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ARI

September 20, 2007
1685

Mr. Dennis Moran, Chair
Selectboard
Town of Russell
P.O. Box 407
Russell, MA 01071-3103

RE: FINAL REPORT OF FINDINGS – Independent Third-Party Environmental Review of Russell Biomass Project

Dear Dennis:

Alternative Resources, Inc (ARI) has completed its independent environmental review of the Russell Biomass Power Plant project, and we have prepared our final report. The report documents how we performed the review, as well as our findings and recommendations. This final version of the report is similar to the draft report you have reviewed previously; however, we have added an analysis of the effects on the Westfield River flow of the near-drought conditions experienced in August and September. We enclose here seven bound copies of the report, as well as seven electronic copies on compact disk (CD), for appropriate distribution by the Town.

In our report, we make a number of recommendations for the Town to request Russell Biomass LLC to address, in order to ensure adequate environmental protection should the project go forth. Those recommendations are also summarized below:

- Fuller evaluation of the truck-related safety hazard on Main Street
- Fuller evaluation of the rail alternative for wood fuel delivery
- Make legally binding the commitment to exclude C&D wood from the fuel supply, irrespective of possible future changes in regulations or plant ownership
- Commit to furnish the Town copies of all wood fuel specifications and reports of inspections performed on wood suppliers' facilities
- Re-evaluate the feasibility of using a fabric filter on the stoker boiler for emission control
- Perform risk assessment for acrolein emissions from the stack and provide results and information to the Town.

- Clarify whether wood-chip grinding or screening is planned onsite. If so, evaluate impacts and mitigation for dust and noise.
- Further detail plans for controlling dust from ash handling
- Describe in common terms the nature of plant-related noise that residents may here
- List for the Town the expected types and quantities of hazardous materials to be stored and used at the plant.
- Town should monitor for any plan by MADEP to tighten discharge limits to the Westfield River, as the project's discharge might make it more difficult for the wastewater treatment plants in Russell to meet such a new limit.
- Town should request that Russell Biomass conduct an evaluation of the recent low flow condition of the Westfield River in August and September 2007, and compare the data from this evaluation to the historic low flow data.

In addition, there are three recommendations that the Town should request MADEP to address:

- MADEP should require periodic stack testing for emissions of heavy metals, hydrogen chloride, and sulfur dioxide for as long as the plant's allowable wood fuel supply includes post-consumer wood products such as old pallets or boxes, or post-industrial wastes such as paper cubes. (Wood derived from C&D waste is not cited here since the project proponent has excluded it from its fuel supply).

- MADEP should require that Russell Biomass LLC make a more rigorous effort to quantify the condensable fraction of PM10 and PM2.5 emissions for the purpose of setting the emission limit for those pollutants. Although wood is a naturally low-sulfur fuel, and the overall contribution of condensable particulate matter to the whole is likely to be low, it is likely not negligible, and should be included in the total permit limit.

- Besides setting air pollutant emission limits if a permit (Plan Approval) is granted, MADEP would also specify the methods by which Russell Biomass LLC must demonstrate compliance with those emission limits. The documents provided to the Town by the project proponent do not provide a summary of the methods proposed to be used at the plant to demonstrate compliance. MADEP should require continuous monitoring for NOx, CO, opacity, and for either CO_2 or O_2. The Town also recommends periodic stack emissions testing for filterable and condensable PM2.5 and PM10, as well as for selected hazardous air pollutants (HAPs) to be identified by MADEP. Per the first recommendation above, the periodic stack testing should also include heavy metals, HCl, and SO_2, as telltale indicators of possible fuel contamination.

The final step in the current engagement is for ARI to attend the public meeting in Russell scheduled for October 4, to present our findings to the public and respond to their questions. At that public meeting, we would provide copies of a summary of our presentation to each person who attends the meeting.

Kindly contact me should you have any questions (978/371-2054 x 112).

Very truly yours,

David H. Minott, CCM, QEP
Vice President

Enclosure – Final Report (7 bound and 7 CD copies)

INDEPENDENT ENVIRONMENTAL REVIEW OF RUSSELL BIOMASS PROJECT

Prepared for

Town of Russell Selectboard

65 Main Street
P.O. Box 407
Russell, MA 01071

September 20, 2007

Prepared by:

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With

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1.0 EXECUTIVE SUMMARY

The Selectboard of the Town of Russell has retained Alternative Resources, Inc. (ARI) to perform an independent environmental review of the biomass power plant proposed for development in Russell by Russell Biomass LLC. In this summary section, the proposed biomass power plant project is briefly described, the purview of the independent environmental review is discussed, and key findings and recommendations of the study are presented in some detail. Subsequent sections of this report describe further details of ARI's independent review and related findings.

1.1 Project Summary

The proponent of the project, Russell Biomass LLC, proposes to develop a 50 MW biomass power plant off Station Road in Russell, at the base of Shatterack Mountain, on the site of the former Westfield River Paper Company. The proponent proposes to fuel the power plant with clean (untreated) wood, as such wood is defined by Massachusetts regulations in 310 CMR 7.00. The definition excludes wood derived from Construction and Demolition ("C&D") waste. A Special Permit issued by the Town, however, defines acceptable fuel more conservatively, as wood from virgin sources.

The plant would consume approximately 2,000 tons per day of wood fuel. Chipped-wood fuel will be delivered to the plant in tractor trailer trucks via Main Street – about 80 such deliveries per day. An approximate 25-day supply of delivered wood fuel will be stockpiled onsite, in an outdoor storage yard. However, a three-day supply of fuel for current use will be maintained onsite under roof. Ash resulting from combustion of the wood will be trucked offsite for an intended beneficial use – land application as a soil amendment and nutrient. Approximately two truckloads of the wood ash would be trucked off the site each day.

The project proponent is considering two alternative boiler types – "stoker" and "fluid bed." In the first alternative, the wood fuel would be combusted in a standard stoker boiler to produce steam. The steam would then drive a conventional turbine-generator to produce

electric power. In the second alternative, the system would be the same, except that a fluid bed boiler would be used, instead of a stoker boiler.

A conventional cooling tower (wet evaporative condenser) is proposed for dissipating waste heat from the boiler to the atmosphere. A maximum of 885,000 gallons per day of water is to be drawn from the Westfield River for use in the cooling tower, with an average withdrawal of 662,000 gallons per day. The amount of water needed for cooling on hot summer days is more than on cold days, because the difference between the temperature of the water and the temperature of the atmosphere is smaller in the summer. Approximately 15 percent of the water withdrawn from the River will be returned to the River following treatment. The remainder – approximately 85 percent of the water draw – will be lost to the atmosphere through evaporation. A system for stormwater management is planned, whereby a portion of the site stormwater would be detained and recharged to ground water, and a portion would be discharged to the River following treatment.

A new, 5.3-mile transmission line is proposed to carry the electric power generated by the plant to a point in Westfield where the new transmission line would tie into the regional electric grid. This independent review has focused on the power plant itself, and has not evaluated the transmission line corridor or the potential effects of the transmission line or its construction.

1.2 Purview of the Independent Environmental Review

The Selectboard of the Town of Russell has retained ARI to conduct an independent review of the relevant health and environmental impact studies prepared by Russell Biomass LLC for the proposed biomass power plant. Specifically, the Selectboard requested ARI to independently review six studies and permit application documents:

- Comprehensive Air Plan-Approval Application (air and noise) dated September 2005, as updated on April 2007, with Updated Dispersion Analysis dated September 2006.
- Make the project proponent's commitment to exclude acceptance of wood fuel from Construction and Demolition waste legally enforceable.

- Diesel Truck Air Quality Study dated March 2006
- Traffic Impact Study dated June 2005
- Water Management Act Application (for river water withdrawal) dated August 2006
- NPDES Application (for wastewater and stormwater discharge) dated August 2006
- Certificate issued by the Massachusetts Environmental Policy Act office – MEPA on the Extended Environmental Notification Form for the project. The MEPA Certificate prescribes scoping for the subject matter of the required Environmental Impact Report.

Subsequent to ARI's having been retained by the Selectboard, the project proponent prepared a comprehensive Draft Environmental Impact Report (DEIR) for the project, as had been required by the MEPA Office. The proponent submitted the DEIR to the MEPA Office in late June 2007. At the request of the Selectboard, ARI has included independent review of the DEIR within this study.

As directed by the Selectboard, ARI has focused its independent environmental review overall on the power plant component of the project, and has not reviewed the transmission line component, most of which would be outside of the Town of Russell.

1.3 Major Findings and Recommendations

1.3.1 Overall Conclusion

ARI concludes that the DEIR, plus the other impact assessments and permitting documents reviewed, collectively addressed all the significant environmental issues that are pertinent for the proposed, Russell Biomass Power Plant project. We found that no major environmental issues were "missed" in this regard.

ARI further concludes that the assessments of environmental impacts presented in these documents were generally performed in a technically thorough manner, using appropriate analytical techniques, and results were presented in a professionally objective manner. ARI concurs that these assessments credibly demonstrate that, with the exception of traffic safety and traffic noise, no significant and permanent

environmental impacts should be expected from the project. This presumes that the effective mitigation measures proposed for the design and operation of the facility will be implemented if the facility is built. For example, ARI concurs that the best available control methods are proposed for air pollutant emissions, and that the projected, maximum air-quality impacts from those emissions are "safe" by conservative criteria established by the Massachusetts Department of Environmental Protection (MADEP). Likewise, ARI concurs that the planned withdrawal of water from the Westfield River and subsequent discharge to the River have received appropriately detailed assessment, leading credibly to the conclusion that water draw and discharge will not have a significant impact on the River.

The most significant impact to the Town of Russell will be the increased safety hazard, noise, and vibration from the project's truck traffic on Main Street. While reasonable measures have been proposed to mitigate those traffic impacts, the impacts will be noticeable and lasting. Neither the project proponent, nor any other party, appears to have demonstrated to date that a practical alternative exists to the use of Main Street for project-related trucking.

While ARI found no major deficiencies or omissions in the studies we reviewed, we did identify a number of areas where further assessment or action by Russell Biomass LLC is recommended to address certain details of environmental impacts or required mitigation. Results of the recommended further assessments should be provided by Russell Biomass LLC to the Town for review. The issues recommended for further study are briefly listed below, with fuller discussion in the body of the report. Those particular items below that are italicized are recommendations that the Town should make to MADEP.

- Fuller evaluation of the truck-related safety hazard on Main Street
- Fuller evaluation of the rail alternative for wood fuel delivery
- Make legally binding the commitment to exclude C&D wood from the fuel supply, irrespective of possible future changes in regulations or plant ownership

- Commit to furnish the Town copies of all wood fuel specifications and reports of inspections performed on wood suppliers' facilities
- *Commit to periodic emissions tests for metals and acid gases for as long as wood from non-virgin sources is included as acceptable wood fuel*
- Re-evaluate the feasibility of using a fabric filter on the stoker boiler for emission control
- *Quantify emissions of condensable fine particulate matter*
- Perform risk assessment for acrolein emissions from the stack and provide results and information to the Town.
- *Clarify proposed methods for demonstrating compliance with air emissions limits*, and commit to copy the Town on compliance results
- Clarify whether wood-chip grinding or screening is planned onsite. If so, evaluate impacts and mitigation for dust and noise.
- Further detail plans for controlling dust from ash handling
- Describe in common terms the nature of plant-related noise that residents may here
- List for the Town the expected types and quantities of hazardous materials to be stored and used at the plant.
- Town should monitor for any plan by MADEP to tighten discharge limits to the Westfield River, as the project's discharge might make it more difficult for the wastewater treatment plants in Russell to meet such a new limit.
- Town should request that Russell Biomass conduct an evaluation of the recent low flow condition of the Westfield River in August and September 2007, and compare the data from this evaluation to the historic low flow data.

Most of the recommended supplemental studies should be conducted at this time for the benefit of the Town. For example, while the project proponent has adequately assessed traffic impacts on Main Street from the technical standpoint (impacts on traffic flow), ARI recommends more detailed assessment and communication of the safety hazard aspect of the increase in truck traffic. In addition, we recommend a more complete reporting of why the project proponent believes delivery of wood fuel by rail is not feasible at this time.

Three of the recommendations, however, should be addressed by the Town to the MADEP for inclusion in permit conditions if the project is approved.

1.3.2 Specific Conclusions and Recommendations

a. Acceptable Wood Fuel

The definition of acceptable wood fuel adopted by the project proponent is, from a practical standpoint, similar to the Town's more conservative definition. In either case, the large majority of the wood waste burned would be either virgin wood or minimally processed wood (sawdust, lumber scraps). If the MADEP definition is followed, wood from discarded pallets or boxes, as well as paper cubes, would also be allowed, but these sources are likely to constitute a small fraction of the total amount of fuel consumed. While those types of wood waste can become contaminated, depending on where and how the wood product was used, the likelihood of significant quantities of contaminated wood being delivered can be greatly reduced if the project proponent enforces appropriate fuel specifications on its wood suppliers, and conducts regular inspections of their fuel preparation yards for banned types of wood. In this regard, ARI recommends that the Town of Russell be provided with copies of all of the proponent's wood fuel specifications and reports of inspections of wood-supplier facilities. We also recommend to MADEP that the air permit require periodic emissions tests for metals and acid gases, as long as non-virgin wood remains in the definition of acceptable fuel. With those recommendations, ARI believes that the Town can safely accept the MADEP's definition of clean wood, with reasonable assurance that contaminated wood won't be delivered in quantities significant enough to affect air pollutant emissions from the plant. ARI also recommends that the Town make legally enforceable the commitment of Russell Biomass LLC to adhere to the MADEP definition of Clean Wood Fuel that was in effect on July 1, 2007, even if MADEP should change its definition in the future to include some wood from the C&D stream.

b. Boiler Technology

The project proponent is considering two types of boiler technology: fluid-bed versus stoker. Fluid-bed boilers are inherently lower-emitting for the air pollutants, nitrogen oxides and carbon monoxide, than stoker boilers. But, if a stoker boiler is equipped with additional emission controls, the two technologies should achieve similar emission rates. From the standpoint of air emissions and impacts, ARI does not see an important difference in performance between a fluid-bed boiler versus a stoker boiler. ARI is comfortable that either technology can achieve the very low emission levels required for designation as a "low-emissions technology" in Massachusetts, as is needed for a power plant to qualify for Renewable Energy Credits in the Commonwealth.

c. Air Pollutant Emission Controls

The biomass power plant will emit common combustion-related air pollutants such as nitrogen oxides, carbon monoxide, and particulate matter, and will also emit very small quantities of toxic air pollutants. Add-on controls proposed for these emissions differ between the fluid-bed boiler and the stoker boiler options. For the fluid-bed boiler, an electrostatic precipitator (ESP) is proposed for control of emissions of particulate matter, and Selective Catalytic Reduction for control of emissions of nitrogen oxides. The stoker boiler would use a fabric filter (baghouse) for control of particulate matter, Selective Catalytic Reduction to control nitrogen oxides, and a catalytic device to control emissions of carbon monoxide.

ARI concurs that the proposed control technologies for both boiler types would provide very stringent emission control, and are likely to meet regulatory requirements to be prescribed by MADEP for Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER) technology, as applicable. In addition, all of the proposed controls are capable of reducing emission rates such that resulting air quality impacts are minor. However, ARI recommends additional consideration by the project

proponent be given to the choice of equipment for control of particulate emissions with the stoker boiler technology.

The ESP and fabric filter both provide excellent control of particulate emissions; however, the performance edge goes to the fabric filter for control of very small particles of respirable size – less than 2.5 microns in diameter (so-called PM2.5). The project proponent is reluctant to use a fabric filter with the stoker boiler, because of a legitimate concern that embers from the boiler could start a fire in the fabric filter (that risk is not present when a fabric filter is used with a fluid-bed boiler). If the proponent decides to use a stoker boiler, ARI recommends that the proponent investigate again, very thoroughly, whether a fabric filter could be used without this creating an unacceptable fire risk. If technically feasible, ARI believes the fabric filter would be the better choice in the long run. EPA has put a regulatory focus on PM2.5 emissions because of growing evidence of their association with health impacts. The National Ambient Air Quality Standards for PM2.5 were recently tightened (December 2006), because of EPA's continued evaluation of the role of PM2.5 in lung disease. Accordingly, EPA could impose stricter limits in the future on emissions of the small particulate matter (PM2.5) for which the fabric filter's removal performance is better than that of the ESP. In that event, the fabric filter would already provide adequate control to meet the tighter emission standard, but the ESP may not. Again, ARI considers either an ESP or fabric filter to be acceptable, but would recommend the fabric filter if concerns over fire risks can be overcome.

Finally, particulate matter of small diameter (such as PM2.5) is always emitted as solid particles, but along with that, there can be emissions of tiny particles in the form of a condensable liquid aerosol. EPA traditionally regulated emissions of the solid particles, but recently has also put regulatory focus on the condensable aerosols. The project proponent has assumed the condensable fraction of particulate emission to be negligible, compared with the solid particles. ARI concurs that a wood combustor has much lower potential to emit condensable particulate matter than, for example, a power plant burning high sulfur coal. However, ARI is not yet satisfied that

the condensable fraction of particulate matter emitted by a wood-fueled power plant would be negligible. Accordingly, ARI recommends that a more rigorous effort be made to quantify the condensable fraction of fine particulate emissions, for purposes of setting the emission limit for particulate matter.

d. Air Quality Impacts

The project proponent modeled the air quality impacts of emissions from the planned 300-foot boiler stack. The proper air quality model was used, and appropriate techniques were adopted in applying it. The modeling reasonably simulated the influence of local terrain on dispersion, as well as local meteorology, including inversion conditions. The location of maximum impact was projected to be in the high, complex terrain along the ridge line on the west side of Shatterack Mountain, east of the project site. Projected impacts in residential areas of Russell and at the elementary school were shown to be five to ten times lower than the maximum effects. The inhabited areas of Russell are all to the west of the project site, and, with the prevailing winds coming from the northwest to southwest, the maximum impacts were typically found to the east of the stack. The magnitude and location of maximum impacts were similar for the two alternative boiler types, fluid bed and stoker.

The maximum projected impacts for emissions of the standard combustion-related pollutants were all shown to be well below the Ambient Air Quality Standards set by EPA and MADEP to protect public health with a margin of safety, including people who are most susceptible. As for the small emissions of hazardous air pollutants, results demonstrated that the maximum impacts for all hazardous air pollutants evaluated were under the MADEP's health-based thresholds by a substantial margin. MADEP's thresholds are intended to represent exposure levels for short periods (TEL) and also for a lifetime exposure (AAL), below which significant risk for cancer and non-cancer disease would not be expected. The project's demonstrated compliance with the ambient standards and with MADEP's health-based thresholds, in both cases by wide margins, provides strong assurance that the emissions from the biomass power plant

would not pose any significant health risk to people living in the Town of Russell, or in the local region. In other words, there is convincing evidence that emissions from the biomass power plant would be "safe." The plant would not be expected to further stress those with special conditions such as asthma or other chronic respiratory disease.

ARI recommends, however, that one particular hazardous air pollutant be given further analysis by Russell Biomass LLC. That pollutant is acrolein, a compound in the aldehyde family that forms during combustion of various fuels, including wood. A sufficient exposure to acrolein via inhalation can cause respiratory irritation. Of all hazardous air pollutants emitted from wood-fueled power plants, acrolein is typically emitted in the largest quantity. However, MADEP has not yet established health-based thresholds for acrolein. Accordingly, ARI recommends that the project proponent prepare a health-risk assessment for the project's emissions of acrolein using the EPA's Reference Concentration (RfC), and submit it to the Town of Russell. Specific recommendations for an approach to that risk assessment are included in the body of this report. While ARI does not anticipate a significant acrolein-related health risk, we do believe the risk level should be determined and communicated to the Town.

e. Confirming Compliance with Emission Limits

While ARI concurs that emissions from the biomass power plant would be well-controlled, and that the resulting air quality impacts would be "safe," a key remaining issue is to ensure that the assumed emission limits are actually met. ARI recommends that the project proponent provide a comprehensive summary of proposed compliance methods, including continuous emissions monitors and stack emissions testing, to both MADEP and to the Town of Russell at this time. ARI recommends strongly that the biomass power plant should commit to continuous monitors for certain pollutants and parameters (NOx, CO, opacity, and either carbon dioxide or oxygen), and to periodic stack emissions tests for fine particulate matter

(solid-particle and condensable aerosol fractions) and for targeted hazardous air pollutants. ARI recommends that the Town's Board of Health be automatically copied on all continuous monitoring emissions summaries and stack test results that are submitted to MADEP. Ideally, Russell Biomass LLC would also provide the Town with electronic copies of these summaries (e.g., CD-ROM) that can then be viewed by residents in the local library or Board of Health office. Such transparency on emissions performance builds public trust.

f. Dust from Wood and Ash Handling

While the wood fuel is to be delivered already chipped, the DEIR appeared to indicate that some further mechanical processing of the wood fuel is planned onsite – grinding and screening to ensure proper wood-chip size for the boiler. Grinding and screening have the potential to create significant dust and noise. ARI recommends that Russell Biomass LLC clarify its plans with regard to onsite processing of wood fuel. If such operations are planned, then the proponent should commit to total enclosure of those operations, and to specific means for preventing significant dust and noise impacts.

Similarly, the handling, storage, and out-loading of combustion ash can cause excessive dust if not adequately controlled. The project proponent proposes to handle the ash in a moist state, which is the first step in such active control. ARI, however, recommends further means be considered by Russell Biomass LLC to ensure proper control of ash dust, such as putting a fabric filter on the ash storage silo to control dust emissions there, and looking into more active dust control in the truck ash-loading area.

Finally, wood dust can create the potential for fires and explosions, and Russell Biomass LLC should coordinate formally with the Town of Russell, through its Fire Chief, to enable fire prevention inspections and for emergency response planning.

g. Odor Impacts

Storage of large quantities of organic matter, including wood, creates the potential for offensive odors, if the interior of the stockpiles begins to decompose (ferment). The plans for wood pile management proposed by Russell Biomass LLC for preventing this are industry-standard, and are normally effective (regular turning of the piles, mixing and blending, using wood on a first-in, first-out basis).

h. Bio-aerosols

Bio-aerosols, the spores of some of the fungi involved in the decomposition of leaves and wood, can be toxic to humans (e.g., *Aspergillus*). Studies to date at wood-fueled power plants indicate that airborne spore levels offsite are too low to pose a health risk.

i. Diesel Truck Emissions

USEPA believes that diesel exhaust emissions are associated with both cancer and non-cancer disease, for people receiving a sufficient exposure. USEPA has established a "no-effects" threshold of exposure to diesel emissions with regard to non-cancer disease. However, they have not yet developed a criterion for use in assessing the risk of cancer from exposure to diesel emission. The project proponent modeled the maximum exposures to increased diesel emissions that would result from the project's truck traffic. Maximum impacts projected in Russell were less than 1/100th of USEPA's no-effects threshold. ARI concurs that this analysis was reasonably based technically, and conservatively portrays the expected air quality impacts from the diesel truck emissions. We agree that the truck emissions are very unlikely to cause any health problems to the residents of Russell. To put this in perspective, the substantive issue with trucks is the significant increase in truck-related safety concerns on Main Street compared with current conditions, not truck-related air quality issues.

j. Truck Traffic Impacts

Having reviewed the project's environmental impacts overall, ARI believes that traffic impacts on Main Street are likely to have the most significant and lasting impact on the Town of Russell. Besides the increased traffic safety hazard, there will be noticeably increased noise and vibration along Main Street from the trucks.

It is true that the Town has experienced similarly-high truck traffic levels in the past, associated with the former Westfield River Paper Mill, which operated on the project site until it closed in 1994. But, over 12 years have passed without those historically high truck volumes, and it is legitimate to view the proposed truck increases as a "quality of life" issue in Town, and as a safety concern. Concern about increased truck traffic was the single most noted issue identified by the residents who met with ARI on July 10, 2007 at the Russell Town Hall.

Russell Biomass LLC performed a traffic impact assessment for the biomass power project, as required by the Town, in conjunction with the Site Plan Review and the application for a Special Permit from the Town. ARI concurs that the study credibly documented that Main Street and the bridge are of adequate design to handle the project's truck traffic, and the route has adequate capacity to do so. However, such an increase in truck traffic on the main street of a small rural community does, as noted above, create a quality of life issue, and does legitimately increase safety concerns. Accordingly, ARI sees those as the "real" issues for traffic. ARI does not opine here on the quality of life aspect of increased truck traffic on Main Street. That is a matter addressed through the local political process. However, ARI does recommend that the proponent's traffic study be supplemented with a more robust assessment of potential safety hazards along the truck route. For example, ARI did not find in the traffic assessment any discussion of features of the route for which increased truck traffic could increase the safety hazard. For example, are there line-of-site deficiencies, blind or uncontrolled intersections, road segments where slippage on ice and snow could be a problem, cross walks or lack thereof, school bus stops where children

gather, and places along the route from which children might dart out unexpectedly? ARI is not stating that such factors exist (we have not performed a traffic study ourselves), just that the safety hazard issue should have been investigated more explicitly.

The project proponent has set out “enforceable” measures for mitigating traffic impacts in Russell. These include no trucking allowed in the evening, nighttime, or on Sundays; low speed limits to reduce noise and vibration; and limits on unnecessary truck idling. ARI agrees that these are standard, reasonable means adopted by biomass power plants in general to mitigate trucking impacts.

k. Alternatives to Trucking on Main Street

Russell Biomass LLC considered two alternative truck routes to the use of Main Street. Based on the evidence we have reviewed, however, ARI would come to the same regrettable conclusion as did the project proponent: a practical alternative to the use of Main Street is not currently apparent. The State is unlikely to approve building another bridge over the river, as needed to make one of the alternative routes feasible. With regard to the second alternative route, this would require the Town’s taking on a road construction project, a major undertaking for a small Town, especially when funding mechanisms and permitting timeframes are uncertain.

With an active rail line adjacent to the site, this presents an obvious potential alternative to the use of Main Street for wood fuel deliveries. The DEIR alluded briefly to possible rail delivery in the future. Given the significant impacts to the Town of trucking on Main Street, ARI recommends that Russell Biomass LLC formally address at this time the rail haul alternative in detail. Is it technically and economically feasible? If not, what are the factors that prohibit this option? For example, if the main issue is access to rail at the wood-fuel suppliers’ end, and their need to use trucks to take the fuel to a rail depot, the proponent should evaluate the feasibility of using roll-on/roll-off containers that can be converted from truck to rail.

I. Noise Impacts

ARI agrees that Russell Biomass LLC has identified the important noise sources at the planned biomass power plant, with one exception. It is not clear whether wood-chip grinding and screening equipment, cited in the DEIR as planned for use at the biomass power plant, were included as a noise source. As that equipment can be very noisy, ARI specifically recommends that the project proponent clarify its planned use. If that equipment is indeed to be operated, then it requires special attention in the noise study. That equipment's high noise potential warrants detailed reporting regarding the sound levels the equipment produces, associated noise impacts, and whether or not the equipment will be fully enclosed to reduce noise and dust.

Specific noise mitigation measures for the biomass power plant are to be developed during the engineering design phase of the project. ARI concurs that the general mitigation approaches that Russell Biomass LLC has described are industry-standard techniques that provide a substantial degree of noise attenuation.

ARI finds that the project proponent used appropriate and standard techniques in assessing noise impacts on the closest residential areas on Grove, Lincoln, and River Streets, and at the Russell Elementary School. The study showed that the maximum noise impacts from the biomass power plant are projected to comply with MADEP's limit on noise increases of 10 dBA. The study results indicate that plant noise is likely to be noticeable at River St. residences, particularly at night, but would be barely noticeable at other nearby residential areas and at the Russell Elementary School.

We concur that the study has reasonably demonstrated that noise increases in the community would not exceed MADEP's noise-increase limit of 10 dBA, and satisfies regulatory review requirements of MADEP and MEPA. However, we do not believe that the study contains enough information for residents to understand clearly the nature of what they are apt to hear and how annoying that noise may or may not be to them. Accordingly, ARI recommends that the project proponent prepare for the

Town's edification, a plain-language description of the types and character of noise from the plant that residents may experience. For example, will they hear the clatter of wood grinding equipment, the low continuous rumble of the boiler exhaust fan, the hum of pumps operating, transformer hum, rapper bangs, periodic tube-blowing shrieks, front-end loader engine noise, outdoor P.A. system announcements, loud bangs associated with truck dumping, or truck back-up beepers?

m. Withdrawal of Water from the Westfield River

The planned biomass power plant uses water to make steam. After the steam has been used to produce electric power, the steam is cooled using a cooling tower and the spent steam is condensed back to water. That water is then recycled back to the boiler for making new steam. A small portion of this water flow through the cooling tower and the boiler, however, must be continuously bled off ("blowdown"), and must be replaced with new fresh water. The water supplied to the biomass power plant is consumed principally by the cooling tower, and to a much lesser degree, by the boiler.

Water needed for those process uses at the biomass power plant is proposed to be drawn from the Westfield River. Russell Biomass LLC proposes to withdraw an average of 662,000 gallons per day of water from the River, and a maximum of 885,000 gallons per day. The water would be drawn from the River at the same location that the former paper mill used in the past to draw water. Some re-habilitation of the existing water intake structure would be required. The water would be stored on site in a 1.5 million gallon tank.

Russell Biomass LLC has evaluated the environmental impacts to the River that could result from the proposed water draw. Such impacts could potentially occur as a consequence of a reduction in the River's water volume flow, and also as a consequence of the disturbance to fish and other aquatic life that comes from drawing water into the water intake.

Russell Biomass LLC calculated the maximum water draw as a percentage of the flow rate of the Westfield River at the withdrawal point, specifically for low-flow conditions. The analysis considered a number of different measures of low-flow conditions, following substantial technical discussion between the proponent and MADEP in that regard. Historical gauge data for the River were used to characterize low-flow conditions.

The analysis showed that the project's maximum water draw of 885,000 gallons per day would be less than 2% of the River's median flow rate during the lowest-flow month of August; about 4% of the lowest weekly flow rate experienced over a 10-year period, and less than 8% of the lowest single-day flow rate experienced in nearly 40 years. These are very small percentages of low-flow conditions in the River, including for the particularly conservative comparison with the lowest, historic, single-day flow. ARI concludes that the assessments of the planned water draw on the River's flow were conducted in a technically appropriate manner and used conservative assumptions to ensure that the worst-case impacts would be evaluated. ARI concurs that the proposed water withdrawal is unlikely to alter the River's flow rate enough to have a significant impact on navigation (boating), fishing and other recreation, the River's biology, or operation of downstream wastewater treatment plants or hydroelectric facilities.

ARI does recommend, however, that the Town request that Russell Biomass evaluate the flow condition of the Westfield River in August and September 2007, and compare the low flow data for this two-month period to the historic low flow data. August 2007 was the second driest August on record, and the River approached historic low flow conditions in late August and early September.

The project proponent also assessed the impact on the River's fish and other aquatic life from the planned water intake structure. They cited design features of the planned water intake structure, as well as River characteristics in the vicinity of the water intake, as likely to preclude significant impacts. The proponent noted that there will be

intake screens, preceded by a coarse grate, to prevent large fish from impinging on the screens during water intake. Importantly, the water intake velocity will be kept low (0.2 ft/sec), well below the recommended maximum of 0.5 ft/sec under the Clean Water Act. The low intake velocity minimizes the opportunity for smaller aquatic organisms to be entrained against the screens in the intake water flow. Finally, the project proponent noted that the intake's location is across the River and slightly upstream of Bradley Brook, which is stocked with salmon fry. There is a sufficient zone of passage there in the River – away from the intake – for the fish to migrate downstream without interference from the intake. ARI concurs that the project proponent has made a sufficient demonstration that the planned water draw would not have a significant effect on fish or other aquatic life in the River.

The River in the vicinity of the project site has been designated as habitat for two protected species of freshwater mussel. Impacts on those protected species are addressed below under the discussion of impacts from wastewater discharge.

n. Alternative for Reducing the Water Draw

The principal means proposed by Russell Biomass LLC for mitigating its planned water draw is to recycle and re-use the process water. A more dramatic option would be to substitute an air-cooled condenser for the proposed, standard cooling tower. While the standard cooling tower uses water to dissipate waste heat via the release of latent heat of evaporation, the air-cooled condenser does not use water. Rather, it dissipates heat by directly transferring the heat to moving air, which entails use of very large fans. The key advantage of the standard, evaporative cooling tower is its efficiency in dissipating waste heat. The key advantage of an air-cooled condenser is that it dramatically reduces overall water consumption by a power plant.

Russell Biomass LLC evaluated the alternative of using an air-cooled condenser instead of the planned, wet evaporative cooling tower. ARI reviewed that study and concludes that it reasonably demonstrates that the standard cooling tower is the

appropriate choice in this case. Specifically, ARI concurs that a wet evaporative cooling tower represents the standard design option for power plants in the U.S., except at project sites where water resources are inadequate. ARI also concurs that use of an air cooled condenser would reduce the energy efficiency of the biomass power plant overall by at least 5%, and that this loss of energy efficiency would be significant. The resulting need to combust substantially more wood to make the same amount of power for sale would negatively affect the economics of the project. Likewise, the large increase in the project's total capital cost for an air-cooled condenser (ARI estimates a 5-6% increase) would have a further negative affect project economics. Overall, use of an air-cooled condenser would impose a significant economic penalty on this (or any) biomass power plant, making it even more difficult than it already is for renewable energy generators to compete with fossil fuel generators. While use of the standard cooling tower would be consistent with promoting renewable energy, that overall benefit to Massachusetts should not come at an undue environmental cost locally to Russell residents. In that regard, it appears that water for the project can be drawn from the River and discharged back to it, without significant environmental impacts.

o. Wastewater and Stormwater Discharge to the Westfield River

The Westfield River is an important scenic, recreational, and conservation asset for residents of Russell and the general region. The segment of the River affected by the project is classified as a "Class B Warm Water Fishery," although the Massachusetts Division of Fish and Wildlife (MADFW) indicates that this reach also supports cold water fish. MADFW stocks the River near the project site with trout, and also stocks River branches and tributaries upstream with Atlantic salmon fry. A Federal agency has designated the entire Westfield River as a critical habitat for the Atlantic salmon. MADFW has documented numerous naturally-occurring fish in the River upstream and downstream in the vicinity of the project site, such as bass, shiners, eel, pumpkinseed and white sucker. This stretch of the River has also been designated as habitat for two protected species of freshwater mussel: the Creeper Mussel and the Triangle

Floater Mussel. Portions of the Westfield River beyond two miles upstream have been designated as a National Wild and Scenic River.

Wastewater and stormwater from the operation of the Russell Biomass Facility will be discharged to the Westfield River. Process wastewater generated by the biomass power plant will come mostly from the cooling tower; however, a small fraction will come from the boiler, the plant laboratory, equipment pads, and floor drains. The discharged water will also include stormwater collected at the project site. While process wastewater flows and stormwater flows will be treated and monitored separately, they will be combined prior to discharge to the Westfield River.

The total discharge to the River will represent approximately 15% of the amount of water to be drawn from the River. The remaining 85% of the water taken from the River will be lost from the cooling tower via evaporation to the atmosphere. The project proponent expects the discharge to the River to average 101,000 gallons per day (gpd), with the maximum discharge rate at 133,000 gpd.

For discharge of the combined wastewater and stormwater, the proponent had considered using the same discharge point as used by the former paper mill. That discharge location, the tail race of the Indian River hydro facility, is not available, however, because of Indian River's plans to rehabilitate the hydro facility. Accordingly, the combined flow would be discharged at a new outfall location 500 feet downstream of the Indian River Hydro Dam. The discharge would be via a bank discharge over a natural stone discharge pad to prevent erosion of the banking and is intended to match the large-boulder flooring of the River at this location, so as to encourage effluent mixing upon discharge. The project proponent also notes that the proposed outfall location is at the beginning of a straight stretch of the River that has a strong riffle (shallow choppy flow over a rocky bottom), and that this would promote further mixing of the effluent in the River to dissipate heat and pollutants. ARI concurs that the proposed outfall location is appropriately chosen, as the River's characteristics

immediately down stream would promote rapid mixing and dilution of the effluent water.

Process wastewater from the cooling tower and boiler will be treated prior to discharge to adjust pH, so that the discharge is not too acidic or basic, and to neutralize chlorine and bromine disinfectants. The wastewater is not expected to contain toxic water pollutants or EPA “priority pollutants” that are commonly discharged from manufacturing industries. ARI concurs that the proposed wastewater treatment is consistent with standard engineering practice, and therefore, would provide reasonable assurance that the discharge will meet the limitations on excess heat and pollutant levels to be imposed by the required discharge permit.

The project proponent applied standard and acceptable techniques to project the amounts of stormwater that would be generated in 2-year, 10-year, and 100-year extreme storm events. They described their design for containing, managing and treating the maximum stormwater flow. Stormwater generated by the planned biomass power plant will be contained using standard methods such as curbing, then collected in three detention basins. The stormwater will be retained in the basins to control the rate of discharge from the site and to provide time for suspended solids such as soil and wood dust to settle out in the basins rather than reaching the River. As noted above, oil and grease will also be removed from the stormwater. The treated stormwater would then be combined with process wastewater, and discharged through the common river outfall. As required by regulations, the stormwater flow projected after the biomass power plant is constructed will not exceed the flow under existing conditions; the design of the stormwater management system will result in lower stormwater flows than currently leave the project site. ARI concurs that the plan for containment, outflow regulation, and discharge of stormwater was based on standard design techniques. The design can reasonably be expected to enable the combined, wastewater and stormwater discharge to the River to meet discharge limits for suspended solids that will be imposed by permit, and to prevent adverse impacts to aquatic species from suspended solids.

Russell Biomass LLC has evaluated the environmental impacts to fish, mussels (including two protected species of mussel), and other aquatic life that could result from the proposed discharge of treated wastewater and stormwater to the River. Such impacts could potentially occur as a consequence of discharging a large water volume compared with the River's flow, or from discharging water that is warmer in temperature than the River water, and contains pollutants at permitted levels.

The project proponent compared the expected maximum projected discharge with the median and extreme low-flow conditions of the River. The maximum discharge of 133,000 gallons per day would represent 0.2% of the River's August median flow, 0.7% of the lowest 7-day flow, and just over 1% of the historical single-lowest-daily flow. ARI concurs that the proposed maximum discharge would not significantly affect the River's flow rate.

Russell Biomass LLC projected the impact on the water quality of the River, assuming the discharge contains the maximum levels of contaminant to be allowed by permit discharge limits. The most important pollutants expected with the discharge are excess heat (a regulated wastewater pollutant), aluminum (toxic to fish), and phosphorus (enhances algae growth). With the planned discharge, the River water was projected to meet Massachusetts Water Quality Standards for surface water bodies. Those Standards are intended to protect fish and other aquatic species. As such, ARI concurs that this provides reasonable assurance that the levels of heat and pollutants present in the discharge will not harm fish or other aquatic species.

As noted above, this reach of the Westfield River has been designated as habitat for two species of protected mussel, the Creeper Mussel and the Triangle Floater Mussel. A specialist in mussel taxonomy performed a survey of mussels and their habitat in the vicinity of the project site in 2004 and again in 2007. ARI concurs that the survey work done in the River near the project site provides credible evidence that freshwater mussels are scare there now, and that the habitat is not likely to support significant

mussel populations, including the protected Creeper and Floater Triangle varieties of mussel.

The project proponent has reasonably demonstrated that fish would have an adequate zone of passage by the discharge structure, without adverse impact from exposure to the discharge flow and its associated heat and pollutants. Finally, the enhanced mixing of the discharge by the riffle downstream from the discharge point shortens the required mixing zone for dissipation of effluent heat and pollutants. ARI concludes that the impact assessment on aquatic life due to the proposed discharge was conducted using appropriate techniques. Given the projection of compliance with water quality standards, and the favorable mixing characteristics of this stretch of the River, ARI concurs that adverse effects on fish and other aquatic life should not be expected.

The Clean Water Act requires surface water bodies, which would include the Westfield River, to meet surface water quality standards. If a water body does not meet the standards for a particular pollutant or other water quality criterion, then the state must establish a Total Maximum Daily Load ("TMDL") of that pollutant into the receiving water body. A TMDL limits the total load of pollutant to the water from all dischargers, as needed to achieve compliance with the standard. The River near the project site meets all water quality standards, except one. MADEP has listed the segment of the River adjacent to the project site as being impaired for taste, odor, color, turbidity, and noxious plants; however, the State has not yet diagnosed the cause of the degradation or set a TMDL for the Westfield River. ARI concurs with the project proponent's conclusion that the discharge from the biomass power plant will not have a major impact on the pollutants identified as requiring a TMDL. Rather, the treated effluent may be cleaner than the existing River water for those pollutants.

ARI recommends that the Town should monitor the schedule and status of TMDL development for this Westfield River segment, because imposition of a TMDL by MADEP in the future could potentially affect both the Russell Village POTW and the

Woronoco Village POTW. The Town should enter into an agreement with Russell Biomass LLC to ensure that the project owner will assist the Town with developing appropriate control technology if future TMDLs affect discharge limits at the town POTWs, and if those limits are in any way affected by the addition of the Russell Biomass discharge.

Finally, santitary wastewater from the biomass power plant will not be discharged to the River, but rather, to an approved septic system to be constructed on the site in conformance with Massachusetts Title 5.

p. Visual Impacts of the Power Plant

Besides the structures of the biomass power plant itself, what will likely be most visible to Town residents are white plumes ("steam plumes") emitted from the cooling tower. These visible plumes are not smoke, but plumes of condensed water vapor. The project proponent performed a modeling assessment to project the frequency and extent of cooling tower plumes. That assessment used acceptable techniques.

The modeling shows that Town residents can expect to see a white plume coming from the cooling tower most of the time, but normally dissipating after a short travel distance. While the cooling tower plume is capable of extending aloft to and beyond the residential areas of Grove St., Lincoln St. and River St., this would occur infrequently and the plume would only rarely be visible overhead to residents.

Regarding traffic hazards, the model projected that the cooling tower's plume will extend at times toward, and sometimes past the locations of the Main Street bridge and other Town roads. Importantly, however, results also show that the bottom edge of the plume would stay well above the deck of the bridge and other road surfaces in the Town. Accordingly, ARI concurs with the project proponent's conclusion that the cooling tower plume is not expected to cause visibility or icing hazards to traffic in the Town of Russell.

q. Existing Site Contamination

Several Environmental Site Assessments were conducted on the planned project site between 1999 and 2006, to evaluate the extent of any site contamination. The early studies found contamination from underground oil storage tanks and from buried drums. The affected soils were remediated. The most recent assessment made in 2006 found no further release of contaminants to the environment of regulatory significance. ARI concludes that there is reasonable evidence that subsurface environmental conditions at the site have been sufficiently investigated and remediated.

r. Hazardous Waste Management

The DEIR outlined the general elements of a Hazardous Waste Management Plan to be put in place once the proposed biomass power plant would be operating. However, no summary was found in the DEIR of the types and quantities of hazardous materials expected to be stored and used on site, except for fuel oil. For example, a description of the amount and concentration of ammonia to be stored on site would have been appropriate (the ammonia concentration was given as 19% and also at a higher percentage in different environmental permitting documents). ARI recommends that a preliminary summary be developed at once by Russell Biomass LLC, and furnished to the Town for review by Russell fire officials and by any other Town entities with responsibility for emergency planning and response.

s. Wetlands

As reported in the DEIR, except for the banks of the Westfield River itself, there were no vegetated wetlands found on the site of the proposed biomass power plant. Accordingly, ARI does not see a significant wetlands impacts issue for the power plant site. Wetlands issues are likely to be more significant for the transmission corridor

associated with the project; however, that component of the project is not within ARI's purview of study.

t. Impacts during the Construction Period

Construction of the proposed biomass power plant would result in environmental impacts during the construction period, such as noise, dust, and soil erosion. Those impacts would affect residents of the Town of Russell and have the potential to affect the Westfield River. ARI finds that the methods and procedures proposed to mitigate environmental impacts during the construction period are standard in the industry, and if fully implemented, are likely to minimize construction impacts to the extent practically feasible. While construction impacts can be reduced via mitigation, some level of impact will nonetheless be noticed by residents of Russell. For example, despite mitigation, there will be episodes of annoying noise from activities such as pile driving. Such impacts, while potentially annoying, are temporary and would end with completion of construction.

2.0 APPROACH

On July 10, 2007, ARI visited the Town of Russell to meet with Town officials and involved citizens (both project supporters and project opponents) prior to ARI's starting its independent review. ARI desired to hear directly what environmental issues associated with this project are of greatest concern to residents of Russell to enable us to focus our independent environmental review on those key issues. Speakers discussed the perceived benefits of the project, as well as various concerns they have, some environmental in nature, some not. Below, the *environmental* concerns raised by one or more of those in attendance are listed. Other types of comments made, particularly those addressing the economic and taxation benefits of the project, while clearly of concern to those who made them, are not within ARI's purview for the independent environmental review. It is noted that traffic impacts on Main Street and on other town roads were the singular environmental review issue raised most often by both proponents and opponents of the project.

The first grouping below, lists issues that were raised by multiple speakers. The second grouping summarizes issues brought up less frequently.

- Truck traffic on Main St.
- Lack of specificity regarding acceptable wood fuels
- Air quality impacts, local atmospheric inversions, health risks
- Impacts on the Westfield River from water draw (flow reduction, fish impacts)
- Impacts on the River from water discharge (thermal and contaminants – fish habitat)

- Traffic – didn't include some project generated trucks in the traffic study (trucks delivering oil and other supplies)
- Traffic – alternate truck route
- Truck emissions impacts on air quality
- Pallets as a "contaminated" wood fuel
- Use of forest wood for fuel not "sustainable"
- Project sited in a flood zone
- Noise impacts
- "Diminished" plant environmental design (stoker vs. fluid bed; water cooling vs. air cooling)
- Site location ("in a neighborhood" and "close to school and homes")
- Visual aesthetic impacts on a "designated scenic road" and on a "wild and scenic" river

Following these meetings, ARI carried out its independent review of the relevant environmental documents listed above. We then developed independent opinions in response to the following questions:

- Were the conclusions regarding health and environmental impacts, as presented by the project proponent in those documents, adequately supported by the technical facts presented? Where warranted, we made recommendations that the project proponent provide clarification of their impact assessment, or further impact analysis as appropriate.

- Were the measures proposed for mitigating environmental impacts consistent with those that we have found generally to be most effective? Where appropriate, we make recommendations for the proponent to consider further mitigation techniques that are practical to implement and could make this a better project, environmentally.

- Were the expected environmental impacts in the community, following planned mitigation, effectively described in plain language, so that residents will have a good feel for what to expect?

- Were any significant environmental issues "missed?" That is, were there any environmental issues not covered in the environmental documents that, in our opinion, should have been addressed?

After completing the independent environmental review, the final step was to document the review in this report, and to include in the report a summary of findings and recommendations.

3.0 INDEPENDENT ENVIRONMENTAL REVIEW

In this section, ARI summarizes the results of our independent environmental review of the Russell Biomass Power Plant, based on our analyses of the environmental and permitting documents prepared to date by the project proponent. Discussions for each environmental topic of interest are presented below.

3.1 Acceptable Biomass Fuels

Russell Biomass LLC proposes acceptable "wood fuel" to be that defined by the Massachusetts Department of Environmental Protection (MADEP) at 310 CMR 7.00, which includes virgin wood sources (e.g., trees, logs, bark, wood chips), but also allows minimally processed, clean wood in the form of lumber and saw dust, as well as wood from discarded consumer goods such as waste pallets and wood boxes. It also allows use of paper cubes

made from paper floor-scrap from paper mills. The MADEP definition excludes wood that is treated with any preservative, paint, or oil.

The Special Permit, issued by the Town of Russell, defines acceptable wood fuel more conservatively. That is, the Special Permit limits acceptable fuel to virgin wood, taken from its point of growth (e.g., from logging, tree thinning, lot clearing, brush removal, bark, wood chips and shavings). The definition excludes processed wood, for example, painted or treated wood, wood pallets, any wood from the Construction and Demolition (C&D) stream, and paper cubes.

The specific types of wood fuel that Russell Biomass LLC proposes to use include wood chips, wood by-product, ground pallets, wood stove pellets, sawmill bark and sawdust, ground stumps, and municipal recycled clean wood (brush, logs, stumps). They have explicitly ruled out combustion of any wood derived from C&D waste.

The economics of renewable energy are always a challenge, and using the MADEP definition of acceptable wood fuel would result in the fuel supply being broader-based and more economic than if the definition in the Special Permit were used. While this would have the benefit of promoting renewable energy, the question is, would that general benefit to Massachusetts come at the cost of increased air quality impacts in the Town of Russell? With both the Town and the project proponent agreeing to exclude C&D wood, as a key conclusion, ARI believes that there would be no discernible difference in air pollutant emissions whether the supply of wood fuel follows the Special Permit's definition of acceptable wood fuel, or the State MADEP's definition. Two objective points support this opinion:

- Most importantly, the project proponent has unequivocally committed to preclude use of wood derived from C&D waste,

- With use of either the Special Permit definition of acceptable wood waste, or the MADEP definition, the large majority of the wood waste burned would be either virgin wood or minimally processed wood (sawdust, lumber scraps). If the MADEP definition

is followed, wood from discarded pallets or boxes, as well as paper cubes, would be allowed, but these sources are likely to constitute a small fraction of the total amount of fuel consumed.

With pallets and boxes, there is some potential for these to be contaminated with spilled oil, plastic wrap, and other foreign matter. Some paper cubes can include plastic-coated paper. Any contaminated pallets would be difficult to spot after pallet-derived wood has been delivered to the plant in Russell, because the pallets would have already been chipped prior to delivery. The key to keeping contaminated articles out of the fuel supply is for Russell Biomass LLC to impose clear fuel specifications on its wood suppliers, and to conduct regular, unannounced inspections of those suppliers' fuel storage yards. Russell Biomass LLC should also require the suppliers to maintain written inspection logs that record results of visual inspection of wood prior to chipping, and documenting the source of the wood. The key to making sure that Russell Biomass does this effectively is to require them to make all these specifications and inspection reports available to both the MADEP and to the Town.

To help ensure that only clean wood is combusted at the plant, ARI makes a number of recommendations:

- That the Town accept the MADEP's definition of allowable wood fuels, providing that the Town makes legally enforceable a commitment made by Russell Biomass LLC by letter dated March 29, 2007 banning wood derived from C&D waste from the fuel supply, and to make that ban binding, even if there are changes in the MADEP definition of wood fuel or changes in plant ownership in the future. It is possible that MADEP may change the definition to include some wood from the C&D stream in the future, and by binding the facility to the MADEP definition as of July 1, 2007, C&D wood will be banned from use at Russell Biomass.

- That Russell Biomass LLC shall submit to MADEP and simultaneously to the Town's Board of Health and Fire Chief, (1) a full copy of the formal fuel specification it requires by contract that each fuel supplier meet, and (2) a full copy of the reports of its

unannounced inspections of its suppliers' fuel yards for unacceptable or contaminated wood fuel.

- That the Town and Russell Biomass LLC agree that the Town's Board of Health (or designated agent) has the right to make unannounced inspections at any time of any portions the Russell Biomass Power Plant, including inspections of fuel deliveries in progress and fuel storage for evidence of disallowed or contaminated wood.

In addition, ARI recommends that MADEP, as a condition of the air permit for the plant, requires periodic stack testing for emissions of heavy metals, hydrogen chloride, and sulfur dioxide, for as long as the plant's allowable wood fuel supply includes post-consumer wood (e.g., old pallets or boxes) or post-industrial wastes such as paper cubes. ARI recommends that the Town's Board of Health be automatically copied on the test reports submitted to MADEP.

Finally, ARI finds that the DEIR provides credible evidence that a more-than-adequate supply of wood fuel exists in Massachusetts and neighboring states to fuel the plant, without the plant's demand for wood jeopardizing sustainable forestry practices in the region.

3.2 Air Quality Impacts from the Power Plant

With regard to air quality impacts of the power plant, there are four key questions. What types of air pollutants would the biomass power plant emit, and in what quantities? What control methods are proposed for those emissions, and how effective are they? What are the air quality impacts in Russell from the stack emissions, and what are the implications for the public health of people living in the Town of Russell and vicinity. How can we be assured that actual plant emissions stay within permit limits? Each of these questions is addressed in the sections that follow.

3.2.1 Air Pollutants Emitted

The principal air pollutants that would be emitted from the boiler stack are the common, combustion-related pollutants: nitrogen oxides (NOx), carbon monoxide (CO), and particulate matter (soot). NOx is of concern because it contributes to the formation of ground-level ozone (smog). Carbon monoxide emissions are a significant concern for urban vehicular traffic, but a relatively minor concern for power plants. Particulate matter is regulated according to particle size. There is coarse, respirable particulate that is 10 microns or less in diameter (PM 10). There is also fine respirable particulate that is 2.5 microns or less in diameter (PM 2.5). For particulate matter, there has been increased regulatory focus on PM 2.5, since particles that fine can be travel deep into the respiratory system. There is mounting scientific evidence that exposure to PM 2.5 *in excessive concentrations*, and especially coupled with exposure to sulfur oxides, is responsible for increased pulmonary and other disease in the U.S.

Unlike with some other fuels such as coal and municipal solid waste, wood fuel contains only small amounts of sulfur and chlorine compounds. Accordingly, wood combustion does not have the potential that those other fuels have to cause significant emission of acid gases such as sulfur dioxide and hydrogen chloride.

The amounts of the principal combustion pollutants that would be emitted from the biomass power plant are not large enough to trigger the need to obtain a Federal air-quality construction permit. However, the emissions are large enough to require a Federal air-quality operating permit, and a “Major Comprehensive Plan Approval” (air quality construction permit) from MADEP. In addition, the emissions of NOx are large enough to trigger special requirements for emissions control, given that the region does not currently meet ambient air quality standards for ozone.

Besides the standard combustion pollutants, the biomass power plant will also emit small quantities of hazardous air pollutants (HAPs). Relative to many other combustion emission sources, biomass power plants are inherently low-emitting for hazardous air

pollutants. There will be small emissions of heavy metals, resulting from the fact that traces of such metals occur at environmental background levels in virgin wood. Trees take up metals from soil and groundwater, and these become bound in the wood fibers. Most of those metal emissions will be effectively removed by the planned emission control devices. The plant is stated to have emissions of one regulated hazardous air pollutant (acrolein) exceeding 10 tons per year, and combined emissions of several hazardous air pollutants together exceeding 25 tons per year, making the project a major emitter of hazardous air pollutants under EPA regulations. Having major emissions per this definition means that the emissions are large enough to require obtaining a Federal air-quality operating permit for the project, as noted above. Importantly, the major emissions designation does not in itself indicate the presence or absence of an associated health risk of concern.

Finally, there are differences in the air pollutant emissions profiles of the two boiler technologies under consideration – stoker and fluid bed. The fluid bed boiler generates inherently lower amounts of the combustion pollutants, NOx and CO, than does a stoker boiler. With an additional complement of add-on emission controls, however, the stoker boiler has similar levels of controlled emissions of NOx and CO as the fluid bed boiler. For some other pollutants, the emissions generated by the stoker will be modestly smaller than for the fluid bed boiler, because the stoker uses modestly less fuel to generate the same amount of electric power for sale. The important point, however, is that both the stoker boiler and fluid bed boiler can achieve similar performance for controlled emission levels. From the standpoint of air pollutant emissions, ARI is comfortable that either technology can achieve the very low emission levels required for designation as a “low-emissions technology” in Massachusetts, as is needed for a power plant to qualify for Renewable Energy Credits in this State.

3.2.2 Emission Controls

Under Massachusetts MADEP regulations, the biomass power plant must employ Best Available Control Technology (BACT) to limit air pollutant emissions from the boiler stack. BACT requires the lowest emission rate demonstrated to be achievable in similar applications, while considering acceptable cost-effectiveness. As noted above, however, special control requirements apply in Massachusetts for emissions of NOx, because NOx emissions contribute to the existing violations of the ambient air quality standard for ozone. For NOx, the requirement is for Lowest Achievable Emission Rate (LAER), which is similar to BACT, except that costs are not considered in the selection of the most effective control technique.

Summarized in the following table are the emission control techniques and emission limits proposed for the Russell Biomass Power Plant, for the two boiler technologies under consideration – stoker and fluid bed.

Pollutant	Control Technology		Emission Rate (lb/MMBtu)	
	Stoker	Fluid Bed	Stoker	Fluid Bed
NOx	Selective Catalytic Reduction (SCR) – Regenerative Type	Selective Catalytic Reduction (SCR)	0.065	0.075
CO	Oxidation Catalyst and Good Combustion Control	Low-emitting boiler technology (fluid bed) and Good Combustion Control	0.075	0.075
PM 10/2.5	Cyclone Separator and Electrostatic Precipitator (ESP)	Fabric Filter (baghouse)	0.012	0.012
SO_2 (1)	Inherently low-sulfur fuel	Inherently low-sulfur fuel	0.025	0.025
VOC (2)	Oxidation Catalyst and Good Combustion Control	Good Combustion Control	0.01	0.01

(1) Sulfur dioxide

(2) Volatile Organic Compounds

For control of NOx emissions, which requires LAER in Massachusetts, the project has proposed Selective Catalytic Reduction (SCR) as the control technique. The corresponding, proposed emission limit for NOx is very low. ARI is not aware of a

more stringent limit having been set anywhere in the U.S. for NOx emissions from a biomass power plant.

ARI concurs that SCR is well-recognized to provide the top level of control, and represents LAER. Again, LAER requires the best control without considering the cost, and BACT means the best control, with cost-effectiveness considered. For biomass power plants nationally, BACT for control of NOx has generally been another control technique, Selective Non-Catalytic Reduction (SNCR). By comparison, SNCR typically controls NOx emissions with 50% to 60% efficiency, while SCR controls the emissions with 70% to 90% efficiency. At biomass power plants, SCR costs substantially more to operate than SNCR. While more expensive, the Russell Biomass Power Plant will employ the more effective control device, SCR, because LAER requirements preclude cost-effectiveness considerations.

The SCR control technique uses ammonia as a reagent. Some of the ammonia reagent always slips through the SCR system un-reacted and gets emitted from the stack. If such ammonia “slip” is excessive, it can result in the formation of a visible, bluish tint to the emitted plume. The maximum ammonia emissions proposed of 10 to 13 parts per million are very low. Nationally, the ammonia emissions limit has been set typically at 25 parts per million. Accordingly, the potential for formation of a visible plume from excessive ammonia emission appears very unlikely.

There is a final note on the subject of NOx emissions and their relation to ozone formation. Massachusetts rules not only require the top level of emissions control (LAER) for NOx, they also require the project to offset all of its new NOx emissions, by finding NOx emissions reductions elsewhere (“emissions offsets”). In fact, more emissions reductions must be secured, than are needed to fully offset the new emissions in a ratio of greater than one to one. Therefore, by regulation, the project must provide a net reduction in emissions of NOx. Factually, that net reduction would help to reduce formation of ozone (smog) in the region.

For the other pollutants besides NOx, the control requirement is for BACT. For carbon monoxide (CO) and volatile organic compounds (VOC), BACT for biomass power plants nationally has traditionally been good control of the combustion process, without any add-on control devices. For the fluid bed technology, the project has made the standard, BACT proposal: Good Combustion Controls for control of CO and VOC emissions. ARI concurs with that BACT proposal. For the stoker technology, the project has proposed an add-on control technique – an oxidation catalyst – besides Good Combustion Control. ARI notes that the proposed oxidation catalyst likely represents LAER for control of CO and VOC emissions at biomass power plants, rather than BACT. However, we suspect that the project proponent desired to show very low emission rates for those pollutants, to qualify for Renewable Energy Credits under Massachusetts's renewable energy program. The fluid bed emissions of CO and VOC are inherently low enough without add-on controls to achieve the same, very low emission levels as the stoker unit would achieve with add-on controls. It is not likely cost-effective to apply a CO catalyst to the fluid bed boiler. The flue gas temperature in the fluid bed technology is not likely high enough to support operation of a CO catalyst, without expensive flue-gas re-heating.

Regarding control of emissions of particulate matter (PM10 and PM2.5) from biomass power plants, the control device traditionally determined to represent BACT nationally has been the Electrostatic Precipitator (ESP). However, there are some biomass power plants for which a Fabric Filter (baghouse) has been selected. The project has proposed a Fabric Filter as BACT for control of particulate matter for the fluid bed boiler, and has proposed an ESP (preceded by a cyclone separator) for the stoker boiler.

Both the ESP and the Fabric Filter devices are capable of removing particles from the flue gas with very high efficiency, and delivering guaranteed, similarly-low emission levels (see table above). However, ARI believes that the performance edge goes to the Fabric Filter, particularly with regard to removal of very small, respirable-sized particles. Fabric filters work by physically filtering out particles of all sizes as the flue

gas passes through a fine, fabric medium. An ESP works by electrostatically charging particles in the flue gas, and removing them by electrostatic attraction to collection plates in the device. The filtering mechanism of the Fabric Filter tends remove most solid particles, irrespective of particle size. The ESP removes most particles as well, especially particles over 10 microns in size and under 1 micron in size. But, ESPs do not appear to be as efficient as Fabric Filters at removing particles specifically in the several-micron size range, including the PM2.5 particulate matter that is of current regulatory concern. Given that regulatory focus on controlling emissions of PM2.5 is likely to continue to increase in the future, ARI believes that a Fabric Filter would be the better choice with an eye towards having the means in place to comply with potentially more stringent PM2.5 emissions limits in the future. The project proponent is currently reluctant to use a Fabric Filter with the stoker boiler alternative, citing concerns that with the stoker boiler, there is a much greater potential for embers to carry out from the combustion zone and cause fires in the Fabric Filter. An ESP is not prone to that fire risk from embers. ARI concurs that the project proponent's concern over the fire risk is valid. However, we believe that the performance edge offered by the Fabric Filter warrants the project proponent's giving the issue a second look. We recommend, therefore, that Russell Biomass LLC further explore the feasibility of applying a fabric filter to the stoker boiler, to see if cost-effective means are available for reducing the fire risk to an acceptable level. For example, ARI conversed recently on this subject with a leading supplier of high-temperature fabric filter material (the Gore Company, of Gore-Tex familiarity). Gore said it knows of at least two wood-fueled stoker boilers operating in the U.S. with fabric filters, and without any special ember suppression techniques such as quenching the flue gas with a water spray.

With regard to regulation of particulate matter, the traditional focus by U.S. EPA has been on emissions of solid particles that can be physically filtered from the flue gas. Recently, the U.S. EPA has put a regulatory focus on another form of particulate matter – condensable particulate matter. Condensable particles are typically emitted as tiny droplets of liquid aerosol that are now regulated as a component of emissions of PM10 and PM2.5. By regulation, the permit limits to be set by MADEP for

emissions of PM10 and PM2.5 from the Russell Biomass Power Plant must include both the solid "filterable" particles and the condensable particles. Technical information supplied by Russell Biomass LLC to ARI in response to a question on this subject indicates that an experienced boiler vendor believes that the condensable fraction of PM10 and PM2.5 will be negligible, compared with the filterable solids component. The vendor noted that the formation of condensable aerosol is correlated with the amount of sulfur in the fuel. Wood, as an inherently low-sulfur fuel, they reasoned, offers little potential for formation of condensable particulate matter. ARI concurs that a wood combustor has much lower potential to emit condensable particulate matter than, for example, a power plant burning high sulfur coal. However, ARI is not yet satisfied that the condensable fraction of PM10 and PM2.5 emitted by a wood-fueled power plant would be negligible. There is some sulfur in wood, and ammonia is used as a reagent in the control device (SCR) for NOx emissions. Some measurable level of condensable particulate emissions could result from that sulfur and ammonia. Accordingly, ARI recommends that a more rigorous effort be made to quantify the condensable fraction of PM10 and PM2.5 emissions, for purposes of setting the emission limit for those pollutants. While ARI noted above that it believes that a Fabric Filter is better at removing fine solid particles than an ESP, ARI does not have evidence that one device would be better than the other at removing condensable particulate matter, or for that matter, that either device would be highly effective in that regard.

Finally, as the sulfur level of wood fuel is inherently low, the associated emission of sulfur dioxide (SO_2) will also be inherently low. Therefore, there is no need for add-on controls (e.g., an acid gas scrubber) for control of SO_2 emissions.

3.2.3 Air Quality Impacts and Health Risks

In general, contaminants are released into the ambient air environment from numerous natural and human-influenced sources in both rural and urban environments. These contaminants include vapors and gases, mists, and solid particulate matter. Air

contaminants can have various effects on human health and on the environment, depending on the physical and chemical properties of the contaminants, their toxicity, and the concentrations in which they are present. Two factors primarily determine whether the presence of a contaminant in the ambient air might present an unacceptable health risk – the toxicity of the contaminant (also referred to as hazard) and the degree of exposure to the contaminant that a person receives. A risk assessor must evaluate both toxicity and exposure in order to determine if there is a potential for adverse health effects, and what the magnitude of those effects might be.

Toxicity or hazard is an intrinsic property of each contaminant. Some contaminants are more toxic (hazardous) than others. Some cause minor effects such as mild tissue irritation, and others can cause more critical effects, such as severe tissue irritation (in turn, responsible for pulmonary and many other diseases), central nervous system or other systemic illness, reproductive effects, and cancer. Information about toxicity is obtained from laboratory animal studies as well as from research studies that evaluate human data using epidemiological techniques to investigate associations between contact with environmental contaminants and the incidence and prevalence of specific diseases.

In addition to toxicity, exposure is the other factor critical to determining if there is a risk of illness associated with contaminants in the environment. Exposure assessment is a measure of how much of a contaminant people are in contact with, and over what period of time. Exposure to contaminants can be evaluated using monitoring data or modeling data in the environment.

Risk Assessment is used to determine whether a specific contaminant present at a given concentration presents a threat to health. EPA and MADEP conduct Risk Assessments and use the results to set standards and criteria for acceptable levels of contaminants in the environment. Project proponents then compare their maximum impacts of contaminants to those health-based standards and criteria to determine if their emissions could present a significant health risk.

The project proponent was required by MADEP to demonstrate that pollutant emissions from the 300-foot boiler stack would not cause ground level impacts that exceed the Ambient Air Quality Standards. Those Ambient Standards have been set by U.S. EPA to protect public health, with a margin of safety. The Ambient Standards are intended by EPA to protect the most susceptible members of the public, for example, children, the elderly, and those whose health is impaired (such as with asthma). Ambient Standards have been established for a number of air pollutants, including ozone, nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM10 and PM2.5), and lead (Pb). Massachusetts currently attains the Ambient Standards for all those pollutants, except for ozone (smog). As already discussed above, Massachusetts air quality does not currently comply with the Ambient Standard for ozone (8-hour standard).

To simulate pollutant dispersion, the project proponent applied an EPA-approved computer model (AERMOD). The model simulates the buoyant rise of the emitted hot plume after release from the stack, and the plume's subsequent travel and dispersion downwind. It also simulates the interaction of the dispersing plume with elevated, hilly terrain such as Shatterack Mountain. As required by EPA and MADEP modeling protocols, five years of hour-by-hour meteorological data measured at a representative monitoring location (Westover AFB) were input to the model. Using five years of hourly data makes it likely that all possible combinations of wind direction, wind speed, and atmospheric stability (including inversion conditions) have been represented in the dispersion modeling. Once the maximum ground-level impacts of the biomass power plant have been projected using the model, those maximum impacts are added to the existing "background" air quality levels, to yield a projected total air quality level with the plant in operation. The existing ambient background values are taken from the nearest ambient monitoring stations in Massachusetts, operated by MADEP. The projected total air quality levels are then compared with the Ambient Standards, to determine if the plant's new emissions would cause or contribute to a violation of the

Ambient Standards. Air quality impacts for the biomass power plant were simulated for both the stoker boiler design and the fluid bed design.

ARI finds that the computer model applied to project the plant's air quality impacts (AERMOD) was the correct model to use and was properly applied. We agree that the meteorological data from Westover AFB are adequately representative of the project site in Russell. And, we find that the background air quality data selected for use are conservatively representative of Russell – conservative in that the monitoring stations from which the data came are generally located in developed/urbanized locales.

Results of the air quality impact analysis showed that projected impacts differed little between the stoker boiler design and the fluid bed design. The results indicated that the maximum impacts from the Russell Biomass Power Plant would occur near the top of Shatterack Mountain. Impacts in populated areas – residences and the school – were shown to be five to ten times lower than maximum impacts. The populated areas in Russell are located west of the project site, and the prevailing winds are from the northwest to southwest, placing the residential areas upwind of the source most of the time. Considering the project's maximum impacts, when added to existing background levels, the resulting projected future air quality levels would remain well within Ambient Standards for NO_2, CO, SO_2, PM10 / PM2.5, and lead. The project's maximum impacts by themselves would be less than 4% of the values of the Ambient Standards for all of those pollutants. Accordingly, ARI concludes that emissions of NO_2, CO, SO_2, PM10 / PM2.5, and lead from the biomass power plant would not pose a health risk of significance to residents of Russell.

Russell Biomass LLC has compared the air pollutant emissions and ground level impacts from the biomass power plant with emissions and impacts associated with wood stoves. ARI agrees that the technical points made in this regard by the project proponent are accurate. That is, burning a cord of wood in a standard wood stove emits far more air pollution than burning that same cord of wood in the biomass power plant. The reason is that emissions from a power plant must be well controlled, but

emissions from standard wood stoves occur without control. Also, the project proponents state that air quality impacts on Russell residents from wood stove emissions are much higher than the emissions impacts would be for the biomass power plant. This statement is also technically true, even though the power plant would burn far more wood per hour or per year than would all the wood stoves in Russell. The reason is that the power plant emissions undergo substantial dispersion before reaching ground level where residents would be affected. Wood stoves emit close to the ground, and the emissions undergo little dispersion before affecting residents. While from a technical perspective, the air quality impacts from wood stoves on Russell's residents are likely to be significantly greater than from the biomass power plant, this type of comparison can leave some people feeling somewhat suspicious and distrustful. The explanation for this normally lies in the fact that even though the health risks from wood stove emissions may be factually higher, the decision to use our wood stoves and to accept the emissions consequences is a decision we make for ourselves. With the power plant emissions, however, our exposure to the emissions is decided by others, not us.

3.2.4 Health Risk Assessment for Hazardous Air Pollutants in the Power Plant Emissions

It was noted above that emissions of the pollutants having Ambient Standards (NO_2, CO, SO_2, PM10 / PM2.5, and lead) would not result in those Ambient Standards being exceeded. Accordingly, this demonstrates that emissions of those pollutants would not result in a significant health risk to residents of Russell.

Besides the common air pollutants having Ambient Standards, Russell Biomass LLC also analyzed the potential health risks that would be associated with emissions from the biomass power plant of hazardous air pollutants ("HAPs"). All forms of wood combustion can result in the emission of small quantities of organic compounds and heavy metals. The HAPs evaluated for the project are those for which EPA has developed emissions information, specifically for wood-fueled boilers.

Hazardous air pollutants are called such for a good reason: they have the *potential* for creating health risks to those exposed to them. It is fundamentally important, however, to understand that simply because a hazardous air pollutant is toxic and is emitted, one is not justified in concluding that the emission automatically creates a significant level of health risk. Whether or not the emission of a given toxic air pollutant creates a significant health risk depends on a number of factors. Those factors include the toxic potency of the substance being emitted, the amount of exposure a person gets following dispersion of the emission, the duration of that exposure, and the susceptibility of the particular individual exposed.

In Massachusetts, the potential health risks associated with emissions of toxic air pollutants are assessed by comparing the maximum projected ground-level impact for each pollutant, with health-based guidelines intended to serve as threshold concentrations. MADEP has established thresholds for assessing the significance of short-term, 24-hour exposure to toxic pollutants (Threshold Effects Limits or "TEL's"), and other thresholds for assessing cancer risks and risks of other disease from long-term exposure to toxic pollutants (Allowable Ambient Limits or "AAL's"). These threshold concentrations were developed by MADEP and the Massachusetts Department of Health to protect public health, with a deliberate margin of safety added. If maximum impacts of HAPs are shown to be below the TEL and AAL threshold concentrations, this demonstrates that those emissions are unlikely to carry any significant health risk. If the impacts exceed the threshold, this does not mean in itself that the associated health risk is excessive. Rather, it means that the health risk can not be deemed insignificant, and the extent of health risk requires further, more refined assessment to determine whether the risk is excessive or not.

MADEP intends the TEL and AAL threshold concentrations to be used for assessing whether or not the incremental air quality impact from the emissions source of interest could significantly affect the health of those exposed to the emissions. The TELs and AALs are not ambient standards. That is, they are not intended to serve as limits that cannot be exceeded, when considering the cumulative impacts of the emissions

source of interest, plus all other sources of toxic pollutant emissions in the area. In simple terms, if the biomass power plant's impacts for HAPs comply with the TEL and AAL thresholds, this is credible evidence that those emissions are unlikely to contribute significantly to increased health risks.

Russell Biomass LLC projected the maximum 24-hour and annual impacts from HAPs that would be emitted from the biomass power plant, as part of the dispersion modeling analysis described previously above. Results demonstrated that the maximum impacts for all HAPs evaluated were under the TEL and AAL thresholds by a substantial margin. ARI concludes that this demonstration provides strong evidence that emissions of hazardous air pollutants from the biomass power plant would not result in a significant increase in health risks for residents of Russell.

As additional background, a more detailed summary is provided here of the projected impacts of several specific HAPs. Of the numerous HAPs evaluated, only three HAPs had maximum impacts predicted to be 10% or more of the TEL thresholds that apply for a short-term exposure of 24 hours. The maximum impacts for acetaldehyde and formaldehyde were each estimated at 10% of their respective TEL thresholds, and the maximum impact of hydrogen chloride was estimated at 14% of the TEL. For all other HAPs evaluated, the maximum concentrations were less than 10% of the TEL, and many were less than 1% of the TEL. Acetaldehyde and formaldehyde are irritants that are by-products of the combustion of wood. Hydrogen chloride is an acid gas and an irritant; it is also a by-product of the combustion of wood that contains small amounts of chlorine taken up by the living tree.

With regard to long-term exposures to these particular HAPs, only hydrogen chloride was predicted to be present at more than 10% of the AAL threshold, which is the concentration threshold that people can be exposed to long-term, without any ill effects. The maximum annual concentration predicted for acetaldehyde was 4% of the AAL, and for formaldehyde, it was 2.5% of the AAL.

In addition to being an irritant, formaldehyde is classified as a probably human carcinogen based on animal data and some epidemiological data. MADEP took the potential carcinogenic risks from exposure to formaldehyde into consideration as part of the process that established the AAL and TEL. The AAL threshold concentration is equivalent to a cancer risk of 1 in one million for a person exposed to this concentration through inhalation for 24 hours/day over a 75-year lifetime. EPA uses the 1 in one million incremental risk level as a baseline, to indicate an acceptably-small risk; risks above this may require further mitigation.

For a person exposed over a 75-year lifetime to the maximum predicted annual concentration of formaldehyde released from the Russell Biomass facility, the incremental cancer risk would be approximately 2.5 in 10 million. This is a minimal risk that would not be regulated by USEPA or MADEP programs. This is an upper bound estimate; most people would not be exposed to the annual maximum, as the dispersion modeling shows those concentrations occurring to the east of the stack, in uninhabited steep terrain.

ARI recommends that one particular hazardous air pollutant warrants further analysis by Russell Biomass LLC. That pollutant is acrolein, a compound in the aldehyde family that forms during combustion of various fuels, including wood. A sufficient exposure to acrolein via inhalation can cause respiratory irritation. The reason that acrolein health risks were not assessed by the project proponent is most likely attributable to the fact that MADEP has not developed TEL and AAL thresholds for that pollutant as yet. The reasons that ARI recommends further assessment of acrolein are as follows:

- Acrolein has historically been the hazardous air pollutant getting the most regulatory attention for wood combustion.

- The project proponent listed acrolein as having the largest emission rate of all hazardous air pollutants assessed for the Russell Biomass Power Plant.

ARI recommends two steps in further assessing acrolein. The first is to review the most current technical evidence on acrolein emission levels from modern wood-fueled boilers, to develop a more technically-robust estimate of the emission rate. The correct magnitude of acrolein emissions from wood fueled boilers is known to be uncertain. The official USEPA emission factor (likely used for this project to date) is hundreds of times greater than the emission factor for acrolein that EPA most recently required be used in relation to USEPA's national emission standards established for industrial and commercial boilers (including wood boilers). In addition, the emission factor developed for acrolein in the 1990's by the National Council for Air and Stream Improvement (NCASI) is much lower than the standard USEPA emission factor. Many experts view the NCASI emission factor to be better based technically than the standard USEPA emission factor, including the environmental regulatory agencies in Maine and Minnesota, both of which have substantial experience in regulating wood biomass power plants. ARI concurs with that technical opinion.

Once acrolein emissions have been re-estimated based on the most recent technical evidence, the associated health risks should be assessed, by comparing the projected impacts with the Reference Concentration (RfC) for acrolein set by USEPA to define a no-effects threshold of exposure. While ARI does not anticipate any significant acrolein-related health risk from the biomass power plant, we do believe that the risk should be assessed, and results communicated to the Town. ARI believes that the USEPA Reference Concentration for acrolein provides a conservative means for assessing the acrolein-related health risk for the project. ARI does not believe it necessary to develop acrolein TEL and AAL values for formal approval by MADEP, as the time and expense required for a formal development process is not warranted on a single project basis, particularly when significant risk levels are not anticipated.

3.2.5 Confirming Compliance with Emission Limits

While ARI concurs that emissions from the biomass power plant would be well-controlled with the proposed control techniques, and that the resulting air quality

impacts would be “safe,” a key remaining issue is to ensure that those emission limits are actually met. For certain air pollutants, reliable means are available to continuously monitor emissions for compliance. For other pollutants, continuous emissions monitors are not yet available, and periodic stack testing is done to confirm compliance.

In the documents reviewed by ARI, we were unable to find a summary of the methods proposed by Russell Biomass LLC to assure compliance with air pollutant emission limits. In discussions of certain Federally applicable emissions standards, there was acknowledgement that those standards required continuous monitoring for certain pollutants. However, a comprehensive summary was not found of the continuous monitoring and stack testing that is proposed. In addition, one of the major, national emission standards that applied to the project (the standard for Commercial and Industrial Boilers) was set aside by the court, so it is no longer a driver for continuous monitoring requirements. In light of this recent development, USEPA and MADEP may require Russell Biomass LLC to prepare project-specific emission standards for certain hazardous pollutants, and a project-specific plan for assuring compliance with emission limits.

ARI recommends that the project proponent provide a comprehensive summary of proposed compliance methods, including continuous emissions monitors and stack emissions testing, to both MADEP and to the Town of Russell at this time. ARI recommends strongly that the biomass power plant should commit to continuous monitors for NOx, CO, opacity, and either carbon dioxide or oxygen, and to periodic stack emissions test for PM 10 and PM 2.5 (filterable and condensable fractions) and for targeted HAPs. In addition, as recommended previously above, ARI recommends that MADEP, as a condition of the air permit for the plant, requires periodic stack testing for emissions of heavy metals, hydrogen chloride, and sulfur dioxide, for as long as the plant’s allowable wood fuel supply includes post-consumer wood (e.g., old pallets or boxes) or post-industrial wastes such as paper cubes. ARI recommends that the Town’s Board of Health be automatically copied on all continuous monitoring

emissions summaries and stack test results that are submitted to MADEP. Ideally, Russell Biomass LLC would also provide the Town with electronic copies of these summaries (e.g., CD-ROM) that can be viewed by residents in the local library or Board of Health office. Such transparency on emissions performance builds public trust.

3.3 Dust from the Power Plant

There is potential for dust emissions to occur during wood chip delivery, from trailer dumping and truck-tire tracking. Dust can also result from wood-chip handling during storage (e.g., pile turning with front end loaders), and during mechanical processing of wood chips (grinding and screening). Dust can also result from the storage of combustion ash (silo filling) and during truck out-loading of the ash. Dust emissions of these types are referred to as "fugitive emissions" of dust, as they do not get emitted from a defined stack or vent.

Most of the wood-chip fuel inventory will be stored outdoors on the site. ARI concurs that outdoor storage is industry-standard practice, and that indoor storage of that much wood fuel is not practical given the size building required. ARI also agrees that dust from wood fuel delivery, storage, and handling can be effectively controlled by water spraying, as proposed by Russell Biomass LLC.

A 3-day supply of wood fuel will be kept under roof. The DEIR indicates that there will be equipment for hogging (grinding) and screening the wood chips, to prepare them for use in the boiler. Russell Biomass LLC has noted in the permit documents that the wood will be processed by the suppliers, and ARI assumes that the wood that arrives at the Russell facility will be in chipped form. However, it appears that some additional processing will be done at the site, possibly to ensure that the wood chips are of similar size and also to remove foreign matter such as small rocks. ARI finds, however, that details of those operations were not described in either the DEIR or the permit documents, and the associated environmental impacts and proposed mitigation were not discussed in adequate detail. Wood grinding and screening equipment has the potential to cause significant dust and noise impacts. If the

project does indeed include the grinding and screening of wood fuel, then those operations must take place in totally enclosed structures to contain dust and noise, and the ventilation air from the structure would require active control to remove dust. Accordingly, ARI specifically recommends that Russell Biomass LLC be requested to provide further details about the wood grinding and screening equipment and operation, and the related dust and noise impacts, and proposed mitigation.

The storage and handling of combustion ash also creates the potential for fugitive dust emissions. Ash collected at the bottom of a stoker boiler would be quenched with water before it is conveyed for storage in an ash silo. Bottom ash from a fluid bed is not quenched, but is moistened with a water spray before conveyance to the ash silo. With either boiler, ash removed from the flue gas by the air emissions controls is similarly moistened before being conveyed to the ash silo.

Effective prevention of dust problems associated with ash handling starts with maintaining the ash in a moist state. In addition, ash will be hauled from the site in Russell only in totally enclosed trucks. Accordingly, ARI agrees that the project proponent's plans in those regards are a key component of preventing ash dust emissions. However, ARI was unable to find evidence that further, active means for preventing ash dusting are planned at the biomass power plant, and we believe further mitigation measures are necessary. While ash is moistened as it goes into the ash silo, the surface of the ash pile inside can dry out. The ash silo should have a fabric filter installed on its exhaust vent, to prevent ash dust from escaping, as air is displaced from inside the silo during silo filling and emptying operations. In addition, more attention should be paid to whether additional dust prevention measures are needed in conjunction with the loading of ash into trucks for shipment offsite. Consideration should be given to enclosing the ash loading area to contain dust, and controlling the dust emissions from the ventilation air. Washing truck tires can reduce the potential for trucks tracking ash dust out of the truck loading area and onto local roads. By example, waste-to-energy plants handle their bottom and flue-gas ash streams in a moist state, exactly as Russell Biomass LLC proposes to do here. But, waste-to-energy plants, as well as recently commissioned wood biomass plants, go beyond that to actively control dust emissions from the ash silo and

from ash loading into trucks. While this comparison with waste-to-energy plants is valid in terms of illustrating appropriate ash-dust mitigation requirements, one should note an important distinction between the ash produced by waste-to-energy plants and that produced by wood biomass power plants. Ash from waste-to-energy plants is controversial, as it can contain significant amounts of heavy metals. Ash from wood biomass power plants contains only trace levels of metals, and is widely accepted for beneficial use as a soil amendment and fertilizer.

ARI makes the recommendation that MADEP's air permit for the biomass power plant should include a specific requirement to preclude excessive emissions of fugitive dust. If strong mitigation measures are agreed to by the project proponent (active control of dust from wood grinding/screening; fabric filter on ash silo vent; and active prevention of dust emissions from ash truck loading), then an adequate permit condition would likely be simple verbiage along the lines of the facility "shall not cause excessive emissions of fugitive dust." However, if state-of-the art controls for dust mitigation are not adopted, then the MADEP should consider imposing a permit requirement for periodic compliance testing for excessive emissions of fugitive dust. A suitable test method in this regard (EPA Method 22) is required to be used at waste-to-energy facilities. Russell Biomass LLC should also consider developing a Standard Operating Procedure for wood chip fuel handling that would stop handling operations if wind conditions resulted in visible dust approaching the property line. We anticipate that such conditions would be rare.

Another possible concern with wood dust is fire and dust explosion. Using a water spray for dust control will also prevent dust from reaching explosive concentrations in air. The permit documents do not address fire prevention and fire suppression systems in detail that will be in place in the wood fuel storage area. The DEIR notes that there will be a looped water system around the fuel storage area to provide fire suppression, and there will be a water storage tank onsite of a capacity to be determined later. ARI recommends that Russell Biomass LLC provide the Town of Russell, specifically through its Fire Chief, information regarding fire prevention and fire suppression at the site. Russell Biomass LLC should also allow the Fire Chief to inspect the wood storage facility periodically.

Storage of wood chips may also provide harborage for vermin, specifically rodents such as rats and mice, but also burrowing mammals including woodchuck. Russell Biomass LLC should be asked to provide the Board of Health with information about rodent control at the facility and should ensure the Board that it will respond to any complaints about vermin.

3.4 Odor from the Power Plant

The principal source of potential odor from the biomass power plant would be wood-chip storage. Wood storage piles are subject to biological decomposition. With sufficient time in storage, wood decomposes (ferments) due to the action of bacteria and fungi that live without the need for oxygen (anaerobes). The process of decomposition gives off gases such as aldehydes and various organic acids, which are odorous. The decomposition process also degrades the quality of the wood for use as a fuel. Operators of wood-fueled power plants, therefore, have an economic incentive to manage their stockpiles of wood fuel to minimize the wood's decomposition.

Russell Biomass LLC has proposed measures for active management of their wood fuel supply that ARI finds to be consistent with industry standard practices, and likely to preclude offsite odor impacts. Wood storage on site would normally be limited to a 30-day supply, and in any case, wood would not reside there for more than six months. The pile height for the wood chips would be limited to a maximum of 45 feet. The wood chip piles would be regularly turned over and mixed to aerate the pile and discourage decomposition and mold growth, and to ensure that wood fuel will be used on a first in, first out basis. Experience with municipal wood waste and yard waste composting demonstrates that if biomass materials can be maintained under aerobic conditions, odors are not a problem, even when these storage areas are located near residential areas.

Odors from the storage area will likely not be a problem for people living in the Town of Russell, because the wood chip piles will be actively managed, and in any case, because most of the inhabited area of the Town will be upwind of the facility most of the time.

However, if unexpectedly, odors from the facility are noticed by people living in the Town, Russell Biomass LLC should ensure the Board of Health that it will respond to concerns.

As a related note, “bio-aerosols,” the spores of some of the fungi involved in wood decomposition, can be toxic to humans (e.g., *Aspergillus*). The limited field work done to date on this subject at wood-fueled power plants indicates that airborne spore levels at wood-fueled power plants are too low to pose a health threat offsite, but that measures to limit the exposure of workers onsite to wood dust carrying the spores may be advisable. Research at facilities for composting yard waste and other organic municipal waste shows the same conclusions.

3.5 Diesel Truck Emissions

There is concern that exposure to the emissions from vehicles using diesel engines may be impairing people’s health, particularly in urbanized areas where diesel truck activity is heavy and associated emissions are large. As noted by the project proponent in its assessment of diesel-truck air quality impacts, EPA’s focus for related health risks is on the very fine particles that are emitted with diesel exhaust. EPA has established a Reference Concentration for diesel particulate matter, representing, in EPA’s terminology, a threshold “of daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.” In other words, this is a “no effects” threshold. This particular reference dose addresses the risk of disease from exposure to diesel particulate matter other than cancer risk. While EPA has designated diesel particulate emissions as likely capable of causing cancer, EPA does not yet have sufficient relevant data in hand to develop a criterion for assessing cancer risk.

Russell Biomass LLC estimated the emissions of diesel particulate matter that would occur in Russell from project-related trucks and the existing trucks associated with the current logging operation off Station Road. They assumed emissions characteristic of the current fleet of trucks on the road. The emissions projections will conservatively represent future emissions,

since EPA has mandated reductions in emissions in new diesel trucks, starting with the 2007 model year.

The project proponent applied a suitable dispersion model, with five years of hourly meteorological data from Westover AFB as input, to project the maximum air quality impacts from the trucks. The maximum projected impacts for diesel particulate matter occurred in the middle of the road, as expected, with lower concentrations projected on the sidewalk and at the nearest residence. In all cases, the maximum impacts were less than 1% of the EPA Reference Concentration. The project proponent then assumed a conservative value for the background concentration of diesel particulate matter, which is about 16% of the Reference Concentration. When the impact from the project-related trucks was added to the background level, the total project concentration of diesel particulate matter was 17% of the no-effects Reference Concentration.

ARI concurs that this analysis is reasonably based, and conservatively portrays the expected air quality impacts from the diesel truck emissions. We agree that the truck emissions are very unlikely to cause any health problems to the residents of Russell. To put this in perspective, the substantive issue with trucks is the significant increase in truck traffic on Main Street compared with current conditions, not truck-related air quality issues.

Because USEPA has not yet developed a criterion for assessing the cancer risk associated with exposure to diesel particulate matter, the cancer risk has not been estimated for this project's truck emissions. However, because the maximum impact for project-related trucks is shown to be 1/100th of the no-effects threshold for disease other than cancer, it is reasonable to assume that the associated cancer risk would be small as well.

3.6 Truck Traffic

At the meetings between ARI and Town residents held in July 2007, the concern most often cited, both by those supporting and opposing the project, was the increase in truck traffic on Main St. that would result from the biomass power plant**.**

Russell Biomass LLC's proposed traffic route has trucks and automobiles accessing the biomass power plant by entering the Town of Russell from Rt. 20, proceeding east on Main Street, crossing the Westfield River on the Main Street bridge, then bearing right into the site off Station Road. The project proponent has estimated that there will be 75-80 round trips per day through the Town of trailer trucks carrying wood fuel to the biomass power plant, as well as two round trips per day for trucks hauling combustion ash from the plant. Russell Biomass LLC increased the truck traffic from the initial estimate of 60 round trips per day because the agreement to not use any wood from the C&D stream means that they will have to increase use of wood with a higher water content than C&D wood, which means that increased tonnage of fuel will be required to provide the same amount of energy from the fuel.

In addition to truck traffic, there would also be 23 automobile round trips per day. The project proponent states that there are presently two trucks using this route daily to access the existing log-storage operation on the site. As pointed out by a citizen at the meetings with ARI in July 2007, this traffic projection misses some expected traffic. ARI agrees with the comment, and estimates that there would be 10 round trips daily of a mix of trucks, vans, and automobiles delivering fuel oil, emission control reagent, miscellaneous supplies, and food, as well as vehicles driven by repair and maintenance contractors and by visitors. ARI does not believe, however, that this omission materially affects traffic impacts assessment.

Clearly, the Russell Biomass Power Plant would result in a significant increase in truck traffic on Main Street. It is true that the Town has experienced similar truck traffic levels in the past, associated with the former Westfield River Paper Mill, which operated on the project site until it closed in 1994. But, over 12 years have passed without the historically higher truck

volumes, and it is legitimate to view the proposed truck increases as a “quality of life” issue in Town, and as a safety concern.

Russell Biomass LLC did consider two alternative truck routes to the use of Main Street. They explored the possibility of constructing a new bridge across the river, about 1 mile south of the site, off Rt. 20. MADEP indicated that State approval for the new bridge would be doubtful, given the proximity of the Main Street bridge and its structural capacity for to handling the truck traffic. The second alternative considered was to re-construct and lengthen Frog Hollow Road from the transfer station, to intersect with Rt. 20, north of the trailer park. This alternative did not appear practical for further consideration, because this route would be a Town-owned road, and would also require taking of bordering vegetated wetlands along the Westfield River. It did not appear realistic for the Town to take on the burden of getting voter approval for such a road project, getting State financing assistance, and getting through the complex permitting requirements for the project. ARI agrees that the time burden and cost requirements for establishing that route are beyond what can be reasonably accommodated by either the Town or by a project of this scale. Accordingly, based on the material ARI has reviewed, we too come to the regrettable conclusion that a practical alternative to the use of Main Street is not currently apparent.

Russell Biomass LLC performed a traffic impact assessment for the biomass power project, as required by the Town in conjunction with the Site Plan Review and the application for a Special Permit from the Town. The study documented credibly that Main Street and the bridge are of adequate design to handle the project’s truck traffic, and the route has adequate capacity to do so. Main Street is currently at 2/3 capacity, and that would increase to 3/4 capacity with the project’s added traffic.

Generally, the main focus for traffic impact studies is on technical aspects; that is, how will the added vehicles affect traffic flow? Are the roads built to take this traffic? But, Russell is a small, rural town, and in this case, other concerns about traffic are far more important. ARI agrees that the traffic study provides adequate demonstration that the road system in Town is capable of handling the truck traffic from the standpoints of design and traffic flow. However,

such an increase in truck traffic on the main street of a small rural community does, as noted above, create a quality of life issue, and does legitimately increase safety concerns. So, ARI sees those as the "real" issues for traffic. ARI does not opine here on the quality of life aspect of increased truck traffic on Main St. That is a matter addressed through the local political process. However, we do make comment on the safety issue. With regard to safety, the project proponent did point out that sidewalks exist the entire length of the proposed truck route. ARI agrees that to be a key factor in ensuring pedestrian safety along the truck route. Since the key issue here is safety along Main Street, ARI recommends that the traffic study be supplemented with a more robust assessment of potential safety hazards along the truck route. For example, ARI did not find in the traffic assessment any discussion of features of the route for which increased truck traffic could increase the safety hazard. For example, are there line-of-site deficiencies, blind or uncontrolled intersections, road segments where slippage on ice and snow could be a problem, cross walks or lack thereof, school bus stops where children gather, and places along the route from which children might dart out unexpectedly? The traffic assessment also did not address issues of vibration from truck traffic, specifically from trucks downshifting as they turn onto Main Street and as they proceed down the hill to the Main Street bridge; this is another potential quality of life impact. ARI is not stating that such factors exist (we have not performed a traffic study), just that the safety hazard issue should have been investigated and reported somewhat more explicitly.

The project proponent has set out "enforceable" measures for mitigating traffic impacts in Russell. They will enforce low speed limits for trucks on Main St. to reduce noise and vibration, and to reduce speed-related safety hazards. They will restrict trucking hours to between 6 AM and 6 PM, with no Sunday trucking. They will not allow truck queuing on public streets or at the facility gate, and will restrict truck idling time onsite to five minutes. ARI agrees that these are standard and reasonable means adopted by biomass power plants in general to mitigate truck impacts. Presuming that the project proponent does supplement its traffic study to include further assessment of potential safety issues, it is possible that could lead to further mitigation requirements.

It should be noted that Massachusetts law limits “unnecessary” idling of all vehicles to less than five minutes. Unnecessary idling is punishable by a fine, generally $100. The statute prohibiting idling is at MGL c. 90, Section 16A, and the regulation is at 310 CMR 7.11. The regulation is enforceable by all local police and health departments, as well as by MADEP. We recommend that the Town of Russell Police Department and Board of Health review the regulation and that the Town adopt a system of fines for illegal idling, and that the Town be diligent in enforcing the state law.

An active rail line is adjacent to the proposed biomass power plant site. This rail line is operated by CSX. Russell Biomass LLC has not addressed the feasibility of hauling wood fuel to the site via rail as an alternative to using trucks. Is it technically and/or economically feasible to substitute rail transport? This may be a problem at the source of the wood fuel, if the suppliers are not near rail depots. It is possible that rail could be used to haul the fuel to the site, but that it would have to be hauled by truck from the suppliers/processors to a rail yard. This would mean two loading and off-loading operations, which adds significant expense, and which would generate dust and noise, although not in Russell. If the main issue is access to rail at the wood-fuel suppliers’ end, and their need to use trucks to take the fuel to a rail depot, the proponent should evaluate the feasibility of using roll-on/roll-off containers that can be converted from truck to rail. We recommend that Russell Biomass LLC address for the Town of Russell the feasibility of rail, and discuss any factors they believe that would prohibit this as a practical option.

3.7 Noise Impacts

Russell Biomass LLC has identified the noise-producing equipment associated with the biomass power plant: the big fan that draws the boiler exhaust gases up and out the stack, building ventilation fans, wood chip handling (front-end loaders), water pumps, the cooling tower, the switchyard, and the emergency diesel generator. ARI agrees that these constitute the more important noise sources, with one possible exception. It is not clear whether wood-chip grinding and screening equipment, cited in the DEIR as planned for use at the biomass power plant, was included in the noise study as a noise source. As that equipment can be

very noisy, ARI specifically recommends that the project proponent clarify this. If that equipment is indeed planned for use, then it requires special attention in the noise study. That equipment's high noise potential warrants detailed reporting regarding the sound levels the equipment produces, and whether or not the equipment will be fully enclosed to reduce noise and dust.

Specific noise mitigation measures for the biomass power plant are to be developed during the engineering design phase of the project. ARI concurs that the general mitigation approaches that Russell Biomass LLC has described are industry-standard techniques that provide a substantial degree of noise attenuation. General noise mitigation techniques planned by the project proponent include the specification of low noise equipment, siting of equipment to the physically shield the community from the noise, and the enclosure of noise producing equipment in enclosed structures that are designed to attenuate noise.

MADEP regulations prevent the biomass power plant from increasing noise in the community by more than 10 decibels (10 dBA) over the existing background noise levels. MADEP's noise increase limit applies to the so-called L90 noise, which is the noise level heard 90% of the time, or the typical noise level. The noise regulations also prohibit the creation of a pure tone condition, which is noise persisting at a single sound frequency (for example, having to listen to a buzzer going for an hour). While the MADEP noise limit protects against large increases in typical noise levels, it does not limit loud noise of very short duration, such as occasional loud bangs, a brief whistle blow, or a loud P.A. system announcement. Such short but loud noises can be annoying.

Russell Biomass LLC measured the existing noise levels in the community during the daytime and more importantly, during the nighttime, when noise levels are normally quietest. ARI concurs that the noise measurements locations in the community were appropriately selected. Those were the locations of the closest residences on Grove Street, Lincoln Street, and River Street, as well as the Russell Elementary School. The existing background noise levels at night were in the range of 32 DBA to 52 DBA. Accordingly, existing nighttime noise in Russell is generally higher than the noise levels typical of a quite rural community (25 to 30

dBA). This may be attributed to the fact that there are existing, noise sources in and near the community such as the Town's wastewater treatment plant, the hydroelectric generating plant (spillway noise), and traffic on Rt. 20 and even I-90.

The project proponent then prepared a noise impact assessment for the biomass power plant. They estimated sound emissions from the noise-producing equipment using standard emission factors, and applied a conventional model of noise propagation to project noise impacts in the community. Results indicated that the closest residences on Grove Street would receive the greatest noise exposure from plant noise (direct line-of-sight exposure), but that most of that noise would be masked by the noise from the hydroelectric plant. Results showed that the greatest noise *increase* of 5 dBA was projected at the closest residences on River Street. That noise increase is well below the MADEP's 10 dBA noise increase limit, but nonetheless, would certainly be noticeable. Nighttime noise at Lincoln Street (3 dBA) and at Grove Street (1 dBA) would be barely perceptible to imperceptible. Nighttime noise impacts at the school were not assessed, as the school is not used late at night. The projected daytime noise increase at the school was 2 dBA, which would be barely perceptible. In summary, the maximum noise impacts from the biomass power plant are projected to comply with MADEP's limit on noise increases. However, plant noise is likely to be noticeable at River Street residences, particularly at night, and would be barely noticeable at other nearby residential areas and at the Russell Elementary School.

While plant noise would comply with MADEP's noise limit, and noise impacts in the community are projected to be quite small, River Street residents are expected to hear the noise, and the noise may be audible to a limited extent in other areas of the Town. While ARI concurs that the project proponent's technical analysis of noise impacts satisfies regulatory review requirements (MEPA, MADEP), this is not sufficient for residents to understand clearly the nature of what they are apt to hear and how annoying that noise may or may not be to them. Accordingly, ARI recommends that the project proponent prepare for the Town's edification, a plain-language description of the types and character of noise from the plant that residents may experience. For example, will they hear the clatter of wood grinding equipment, the low continuous rumble of the boiler exhaust fan, the hum of pumps operating,

transformer hum, rapper bangs, periodic tube-blowing shrieks, front-end loader engine noise, outdoor P.A. system announcements, loud bangs associated with truck dumping, or truck back-up beepers?

3.8 Process Water Withdrawal from the Westfield River

Water needed for process uses at the biomass power plant is proposed to be drawn from the Westfield River. Russell Biomass LLC claims that the project site has the deeded right to withdraw up to 600,000 gallons per day (gpd) of water from the River, as a legacy of the former paper mill's water withdrawal. Nonetheless, the proposed water draw requires Russell Biomass LLC to apply for and obtain a water withdrawal permit from MADEP under the Massachusetts Water Management Act. The water would be drawn from the River at the same location as the former paper mill used in the past to draw water. Some rehabilitation of the existing water intake structure would be required. The water would be stored on site in a 1.5 million gallon tank.

Russell Biomass LLC proposes to withdraw an average of 662,000 gallons per day of water from the River, and a maximum of 885,000 gallons per day. The principal use of the water would be for condensing steam. After steam produced by the boiler has been passed through the turbine to generate electric power, the "spent" steam is condensed back to water, so that the water can be re-used to again produce steam in the boiler. Cooling water needed by the condenser to turn the spent steam back into water is supplied by the cooling tower. Warm water coming out of the steam condenser is sent to the cooling tower, where the water is re-cooled by evaporation. About 85% of the water taken from the River and circulated through the cooling tower is lost to the atmosphere by evaporation. A portion of the water circulating in the cooling tower must be continuously bled off ("blowdown") to prevent a build-up of solid particles in the circulating water as a result of water evaporation. After treatment, that blowdown water is returned to the River. Overall, 15% of the water taken from the River would be returned to the River. Both the water drawn from the River and the water returned to the River would be metered.

As with cooling tower water, a portion of the water that is used in the boiler to make steam must also be bled off to prevent solids build-up. That boiler blowdown, however, is not returned directly to the River. Rather, it is recycled to the cooling tower for use there.

As detailed above, the source of water supply for both the cooling tower and the boiler is water to be drawn from the Westfield River. Before the river water can be used, it has to be treated to remove solids, primarily sand and silt carried by the river, but also other small particulate matter including carbon from plant and animal matter in the River (detritus). Before being used, the river water will go into a clarifier where coagulants will be added. The coagulants react with solids present in the water, and the coagulated solids settle out in the tank, leaving the water treated for use. Regarding the disposition of the settled solids, after extracting some of the water present in the settled solids, the solids will then be disposed offsite. These solids are not toxic, and can be disposed as normal solid waste at an appropriate disposal facility.

Sodium hypochlorite, which is the primary component of household bleach and products used in swimming pools, will also be added to the water supply for the cooling tower, to inhibit growth of algae and bacteria. The algae are present in the river water and cannot be removed by coagulation and settling. Bacteria are also present in the river water as well as in the air, and can settle out in the cooling tower. In addition to sodium hypochlorite, sodium bromide will also be used to inhibit algal growth in the cooling tower, algae growth can reduce cooling efficiency. A nontoxic polymer will also be added to the water in the cooling tower to keep minerals naturally present in the water from forming scale on the heat exchangers in the cooling tower when the water is evaporated. Scale build-up also reduces cooling efficiency.

The water fed to the boiler is also treated before use to control pH, remove oxygen, and remove dissolved solids. As discussed previously above, process wastewater discharge from the boiler (i.e., boiler blowdown) will be directed to the cooling tower where it will be re-used there by commingling it with the circulating cooling water in the tower.

Russell Biomass LLC has evaluated the environmental impacts to the River that could result from the proposed water draw. Such impacts could potentially occur as a consequence of a reduction in the River's water volume flow, also as a consequence of the disturbance that comes from drawing water into the water intake, and finally as a result of construction activities to re-habilitate the intake structure. The project proponent's impact assessments in these regards are discussed below.

The reduction in volume flow of the River could potentially affect navigation (boating), fishing (reduce fish populations), and other organisms besides fish that live in the River. In addition, a reduction in volume flow could potentially impact the capability of wastewater treatment plants down-river to function with the same efficiency, because of a reduced opportunity to dilute their wastewater discharges.

Russell Biomass LLC calculated the maximum water draw as a percentage of the flow rate of the Westfield River at the withdrawal point, specifically for low-flow conditions. Flow gauges have monitored the flows into this stretch of the River historically since the early 1900's at three locations upstream of the project site. Historically, the River experiences its lowest flow conditions during the month of August, so the analysis focused principally on August flows, both historic median flows during that month, and the historic lowest single-day flow. There was substantial technical discourse between the project proponent and MADEP about the best technical approaches to use in estimating low flow conditions. MADEP had suggested using River gauge data extending back to the early 1900's. The project proponent, however, asserted that gauge flow data measured since 1966 would be more indicative of current flows, because the last of the dams built upstream of the site was completed in that year. ARI agrees that gauge data taken after the River damming was completed in 1966 is technically preferable for use, and that the resulting data period of record of 39 years (1966 to 2005) is adequately long for revealing low-flow extremes.

In addition, the project proponent had used methods recommended by the U.S. Geological Survey (USGS) to estimate low flow rates, but the MADEP recommended different

techniques. In the end, the project proponent estimated low flow conditions both ways, and in general, there was reasonable correspondence in the results.

In the DEIR, the project proponent compared the planned, maximum water draw with the various indicators of historic low-flow conditions. The most relevant of those comparisons are shown in the following table. Note that the maximum water draw of 885,000 gpd corresponds to 1.37 cubic feet per second (cfs) of River flow.

Low-Flow Statistic	Analysis Method	River Low-Flow Rate (cu. ft per sec)	Maximum Water Draw as Percent of Low River Flow
Median Flow – Month of August	USGS Method for Analyzing Historical Gauge Data	104.7	1.3%
Median Flow – Month of August	MADEP Method for Time Series Analysis of Gauge Data (1966 to 2005)	98.0	1.4%
Lowest 7-Day Flow , aka the "7Q10" Flow (Note 1)	USGS Method for Analyzing Historical Gauge Data	32.5	4.2%
Single Lowest Flow Day	8/19/70 was lowest flow date on record, based on gauge data for 1966 to 2005.	17.8	7.7%

Note 1: The 7Q10 flow rate is the lowest flow rate experienced over seven consecutive days in any 10 year period.

The maximum water withdrawal would be less than 2% of the median flow rate of the River during the low-flow month of August; about 4% of the lowest weekly flow rate experienced over a 10-year period, and less than 8% of the lowest single-day flow rate experienced in nearly 40 years. These are very small percentages of low-flow conditions in the River, including for the particularly conservative comparison with the lowest, historic, single-day flow. ARI concurs that the proposed water withdrawal is unlikely to alter the River's flow rate enough to have a significant impact on navigation, fishing and other recreation, the River's biology, or operation of downstream wastewater treatment plants or hydroelectric facilities. ARI independently contacted an official of the Westfield wastewater treatment plant in this regard, and that official confirmed no concern that the planned water draw would affect the operation of the wastewater plant.

As part of our review, we monitored gage data for the Westfield River during August and September 2007. August 2007 was the second driest August since records have been kept in New England. In early September, flow rates in the Westfield River approached historic lows.

On September 9, 2007, the flow at the Knightville Dam gage was 15 cubic feet per second (cfs), and flow was 14 cfs from September 6 through September 8. The historic minimum for September 9 is 9 cfs, and the median flow is 45 cfs.

At the Littleville Dam/Goss Heights gage, flow on September 9 was 1.6 cfs, and on September 6 it was 0.8 cfs, compared to a September 9 historic low of 0.5 cfs.

At the Huntington gage, which is most representative of the reach in which the proposed project is located, the flow from September 6 through September 9 was 13 cfs, compared to a historic low of 5.4 cfs.

At the Westfield gauge, downstream from the proposed project site, the September 9 flow was 57 cfs, and the September 8 flow was 50 cfs, compared to a historic low of 50 cfs.

The flow rates at each gage recovered on September 12, after a significant rain event on September 11, but on September 19, flow rates were low again. The following flows were noted on September 12 and September 19:

Gage	September 12	September 19
Knightville Dam	400 cfs	31 cfs
Littleville Dam/Goss Heights	18 cfs	5 cfs
Huntington gage	92 cfs	19 cfs
Westfield gage (downstream)	520 cfs	104 cfs

The increased flow on September 12 correlates with rainfall on September 11; on that day, 0.75 inch was recorded at Hartford and 1.47 inches was recorded at Pittsfield. Although these stations are not in the Westfield River watershed, they are good indicators of rainfall in the region.

The River flow data for August and September show the response of the River to reduced precipitation and runoff, and also show the River's ability to recover rapidly. Russell Biomass should include an evaluation of the August and September flow data in its analysis, and should explain how the recent data relate to the proposed withdrawal during low flow periods.

Besides evaluating the effects of water withdrawal on River flow, the potential environmental impacts from operation of the water intake structure must be considered. ARI independently concurs that the planned design of the intake structure, as well as River characteristics in the vicinity of the intake, should preclude significant impacts:

- There will be intake screens, preceded by a coarse grate intended to prevent large organisms from impinging on the screens during water intake.

- The water intake velocity will be kept low (0.2 ft/sec) well below the recommended maximum of 0.5 ft/sec under the Clean Water Act. The low intake velocity minimizes the opportunity for smaller aquatic organisms to be entrained against the screens in the intake water flow.

- The intake's location is across the River and slightly upstream of Bradley Brook, which is stocked with salmon fry. There is a sufficient zone of passage there in the River – away from the intake – for the fish to migrate downstream without interference from the intake.

- All sediment removed during re-habilitation of the intake structure will be disposed properly on land, and not returned to the River.

The project proponent notes that the flow velocity of the River on the east side where the water intake is located is higher than on the west side near the Bradley Brook confluence. They state that this flow velocity difference from one side to the other would tend to discourage fish that enter the River from Bradley Brook, from the swimming close to the intake. In addition, as noted previously above, the design of the intake structure (low intake velocity and coarse screen) is intended to reduce the potential for entrainment and impingement of fish and other organisms by the intake flow. ARI concurs that adverse impacts on fish populations should not be expected, because of the favorable flow characteristics of the River near the intake, and the planned design of the intake structure to prevent such impacts.

ARI further addresses impacts on the River, including with regard to endangered mussel species, in a subsequent section that deals with impacts from wastewater discharge.

The principal means proposed by Russell Biomass LLC for mitigating its planned water draw is to recycle and re-use the process water. Another more dramatic option would be to substitute an air-cooled condenser for the proposed, standard cooling tower. While the standard cooling tower uses water to dissipate waste heat via the release of latent heat of evaporation, the air-cooled condenser does not use water. Rather, it dissipates heat by directly transferring the heat to moving air, which entails use of very large fans. The key advantage of the standard, evaporative cooling tower is its efficiency in dissipating waste heat. The key advantage of an air-cooled condenser is that it dramatically reduces overall water consumption by a power plant. Russell Biomass LLC evaluated the alternative of using an air-cooled condenser instead of the planned, wet evaporative cooling tower.

The project proponent states that the evaporative cooling tower is standard cooling technology at power plants, and that air cooled condensers are used only when the quantity or quality of the local supply of ground water or surface water is inadequate. ARI concurs that this is an accurate generalization. The project proponent asserted that if an air cooled condenser were used at the Russell Biomass Power Plant, that equipment's large fans would consume substantially more electric power than would be needed with the standard

evaporative cooling tower. That extra energy requirement would take away from the net amount of electric power that the plant puts on the grid. That is, the net electric output of the plant would be reduced by approximately 8%. Therefore, to make the originally-planned amount of electric power output, this would require 8% more fuel to be combusted than with the standard cooling tower, and along with that would come an 8% increase in combustion-related emissions of air pollutants. The project proponent also noted that using an air-cooled condenser would require $9 million of additional capital cost, versus use of the standard cooling tower, as well as markedly increased operating costs for the plant.

ARI concurs that a wet evaporative cooling tower represents the standard design option for power plants in the U.S., except at project sites where water resources are inadequate. ARI also concurs that use of an air cooled condenser would reduce the energy efficiency of the biomass power plant overall by at least 5%, and that this loss of energy efficiency would be very significant. Having to combust substantially more wood to make the same amount of power for sale would negatively affect the economics of the project. Likewise, the large increase in the project's total capital cost for an air-cooled condenser (ARI estimates a 5-6% increase) would further affect project economics negatively. Overall, use of an air cooled condenser would impose a significant economic penalty on this (or any) biomass power plant, making it even more difficult than it already is for renewable energy generators to compete with fossil fuel generators. Massachusetts energy policy encourages renewable energy. While use of the standard cooling tower would be consistent with that policy, that overall benefit to Massachusetts should not come at an undue environmental cost locally to Russell residents. In that regard, it appears that water for the project can be drawn from the River and discharged back to it, without significant environmental impacts.

A standard, wet evaporative cooling tower will have a visual impact to residents, because at times, its condensed water plume will be large enough to intrude on the viewscape. While the alternative, air cooled condenser would not have that type of visual impact (no plume), it would have another type of visual impact. This physical size of an air-cooled condenser is much larger and more visually imposing than a standard cooling tower, and noise can be more noticeable with an air-cooled condenser (large fans). From the local perspective, the

standard cooling tower should not be expected to have a significant impact on the River, and there is a trade-off in other local impacts for one design versus the other. Accordingly, a compelling environmental case cannot be made for the air cooled condenser, but there is a strong and legitimate economic basis for rejecting it.

3.9 Wastewater and Stormwater Discharge to the Westfield River

Water will be discharged to the Westfield River from the operation of the Russell Biomass Facility. Process wastewater generated by the biomass power plant will come mostly from the cooling tower; however, a small fraction will also come from boiler blowdown, the plant laboratory, equipment pads, and floor drains. The discharged water will also include stormwater collected at the project site. While process wastewater flows and stormwater flows will be treated and monitored separately, they will be combined in a single outfall prior to discharge to the Westfield River, which will reduce overall impact on the River.

3.9.1 Status of the Westfield River Today

The Westfield River is an important scenic, recreational, and conservation asset for residents of Russell and the general region. The segment of the River affected by the project is classified according to Massachusetts water quality standards as a "Class B Warm Water Fishery," although the Massachusetts Division of Fish and Wildlife (MADFW) recently indicated that this stretch also supports cold water fish. MADFW stocks the River near the project site with trout, and also stocks River branches and tributaries upstream with Atlantic salmon fry. The National Oceanic and Atmospheric Administration (NOAA) has designated the entire Westfield River as a critical habitat for the Atlantic salmon. MADFW has documented numerous naturally-occurring fish in the River upstream and downstream in the vicinity of the project site, such as bass, shiners, eel, pumpkinseed and white sucker. MADEP conducted habitat assessments in 1996 and again in 1999 for benthic macroinvertebrate communities (e.g., mussels), and an environmental consulting firm performed a similar assessment in 2001. The assessments were performed in the River downstream of the project site in both

Russell and Westfield. The 1999 and 2001 studies showed similar results that indicated the biological condition of the habitats for these species improved slightly since 1996.

Through its Natural Heritage and Endangered Species Program, the MADFW very recently updated its listing of protected habitats of rare animals and plants in the project region. Two protected species could be affected by the power plant component of the project; both are fresh water mussels potentially found in the Westfield River: the Creeper mussel (*Strophitus undulatus*) and the Triangle Floater mussel (*Alasmidonta undulata*).

Portions of the Westfield River are designated as a "National Wild and Scenic River" under the Wild and Scenic Rivers Act. However, that designation applies to River segments that are upstream of the biomass power plant site, no closer than approximately 2-3 miles from the site.

3.9.2 Discharge Point to the Westfield River

Again, while process wastewater flows and stormwater flows will be treated and monitored separately, they will be combined prior to discharge to the Westfield River. The combined flow would be conveyed via a new pipe for discharge to the River, at a new outfall location 500 feet downstream of the Indian River Hydro Dam. The project proponent expects the discharge to the River to average 101,000 gallons per day (gpd), with the maximum flow rate at 133,000 gpd. The discharge would be via a bank discharge over a natural stone discharge pad to prevent erosion of the banking and is intended to match the large-boulder flooring of the River at this location, so as to encourage effluent mixing upon discharge. Effluent mixing during discharge promotes dissipation of the excess heat and the pollutants present (at permitted levels) in the effluent water. ARI concurs that this is preferable to a pipe discharge, as the bank discharge would provide similar mixing of the effluent during its discharge, and would be less disruptive to the River than a submerged pipe outfall.

The project proponent also notes that the proposed outfall location is at the beginning of a straight stretch of the River that has a strong riffle (shallow choppy flow over a rocky bottom), and that this would promote further mixing of the effluent in the River to dissipate heat and pollutants. ARI concurs that the proposed outfall location is appropriate, as the River's characteristics immediately down stream would promote rapid mixing and dilution of the effluent water.

The project proponent had considered using the former paper mill's discharge route through the tail race of Indian River's hydro facility. Using the prior discharge point was precluded, however, by Indian River's plans for rehabilitating the hydro plant and a concern by MADWF that fish could congregate there.

3.9.3 Wastewater and Stormwater Treatment

All wastewater and stormwater generated by the biomass power plant project will be treated prior to discharge to the River. Process wastewater from the cooling tower and the boiler will be treated prior to discharge to adjust pH, so that the discharge is not too acidic or basic. Stormwater will be treated by holding it temporarily (retention) in sedimentation basins to allow time for excess accumulated solids in the water to settle out. Such solid particles can be entrained into the runoff from ground surface soils and the wood fuel storage piles. The stormwater is also treated to remove oil and grease in runoff from the paved road surfaces and parking area. Stormwater and wash water from equipment pads and the maintenance area will also go through an oil/water separator to remove any oils or grease prior to final treatment. This is a small flow, with an estimate of approximately 500 gallons per day.

Wastewater from the oil/water separator and from the cooling tower, which includes the boiler blowdown water, will flow to a collection tank and then to a neutralization tank where pH is adjusted to between 6.5 and 9.0 standard units, the acceptable range of acid to base characteristics. After pH adjustment, potassium sulfite is added

to neutralize any remaining residue of chlorine and bromine disinfectants. ARI concurs that the proposed wastewater treatment is consistent with standard engineering practice, and therefore, is expected to be adequate for meeting the discharge limits that will be imposed by permit.

Stormwater collection and treatment are discussed in detail below. In brief, stormwater falling on the project site would be contained using standard methods such as curbing. A portion of the stormwater falling on the site would recharge to ground water by infiltration into the ground, and the remainder would be collected in catchbasins and conveyed to detention ponds for treatment and for regulation of outflow rate. From there, the stormwater would be combined with the treated process wastewater and discharged to the River. The volume flow and pollutant characteristics of the wastewater and the stormwater would be monitored separately, before the flows are combined.

3.9.4 Wastewater Discharge Permitting and the Ambient Water Quality Standards

The proposed discharge to the River of treated wastewater and stormwater is considered a “point source” that requires Russell Biomass LLC to obtain a project-specific discharge permit. The permit is called a National Pollutant Discharge Elimination System (NPDES) permit for discharge to surface waters, and the permit program is administered jointly by MADEP and USEPA. Discharges of both wastewater and stormwater would be covered by the NPDES permit. The permit sets discharge limits on pollutants to ensure that the River meets Federal water quality standards set under the Clean Water Act as well as the Massachusetts water quality standards. The water quality standards are intended to maintain the environmental quality of surface waters, including specifically fisheries and other aquatic species.

The Clean Water Act requires surface water bodies, which would include the Westfield River, to meet surface water quality standards. If a water body does not meet the standards for a particular pollutant or other water quality criterion, then the state must

establish a Total Maximum Daily Load ("TMDL"). The TMDL limits the total load of that pollutant into the receiving water body, from all dischargers, as needed to achieve compliance with the standard. Imposing a total allowable load then requires the State to allocate that total acceptable pollutant load among those discharging to the water body, in the form of discharge limits. MADEP has listed the segment of the River adjacent to the project site as being impaired for taste, odor, color, turbidity, and noxious plants; however, the State has not yet diagnosed the cause of the degradation or set a TMDL for the River.

The pollutants that will be discharged in the wastewater stream from the biomass power plant are "conventional" pollutants that are regulated in almost all discharge, and no toxics or EPA "priority pollutants" that have their source in discharges of industrial chemicals are anticipated to be present in the wastewater, or in the stormwater. The pollutants that will be discharged in the project wastewater, with the exception of aluminum, are regulated primarily because they degrade the overall quality of water as a habitat rather than because they are toxic to organisms that live in the water. Under both the federal Clean Water Act and the Massachusetts regulations, the heat associated with a heated water discharge is defined as a pollutant, and is the primary pollutant that will be present in the Russell Biomass wastewater. Total suspended solids (TSS), aluminum, phosphorus, and total residual free chlorine (TRC) will also be pollutants present in the wastewater.

The primary contaminant in the stormwater from the site will be Total Suspended Solids (TSS), although oil and grease will also be a potential component. The pollutants, biochemical oxygen demand (BOD), chemical oxygen demand (COD) and total organic chlorine (TOC) will not be significant components of the wastewater or stormwater generated at the facility.

3.9.5 Compliance with Discharge Limits

The water that is discharged to the Westfield River will meet proposed discharge limits for all regulated parameters. Total Residual Free Chlorine, which includes bromine, will be less than 0.2 mg/liter, and, as noted above, final pH of the discharge will be between 6.5 and 9.0 standard units. More detailed discussions follow with regard to wastewater discharge limits for aluminum, phosphorous, temperature, as well as TMDL issues.

Aluminum

Aluminum, which is the only metal added to the system in the treatment of the raw water prior to use, will react with phosphate in the system. The evaluation performed by Russell Biomass estimated that the final aluminum concentration in the discharge would be between 0.5 and 1.0 mg/liter. Using the maximum aluminum concentration and the dilution ratio at the River's mixing zone, and using the lowest-seven-day flow statistic defined previously for the River (7Q10 flow), the estimated concentration of aluminum in the stream at the edge of the mixing zone would be 86 µg/liter. This is below the US EPA Acute Ambient Water Quality Criterion of 750 µg/liter. Russell Biomass also estimated the in-stream concentration after mixing; this would be 6.0 µg/liter, which is below the EPA Chronic Ambient Water Quality Criterion of 87 µg/liter. The method used to estimate the concentrations was appropriate for this type of analysis. Aluminum is a "conservative" substance, as that term is used by chemists, which means that all the aluminum discharged remains in the water system. It does not evaporate into the air or biodegrade in the water environment. The analysis performed accounts for all the aluminum in the system. Aluminum is toxic to some aquatic plants and to fish. The toxic effects of aluminum are increased at low pH (acidic water), particularly to fish, and the Water Quality Criteria were set to protect fish. The Chronic Criterion is the concentration that will not be harmful to fish based on 96-hour exposure (4 days), and the Acute Criterion, which is nearly ten times higher than the chronic criterion, is the concentration that will not be harmful to fish

that are exposed at that level for one hour. The available monitoring data for the Westfield River show ambient pH values generally between 6.5 and 9.0 standard units. The 2001 Westfield River Watershed Water Quality Assessment Report reported only one value below 6.5 in the River, and NPDES Monitoring data from other discharges to the River indicated only two values out of 50 below 6.5, but none of the values were below a pH of 6.0. Aluminum is more likely to be bioavailable to fish at pH < 5.5. The aluminum discharge from the proposed facility will not result in unacceptable degradation of river water quality, and would not be expected to be harmful to fish.

Phosphorus

Phosphorus is added to the feed water for the boiler as tri-sodium phosphate along with other treatment chemicals that capture dissolved solids that otherwise could precipitate out of the water in the boiler at high temperature and pressure. In addition to the added phosphorus, phosphorus is also present in the river water, and is not removed as part of the pre-treatment. Based on the data provided, approximately 25 to 35 percent of the phosphorus that will be discharged to the river will have originated in the raw water pumped from the river in the first place. The phosphorus in the feed water to the boiler and in the water used in the cooling tower will be concentrated because of the evaporative water loss. Phosphorus is a conservative substance, and the total mass of phosphorus will be present after water evaporation, thus increasing the concentration in the discharged water. Phosphorus is non-toxic, but it is a plant nutrient that can enhance growth of algae and other nuisance aquatic plants.

Publicly operated wastewater treatment works (facilities), or “POTWs,” that treat domestic wastewater are a primary source of phosphorus in ambient water; phosphorus is excreted in human waste and is concentrated during wastewater treatment. Poorly managed agricultural runoff, or runoff from grazing areas also contribute some phosphorus to rivers. Most of the phosphorus loading to the Westfield River is from POTWs, as there is very little land bordering the river in

agricultural or grazing use. According to the 2001 Assessment, approximately 5 percent of the land use in the segment of the watershed that includes the project is agricultural. Most of the land, 84 percent, is forested. Approximately 5 percent is residential. Forested land protects against runoff of nutrients, and maintaining the forests will continue to provide this protection. Some land uses downstream of the proposed facility, particularly golf courses, may contribute nutrient-rich runoff if they are not properly managed. Many rivers in Massachusetts are nutrient rich because of multiple wastewater discharges, but the Westfield River is not a critical river for regulation of phosphorus because it does not have a lot of discharges from POTWs upriver from of phosphorus in the river, based on the 2001 Westfield. The background concentration Water Quality Assessment, is 0.03 mg/liter. With the discharge from the Russell Biomass Facility, the resultant concentration of phosphorus was estimated at a maximum 0.037 mg/liter at low flow. This concentration is below the in-stream concentration of 0.1 mg/l recommended by EPA to prevent growth of algae and aquatic plants leading to potential eutrophication problems. The calculations performed by Russell Biomass used the appropriate methods, and are conservative (err on the side of overstating impacts), by using the highest estimated discharge concentrations. ARI concurs that the anticipated level of phosphorus discharge would not have a significant adverse impact as a nutrient for algae and nuisance aquatic plants.

A detail for the Town of Russell to consider regarding phosphorus discharge to the River by Russell Biomass is potential future impact on permit limits for the Russell Village POTW and the Woronoco Village POTW. The prospects for such regulatory clamp-down are probably unlikely. This is because the baseline concentration of phosphorus in the Westfield River is very low, and the total predicted concentration of phosphorus in the River after the addition of the Russell Biomass NPDES discharge will be 0.037 mg/liter, well below the current EPA criterion of 0.1 mg/liter. The increased phosphorus concentration will be less than 3 percent of background. Nonetheless, it would be prudent for the Town of Russell to enter into an agreement with Russell Biomass that if MADEP or EPA proposes a possible tightening of the

Town's discharge limits for phosphorus in the future, and if those limits are in any way affected by the addition of the Russell Biomass discharge, Russell Biomass will assist the Town technologically and financially, as necessary to meet the new limits at either or both POTWs

Temperature

The reach of the Westfield River that will receive the discharge is classified as Class B Warm Water Fisheries. There are data that indicate that cold water species, including trout, Atlantic salmon, and others, are found in the reach, but because of high ambient summer water temperatures, that reach is not classified for Cold Water Fisheries. The river currently does not meet criteria for a cold water fishery because the summer ambient water temperature exceeds 68ºF, particularly in July and August, based on current monitoring data.

The River is Class B because it is not a direct source of drinking water. Because of its classification, the water must meet EPA Ambient Water Quality Criteria for protection of aquatic life and people who consume aquatic life. The water must also meet MADEP criteria for temperature and dissolved oxygen (DO) for warm water fisheries. All relevant criteria are currently met in the Westfield River.

The Ambient Water Criteria for warm water fisheries require that the temperature downstream of the mixing zone of the discharge not exceed 83ºF, and that the change in temperature not exceed an increase of 5ºF. The project will meet both criteria, as demonstrated by an appropriate mixing model using both average monthly flow in the River and the historic lowest-seven-day flow (7Q10 flow). The model shows that the average increase in River water temperature from the heated discharge is an increase of between 0.003ºF and 0.014ºF, with the greatest impact in September and October when the flow is lowest. Using the lowest-seven-day flow rate (7Q10 flow), the maximum increase in temperature would be between 0.059ºF and 2.49ºF, with the greatest impact in winter when the difference between the ambient temperature of

River water and the temperature of the discharge is the greatest. This last analysis is particularly conservative (erring on the side of overestimating impacts) because the 7Q10 flow will likely occur in August or September, and not throughout the winter months.

The resulting water temperatures, with the project's discharge, will not exceed the criterion for warm water fisheries of 83ºF at any time. The resulting water temperature will exceed the cold water fisheries criterion of 68ºF only when the ambient water temperature already exceeds 68ºF, which, as noted above, is in July and August.

Russell Biomass conducted a modeling analysis using a conventional dilution model to calculate the temperature of the discharge needed to exceed the criteria. In order to exceed an in-stream temperature of 83ºF at critical low flow conditions, i.e. 7Q10, and with the intake water at the permitted maximum of 82ºF, the theoretical temperature of the discharged water would have to be 240ºF, which would be superheated water at ambient pressure. In order to exceed 83ºF within the mixing zone, the temperature of the discharged water would have to be 96.6ºF. The highest projected temperature of the water discharged from the cooling tower is 84ºF, in July, when the ambient temperature of the intake water is highest, at 75.4ºF, and not the 82ºF used in the conservative mixing model. The model shows an increase in downstream water temperature of less than 1ºF under those conditions. In order to increase the downstream water temperature by 5ºF, the water would have to be discharged at over 800ºF, which could not happen at this facility.

The analysis conducted by Russell Biomass is conservative and technically appropriate, and shows no significant impact on river water temperature as a result of the discharge. Currently, there are no known impacts on cold water fish species that exist in that reach of the river, particularly trout and salmon. The only time the water temperature will exceed the 68ºF criterion for cold water fisheries is when the ambient water temperature is already above that temperature. The trout and other cold water

fish appear to have adapted to the brief excursions of the 68ºF value, and this project will not adversely affect their ability to thrive in the river.

TMDL

Under section 303(d) of the 1972 Federal Clean Water Act, states are required to develop lists of impaired waters. Such impaired waters do not meet one or more water quality standards, even after point sources of pollution on the waterway have installed the minimum required levels of pollution control technology. The law requires that these states establish priority rankings for waters on the lists and develop Total Maximun Daily Loads (TMDLs) for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive from all sources, and still meet water quality standards. Accordingly, A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The determination of a TMDL must also account for seasonal variation in water quality, and considers the flow, chemistry, and assimilative characteristics of the waterbody.

When states develop TMDLs, this is accompanied by an allocation of how much of the total permissible pollutant load can be discharged by each source of the pollutant that has a permitted discharge, and also accounts for nonpermitted discharges, such as sheet flow from stormwater and agricultural runoff.

Water quality standards and TMDLs correspond to the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use.

At the time that the NPDES application was filed, August 2006, MADEP had not yet completed its assessment for the Westfield River for compliance with ambient water standards. This was completed after the application was filed. MADEP's recently

completed assessment found this segment of the Westfield River generally meet the ambient water standards, but to fail one. MADEP found the segment of the Westfield River into which the Russell Biomass facility will discharge as being impaired for the following parameters: taste, odor, color, noxious aquatic plants, and turbidity. The segment will require TMDLs for these parameters. At the current time, MADEP has not identified the cause(s) of the impairment, and TMDLs have not been prepared.

Based on the current assessments statewide, Massachusetts must develop approximately 1,500 TMDLs by 2012. MADEP has a five-year assessment and management plan to assess waterbody impairment and to set priorities for setting TMDLs. The Westfield River basin has recently been added to the MADEP plan, but it has not been assigned a priority for TMDL development. Some of the pollution causing impairment in the reach where the project is located is likely to be naturally-occuring, and MADEP takes natural sources into consideration when allocating discharge limits.

In any case, ARI concurs with the project proponent's conclusion that the discharge from the Russell Biomass facility will not have a major impact on the pollutants identified as requiring a TMDL. The treatment process will likely reduce color and turbidity, so the levels will be lower in the discharged water than in the intake water. Odor and taste should not be significanly affected by the discharge, and growth of noxious aquatic plants may be reduced by the use of chlorine and bromine to control algal growth in the cooling tower. As recommended above in the discussion of phosphorus discharge, the Town should continue to monitor the schedule and status of TMDL development for the Westfield River segment because these may affect both the Russell Village POTW and the Woronoco Village POTW. The Town should enter into an agreement with Russell Biomass LLC to ensure that the operator will assist the Town with developing appropriate control technology if future TMDLs affect discharge limits at the town POTWs, and if those limits are in any way affected by the addition of the Russell Biomass discharge.

3.9.6 Stormwater Collection, Treatment, and Discharge

Stormwater generated by the planned biomass power plant will be collected in three detention basins, treated by settling to remove solids, and combined with process wastewater, discharged through the common river outfall. Although the final discharge will be combined, there will be five separate outfalls on the site for stormwater, three from each of the detention basins, to allow each discharge contributor to be monitored individually and independently. Flows will be combined downstream of monitoring points for discharge to the River.

Stormwater from precipitation and snowmelt currently leave the site as uncontrolled sheet flow. This runoff contains solids, including silt and sand, as well as some organic solids from the current log storage operation at the site. Under the proposed plan, stormwater will be collected and will be released in a controlled manner after sedimentation/settling. Sheet flow from parking areas will be collected in catch basins that have oil/water separators and hoods to collect solids. Oil and grease are present in runoff from pavement because cars and trucks routinely leak and “drip” oil and other fluids, and some oils can leach from pavement, particularly new pavement. The amount of oil on a paved surface depends on the type and amount of traffic and the number of dry days since the last precipitation event. The amount of oil present in runoff depends on the intensity of rainfall, with the most oil present in runoff in the first half hour of an intense rainstorm. Solid particles will be present in runoff from the wood fuel piles.

The project will produce more runoff once it is built than it does currently because of the increase in impervious surface, particularly due to new onsite roads and roofs. While the large wood-storage area will be unpaved, and unlikely to increase runoff, there will be some increase from water flowing off the wood storage piles themselves. When precipitation falls on a surface, a portion infiltrates, a portion runs off the surface, and a portion is returned to the atmosphere as evapotranspiration

(evaporation from the surface of land and water and transpiration from the respiration of green plants). During the precipitation event, there is no evapotranspiration, but this factor may be significant after the event, particularly when there is bright sunshine, and low relative humidity. Therefore, evaporation from the surface of the detention basins can be a factor even in winter, although transpiration is negligible.

Infiltration and runoff are controlled by the surface type, slope, and soil type, as well as by the intensity of the rain event. Runoff is nearly 100 percent from impervious surface types such as roofs and pavement. Permeable soils will allow more infiltration than less permeable soils, and vegetation will slow the rate of runoff and allow more time for infiltration. Slope is critical, as there is less time for infiltration on steep slopes than on shallower slopes.

New projects that will generate stormwater must demonstrate that the runoff flows from the site will not be greater after development than before development.

Russell Biomass projected its stormwater impacts using a model that is based on protocols developed by the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), formerly Soil Conservation Service (SCS) protocols. The model, HydroCad 7.0^{R}, uses both hydraulic and hydrologic data for the site to calculate the amount of runoff from specific “design storms”. The design storms required for analysis by MADEP were a storm that would generate 0.5 inches of runoff based on historic regional climatological data, and the most extreme storms that would be expected over 2-year, 10-year, and 100-year periods. The 2-year storm is the storm which will have the greatest intensity, both in amount of rainfall and duration of rainfall, that can be expected statistically to occur every two years, and the other design storms are defined similarly. The detention basins proposed for the site will retain stormwater and release it at a controlled rate over sufficient time, such that the maximum flow rates of stormwater leaving the site after development of the project will be less than currently, at the undeveloped site. Controlling the release rate of the of discharge to the River, and reducing the suspended solids such as sands, silts, and carbon in the discharge, will improve the overall quality of water in the Westfield River. This is because the stormwater flow from the site into the River after development of

the project will be less than it is today, and because the solids content of the runoff with the project development would be less than in the present stormwater discharge.

In summary, stormwater will be treated for removal of suspended particles, to prevent excessive quantities of eroded soil, wood dust, and other solid matter from reaching the River. Excess suspended particles will be removed by the standard method of storing stormwater runoff in a detention pond long enough for the particles to settle out, before the water is discharged. ARI concurs that this is the standard approach for treating stormwater and it should provide sufficient removal of suspended solids to enable the stormwater to meet NPDES discharge limits for suspended solids.

Currently, there is evidence of erosion on the slope east of the formerly developed portion of the site, in an area that was recently mined for sand and gravel. The slope has been partially vegetated in an attempt to control erosion, but there were erosion fissures in the slope at the time that ARI visited the site in July 2007. This erosion is contributing solids and turbidity to the river. Turbidity (water cloudiness from suspended solid material) is one of the parameters identified for TMDL by MADEP. Reducing turbidity by sedimentation will improve overall river water quality

3.9.7 Impacts of the Discharge on the Westfield River

Russell Biomass LLC has evaluated the environmental impacts to fish, mussels (including two protected species of mussel), and other aquatic life that could result from the proposed discharge of treated wastewater and stormwater to the River. Such impacts could potentially occur as a consequence of discharging water that is warmer in temperature than the River water, and contains pollutants at permitted levels. The project proponent also addressed environmental impacts associated with constructing the proposed new outfall. The project proponent's impact assessments in these regards are discussed below.

The expected maximum discharge of 133,000 gpd was compared with the median and extreme low-flow conditions of the River determined as described in the discussion of water intake impacts. The maximum discharge of 133,000 gpd would represent 0.2% of the August median flow, 0.7% of the lowest 7-day flow ("7Q/10" flow defined previously), and just over 1% of the historical single-lowest-daily flow. ARI concurs that the proposed maximum discharge would not significantly affect the River's flow rate.

As discussed above, it has been reasonably demonstrated that, with the planned discharge, the River water would meet Massachusetts Water Quality Standards for surface water bodies. Those Standards are intended to protect fish and other aquatic species. In addition, the project proponent has reasonably demonstrated that fish would have an adequate zone of passage by the discharge area, without adverse impact from exposure to the discharge flow and its associated heat and pollutants. This is because the discharge would meet MADEP's criteria in this regard. The geometry of the River below the discharge location (an inverted-pyramid trough) is such that the discharge mixing zone would not extend beyond half of the River's area or volume, leaving an adequate zone of passage without significant exposure to the discharge. In addition, the enhanced mixing of the discharge by the riffle downstream from the discharge point shortens the required mixing zone for dissipation of effluent heat and pollutants.

As noted above, this reach of the Westfield River has been designated as habitat for two species of protected mussel. A specialist in mussel taxonomy performed a survey of mussels and their habitat in the vicinity of the project site in 2004 and again in 2007. Findings were consistent between the two studies. The purpose of the 2007 mussels survey was to document the suitability of the River habitat for the protected Creeper and Triangle Floater mussels, in the vicinity of the proposed water intake and discharge locations. Downstream of the proposed discharge point, the habitat was found to be unsuitable for mussels in general, and the Creeper and Triangle Floater in particular (e.g., rocky bottom, fast flow, and near the outfall, shallow water). Except for

a few common mussels at one location, no mussels were found below the Westfield Paper Company dam. ARI concurs that the survey adequately demonstrates that the River at the proposed outfall location and downstream has unsuitable habitat for these mussels, and does not currently support any significant mussel populations.

The survey upstream of the dam entailed the east side of the River, from the dam upstream to the Main St. Bridge. The River in this stretch was found to be generally suitable to support mussel populations, including the Creeper and Triangle Floater species. However, no protected species were found, and very low densities of common mussels were observed there. ARI concurs with the proponent's observation that the lack of common mussels in this reach of the River is likely a "habitat indicator," suggesting the River is not likely to support viable mussel populations at this location. In summary, ARI concurs that the survey work done in the River near the project site provides credible evidence that freshwater mussels are scare there now, and that the habitat is not likely to support significant mussel populations, including the protected Creeper and Floater Triangle varieties of mussel. The project proponent indicates that still another, more thorough mussel survey is planned, and results will be available afterwards for review.

In summary, ARI finds that the project proponent has made an adequate demonstration that the planned discharge to the Westfield River would comply with Massachusetts Water Quality Standards, and that therefore, no adverse effects on fish and other aquatic species should be expected, including to any protected species of mussels, should they be present. ARI concurs that significant survey work performed in the River reasonably demonstrates that no protected species of mussels were found, and that this reach of the River is likely unsuitable to support significant populations of mussels in general. ARI concurs as well that the geometry and mixing characteristics of the River at the planned discharge point are likely to provide adequate mixing of the discharge wastewaters, so that fish can pass safely outside of the mixing zone.

3.9.8 Sanitary Wastewater Flows

The project will use up to approximately 3,000 gallons per day of water from the municipal water system for sanitary and other uses within the plant. This includes drinking water, toilet flushing, showers, and water used in laboratory sinks. Wastewater generated from these uses will be discharged to an on-site subsurface waste disposal system consistent with Massachusetts Title 5, and consisting of a septic tank and leaching area. The proponent will work with a Massachusetts Title 5 soil evaluator under the direction of the Town of Russell Board of Health to design and permit the system. No sanitary or domestic wastewater will be discharged to the Westfield River.

3.10 Visual Impacts of the Power Plant

Besides the structures of the biomass power plant itself, what will likely be most visible to Town residents are white plumes of condensed water vapor ("steam plumes") emitted from the boiler stack and from the cooling tower. These visible plumes are not smoke. Rather, these plumes are actually clouds, that is, they are comprised of tiny water droplets – like fog. Depending on atmospheric conditions, residents may see little visible emissions from the boiler stack, or may see a white cloud-like plume being emitted from the stack. When there is a white condensed-water plume, it may be very short and wispy, or it may persist downwind for a distance before dissipating.

The cooling tower will also emit a white, condensed-water plume quite frequently. Generally, cooling tower plumes can be larger physically and can persist for longer distances than similar plumes from a boiler stack. Accordingly, the white fog plume from a cooling tower can, at times, be a very noticeable intrusion on the viewshed. In addition, the foggy plume from a cooling tower can cause visibility reduction and icing on local roads, if the plume gets close enough to ground to contact the road surface.

Russell Biomass LLC applied a suitable dispersion model to project the frequency of occurrence of condensed-water plumes from the cooling tower, the length of the plumes with regard to the locations of local residences, and the height of the plumes above ground with respect to road safety. One year of hour-by-hour meteorological data from Bradley Field (Windsor Locks, Connecticut) was input to the model. ARI concurs that the meteorological data utilized are adequately representative for the purposes of cooling tower modeling, but would have used data from Westover AFB as also being representative, but closer by. In addition, the Westover AFB data had been used for modeling the impacts from both the stack emissions and truck emissions.

The modeling shows that Town residents can expect to see a white fog plume coming from the cooling tower most of the time. Results indicated that, setting aside rainy, snowy, and foggy days, the white fog plume would be visible more than 90% of the time.

Regarding traffic hazards, the model projected that the cooling tower's plume will extend at times toward, and sometimes past the locations of the Main Street bridge and other Town roads. Importantly, however, results also show that the bottom edge of the plume would stay well above the deck of the bridge and other road surfaces in the Town. Accordingly, ARI concurs with the project proponent's conclusion that the cooling tower plume is not expected to cause visibility or icing hazards to traffic in the Town of Russell.

The model shows that the cooling tower plume would not occur frequently in the direction of the closest residents on Grove Street, or Lincoln Street or River Street. While the cooling tower plume is capable of extending aloft to and beyond those residential areas, this would occur infrequently and the plume would only rarely be visible overhead to residents.

3.11 Existing Site Contamination

The Russell Biomass plant is being proposed for a former industrial site that had been in industrial use for at least 100 years. The project site is a "brownfield site," which is an abandoned industrial property that has fallen into disrepair. As a brownfield, the project site

is appropriate for continued use as industrial property. This is considered a beneficial use of the property, and is preferable to using undeveloped property for industrial development. Redevelopment of brownfields, and maintaining them in industrial use, ultimately protects open space.

The DEIR noted that the property of the closed paper mill included a former lagoon and a former landfill, but that those features were not located within property constituting the site of the planned, biomass power plant. As with most abandoned industrial properties, the proposed project site had some contamination by oils and other materials. Russell Biomass LLC and previous owners of the property have undertaken investigations and cleanups as required by the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. These studies and actions have included soil and groundwater sampling and analysis, excavation and removal of soils contaminated by petroleum, removal of a small number of drums found on the property, and removal of transformers and transformer oil.

In January 2006, Russell Biomass LLC had a qualified consultant conduct an environmental site investigation pursuant to the MCP and determined that there were no current conditions at the site that constituted a “reportable condition” by the MCP. All soil and groundwater samples were below applicable standards, indicating that the previous cleanups at the property were adequate.

ARI independently researched and reviewed the MADEP Sites Database to ensure that there were no regulatory deadlines or requirements remaining for the Russell Biomass property. No open issues were found. The Database shows two closure documents, called Response Action Outcomes, or RAOs, for the property. One was submitted to MADEP in October 2000 for cleanup of petroleum. The document was reviewed by MADEP, and no further action is anticipated. The second RAO was submitted for another area of the property in May 2006, and specifically addressed No. 6 fuel oil. There was a review by MADEP, and, although MADEP has five years to select sites for detailed audits, there is no reason to indicate that this project is not considered complete. The project site appears to be in full compliance with the MCP, and there is no current evidence of soil or groundwater contamination.

If the project goes forth, and site work is undertaken at the Russell Biomass property, the site engineer will be required to investigate any evidence of contaminated soils that are identified during excavation or site work.

3.12 Hazardous Waste Management

The DEIR outlined the general elements of a Hazardous Waste Management Plan to be put in place once the proposed biomass power plant would be operating. However, no summary was found in the DEIR of the types and quantities of hazardous materials expected to be stored and used on site, except for fuel oil. For example, a description of the amount and concentration of ammonia to be stored on site would have been appropriate (the ammonia concentration was given as 19% and also at a higher percentage in different environmental permitting documents). ARI recommends that a preliminary summary be developed at once by Russell Biomass LLC, and furnished to the Town for review by Russell fire officials and by any other Town entities with responsibility for emergency planning and response.

3.13 Wetlands

As reported in the DEIR, except for the banks of the Westfield River itself, there were no vegetated wetlands found on the site of the proposed biomass power plant. Accordingly, ARI does not see significant wetlands impact issues for the power plant site. Wetlands issues are likely to be more significant for the transmission corridor associated with the project; however, that component of the project is not within ARI's purview of study.

4.0 CONSTRUCTION IMPACTS AND MITIGATION

Construction of the proposed biomass power plant would result in environmental impacts during the construction period. Those impacts would affect residents of the Town of Russell and have the potential to affect the Westfield River. ARI finds that the project proponent has proposed reasonable means to mitigate construction-related environmental impacts,

consistent with normal practices for a power plant project and a site adjacent to valued surface waters.

For example, outdoor construction activity, and the associated noise, would normally be limited to normal daylight work hours, Monday to Friday. Potential dust emissions would be minimized by use of water sprays and other dust suppressing agents, also by minimizing the stockpiling onsite of materials and debris, by ensuring all trucks are covered, by washing trucks and their tires before trucks leave the site, and by periodically sweeping streets to minimize dust accumulation.

There is a potentially significant impact to the Westfield River, should construction activities cause erosion of soils, or should there be a spill of oil or other hazardous material to the soil. The project proponent has outlined plans for soil stabilization, runoff containment and treatment, and rapid hazardous-spill cleanup during the construction period, and would detail these mitigation measures in the required Stormwater Pollution Prevention Plan and Spill Contingency Plan.

ARI finds that the methods and procedures proposed to mitigate environmental impacts during the construction period are standard in the industry, and if fully implemented, are likely to minimize construction impacts to the extent practically feasible. While construction impacts can be reduced via mitigation, some level of impact will nonetheless be felt by residents of Russell. For example, despite mitigation, there will be episodes of annoying noise such as pile driving. Such impacts, while potentially annoying, would end with completion of construction.