspective: at average the weather conditions in New Orleans are not dangerous to humans, however very many people died in Hurricane Katrina.

c. The analysis of the West Branch flow data with help of The Nature Conservancy's "Indicators of Hydrological Alteration" model clearly shows that within last twenty years the low flows become lower and more variable. Also the durations of low extreme low flows increased in the second period. The results of the application of this model to the Westfield River data is contained in **Exhibit 13** .

d. The flow analysis conducted by DEP and referred to in the Bumgardner Affidavit is very simplistic and on very short time series. Much more sophisticated analysis incorporating future land use changes and climate change models should have been implemented. Unfortunately, because as documented by Milly at al 2008, "the stationarity" of flow patterns is gone, at this stage looking into the past to estimate the future is not informative.

e. The scientifically documented expected increase in flood intensity as well as the duration and intensity of droughts was not considered by DEP. No simulation of future flow durations has been performed.

f. Similarly, the location of the project in the floodplain of the Westfield River should be investigated. The increase in flood intensity makes the Russelll Biomass project highly vulnerable to devastating floods. The organic matter (wood fuel) stored at the site could cause high levels of pollution downstream of the plant.

54. The Russell Biomass permit statement that the company will withdraw water from the River at a flow value of 1.37 cfs, as a maximum daily withdrawal is incorrect and misleading as it suggests a limitation of instantaneous withdrawal. According to the documentation in this matter, the water may be withdrawn with a pump of the capacity 750 mgd. This means that the pump can withdraw from the river at 1.6 cfs instantaneously. This cfs value is the one that will have a direct impact on the fauna and not the daily average.

Conclusions

55. It is my opinion that based on the record in this matter and my scientific expertise, DEP lacked a sufficient factual basis for making the decision to grant the Water Management Act permit to Russell Biomass. The types and the quality of data used for the determination of the impact of the Russell Biomass withdrawals is insufficient for purposes of making an informed decision under the Water Management Act. In part, this is because the resolution of the data is such that the amount of discussed withdrawals is lower than the associated error or in other words: the consultant applies coarse watershed scale methods to detailed site specific study.

56. The documentation for the granting of the Russell Biomasss Water Management Act permit appears to be full of errors and inaccuracies. For example, the response to comments in the Water Management Act permit that for the analysis of

impact of climate change DEP used data from the West Branch of Westfield River (Permit, Page 15). In the Bumgardner Affidavit however, the DEP states that the Knightville Dam gauge data has been used to determine the climate change impact. (Bumgardner Affidavit ¶ 11) .

57. In granting the permit, DEP deliberately ignored the best available technology and used inadequate tools. This is particularly grotesque because such tools are being spearheaded in Massachusetts, are widely available, and frequently used in a regulatory environment.

58. In its decision making on the permit, DEP should have included the following:

a. Development of reference for **current ecological status** of Westfield River through determination of: (i) a Target Fish Community, (ii) a naturalized hydrograph at the site location, (iii) a surface/subsurface flow model, (iv) target habitat conditions.

b. A **determination of current conditions at the site** by (i) requiring the applicant to provide the continuous flow and temperature recording at the discharge location for a period of one or two years; (ii) requiring a detailed survey of fish and invertebrate fauna, (iii) developing a habitat model for the target fauna at the site locations (modified River2D or MesoHABSIM); and (iv) requiring high frequency water quality monitoring;

c. **Determination of future scenarios** by (i) similutating future flow and thermal conditions that incorporate climate change and human induced alterations without the project, (ii) simulating future habitat conditions with the project and comparing them to the target, and (iii) assessing mitigation and compensation measures.

d. A detailed **monitoring and adaptive management plan** for the site, including streamflow gauge.

59. It is my opinion that DEP violated it stewardship responsibility by blindly relying on Russell Biomass consultant data and not requiring an independent study. It is not for the DEP agency staff to decide that the amount of withdrawn water is "proportionally very small" and that herefore there will be no impact. Factual, quantitative evidence that the proposed project will not harm the natural resources needs to be provided. This is currently clearly lacking.

60. In ¶ 17 of this Affidavit Mr. Bumgardner states that "The MassDEP can not base its **decision on speculation**". With all due respect I am very sorry to say, but the presented habitat assessment is just that.

61. In the face of one of the greatest challenges that our civilization ever faced created by global climate change, the DEP agency staff have particular responsibility to proactively manage our common resources to limit the damage of riverine flora and fauna. We need to apply unprecedented diligence in the permitting process, and thoroughly investigate the **future consequences** of any proposed project. This procedure has not been followed in the Permit #9P2-1-04-256.04.

62. I understand that the purpose of RBM construction is to reduce carbon footprint of our civilization, but this cannot happen at the cost of other, equally important resources, such as water. It is widely recognized, even by large multinational corporations (see Corporate Water Footprint Conference http://www.greenpowerconferences.com/corporateclimateresponse/cw_dl.html), that water is the carbon of the future and we need to reduce our water footprint as much as the carbon

footprint. However, the economical analysis of this project sets the value of withdrawn water with **$0.00**.

Signed under the pains and penalties of perjury this 21 day of December, 2008.

DR. PIOTR PARASIEWICZ