1 LAYMAN'S SUMMARY

This Environmental Impact Assessment relates to the proposed Lodz Regional Tramway (LRT) investment project which calls for the modernisation of an approximately 30 km section of the existing Lodz-Zgierz tramway line.

The Lodz Regional Tramway Project will be implemented in Lodz and Zgierz. It will include the modernisation of the existing tramway line, the purchase of rolling stock, installation of traffic control equipment and reconstruction of level crossings. Its objective is to improve access to the centre of the Conurbation, increase traffic safety and reduce environmental burden.

The Project aims to modernise the tramway infrastructure and the associated road infrastructure, including the traffic control system, and to provide modern rolling stock to operate on the upgraded network and use the new traffic control system.

Most of the existing tramway track, i.e. 45 734 m of its length, is a traditionally constructed segregated system, with concrete sleepers carrying railway-type or grooved rails. Some track sections retain wooden sleepers. The intertrack space is filled with crushed stone ballast. In the remaining 10 450 m of the line, mainly in Pabianice, Lodz, along ul. Piotrkowska and along a short section in Zgierz on the approach to the Pl. Kilińskiego terminus, the track is inset into the carriageway. The subgrade is filled with concrete slabs up to the rail level and is then mainly either asphalted or filled with stone setts. All junctions and tram line crossings are of a similar construction.

The Lodz Regional Tramway Project is a City of Lodz development project intended to achieve a significant improvement in the quality of public transport and increase demand for its services within the Lodz Conurbation and thus to make the Centre more accessible and efficient and to improve road traffic conditions, reduce the environmental burden and ensure greater safety of resident users of the transport system.

The Project will contribute to making the land along the tram line more attractive to investors and will provide improved opportunities for access to employment and educational institutions.

Under the terms of Council of Ministers Regulation of 9 November 2004 (as amended), which lists projects with significant potential environmental impact and the criteria governing their submission for Environmental Impact Assessment, the proposed investment project, which comes under Paragraph 3.1, Section 57 (Tramway Lines) of the Regulation is classified as a project with significant potential environmental impact, with an optional EIA requirement.

As a Conurbation project, the LRT will be implemented in stages, as the individual sections are prepared for upgrading, and as funds become available.

The Project will result in the creation of a modern tramway infrastructure, consisting of:

- A tram line together with a contact system, with a total length of 13,5 km and 27 km of single-track line,
- A modernised power supply system with 10 substations and 10 modernised substation buildings
- New platforms and canopies for 31 tram stops, which will improve safety and raise passenger service standards, and will provide disabled access,
- Approximately 60 modernised intersection traffic signals,
- A new LRT traffic control centre,

- A new area traffic control centre covering the area directly affected by the LTR route.

10 modern low-floor trams will also be purchased.

The implementation of the project will contribute to the elimination of adverse environmental impact, by:

- Reducing emission of gases and particulates harmful to the biosphere (NO, NO_2, CO, CO_2, SO_2, formaldehyde, asbestos, heavy metals and many other fuel combustion products).
- Reducing emission of substances harmful to the aquatic environment (oil derivatives).
- Reducing emission of substances harmful to the soil environment (heavy metals and oil derivatives)
- Reducing the discharge of hazardous waste (oil derivative sludge)
- Reducing energy and noise emission.
- Reducing vibration emission.
- Reducing greenhouse gas emissions.
- Reducing the harmful impact of gases and particulates on the adjoining green areas, including those under the protection of the nature conservation authority.
- Reducing the adverse impact of gases on monuments of culture under the protection of the heritage conservation authority.
- Reducing stray current emissions.
- Eliminating equipment containing asbestos and PCB.

TECHNICAL SOLUTIONS

The building work required to reconstruct the LRT track and contact system will include:

- *Dismantling the tram track and its base course;*
- *Draining the roadbed and directing the water flow to the existing sewerage system;*
- *Constructing the base course for the tram track;*
- *Constructing the tram track;*
- *Constructing the junctions together with points drives,*
- *Providing intertrack space enclosures and safety barriers at tram stops;*
- *Reconstructing level crossings, pedestrian crossings and tram stop platforms;*
- *Constructing cable ducts;*
- *Installing tram stop canopies and providing a canopy lighting power supply*
- *Reconstructing the contact system and adapting it to the requirements of the modernised track*
- *Modernising contact system substations.*

The proposed solutions

The project will be constructed mainly along the existing tram lines. The route will end in tram termini. Both the tram track and the tram stops will be modernised as part of the project.

Sections of the line will be modernised to make them suitable for high-speed trams, and area road traffic control will also be introduced. The route will be served by fast, silent-running, high quality trams, enabling passengers to travel in comfort. This will be achieved by using the modern CityRunner tram cars on the route.

Segregated tram track

Straight sections of the segregated tram track will be laid on pre-tensioned prestressed concrete sleepers with SB-3 fasteners, resting on a base course of crushed stone ballast with a coarse sand isolating course. The technologies will be the same as those used on the railways, allowing for the different vehicle parameters.

Inset tram track

The proposed tram track technology will provide protection against noise and vibration caused by the movement of trams, and will reduce to a minimum stray currents caused by track leakage**.**

Passive cathodic protection systems will be installed to protect underground networks located within the substation areas.

The contact network

The contact network will be constructed to Polish Standard PN-K-92002,"Tram and Trolleybus Contact Systems – Requirements" and in compliance with other relevant regulations. Urban transport contact system accessories will meet West European equipment and quality standards: DIN VDE 0216, DIN VDE 0218 – Contact System Accessories and Fittings, DIN VDE 0446 – Contact System Accessories – Isolators; all accessory components will be made of corrosion-resistant materials, and section isolators will have adjustable clearance. Transverse support structures will use corrosion-resistant non-stretch power twist cable. Arms will be made of an insulating material.

Contact system substations

Power consumption levels based on energy balance data will be used to determine the 15 kV network supply requirements of all facilities to be modernised.

Separate medium voltage switchgear will be provided for Lodz Power Supply Company (LZE) equipment located in the contact system substation.

Contact system consumer equipment is listed below. Contact system substation equipment will include:

- 15kV medium voltage switchgear, at least 6-cubicle, with e.g. Evolis vacuum circuit breakers, configured as follows:
    - 2 input cubicles on the Lodz Power Supply Company side,
    - Metering cubicle,
    - Output cubicles to rectifier units,
    - Substation supply transformer cubicle.

- Dry transformers, e.g. Type TZM9T 1100/15, 1200kVA each
- Type MultiMUZ protection systems for each transformer
- 18–pulse ENI-18D-1 rectifiers,
- Substation supply transformer, 40kVA, type TZM 40/15,
- 660V DC switchgear consisting of:
  - Contact system power supply cubicles
  - Standby circuit breaker cubicle
  - Automation system cubicle
  - Return cable cubicle
- UPS 220V DC power supply unit with a gel battery set,
- EZZ earth fault protection system, manufactured by e.g. Elester PKP,
- Metering system for LZE billing purposes, based on LZQM electronic meters with a data transmission attachment,
- Other auxiliary equipment as required, e.g. contact system isolator switch control unit, LTR remote monitoring cubicle, air conditioning, security and fire alarm and a CCTV system.

The DC switchgear must also contain isolator switch carriage drives, to allow efficient remote control with remote activation for operation on automatically disconnected sections**.**

Cable connections between the medium voltage LZE switchgear, the Consumer's medium voltage switchgear and the transformers and rectifiers will be made using YhdAkX 120 single-core cables.

In line with the above requirements, the new substations will be equipped with a distributed internal control and remote monitoring system, e.g. the CZAT 3000 plus system, currently used in all such tram and train contact system power supply equipment operating in Poland. The system will use fibre optics connections between individual devices within each substation and between substations and the Contact System Control and Monitoring Centre, thus ensuring the required appropriate data transmission level and speed.

Underground infrastructure located within the substations' supply areas will be protected by a passive cathodic protection system.

Segregated tram track

Straight sections of the segregated tram track will consist of S-49 rails, while bends will consist of Ri-60N rails at least 20 m long, solid and laid on pre-tensioned prestressed concrete sleepers (with shorter sleepers used in tram stop areas) with SB-3 ties, resting on a prepared base course of ballast and coarse sand isolating course.
Rails joints will be termite welded. Transition joints between S-49 and Ri60N rails will be made by upsetting and termite welding.

Street crossings will use S-49 rails twisted into a prefabricated check rail, or Ri60N rails.

At level crossings, the track will be laid on a 30 cm thick base course of B-35 dilated reinforced concrete resting on a B-15 concrete levelling course up to 5 cm thick.
Level crossings will be laid on a B-35 concrete base course with an average thickness of 15 cm, and asphalted to the following specification:

- 2 cm anticracking membrane consisting of a fine-grained mineral and elastomeric asphalt mix,
- 3 cm wearing course consisting of an MNU (inequigranular material) and elastomeric asphalt mix, while pedestrian crossings will consist of moulded concrete paving setts.

The surface course of level crossings and pedestrian crossings must lie 0,002 - 0,005 m below the highest point of the rail section.

While repairing the tram track, the prepared base course and the trench walls will be lined with protective material ensuring isolation, filtration, stable load bearing capacity and the least possible, uniform track subsidence.

While repairing to the base course, signal cable ducts will be made in the street crossings.
Barriers and enclosures, corrosion protected by zinc coating and spray painting, will also be installed.

Tram stop platforms will consist of vibration moulded paving setts, and will be provided with a white safety strip located 0,5 m away from the edge of the track.

Inset tram track

The technology to be used in the construction of the tram track will ensure protection against vibrations and noise generated by the running of the trams and will reduce to a minimum stray currents due to track leakage.

Rails will be anchored to the base course, continuously supported and separated from the polyurethane resin road surface.
Minimum materials specification:

- Ri60N grooved rails, minimum steel strength Rm = 800MPa
- 2 cm vibration insulating panels with the following parameters:
  Breaking strength 2,5 x10^4Mpa
  Compression set after 240 hrs at 40^{0}C at 20% deflection - 10% (PN-80/C-04290)
- EDILON CORCELAST TO rail fastener material

Young's modulus	3.0 MPa
Compression strength	10 MPa
24 hr hardness	55 +/-5 ShoreA
7 day hardness	60 +/-5 ShoreA
Tensile strength	1,75 MPa
Surface resistance	1,0 x $10^9\Omega$
Volume resistance	1,0 x$10^9\Omega$
Absorbability	<3%

The straight sections of the tram track will consist of Ri60N rails at least 20 m long, while junctions, tracks connecting junctions at interchanges and bends will consist of grooved Ri60 or Ri59 rails resting on a concrete base course.

The track will be laid on a base course of B-35 dilated reinforced concrete resting on a B-10 concrete levelling course. In addition, polymer vibration insulating panels will be laid across the whole width of the repaired track, under the concrete base course.

The rails will be fixed to the base course with ϕ 24 anchors sunk into the concrete every 1,5 m along straight sections of the track, every 1 m on bends and every 0,67 m at interchanges, attached with ŁP-3 anchor blades, and with protection provided for the fastener assembly.

The rails and junctions will be solidly grouted-in with polyurethane resin grouting, to a minimum thickness of 2,0 cm, with the base of the rail also grouted in.

Spring-loaded points with interchangeable blades will be used, suitable for operation with position control drives and blade locking. The points will consist of Ri60 rails made of grade 900 A material, suitable for attachment to a concrete base.

Frogs will be of the block type, with connecting rails consisting of full-head rails and shallow-groove sections having a minimum hardness of 360 HB. Frogs and blades will be made of high-strength, high abrasion resistance material, $R_m \geq 1000$ MPa, and hardness $\geq$ 360 HB (e.g. with manganese steel fish plates), in order to extend service life.

Track surfacing will be of the SMA type, made of elastomeric asphalt and surface-roughened. The top of the surfacing will lie 0,002 - 0,005 [m] below the highest point of the rail section. The gap between

the rail and the road surface will be filled with filling compound.

Tram stop platforms will be clearly distinguished from the remaining part of the pavement through the use of material of a different colour or texture. Enclosures in the intertrack space in the platform area and pedestrian barriers will be of the rod and rolled section type.

CURRENT DEVELOPMENT STATUS OF THE AREA

The Lodz Regional Tramway will run through areas within the administrative boundaries of Lodz and Zgierz, representing many different forms of development and functionality. In view of the function of rail-based public transport, these are mainly urbanized areas, with occasional open spaces, consisting either of agricultural or of waste land (e.g. the open space along the Pabianicka – Ksawerowska section, which lies to the west of ul. Pabianicka, and has been acquired by investors, initially for a future IKEA mall).

A typical urban alignment is represented by Lodz city centre, where the tram track is inset into the carriageway (e.g. ul. Piotrkowska) or is separated from it, usually by means of a central reservation in a dual carriageway (e.g. Al. Kościuszki).

In addition to the above typical development pattern, other sections include:

- Multifamily housing developments - (e.g. ul. Zgierska near ul. Pojezierska, with the Jagiełło housing estate).
- Single-family housing developments with services - (e.g. the north of ul. Zgierska).

In Lodz, the tram route also runs past a number of individual facilities:

- Institutions where children and young people are present at all times or during the day:

1. ”Art” – a private secondary art college at ul. Piotrkowska 114,
2. The Organisation and Management Department of the Lodz Polytechnic, at ul. Piotrkowska 266,
3. The Lodz Medical University at Al. Kościuszki 4,

- Hospitals and clinics:

1. Polimed – Laser – a private polyclinic at ul. Piotrkowska 204/210,
2. Best – Med – a private clinic at ul. Piotrkowska 182
3. M. Kopernik Regional Specialist Hospital at ul. Pabianicka 62,
4. Jerzy Nofer Clinical Hospital, part of the Institute of Occupational Medicine, at ul. Św. Teresy od Dzieciątka Jezus 8[1],
5. W. Biegański Regional Specialist Hospital at ul. Kniaziewicza 1/5[2].

- Social welfare facilities:

1. Lodz Central MOPS Day Centre at Al. Kościuszki 29,
2. Lodz Central MOPS Day Centre at ul. Piotrkowska 203/205,
3. Municipal Social Welfare Centre at ul. Piotrkowska 147/149,
4. Health Care and Treatment Centre at ul. Kniaziewicza 1/5[3].

[1] Area adjoining ul. Zgierska.
[2] Area adjoining ul. Zgierska.

Types of land development along the LRT route within the Lodz administrative area

Tram route section	Land development	
	Type of land development	Comments
ul. Pabianicka from city limits to ul. Chocianowicka – west side	Agricultural and waste land	No noise level regulations
ul. Pabianicka from city limits to ul. Chocianowicka – east side	Single family housing development	Well-spaced detached houses, Ruda Estate
ul. Pabianicka from ul. Chocianowicka to ul. Rudzka – west side	Municipal Transport Company (MPK) depot and Ner River Valley	No noise level regulations
ul. Pabianicka from ul. Chocianowicka to ul. Rudzka – east side	Single family housing development including craftsman services	Except for Ner Valley
ul. Pabianicka from ul. Rudzka to Pl. Niepodległości	Multifamily housing developments	Interspersed by developments of detached houses with services
ul. Piotrkowska from Pl. Niepodległości to Al. Kościuszki – ul. Zachodnia to ul. Zgierska	City Centre	Variable density development
ul. Zgierska from ul. Zachodnia to ul. Biegańskiego	Multifamily housing developments	Including the Wł. Jagiełło housing estate
ul. Zgierska from ul. Biegańskiego to ul. Sasanek – east side	Woodland area, A Mickiewicz Park	Sokołówka River Valley
ul. Zgierska from ul. Kniaziewicza to city limits – west side	Single family housing development including craftsman services	Except for Sokołówka River Valley and the MPK Helenówek train depot
ul. Zgierska from ul. Sasanek to city limits – east side	Multifamily and single family housing developments with services	Multi-family housing development, Radogoszcz East housing estate

Analysis of the above tram route leads to the conclusion that the proposed investment project is not located in the immediate vicinity of, and does not pass through the following facilities :

- National Park protection zones,
- Areas of outstanding natural beauty and their protection zones,
- Protected landscapes,
- ECONET areas

The tram line does run past several nature monuments located in ul. Pabianicka (2 maple trees) and ul. Jabłoniowa, 200 m from its intersection with ul. Zgierska (1 lime tree).

[3] A Welfare Centre located on the W. Biegański Regional Specialist Hospital site adjoining ul. Zgierska.

PROJECT OPTIONS

In view of the fact that the proposed investment project calls for the modernisation of the existing infrastructure, no other implementation options were examined.

Based on an integrated study, the Warsaw Development Planning Office prepared a traffic analysis for the existing situation (Base Case) in 2003, as well as a 2010 forecast for the following tramway network development options:

Option 1 – Based on the current condition of collective transport subsystems, and involving their modernisation and incorporation of improvements bringing them into line with higher service standards and the expected provision requirements.

Alternative Option 1 – An option based on the current condition of collective transport subsystems, and involving their modernisation and incorporation of improvements bringing them into line with higher service standards and the expected provision requirements, but with the city centre line running in a tunnel and then along ul. Piotrkowska.

Option 2 – This option envisages using the Lodz railway junction to provide internal transport services in Lodz, and specifies the transport volumes which could be taken over by the railway. Under this option, suburban train services to Ozorkowo, Pabianice and Lutomiersk would be discontinued.

Option 3 – This option calls for building a metro line between Teofilow and Janow by 2030. This line would have 23 stations, and the tram routes would remain as at present, with some services discontinued. It further envisages extending the suburban (regional) tram services to Ozorkowo - Zgierz, Pabianice as well as Konstantynowo and Lutomiersk.

Based on a comparative analysis which also took into account the real financial and organisational capabilities, Warsaw Development Planning Office experts recommended for implementation Option I, as meeting the basic functional requirements (raising the standard of travel while maintaining a high share of public transport in non-pedestrian journeys (approx. 60%), as well as being realistic in terms of what the City's capabilities.

The technical and technological solutions proposed by the Project will not only increase the capacity of the route but also improve the living conditions for nearby residents, thanks to the use of silent, vibration-free vehicles.

In addition, the preferred public transport option is environmentally friendly, causing no damage to the soil and water even in the event of collision between trams, or to the nearby trees and facilities under the protection of the heritage conservation authority, since it emits no SOx, which are the cause of acid rain.

THE BASE CASE

If it is not decided to modernise the existing tramway line, the line will continue to deteriorate, and this will further aggravate traffic management problems and compromise safety. Retaining the status quo without taking remedial action will increase the number of accidents and lead to a further loss of service quality.

Track condition has been evaluated by experts on the basis of site visits and documents in the possession of MPK. An internal review held by MPK in 2003, which produced a Report on Tram Track Status in Lodz, describes individual sections of tram routes, listing track widening areas, supporting rail wear on bends and vertical wear of rails. The report contains a list of track sections requiring major overhaul, a number of them on the LRT route.

Failure to implement the project will retain the status quo, i.e. rapid growth of car traffic without the alternative of fast, convenient travel within the Conurbation for residents and for those able to use convenient means of collective transport, and leaving those who don't own their own transport vehicles to travel in the existing discomfort, felt most acutely at peak times, when it is essential to get to work fast.

The tram track

The bulk of the existing tramway track, covering 45 734 m of the line, is a traditionally constructed segregated system, consisting of concrete sleepers with railway-type or grooved rails attached to them. Some track sections retain wooden sleepers. The intertrack space is filled with crushed stone ballast. In the remaining 10 450 m of the line, mainly in Pabianice, Lodz, along ul. Piotrkowska and along a short section in Zgierz on the approach to the Pl. Kilińskiego terminus, the track is inset into the carriageway. The base course is filled with concrete slabs up to the rail level and is mainly either asphalted or filled with stone setts. All junctions and tram line crossings are of a similar construction. These technologies are outdated, and must be replaced with newer ones.

The power supply system

The contact system equipment was installed mainly in the 1960s and 1970s and has basically not had a thorough structural upgrade since its commissioning date. The large variety of power supply equipment types installed at the substations leads to the conclusion that they are between nineteen and fifty two years old. In many cases, damaged subassemblies cannot be repaired, as they are no longer manufactured and the stock of spare parts has been exhausted. The existing solutions make it virtually impossible for the contact system to continue in operation. An example of this situation is provided by medium voltage pneumatic circuit breakers. **Systems of this kind produce stray currents which cause the deterioration of underground infrastructure, such as water, gas and district heating pipelines and power supply and telecommunications cables laid in the vicinity of the track**. **In addition, stray current drainage systems installed at the existing substations are out of order.**

It must be remembered that the tramway line to which the investment project relates continues in operation, and thus continues to exert an environmental impact.

BRIEF DESCRIPTION OF THE PROJECT ENVIRONMENT. THE EXTENT OF ENVIRONMENTAL DETERIORATION

The hydrogeological environment

Lodz lies at the junction of two major structural units, the north-west striking Kuyavian-Pomeranian High and the Mesozoic Mogilensky-Lodz Depression. The Kuyavian-Pomeranian High consists of faulted Jurassic formations rich in many mineral deposits, including salt, iron ore, limestones and marls, but has had no impact on the city's commercial development. The High contains both mineral and thermal waters. The Mogilensky-Lodz Basin consists of Cretaceous formations, and importantly contains a major ground water reservoir.

The relief of the area is composed of numerous depressions and uplifts running north-west to south-east, as well as meridional troughs cutting through the Jurassic and Cretaceous formations, among them convex upwarps.

The Mesozoic basement is overlain by Ternary deposits. They occur randomly, filling depressions in the Cretaceous and Jurassic surface. They are thickest in the bottom section of the Lodz fosilliferous valleys, where non-commercial coal clay deposits have been found.

The outer strata consist of post-glacial Quaternary deposits (a tight mantle of unconsolidated rocks, loams, clays, sands, gravel, pebbles and erratics) of various thicknesses, thinning out towards the south-west, and broken up by tectonic features.

The Lodz Ternary and Quaternary formations have high water content, while the frequent occurrence of postglacial formations has meant that they have found universal use: this applies in particular to their clay, sand and gravel beds.

Lodz overlies four aquifers: Lower Cretaceous, Upper Cretaceous, Ternary and Quaternary. Lower Cretaceous waters form the deepest (up to 940 m) aquifer currently in use. Their hydrogeological qualities are excellent: the waters are fresh, with low salt content and close to uniform chemical composition. They supply factory and municipal water main intakes. Like the Lower Cretaceous, Upper Cretaceous waters are infiltration waters, and are subartesian, which means that they retain their pressure. Their hydrogeological qualities are good.

This aquifer has served as the main water source, especially for Lodz industrial plants, which has resulted in a significant drop in its water level.

The area's Ternary waters are of no municipal importance, unlike its Quaternary waters.

Quaternary waters differ considerably in terms of their occurrence and filtration environments, and thus in terms of their pressure.

They are weakly saline infiltration waters of very varied chemical composition. The differences arise from the different pressure communication between the four subhorizons into which in the Quaternary deposits may be divided.

The natural conditions in the project area

The route of the Lodz Regional Tramway runs from the boundary between Lodz and Ksawerowo, continuing along ul. Pabianicka to pl. Niepodległości and then along ul. Piotrkowska, Żwirki, Al. Kościuszki, Zachodnia and Zgierska to the boundary between Lodz and Zgierz.

The area has a varied relief, with the LRT running along the surface of the postglacial high, intersected by the Ner, Olechówka, Jasienia Łódka, Bałutka, Sokołówka and Brzoza river valleys. The city's rainwater flows into the rivers. Differences in altitude between the river valley bottoms and the watersheds which form the local high points can reach several meters.

PROTECTED AREAS

Natura 2000 areas

The project will be implemented outside Natura 2000 areas. The closest protected area is the Warsaw-Berlin marginal stream valley PLB 100001, which will not be affected by the project either during its implementation or thereafter.

IMPACT ON ATMOSPHERIC AIR. AIR PROTECTION

Calculations have shown that the route under consideration will not produce excessive atmospheric emission levels. The calculations were carried out for two options:

1. Base Case – Retaining the status quo

2. Options assuming project implementation in 2008 and 2020

Calculations carried out for traffic volumes forecast for 2008 and 2028 have shown that the projected increase in traffic intensity will be accompanied by an increase in air pollution. It can be assumed that the modernisation of the tram line and the forecast decrease in road traffic will result in lower air pollution than that produced by the base case, under which the tram line would not be modernised.

Calculations for an option assuming that the track would not be modernised have shown higher pollution levels, with the 2028 option showing excessive nitrogen dioxide emissions.

Calculations have shown that the implementation of the Lodz Regional Tramway project would reduce air pollution by approximately 11 % for the 2008 option and by approximately 9 % for the 2020 option. It may therefore be concluded that track reconstruction will have a beneficial effect on the city's air quality.

IMPACT ON THE ACOUSTIC ENVIRONMENT

Reconstruction of the tram line will not increase noise emission levels. In fact, the reconstruction could significantly reduce noise generated by road vehicles, since it will lead to a reduction in the number of vehicles using the relevant section of the road.

Noise generated by rail-based vehicles travelling along the route may be reduced by implementing the following measures:

- Repairing cracked rails and replacing deformed rails,
- Replacing rail fastenings with more robust ones, gripping a longer section of the rail (e.g. SKL),
- Using additional rubber pads between the rails and the sleepers,
- Using rubber inserts in the rail chamber,
- Raising the track bedding course to reach the rail head.

Road reconstruction should be followed by a post-completion environmental impact assessment, and if measurements show that maximum allowable emission levels have been exceeded, steps should be taken to minimise the environmental impact of the traffic.

IMPACT ON THE SOIL AND WATER ENVIRONMENT

Estimated future precipitation levels:

F - 54 ha catchment area
Q = 130 l/sec * ha
ψ = 0,8 run-off factor
Q rain = 54 ha x 130 x 0,8 = 5 616 m^3/sec

Rainwater will be drained from the track via standard street inlets, into the municipal stormwater drainage system or combined sewerage system, and rainwater from the road crown will be channelled into the nearby rivers (Sokółowka, Bałutka, Brzoza, Obrzynka, Jasień, Olechówka, Ner and Łódka).

Rainwater sewer outfalls emptying into the receiving waters will be fitted with settling tanks or oil derivative separators.

Combined system sewers will direct rainwater from the road crown, including rainwater from the tracks, to the group Effluent Treatment Plant. The plant includes many separators capable of separating various contaminants, including oil derivatives.

Rainwater drainage from the road crown and the tracks will meet the requirements of Paragraph 19.1 of Minister of Environment Regulation of 8 July 2004 (Dz.U. No 168, Item 1763), specifying the requirements for effluent discharge into waters or into the ground, and listing especially environmentally harmful substances.

The existence of a sewerage system in most of the adjoining area facilitates the capture, disposal and treatment of rainwater from the parallel running road crown. Outside Pabianice and Zgierz, rainwater from sections of national roads is surface-drained, and does not undergo preliminary treatment.

WASTE

No waste other than municipal waste (Code 20 03 01) will be generated during the operation of the line.

No repairs to communal road or rail-bound transport vehicles (other than emergency repairs) will take place in situ, with all repair work carried out in the tram depot repair shops.

No hazardous waste will be generated in the event of collision between trams.

The types of waste generated along the Lodz Regional Tramway route and the adjoining transport routes are listed below.

Types of waste generated along the Lodz Regional Tramway route and the adjoining transport routes – Projection

Item No.	Waste code	Description	Waste management method	Projected quantity [Mg]
1	**13 05 01**	*Solid waste from sand traps and from oil separators*	Recycling	20
2	**13 02 05 ***	*Oil separator dewatering sludge*	Recycling	20
3	**20 03 03**	*Street cleaning waste*	Disposal	5
4	**20 03 06**	*Drainage waste*	Disposal	15
5	**20 03 01**	*Unsegregated municipal waste*	Disposal	10
6	**15 02 02 ***	*Spent sorbents*	Disposal	2
7	**16 02 13***	*Discarded equipment containing hazardous components other than those listed under 16 02 09 - 16 02 11*	Disposal	3
8	**16 02 14**	*Discarded equipment other than 16 16 02 09 - 16 02 13*	Disposal	1
9	**16 02 15***	*Hazardous parts or components of discarded equipment*	Disposal	14
10	**17 01 01**	*Concrete waste*	Recycling	1
11	**17 01 81**	*Road repair waste*	Disposal	20
12	**17 01 82**	*Other waste*	Disposal	10
13	**17 04 05**	*Steel waste*	Recycling	30
14	**17 04 07**	*Mixed metals*	Recycling	1
15	**17 04 09***	*Metal waste contaminated with hazardous substances*	Disposal	2
16	**17 02 02**	*Glass*	Recycling	1
17	**17 02 03**	*Plastic waste*	Disposal	2
18	**17 05 03 ***	*Soil contaminated with hazardous substances*	Disposal	2

** Hazardous waste*

The following approaches to the management of waste generated along the tram route have been adopted:

1. Waste generated along the route will be sorted and collected into sealed, labelled containers.

2. The waste will be delivered to a licensed waste transport, disposal and recycling company.

3. The method of interim storage of the waste will not affect its subsequent disposal or recycling.

Overall, waste generated during the upgrading process and during the subsequent operation of the line is not expected to have an adverse environmental impact.

VIBRATION

There will be no vibration from the operation of silent trams running on track with correctly profiled sleepers. The proposed technology envisages vibration protection based on the use of vibration insulating panels and of a concrete tram track.

NATURE AND SPECIALLY PROTECTED AREA CONSERVATION

Protection of the natural environment against the impact of the project will require careful implementation of all the above recommendations on the reduction of air and noise pollution and maintenance of a clean water environment.

PROTECTION OF CULTURAL HERITAGE

As advised by the Regional Historical Monument Protection Office, there are no monuments listed in the Historical Monuments Register in the immediate vicinity of the project area.

It has been established that the project will not endanger the cultural heritage (e.g. archaeological sites). However, if there is any indication (during excavations) that the project area may contain such sites, building work should be suspended and the Regional Heritage Conservation Authority or the District Council notified. Work should only be restarted after a recovery programme has been agreed and archaeological oversight established.

PUBLIC CONSULTATION

The consultation was preceded by a press announcement (Dziennik Łódzki, 4 January 2005, as well as a notice published on www.zdit.uml.lodz.pl as well as in other media. In addition, individual invitations were forwarded to 7 NGOs in current contact with the Highways and Transport Directorate (ZDiT) on transport issues.

The consultation took place on 11 January 2005 in ZDiT offices at ul. Piotrkowska 175, Lodz. There were 13 participants from various organisations and higher educational institutions. The meeting was chaired by a ZDiT representative, and those present included the Chairman of MPK and consultants involved in the specialist studies.

After a presentation on the project (the principles of the Lodz Integrated Public Transport Development Plan and a description of the concept and requirements of LRT as a component of the Plan) the meeting was opened for discussion.

Key issues addressed in the discussion included:

- The need to include in the project the Conurbation's member communes other than Lodz – it was explained that at the preliminary project stage invitations were sent to 5 communes other than Lodz, but only one of them, Zgierz, agreed to participate, while the others decided that they lacked the finance required to contribute to the project; in spite of this, the concept and the composition of the Feasibility Study were designed for the line as a whole, from Pabianice in the south to Zgierz in the north.
- The need to separate tram traffic from the remaining road traffic, so as the trams can have an uninterrupted passage. This is going to be achieved by separating the tracks and by installing coordinated signalling activated by the trams. On shared roads (on the south side of ul. Piotrkowska) barriers will be used to separate the tram track from the road traffic.
- The implementation of the LRT project will call for a decision about the future of other tram transport services providers (MKT and the Suburban Tram Company, Spółka Tramwaje Podmiejskie).
- A number of specific solutions were discussed, including traffic segregation, area traffic control granting priority to public transport and the location of tram stops.

In conclusion, the meeting gave its support to the project, considering it to form an important component of sustainable transport policy in Lodz and the Conurbation, and hoped for its speedy and efficient implementation.

MINIMISING ENVIRONMENTAL BURDEN DURING PROJECT IMPLEMENTATION

All building work imposes various burdens on the environment and the community. The environmental burdens caused by project implementation will be difficult to avoid. Limiting their extent and duration will have an important impact on the scale of interference with the environment and will require appropriate management of the operations.

Waste

Waste must be transported to the municipal dump site as it is generated, with recyclable waste sent to scrap metal or to secondary raw material purchasers, while hazardous waste is removed to a separate location within the disposal site or to another location agreed with the relevant authorities.

Pollution, noise and vibration protection

The selection of equipment and transport vehicles should include considerations of their environmental impact. This includes such aspects as fuel consumption, fuel type, exhaust gas emission, noise, vibration and the technical condition of the equipment and vehicles, as well as their proper operation and maintenance. Machinery and equipment must not be overloaded, and must be able to meet noise and exhaust gas emission requirements.

To reduce noise and vibration during operations, machinery must be of good quality and properly maintained. Work carried out in the vicinity of residential areas must be limited to daylight hours. To avoid adverse impact of vibration, equipment such as vibrating rollers, compactors, pile drivers and others should not be used in the vicinity of vibration-sensitive facilities.

Soil and water protection

Building work must be conducted so as to ensure:

- That surface waters are protected against silting up resulting from the increased surface erosion of the building site, and against contaminants washed out of materials used during the modernisation work and leaking out of machinery and road vehicles,
- That there are no changes and no reduction of surface watercourse and ground water flows,

- That there are no open zones allowing direct contact between ground and surface waters, so as to prevent ground water contamination,
- That building machinery parking and maintenance areas are protected against leakage of oil derivatives into the ground and into ground waters.

THE CONCEPT OF LOCAL MONITORING

Once the line is in operation, it is proposed to conduct a post-completion noise level analysis of the noise-protected area (where the road passes through residential developments).

It is also proposed to conduct periodic tests and to monitor discharged rainwater quality at all test points at outfalls discharging into receiving waters. The frequency of these tests should be specified by the relevant authority at the tramline operating stage.

During the building and modernisation stage, records should be kept of the quality and quantity of waste generated by the operations.

In conclusion, we wish to note that the proposed investment project will bring measurable environmental and economic benefits and to predict that it will meet with public approval, and this leads us to believe that it complies with the principles of sustainable development. In view of the growing socio-economic links between the Conurbation's member communes, there is an urgent need to strengthen and develop the public transport system in the area between the proposed transit routes.

Considered from the point of view of system-based transport solutions, the Lodz Regional Tramway should be regarded as a means of reducing car travel by making public transport services widely available and improving their quality so as to reduce the heightened environmental impact in the area, resulting from the Conurbation's economic development and the associated increased goods traffic volumes.